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USAAVNTA PROJECT NO. 64-28

ENGINEERING FLIGHT TEST OF THE UH-1B HELICOPTER EQUIPPED WITH THE MODEL 540 ROTOR SYSTEM

PHASE D

FINAL REPORT

BY

LAUREL G. SCHROERS AND JOHN R. MELTON
PROJECT ENGINEERS

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PROJECT PILOTS

DECEMBER 1966

U. S. ARMY AVIATION TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA

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ABSTRACT

A Phase D engineering flight test of the UH-1B helicopter equipped with the Model 540 rotor system was conducted by the U. S. Army Aviation Test Activity (USAAVNTA). Objectives of the test were to determine the airworthiness and to define the performance characteristics and flying qualities of the helicopter. Test results, where appropriate, were compared with previous test results of the standard UH-1B. Tests were conducted at Edwards Air Force Base, California, and at remote test sites in California and Colorado from 19 May 1965 through 30 April 1966. Total aircraft flight time totaled 336.30 hours. Quantitative helicopter performance was defined for hovering, takeoff, climb, level flight, and autorotation. Stability and control characteristics were investigated for varied conditions of altitude, airspeed, center-of-gravity location, and gross weight. Correction of the self-excited, self-sustaining pylon motion encountered or determination of its effect upon component stress and life is necessary to resolve the safety-of-flight implications of this deficiency. Correction of the shortcomings listed in this report would result in improved mission performance of the UH-1B equipped with the Model 540 rotor system.

FOREWORD

The U. S. Army Test and Evaluation Command (USATECOM) assigned to the U. S. Army Aviation Test Activity (USAAVNTA) responsibility for preparing test plan, coordinating with the U. S. Army Aviation Test Board, executing test, and submitting final report.

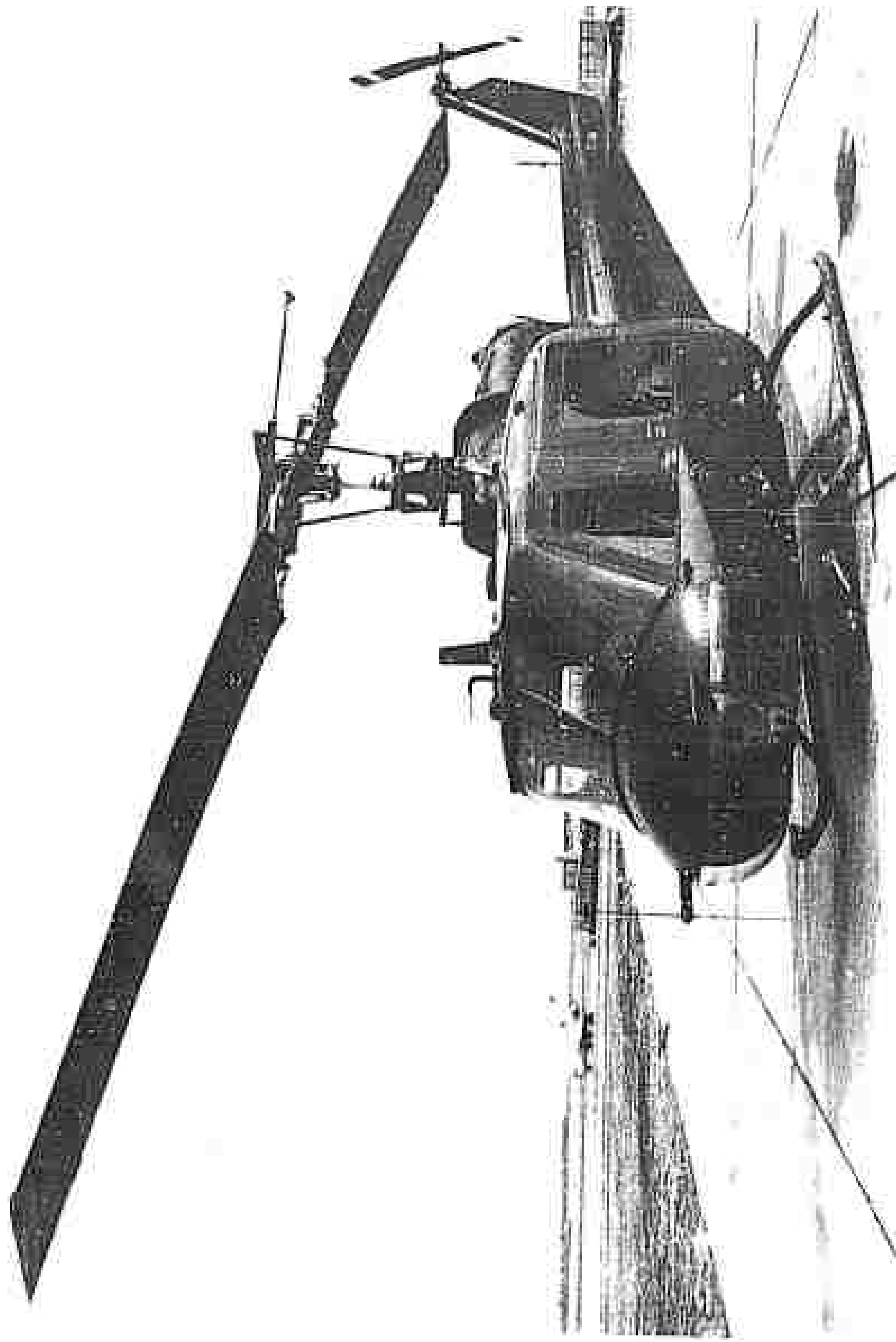


Photo 1 - UH-1B/540 Helicopter

SECTION 1 INTRODUCTION

1.1 BACKGROUND

1.1.1 In October 1963, the contractor proposed a 20-hour flight evaluation of the 540 "Door Hinge" Rotor System at no cost to the Government. In response to request by the Office of the Chief of Research and Development, Department of the Army, in November 1963, the U. S. Army Materiel Command (USAMC) accepted the proposal and assigned the flight evaluation to USATECOM. A 20-hour flight evaluation was conducted by USAAVNTA at the contractor's facility during the period 8 January 1964 to 22 January 1964 using a modified Model 204B helicopter. Based on the results of this evaluation (reference a, appendix VII, "Military Potential Test of the Model 540 'Door Hinge' Rotor System"), the contractor's engineering change proposal ECP-UH-1B-160 (reference b) was procured and the Model 540 Rotor System became standard on production UH-1B helicopters beginning in August 1965.

1.1.2 On 20 August 1964, USATECOM directed USAAVNTA to conduct Phase B and Phase D testing of the UH-1B helicopter equipped with the Model 540 Rotor System (hereafter in this report referred to as the UH-1B/540) in compliance with the request by the Iroquois Project Manager, USAMC. USATECOM issued amendments to test directive on 3 November 1964 and 11 March 1965. Test plan of the engineering test, Phase B and Phase D, was submitted by USAAVNTA in January 1965 and approved by USATECOM on 18 February 1965.

1.1.3 Phase B tests were conducted at the contractor's facilities from 26 February 1965 through 23 March 1965. The results of these tests were presented in reference i. Problem areas uncovered in the Phase B test required that USAAVNTA participate in the contractor's Phase C design refinement tests to evaluate the contractor's corrections.

1.1.4 Phase D testing was conducted from 19 May 1965 through 30 April 1966. Preliminary results were given to the contractor periodically as they became available. This report presents the final results of Phase D testing.

1.2 DESCRIPTION OF MATERIEL

A description of the UH-1B/540 is presented in appendix V.

1.3 TEST OBJECTIVES

The objectives of this test were to determine the airworthiness of the UH-1B/540 and to define the performance characteristics and handling qualities of the aircraft.

1.4 SUMMARY OF RESULTS

Listed in the following paragraphs are the results of the tests. These results are in addition to the specific quantitative results defining the performance of the helicopter during hover, takeoff, climb, level flight and autorotation. A more detailed statement of test results is contained in appendix IV.

1.4.1 A condition of self-induced, self-sustaining pylon motion was exhibited by the helicopter in powered flight in calm air. The pylon (main transmission, mast and rotor) oscillated laterally with a high amplitude at a frequency of 2/3-cycle per main rotor revolution (per rev). The cause of this condition was not defined and its effect upon component life is not known.

1.4.2 Level flight performance with respect to maximum airspeeds available was excellent. Maximum airspeed was limited by takeoff-rated shaft horsepower available for nearly all conditions of gross weight and density altitude. Compared with standard UH-1B test results, the increases in level-flight airspeeds were approximately 15 to 35 knots true airspeed (KTAS) at density altitudes below 5000 feet.

1.4.3 In a takeoff-rated power climb at light gross weight (less than approximately 7000 pounds) with a forward center of gravity (C.G.), there was a discontinuity in the longitudinal cyclic stick-position gradient. A change in airspeed of only 5 knots calibrated airspeed (KCAS) required a change in longitudinal stick position of 1.3 inches, resulting in an apparent instability. It was very difficult to stabilize airspeed at light gross weight near the airspeed for maximum rate of climb.

1.4.4 Static longitudinal stability characteristics in level flight and autorotation were satisfactory for most conditions. In coordinated level flight (trim curves), longitudinal cyclic stick gradients were positive for all conditions tested except for the normal helicopter stick reversal below 40 KCAS. Adequate control margins were present at all conditions but, near the aft C.G. limit of 138 inches, the forward stick position near power-limit airspeed was uncomfortable for an average-size pilot. With collective fixed, variation of airspeed about a 129-KCAS level flight trim point resulted in a slightly negative static longitudinal stick-position gradient at an aft C.G. (137.6 inches).

1.4.5 The collective pitch-rotor speed gradient was small. A large change in rotor speed resulted from a small change in collective pitch. This characteristic, along with RPM lag and overshoot due to high rotor inertia, resulted in difficulty in maintaining a selected rotor speed during autorotation.

1.4.6 The reaction of the helicopter to a throttle chop at speeds above approximately 100 KCAS was objectionable. Following the throttle chop the helicopter would pitch down and roll left abruptly.

1.4.7 Dynamic lateral-directional stability characteristics were poor. Following a lateral or a directional disturbance, a persistent "dutch roll" oscillation developed. In turbulence this characteristic was objectionable.

1.4.8 The pilot was required to "beep" excessively to maintain approximately constant rotor speed during power changes due to poor static droop compensation.

1.4.9 Without a collective pitch position indicator, maximun takeoff performance and stabilized rotor speed in autorotation were difficult to obtain.

1.4.10 It was difficult to achieve a stabilized hover at skid heights between 10 and 25 feet due to random disturbances about all three axes. This condition was not hazardous, but the pilot should be aware of it before conducting operations requiring maximum hovering performance and precision at these skid heights.

1.4.11 Rearward flight was conducted in smooth air at speeds up to 32 KTAS; however, only approximately 4-percent aft longitudinal cyclic stick travel remained at rearward airspeeds of more than 11 KTAS. Stick position stability was neutral with 4 percent remaining from 11 to 32 KTAS.

1.5 CONCLUSIONS

1.5.1 All characteristics of UH-1B/540 were considered to be satisfactory with the following exceptions:

a. <u>Category A. Safety of Flight</u>

The self-sustaining, undamped pylon motion at 2/3 per rev had an unknown effect upon component stress or component life (paragraph 2.4.3).

b. Category B. Mandatory Correction for Satisfactory Mission Performance

There were no aircraft characteristics in this category.

c. Category C. Desirable Corrections for Improved Mission Performance

(1) The static longitudinal cyclic stick-position gradient in a takeoff-rated power climb at light gross weight with a forward C.G. was unsatisfactory near the airspeed for maximum rate of climb (paragraph 2.3.1.2).

(2) The collective-fixed static longitudinal stability was negative near power-limit maximum airspeed in level flight with an aft C.G. of 137.6 inches. At the same condition, the extremely forward longitudinal cyclic stick position required an uncomfortably long reach by the pilot (paragraphs 2.3.1.1 and 2.3.1.3).

(3) The collective pitch-rotor speed gradient in autorotation was small, resulting in difficulty in stabilizing rotor speed during autorotation (paragraph 2.2.5.3).

(4) The reaction of the helicopter to a throttle chop at high speed was objectionable due to an abrupt nose-down pitch and left roll (paragraph 2.3.6).

(5) A "dutch roll" oscillation was present at most flight conditions due to poor dynamic lateral-directional stability characteristics (paragraph 2.3.5).

(6) The static droop characteristics of the test helicopter were unsatisfactory (paragraph 2.4.2).

(7) A collective pitch position indicator was very helpful in obtaining maximum takeoff performance and in establishing stabilized rotor speed during autorotation (paragraphs 2.2.2.4, 2.2.5.3).

(8) It was difficult to achieve a stabilized hover at skid heights between 10 and 25 feet (paragraph 2.2.1.5).

1.5.2 The following characteristic of the UH-1B/540 enhances its mission capability:

The level flight maximum airspeed preformance of the UH-1B/540 was excellent (paragraph 2.2.4.2).

1.6 RECOMMENDATIONS

a. Category A. Safety of Flight

(1) The self-excited, undamped pylon motion should be eliminated or its effect upon component stress or life should be defined (paragraph 2.4.3).

b. Category C. Desirable Corrections for Improved Mission Performance

(1) The static longitudinal cyclic stick gradient discontinuity in a takeoff-rated power climb at light gross weight and forward C.G. should be eliminated. If this characteristic is not eliminated, a note should be placed in the operator's manual indicating that, under these conditions, a climb should be conducted at approximately 10 KCAS above the airspeed for maximum rate of climb when visual horizon reference is restricted (paragraph 2.2.3.3).

(2) The maximum aft C.G. limit should be changed to station 135 (paragraphs 2.3.1.1, 2.3.1.3, 2.2.4.4).

(3) Collective pitch-rotor speed gradients in autorotation should be increased (paragraph 2.2.5.3).

(4) The reaction of the helicopter following a high-speed throttle chop should be improved (paragraph 2.3.6).

(5) Static rotor-speed droop with power changes should be reduced (paragraph 2.4.2).

(6) A collective pitch position indicator should be incorporated as standard cockpit instrumentation (paragraphs 2.2.2.4, 2.2.5.3).

(7) A note should be placed in the operator's manual to the effect that, in a hover, stabilizing at skid heights from 10 to 25 feet is difficult. Although not hazardous, this characteristic should be considered during operations requiring maximum hover performance and precision at these heights (paragraph 2.2.1.6).

Photo 2 - Preflight on UH-1B/540 Helicopter at Leadville, Colorado

SECTION 2 DETAILS of TEST

2.1 INTRODUCTION

2.1.1 This report presents the results of engineering flight tests of the UH-1B/540 helicopter. Testing consisted of 241 flights and was conducted from 19 May 1965 through 30 April 1966. Total aircraft flight time during the program was 336.30 hours. Test sites were Bakersfield, California (488-foot elevation); Edwards Air Force Base, California (2302-foot elevation); Bishop, California (4118-foot elevation); McAfee Meadow, White Mountains, California (11,500-foot elevation); and Leadville, Colorado (9927-foot elevation).

2.1.2 Performance tests defined the performance of the UH-1B/540 helicopter during hover, takeoff, climb, level flight, and autorotation. Stability and control tests defined the helicopter's static longitudinal and static lateral-directional stability, dynamic longitudinal and dynamic lateral-directional stability, reaction to a throttle chop, sideward and rearward flight characteristics, and controllability about all three axes. Details of test methods and data reduction procedures are presented in appendix III.

2.2 PERFORMANCE

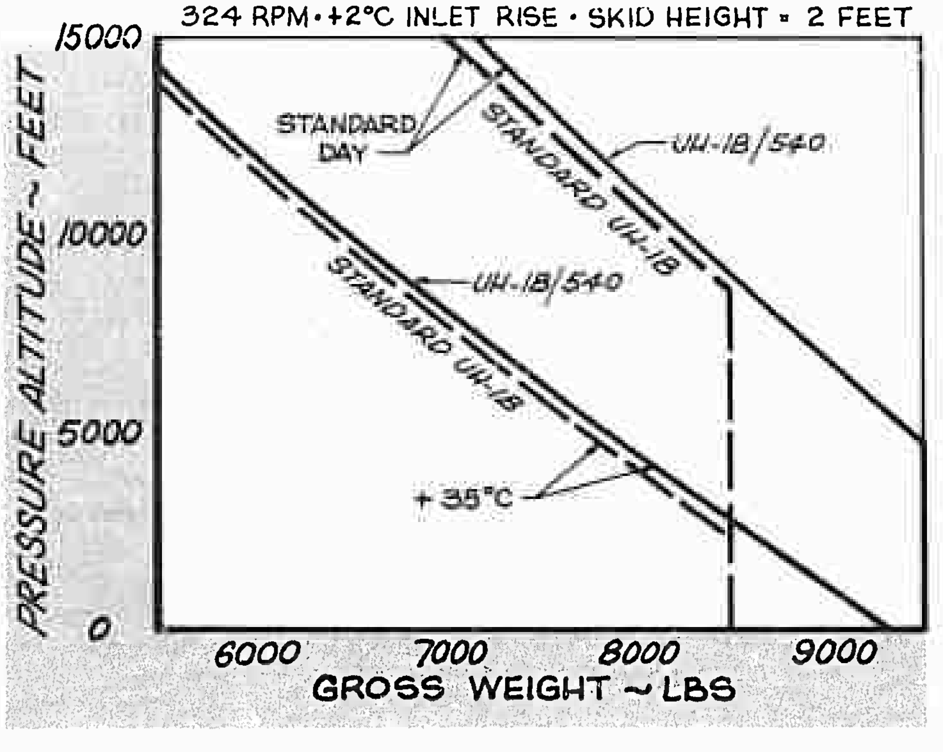
One of the primary parameters of the performance characteristics presented in this report was the gross weight of the helicopter. When direct comparison of the performance of the UH-1B/540 and the standard UH-1B was made it was on a gross-weight comparison basis. It should be noted while making performance comparisons that there was a significant difference in the empty weights of the two helicopters. The detail specification for the FY64 (standard) UH-1B (reference m) defined the empty weight as 4616 pounds. The detail specification for the UH-1B/540 (reference m revised) defined the empty weight as 4842 pounds. The empty weight differential was 226 pounds.

2.2.1 Hover

2.2.1.1 Hover tests were conducted at gross weights from 5800 to 9400 pounds; density altitudes from 1600 to 10,500 feet; rotor speeds of 300, 304, 314, and 324 rpm; skid heights of 2,5, 10, 15, and 25 feet; and out of ground effect (OGE). Both free-flight and tethered hovering techniques were used. Test results are presented in figures 5 through 10 and are summarized in figures 1 through 4, appendix I.

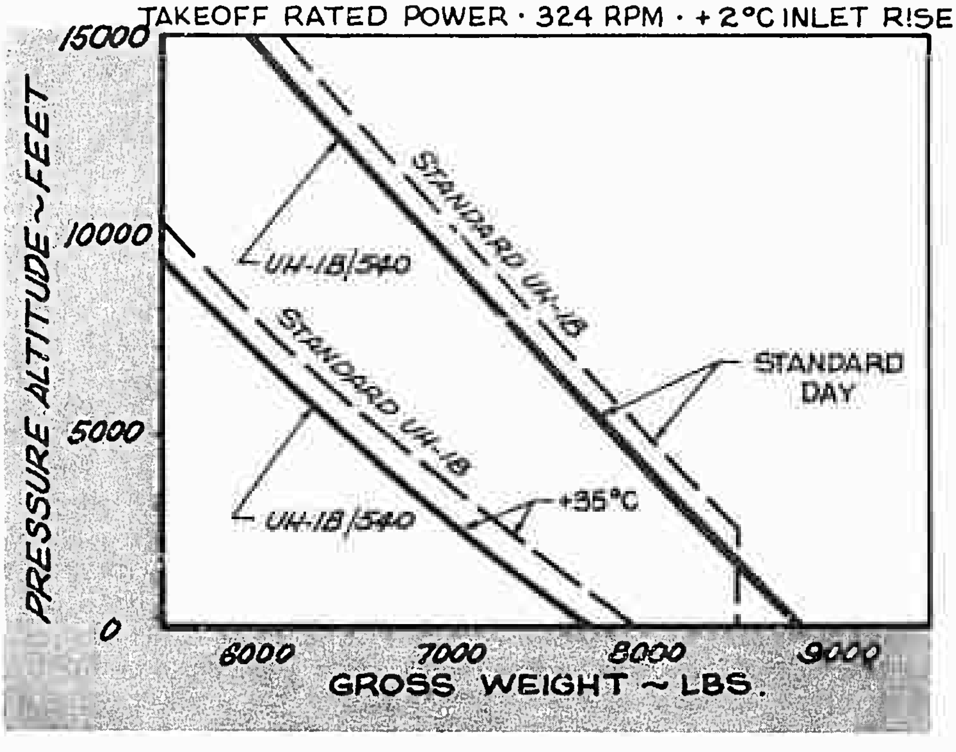
2.2.1.2 The in-ground-effect (IGE) (2-foot skid height) hover ceiling of the UH-1B/540 is shown in figure A and illustrates the improvement in IGE hover performance compared to that of the standard UH-1B. On a standard day, the 2-foot hover ceiling at 9500 pounds gross weight was 4400 feet. At any particular altitude on a standard day the UH-1B/540 could hover at approximately 130 pounds heavier gross weight than the UH-1B at gross weights below the standard UH-1B limitation of 8500 pounds. On a 35-degree Centigrade (C) day, the UH-1B/540 could hover at approximately 60 pounds heavier gross weight than the UH-1B at gross weights below 8500 pounds. At sea level on a 35-degree C day, the maximum gross weight for a 2-foot hover was 9330 pounds; this represented an increase of 830 pounds in the hovering capability of the UH-1B/540.

FIGURE A
In Ground Effect Hover Ceiling
TAKEOFF RATED POWER
324 RPM • +2°C INLET RISE • SKID HEIGHT = 2 FEET



2.2.1.3 The OGE hover ceiling of the UH-1B/540 is shown in figure B. The maximum gross weight for OGE hover at sea level on a standard day was 8825 pounds. The OGE hover capability of the UH-1B/540 was less than that of the standard UH-1B on a standard day at altitudes above 1600 feet. Above 3500 feet on a standard day, the UH-1B could hover at an approximately 170 pounds heavier gross weight than the UH-1B/540. On a 35-degree C day, the UH-1B/540 maximum gross weight for OGE hover at sea level was 7725 pounds. The standard UH-1B could hover at an approximately 210 pounds heavier gross weight than the UH-1B/540 on a 35-degree C day.

FIGURE B
Out Of Ground Effect Hover Ceiling
TAKEOFF RATED POWER · 324 RPM · +2°C INLET RISE



2.2.1.4 Table 1 summarizes a comparison of the hover ceilings both IGE and OGE of the UH-1B/540 and the standard UH-1B at 6600 pounds gross weight. The IGE hover performance of the UH-1B/540 was limited by power available at altitudes above 4400 feet on a standard day and at sea level on a 35-degree C day. The OGE hover performance of the UH-1B/540 was limited by power available at sea level on a standard day.

TABLE 1
HOVER CEILING - FEET

	IGE		OGE	
	Std Day	35°C Day	Std Day	35°C Day
UH-1B/540	17,550	10,360	11,600	4210
UH-1B	17,150	10,100	12,350	5560

Gross Weight 6600 pounds; IGE Skid Height 2 feet.

2.2.1.5 Figure 2, appendix I, summarizes the hover performance of the UH-1B/540 in calm air at takeoff-rated power for periods in excess of 2 minutes. This plot indicates a decrease in IGE hover ceilings compared to those obtained at the same conditions for periods less than 2 minutes (figure 1). This decrease in hover performance was due to the decrease in takeoff-rated shaft horsepower available when hot engine exhaust and cooling air established a hotter-than-ambient engine inlet condition. Figure 2 was based on shaft horsepower available derived from the compressor inlet temperature rise as a function of skid height presented in figure 223, appendix I.

2.2.1.6 The skid height at which the UH-1B/540 was OGE varied with thrust coefficient (C_T). At the lowest C_T's tested, ground effect was measurable at a 45-foot skid height; this skid height increased to 50 feet at the highest C_T's tested. In the range of skid heights from 10 to 25 feet, it was quite difficult to achieve a stabilized hover in calm air. Random inputs about all three axes disturbed the helicopter attitude, requiring corrective control inputs. These corrective control inputs in turn disturbed power to the main rotor and thus skid height. These disturbances were probably due to the disturbed recirculating airflow through both the main rotor and tail rotor. Interaction of the recirculating airflow and the horizontal stabilizer may have been a contributing factor. Although this condition was not hazardous, it should be considered during operations requiring a 10- to 25-foot skid height and maximum hovering precision and performance.

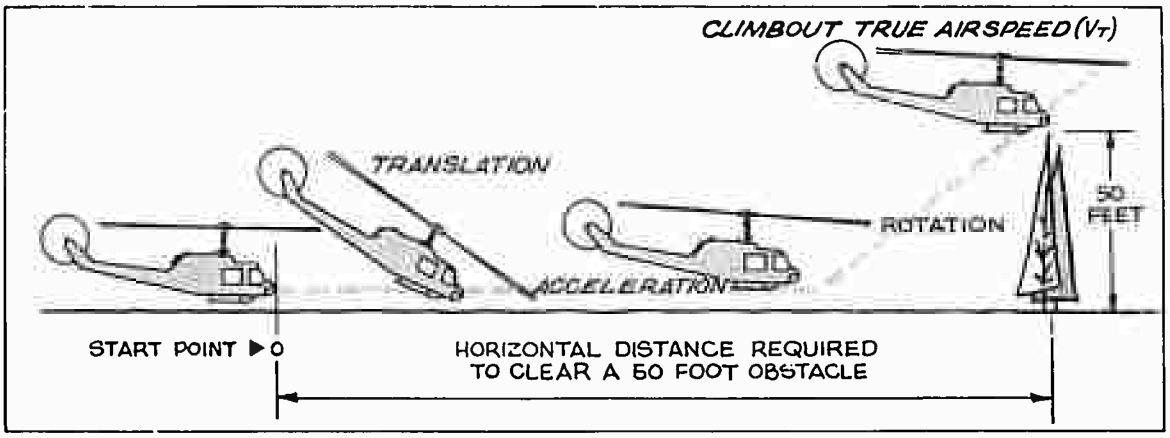
2.2.2 Takeoff

2.2.2.1 Takeoff performance tests were conducted at gross weights from 6100 pounds to 7590 pounds, pressure altitudes from 9500 feet to 9760 feet, and ambient temperatures from -5 degrees C to +1.5 degrees C. Results of the takeoff tests are presented in figures

11 through 20, appendix I. Takeoff performance data are most informative under conditions of limited helicopter performance. In the limiting case, the 2-foot skid height-level acceleration technique offers the only practical means of performing a takeoff without bleeding rotor energy.

2.2.2.2 Figure C illustrates the characteristic takeoff flight path obtained by using a 2-foot skid height-level acceleration technique. Starting from a stabilized hover at a skid height of 2 feet, the takeoff was initiated by simultaneously demanding takeoff-rated power from the engine and accelerating through the translational airspeed of 8 to 15 KTAS. Through the acceleration phase, skid height was maintained at approximately 2 feet. When airspeed reached 2 to 5 KTAS less than the desired climbout airspeed, the helicopter was rotated and the climbout made at a constant airspeed.

FIGURE C
Take Off Flight Path
TWO FOOT SKID HEIGHT LEVEL • ACCELERATION TECHNIQUE



2.2.2.3 Engine acceleration to takeoff power was very smooth with uniform rated torque increase. This allowed the pilot to anticipate and correct accurately any yawing tendencies. Due to the rather high lag in the power turbine speed-select (beep) system, full increase (maximum beep) had to be selected at, or just prior to, takeoff power demand to avoid excessive transient rotor droop. When the helicopter was passing through the translational airspeed range, ground effect was diminished. When operating at low power margins, when nearly takeoff power was required to hover at a 2-foot skid height, the helicopter would settle passing through translation. A power margin allowing a minimum hovering skid height of approximately 3 feet at takeoff power was required to avoid contacting the ground when the helicopter was passing through translation.

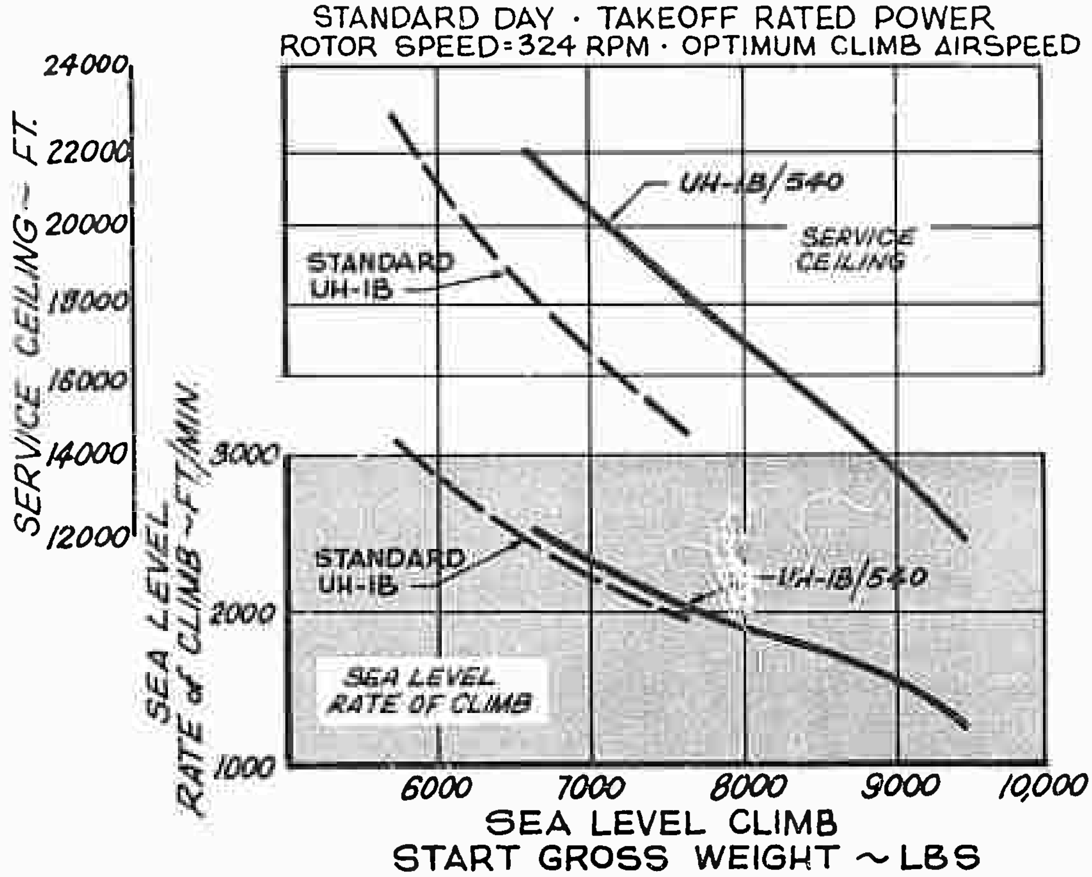
2.2.2.4 When operating at very low power margins, it was necessary to demand full power as quickly as possible so that full power had already been developed as the helicopter passed through translation. The test helicopter was equipped with a collective pitch position indicator as part of the flight test instrumentation. This instrument proved very useful in obtaining maximum takeoff performance. In a hover prior to takeoff, collective pitch was increased until takeoff power at the test conditions was obtained. The collective pitch position at takeoff power was noted. The takeoff was then initiated from a 2-foot skid height hover by rapidly and smoothly increasing collective pitch to the takeoff power position previously noted. During the level acceleration it was necessary to increase collective pitch to maintain takeoff power. With high values of excess power, uncomfortably large nose-down pitch attitudes were required to maintain the acceleration skid height. During climbout, airspeed was maintained by referring to helicopter attitude. The standard airspeed system was not usable at low airspeed due to its large fluctuations and errors.

2.2.3 Climb

2.2.3.1 Climb tests were conducted from sea level to service ceiling at four gross weights. Two climbs were performed at each gross weight, at takeoff-rated power and rotor speed of 324 rpm. Climb airspeed was the airspeed for minimum power required in level flight at the test conditions. Test results were corrected to standard-day conditions. Standard-day service ceilings ranged from 21,800 feet at 6600 pounds gross weight to 11,750 feet at 9500 pounds gross weight. Standard-day sea-level rate of climb ranged from 2530 feet per minute (fpm) at 6600 pounds gross weight to 1230 fpm at 9500 pounds gross weight. Results of the climb performance tests are presented in figures 21 through 24, appendix I.

2.2.3.2 Figure D illustrates a comparison of the climb performance of the UH-1B/540 and the standard UH-1B. Both the service ceilings and sea-level rates of climb were improved for the UH-1B/540. Service ceilings through the gross weight range common to both helicopters were raised approximately 3500 feet. Standard-day sea-level rates of climb through the gross weight range common to both helicopters were increased approximately 50 to 100 fpm.

FIGURE D
Climb Performance



2.2.3.3 The presence of the static longitudinal cyclic stick gradient discontinuity (see paragraph 2.3.1.2) in the region of the airspeed for best rate of climb at light gross weight made it very difficult to stabilize at optimum climb airspeed. The only practical method of stabilizing at optimum climb airspeed was to maintain the proper pitch attitude by constantly correcting any small deviation from that attitude with longitudinal cyclic stick inputs. If indicated airspeed was used as a primary reference, large (up to ± 10 KIAS) excursions in airspeed were experienced. The change in rate of climb with increased airspeed was quite small near the airspeed for maximum rate of climb. Little climb performance would be sacrificed by increasing climb airspeed approximately 10 KIAS when this condition is encountered. This procedure is recommended for flight without a well defined horizon reference or under instrument conditions.

2.2.4 <u>Level Flight</u>

2.2.4.1 Level flight performance tests were conducted at gross weights from 5110 pounds to 9190 pounds, density altitudes from 1780 feet to 15,850 feet, and rotor speeds of 324 rpm and 314 rpm. Basic level flight performance was defined for the helicopter with a mid C.G. Two flights with a forward C.G. and two flights with an aft C.G. were made to define the effect of C.G. upon power required. One flight was made with the cargo doors removed. The level flight speed-power polars are presented in figures 29 through 50, appendix I. Power required in level flight is summarized in non-dimensional form in figures 26 through 28. Specific range and optimum cruise speed summaries are presented in figure 25.

2.2.4.2 Figures E, F, and G illustrate the maximum level flight airspeeds of the UH-1B/540 for both takeoff-rated power and maximum continuous power for three altitudes. At any altitude or gross weight on a standard day, the UH-1B/540 could be operated at maximum continuous power and not exceed the helicopter's never-exceed airspeed (V_{NE}). Airspeeds at maximum continuous power at sea level ranged from 125 KTAS at 6600 pounds gross weight to 115 KTAS at 9500 pounds gross weight. The maximum airspeed in level flight was limited by takeoff-rated power available for nearly all conditions. The only exception, when V_{NE} limits were imposed, was at a condition of high gross weight and low density altitude (sea-level standard day at gross weights more than approximately 8900 pounds). The sea-level standard-day power-limit airspeed at 6600 pounds gross weight was 135 KTAS. At 5000 feet on a standard day, power-

FIGURE E
Level Flight Vmax
Sea Level
STANDARD DAY · 324 RPM · MID C.G.

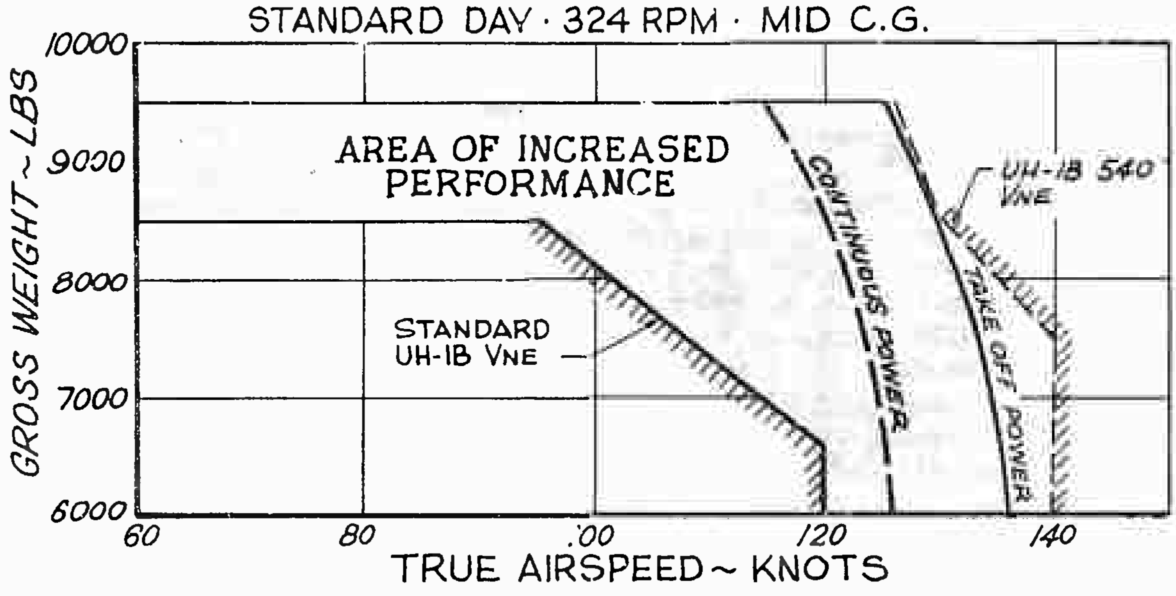


FIGURE F
Level Flight Vmax
Mid C.G.
5000 FEET • STANDARD DAY • 324 RPM

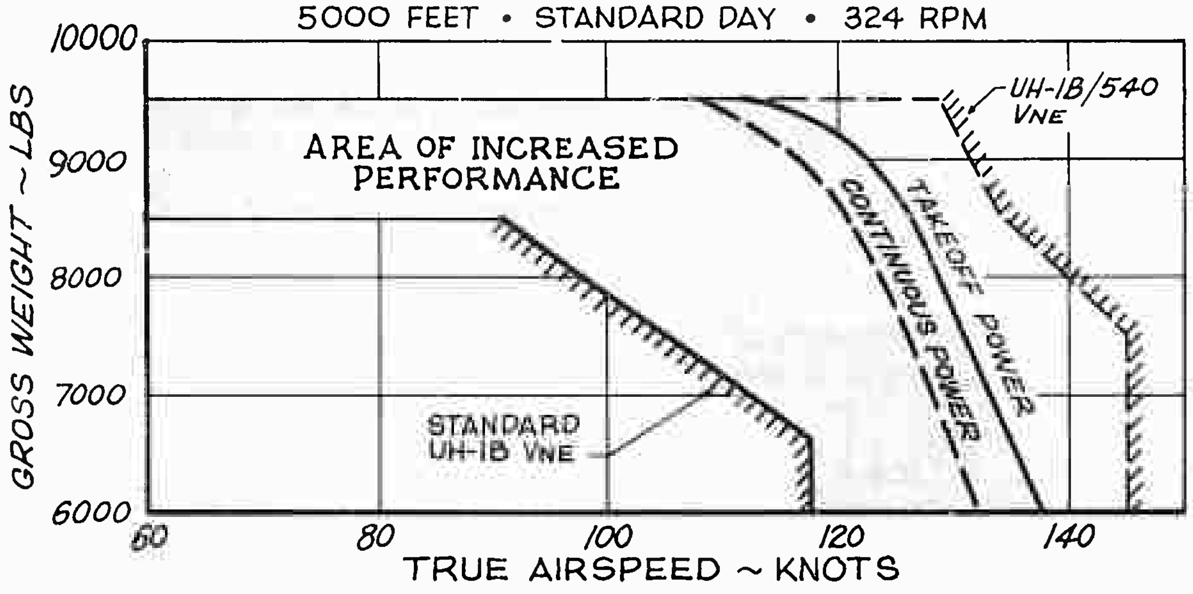
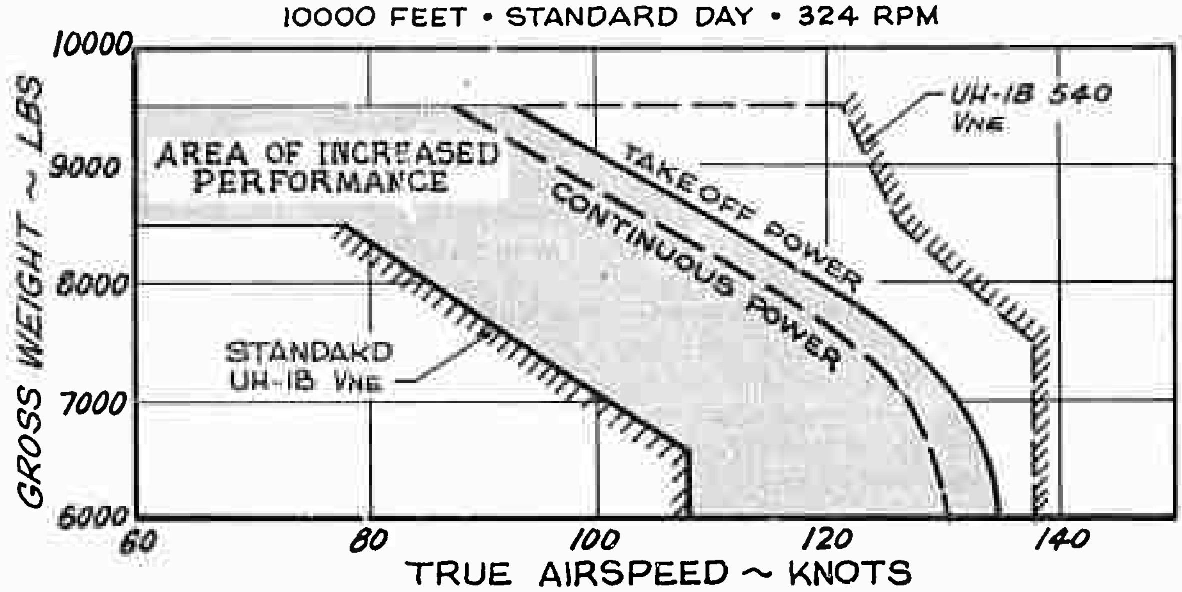


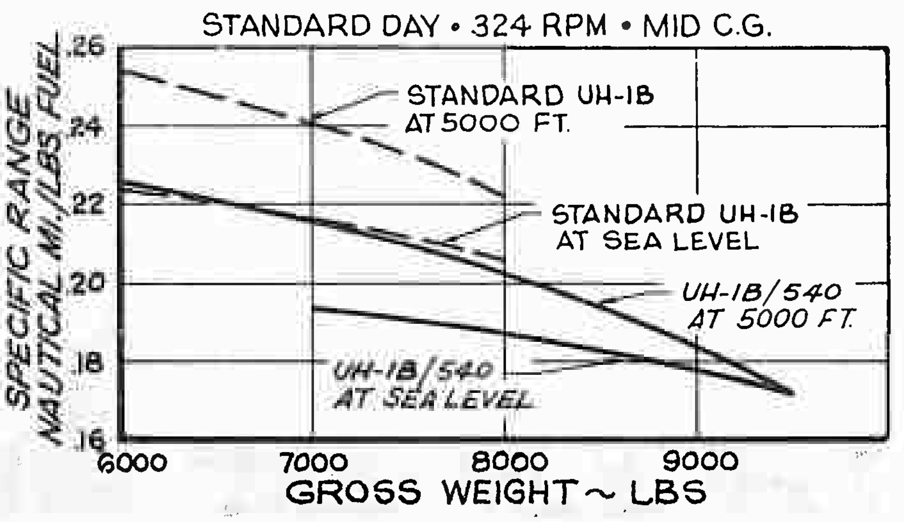
FIGURE G
Level Flight Vmax
Mid C.G.
10000 FEET • STANDARD DAY • 324 RPM



limit airspeeds ranged from approximately 136 KTAS at 6600 pounds gross weight to 113 KTAS at 9500 pounds gross weight. The standard UH-1B was limited by V_{NE} throughout its gross weight and altitude envelope. This limit is shown in figures E, F, and G. In general, the increase in level flight speed of the UH-1B/540, compared to the level flight speed of the standard UH-1B, was 15 to 35 KTAS.

2.2.4.3 Examples of specific range performance at optimum cruise speed of the UH-1B/540 are shown in figure H. These examples were derived from figure 25, appendix I. Specific range of the UH-1B/540 was reduced from that of the standard UH-1B. The decrease in specific range was approximately 10 percent at both sea level and

FIGURE H
Specific Range at Optimum Cruise Speed

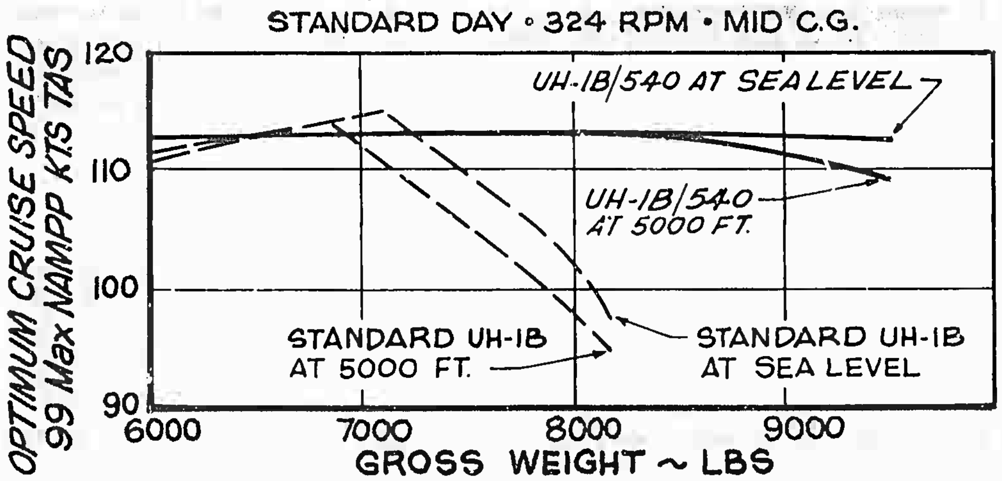


5000 feet density altitude. The airspeeds for optimum specific range, shown in figure I, ranged from 109 KTAS to 113 KTAS at altitudes between sea level and 5000 feet density altitude. At a gross weight of 9500 pounds, the airspeed for optimum cruise was very nearly the airspeed at maximum continuous power (± 2 KTAS). At lower gross weights the airspeed at maximum continuous power increased up to a maximum of 20 KTAS higher than the optimum cruise speed (133 KTAS compared with 113 KTAS at 5000 feet density altitude and 6000 pounds gross weight). Optimum cruise speed at sea level and 5000 feet density altitude was nearly the same for both the standard UH-1B and UH-1B/540 at gross weights up to approximately 7000 pounds. Above that approximate gross weight, the V_{NE} of the standard UH-1B dictated a cruise speed below the optimum cruise speed based on specific range. At 8200 pounds gross weight, optimum cruise speed of the standard UH-1B was 15 KTAS slower than that of the UH-1B/540 at sea level and 18 KTAS slower than that of the UH-1B/540 at 5000 feet density altitude.

FIGURE I

Optimum Cruise Speed

STANDARD DAY • 324 RPM • MID C.G.



2.2.4.4 The effect of a forward or aft C.G. upon level flight performance is shown in figures 40 through 49, appendix I, and summarized in table 2. The equivalent flat plate area increases due to the forward or aft C.G. location when compared with the mid C.G. location were calculated at the recommended cruise speeds. For each case, performance was compared with the level flight performance at a mid C.G. for identical conditions.

TABLE 2

CENTER-OF-GRAVITY EFFECTS UPON LEVEL FLIGHT PERFORMANCE

Center of Gravity in	Gross Weight lb	Density Altitude ft	Recommended Cruise Airspeed KTAS	Equivalent Flat Plate Area Increase ft^2
125.9(Fwd)	8460	5165	113	1.3
126.0(Fwd)	6620	5190	113	1.0
133.9(Aft)	8535	5110	112	0.5
137.9(Aft)	6770	4340	112	2.4

Rotor Speed 324 rpm; mid C.G. location 131.0 inches.

With the cargo doors removed, the power required in level flight was increased significantly. Figure 50, appendix I, indicates that at recommended cruise speed, 108 KTAS, power required was increased by 37 SHP, from 735 SHP to 772 SHP. This increase in power required was equal to an increase in equivalent flat plate area of 3.3 ft^2. Specific range with cargo doors removed was decreased approximately 2.4 percent.

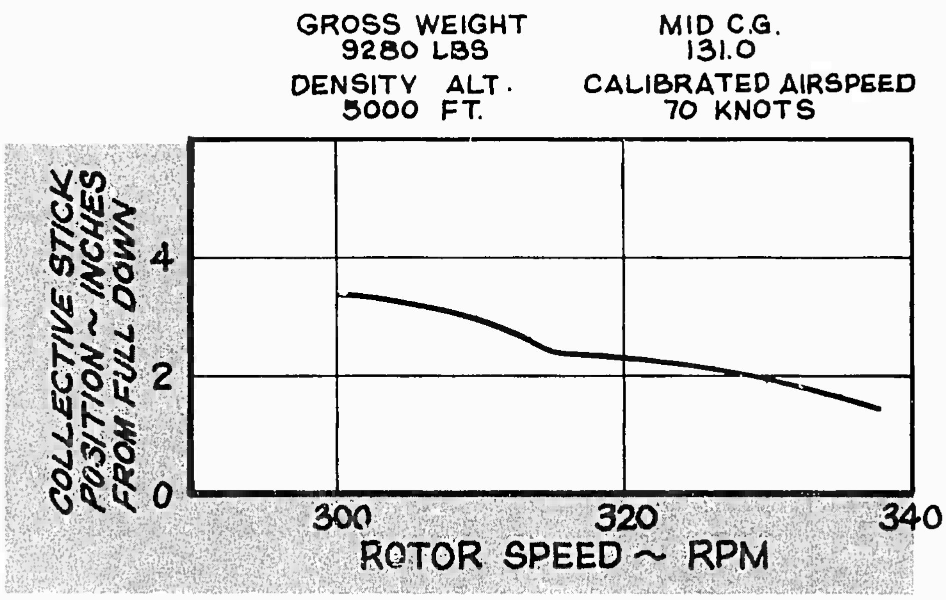
2.2.5 Autorotation

2.2.5.1 Autorotation performance tests were conducted at two altitudes and two ranges of gross weight. At both 5000 feet and 10,000 feet, rates of descent through a range of airspeeds were defined for light gross weight (6200 pounds through 6380 pounds) and for heavy gross weight (7270 pounds through 9250 pounds). Results of the autorotation tests are presented in figures 51 through 53, appendix I.

2.2.5.2 Minimum rates of descent were between approximately 1800 and 2000 fpm in both ranges of gross weight tested. At light gross weight, less than 6380 pounds, airspeed for minimum rate of descent was approximately 60 KTAS. At heavy gross weight, more than 8180 pounds, airspeed for minimum rate of descent was approximately 63 KTAS.

2.2.5.3 Figure J illustrates an undesirable autorotation characteristic of the UH-1B/540. At a constant airspeed, the collective

FIGURE J
Autorotational Descent Performance



pitch-rotor speed gradient was very small. Large changes of rotor speed occurred with small collective pitch changes. In addition to this characteristic, the high inertia of the 540 rotor system caused large lags in the response of rotor speed to collective pitch changes. These two characteristics combined resulted in the pilot's "chasing rotor speed." The low collective gradients caused a tendency to overcorrect collective pitch changes, and the high inertia and resulting rotor speed lag compounded the problem. It was not difficult to maintain rotor speed "between the red lines," but stabilizing on a selected rotor speed required considerable pilot attention at a time when his attention should be directed outside the cockpit. A collective pitch position indicator was helpful for rotor speed control.

2.3 STABILITY AND CONTROL

Stability and controllability tests of the UH-1B/540 were conducted at seven standard helicopter configurations. Helicopter characteristics were defined at both forward and aft C.G. at three gross weights. Gross weights were approximately 6600 pounds, 8500 pounds, and 9200 pounds. In addition, extreme aft C.G. characteristics were defined at light gross weight. All tests were done at a density altitude of 5000 feet and a rotor speed of 324 rpm.

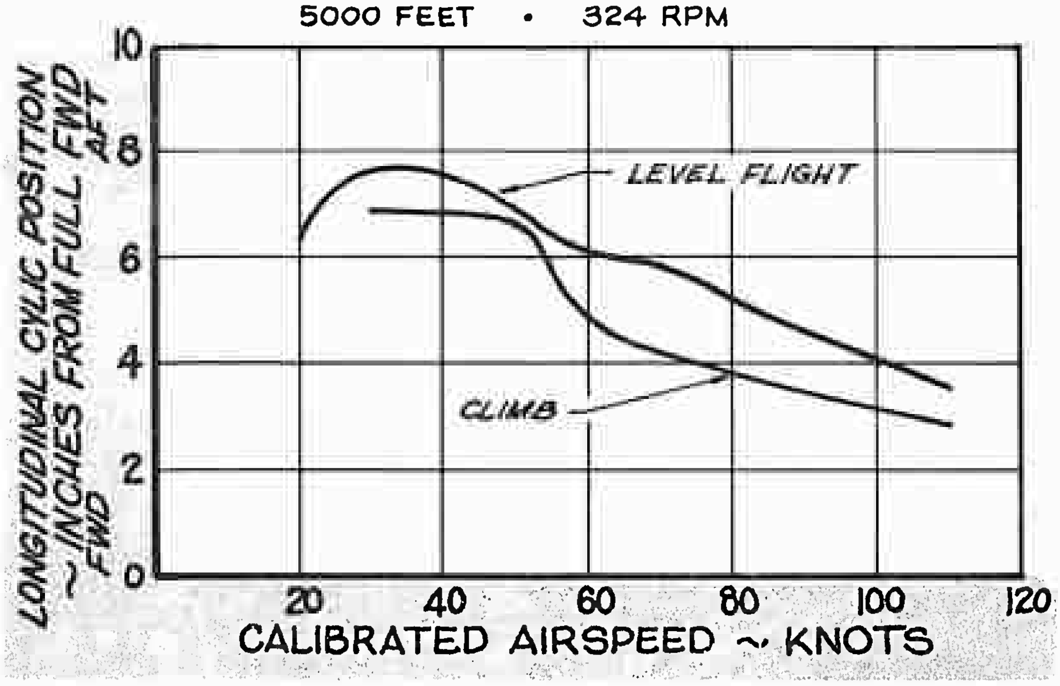
2.3.1 Static Longitudinal Stability

Static longitudinal stability was defined both in coordinated forward flight (control positions in forward flight, figures 54 through 63, appendix I) and in speed changes about a trim point (static longitudinal collective-fixed stability, figures 64 through 85, appendix I).

2.3.1.1 In coordinated forward flight, longitudinal cyclic stick gradients were positive at all configurations tested except for the normal helicopter longitudinal cyclic stick reversal at low speed (less than 40 KCAS). At all gross weights in level flight, the longitudinal cyclic stick gradients were higher with a forward C.G. than with an aft C.G. Near the light gross weight-aft C.G. limit of 138.0 inches, the longitudinal cyclic stick gradient was only weakly positive at high speed. The control margin remaining at power-limited maximum airspeed was approximately 10 percent of the total longitudinal cyclic stick travel. The stick position at these conditions was uncomfortable to the pilot due to the long reach required. Because of the weak stability gradient and the forward cyclic control position, a more realistic aft C.G. limit is 135.0 inches at gross weights less than 7000 pounds.

2.3.1.2 Figure K illustrates the longitudinal cyclic stick position

FIGURE K
Static Longitudinal Stability
GROSS WEIGHT = 6655 LBS • FORWARD C.G.
5000 FEET • 324 RPM



required in level flight and in a maximum power climb at 6655 pounds gross weight and forward C.G. The longitudinal cyclic stick discontinuity during climb was a definite shortcoming. Near the airspeed for maximum rate of climb, a change in airspeed of only 5 KCAS required a longitudinal stick position change of 1.3 inches. This characteristic resulted in an apparent instability even though the control position gradients were strongly positive. The nose-down pitch tendency with a small decrease in airspeed was caused by the loss of nose-up moment when the horizontal stabilizer stalled. The stall resulted from the high angle of attack on the inverted airfoil with low horizontal airspeed component and high rates of climb. With more installed shaft horsepower, this apparent instability should appear at higher airspeeds and higher gross weights.

2.3.1.3 Static longitudinal stability as defined by small airspeed excursions above and below a trim airspeed (static longitudinal collective-fixed stability) was similar to that described in the preceding paragraph, except that longitudinal cyclic stick gradients at high speed were lower. Control margins remained adequate. The apparent instability in a full-power, 6655-pound gross weight climb was again noted. At a C.G. of 137.6, longitudinal cyclic stick gradient became slightly negative about a high-speed level flight trim point and thus did not meet the requirement of MIL-H-8501A.

Photo 3 - Horizontal Stabilizer

2.3.2 Static Lateral-Directional Stability

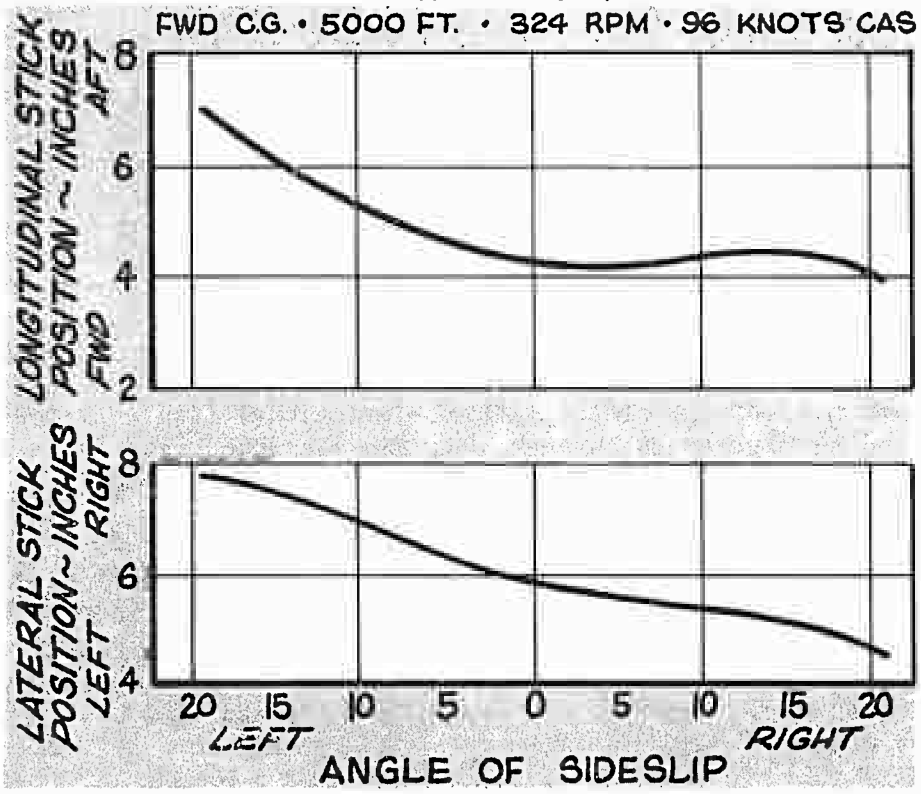
The results of the static lateral-directional stability tests are presented in figures 86 through 104, and are summarized in figures 86, 87, and 88, appendix I.

2.3.2.1 The static directional stability of the UH-1B/540 was positive for all conditions tested. Left pedal input was required to sustain right sideslip and vice versa. Static directional stability was weak (small pedal gradients) at low speeds but increased rapidly above approximately 70 KCAS. Gross weight had a negligible effect. Pedal gradients were generally greater with a forward C.G. than with an aft C.G.

2.3.2.2 Effective dihedral as evidenced by the lateral cyclic stick gradient with sideslip angle was weakly positive at 9200 pounds gross weight. Effective dihedral was stronger for an aft C.G. than for a forward C.G. At 8200 pounds gross weight or less, effective dihedral decreased. The effective dihedral was most negative at light gross weight, forward C.G., and high airspeed, and was objectionable at these conditions. Aerodynamic lateral forces produced a high roll angle during sideslip which gave the impression of strong positive effective dihedral at high speed. The helicopter did not meet the positive effective dihedral requirements of MIL-H-8501A.

2.3.2.3 At the same conditions in which negative effective dihedral was objectionable (light weight, forward C.G., and high speed), the longitudinal trim change with sideslip was pronounced. Figure L indicates that with a 10-degree left sideslip, a 0.9-inch application of aft longitudinal cyclic was required to avoid nose-down pitching. Simultaneously, right lateral cyclic was required due to the negative effective dihedral. One of the implications of this combination of characteristics may be seen by visualizing the cyclic movement required during a flat "horizon-sweep" sideslip to the left (yaw

FIGURE L
Static Lateral-Directional Stability
DESIGN GROSS WEIGHT



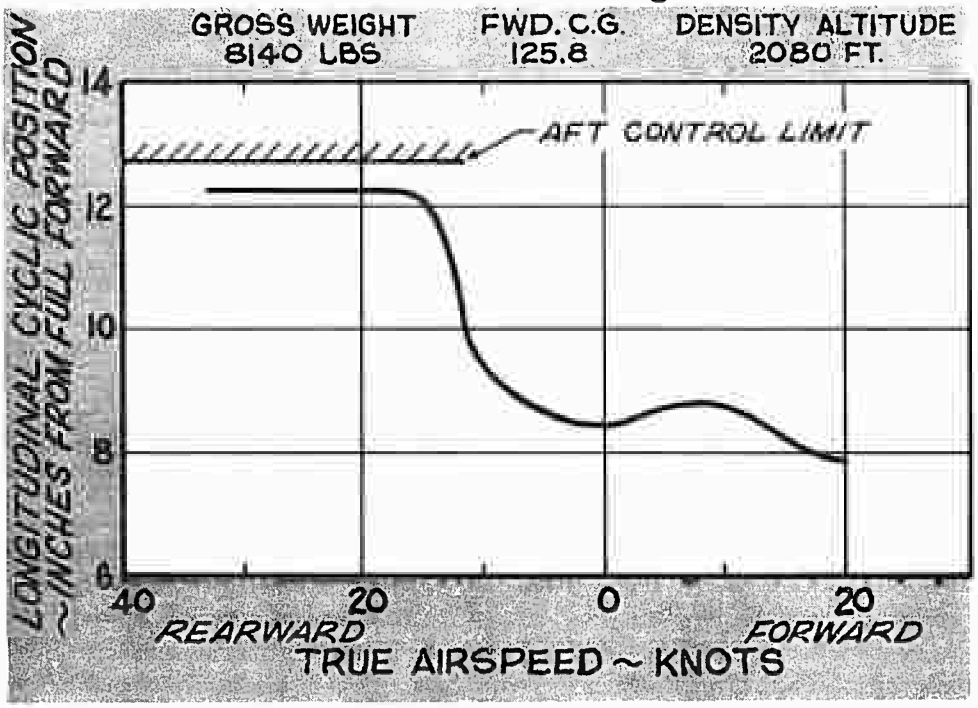
right) as might be required on an armed mission. Following the right pedal input, aft cyclic would be required to counteract the pitchdown, and right lateral cyclic would be required because of the negative effective dihedral.

2.3.3 Sideward and Rearward Flight

Sideward and rearward flight tests were conducted at 8140 pounds gross weight, forward C.G. (125.8 inches), 324 rpm rotor speed, and 2080 feet density altitude. Results are presented in figures 105 and 106, appendix I.

2.3.3.1 Sideward flight at the test conditions was possible at true airspeeds in excess of 30 KTAS to the right and 40 KTAS to the left. Ten percent of the available pedal travel remained at 37 knots to the left, imposing a realistic limit on left sideward flight at that value. No similar control limitation existed during right sideward flight at the highest airspeed attained (32 KTAS). The helicopter exceeded the minimum sideward flight requirements of MIL-H-8501A.

FIGURE M
Rearward Flight



2.3.3.2 Rearward flight was conducted to a maximum speed of 32 KTAS. Figure M illustrates, however, that an abrupt nose-down pitch change occurred at about 10 KTAS rearward requiring an abrupt aft cyclic input. This large aft input left only about 4-percent aft travel available in the 10 to 32 KTAS rearward flight airspeed range.

These tests were conducted in calm, non-turbulent air. No corrections for gust inputs were required. There was insufficient aft longitudinal control available to hover "downwind" and correct gust inputs for wind speeds above 10 KTAS. As a result, the hazards of downwind approaches and hovering were increased. The helicopter did not meet the minimum requirements of MIL-H-8501A in rearward flight due to the small aft control margin remaining at speeds greater than 10 KTAS rearward.

2.3.4 Dynamic Longitudinal Stability

2.3.4.1 The dynamic longitudinal stability characteristics of the UH-1B/540 in level flight and autorotation were excellent. Return to trim was essentially deadbeat. Figures 107 and 108, appendix I, show two typical reactions to longitudinal disturbances. In the airspeed range of the apparent longitudinal static instability as described in 2.3.1.2, the helicopter would not return to trim. Figure 109, appendix I, shows the reaction to an aft longitudinal control pulse at light gross weight with a forward C.G. in a maximum power climb. Following the aft pulse, the airspeed decreased to the point where the horizontal stabilizer stalled and the nose of the helicopter "fell through" with increasing nose-down pitch attitude until recovery was necessary.

2.3.4.2 Strong pitch-roll coupling was present during climb and level flight with the coupling decreasing somewhat with increased airspeed. Nose-up pitch resulted in a right roll tendency. This coupling was not objectionable during normal maneuvering flight; however, during nap-of-the-earth flying, the coupling could become noticeable, with lateral cyclic corrections required following longitudinal control inputs.

2.3.5 Dynamic Lateral-Directional Stability

Both lateral and directional disturbances were heavily damped to a low-amplitude "dutch roll" oscillation at airspeeds above 80 KCAS at all conditions tested. At lower airspeeds directional disturbances were only lightly damped with a high degree of roll coupling resulting in a high-amplitude, persistent lateral-directional or "dutch roll" oscillation. Figure 110, appendix I, illustrates this reaction. This lateral-directional oscillation may be initiated following a disturbance about any axis due to the complex coupling present. The "dutch roll" oscillation may be seen in the helicopter angular acceleration traces following longitudinal disturbance in figures 107 and 108. In light turbulence this characteristic was readily apparent and objectionable, particularly in the areas of weak directional pedal gradients below 70 KCAS (paragraph 2.3.2.1).

2.3.6 Throttle Chop

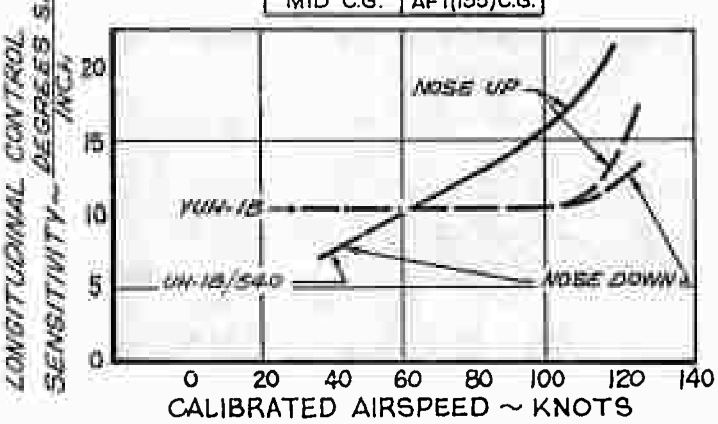
The reaction of the UH-1B/540 to a simulated engine failure at 133 KCAS is shown in figure 111, appendix I. At airspeeds below approximately 100 KCAS there were no unusual dynamic reactions following the power loss. At airspeeds approaching maximum, the reaction was pronounced. In figure 111, collective pitch was maintained for approximately 2.3 seconds following the throttle chop to simulate a typical pilot recognition and reaction time. The helicopter pitched down and rolled left abruptly. The change in helicopter roll attitude 2 seconds after the throttle chop was approximately 18 degrees, which was considerably higher than the maximum of 10 degrees specified by MIL-H-8501A. Pitch and yaw attitudes changed less than 10 degrees in 2 seconds.

2.3.7 Longitudinal Controllability

2.3.7.1 Longitudinal control sensitivity was defined by the maximum pitch angular acceleration resulting from a 1-inch cyclic step input. Longitudinal control sensitivity is presented in figures 112 through 128, and summarized in figure 112, appendix I. Pitch sensitivity at an aft C.G. was not affected by gross weight but increased with airspeed. Sensitivity with a forward C.G. was slightly lower than with an aft C.G. at all conditions. Sensitivities at the highest airspeed available at the test conditions were approximately double those at 35 KCAS. Sensitivities in a climb were slightly higher and in autorotation were slightly lower than those in level flight at the same configuration and airspeed. Generally, nose-up and nose-down sensitivities were approximately equal. Time to maximum accelerations ranged from 0.4 seconds to 0.6 seconds except in hover when times up to 0.9 seconds were measured. Figure N shows a comparison of the longitudinal control sensitivity of the UH-1B/540 with that of the standard UH-1B at

FIGURE N
Longitudinal Sensitivity

TEST CONDITIONS	
YUH-1B	UH-1B/540
6000 LBS 5000 FT 323 RPM MID C.G.	6715 LBS 5000 FT 324 RPM AFT(135)C.G.

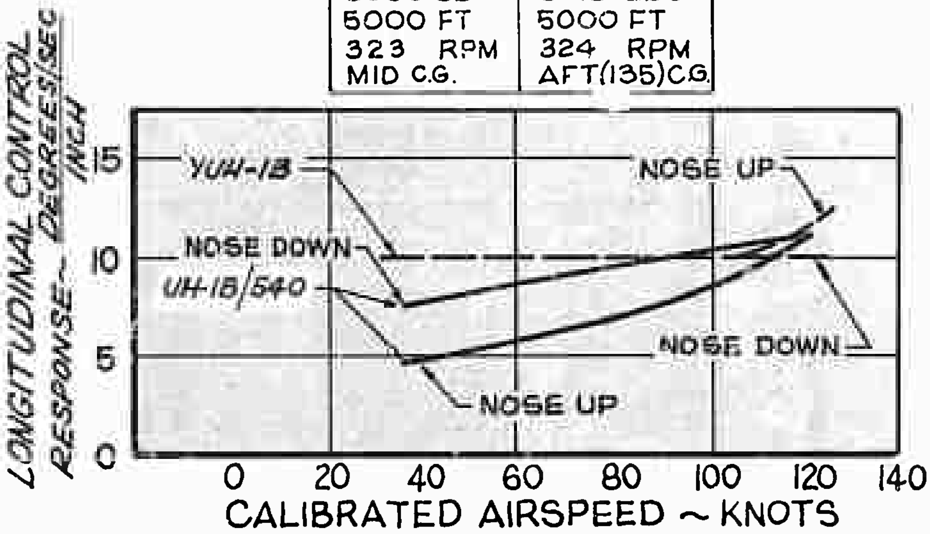


similar conditions. The UH-1B/540 exhibited greater sensitivity at high speeds. Times to maximum accelerations were the same for both helicopters.

2.3.7.2 Longitudinal control response was defined as the maximum pitch rate resulting from a 1-inch step input. Longitudinal control response is presented in figures 129 through 146, and summarized in figure 129, appendix I. At overload gross weight, response was approximately equal at forward and aft C.G., both nose up and nose down, with airspeed having only a small effect. At gross weights less than approximately 8500 pounds, response at a forward C.G. was approximately half that at an aft C.G., both nose up and nose down. At all configurations tested, response during autorotation was equal to or slightly less than in level flight at the same conditions. Response during climb was generally equal to that in level flight except in the area of the apparent longitudinal instability in a light gross weight, takeoff-rated power climb described in paragraph 2.3.1.2. In that area, response was nonlinear with control displacement. Following a forward input, the nose-down pitching rate slowly continued to increase with little tendency to stabilize at a peak rate until recovery was necessary. At all other conditions tested, a time to maximum rate was between 1 and 2 seconds. Figure O compares the longitudinal control response

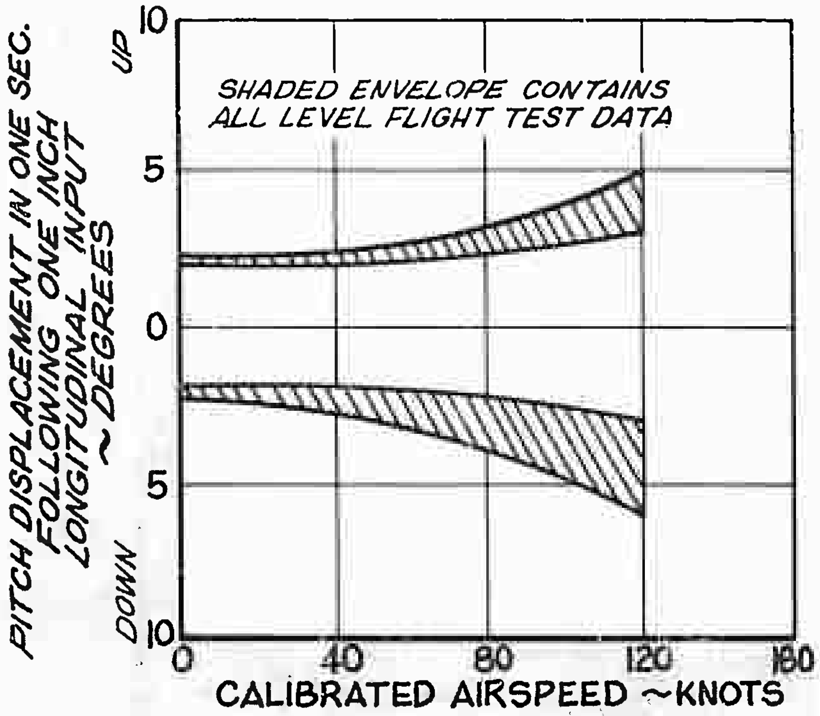
FIGURE O
Longitudinal Response

TEST CONDITIONS	
YUH-1B	UH-1B/540
6000 LBS 5000 FT 323 RPM MID C.G.	6715 LBS 5000 FT 324 RPM AFT(135)C.G.



of the UH-1B/540 with that of the standard UH-1B at similar conditions. Maximum rates for the UH-1B/540 were approximately equal to those of the standard UH-1B at airspeeds over 100 KCAS. The times to maximum rates for the UH-1B/540 were approximately one-half those of the standard UH-1B. This resulted in a more responsive longitudinal "feel."

FIGURE P
Longitudinal Control Power



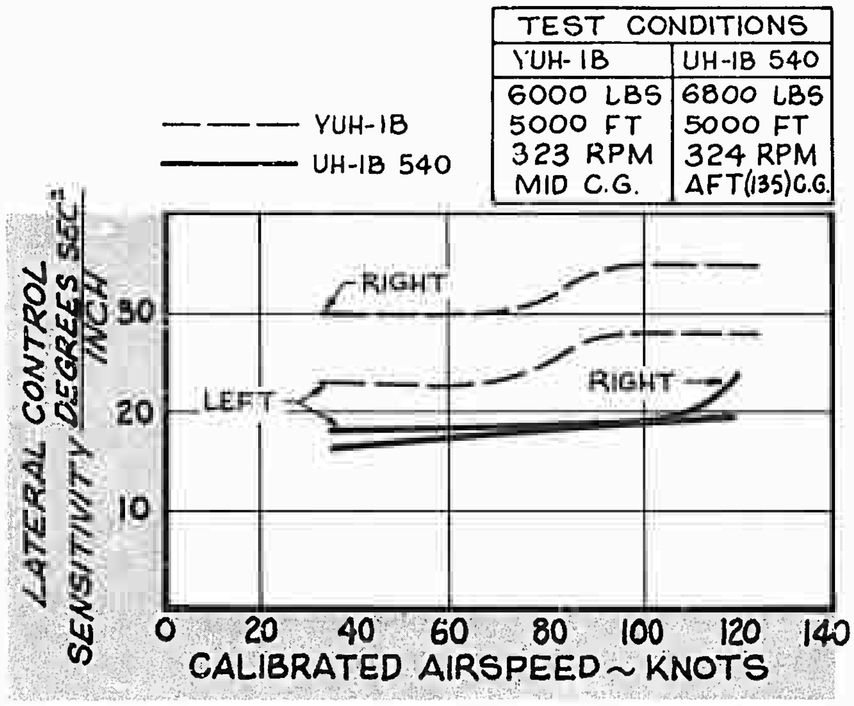
2.3.7.3 Figure P presents the summary of longitudinal control power defined by the angular pitch displacement after 1 second following a 1-inch step control input. The shaded envelope contains all level flight test data for all configurations. Figure 146 shows a typical reaction of the UH-1B/540 to a forward longitudinal step input. Input was at 118 KCAS, 8220 pounds gross weight, and an aft C.G. The strong pitch-roll coupling discussed in paragraph 2.3.4.2 was evident.

2.3.8 Lateral Controllability

2.3.8.1 Lateral control sensitivity was defined by the maximum roll acceleration resulting from a 1-inch lateral step input. Lateral control sensitivity is presented in figures 147 through 165, and summarized in figure 147, appendix I. Level flight sensitivities at all gross weights and C.G.'s ranged from 16 to 25 degrees/second/second/inch, generally increasing with airspeed, and were equal left and right. Sensitivities in a climb were generally equal to or greater than those in level flight at the same conditions. Sensitivities in autorotation were slightly lower than in level flight at the same conditions, ranging from 13 to 16 degrees/second/second/inch. Time to reach maximum roll acceleration was 0.3 to 0.5 seconds at all conditions. Figure Q compares the lateral control sensitivity of the UH-1B/540 with that of the standard UH-1B at similar conditions. Sensitivity of the UH-1B/540 was significantly lower than that of the standard UH-1B. Time to maximum acceleration was essentially equal for both helicopters. Qualitatively, this reduction in lateral control sensitivity was not considered objectionable.

FIGURE Q

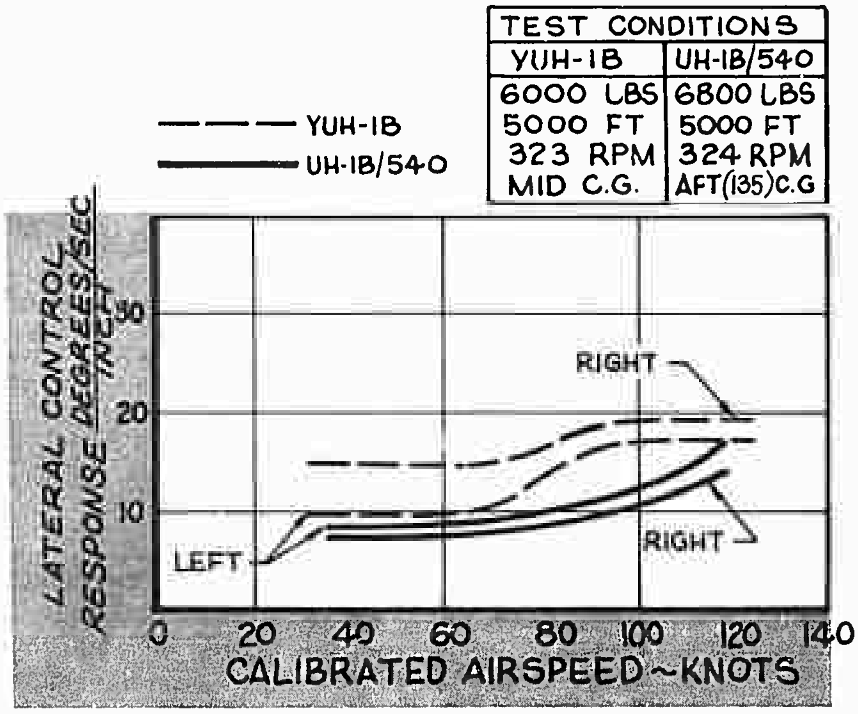
Lateral Sensitivity



2.3.8.2 Lateral control response was defined by the maximum roll rate resulting from a 1-inch lateral step input. Lateral control response is presented in figures 166 through 184 and summarized in figure 166, appendix I. Response ranged from 7 to 16 degrees/second/inch and increased with airspeed. Left response was 10 to 20 percent higher than right response. At all conditions, response in climb was slightly higher and in autorotation was slightly lower than response in level flight at the same conditions. Figure R compares the lateral control response of the UH-1B/540 with that of the standard UH-1B at similar conditions. Left response was similar for both helicopters, but the right response of the UH-1B/540 was significantly lower than that of the standard UH-1B for all airspeeds. The time to maximum rate was essentially equal for both

FIGURE R

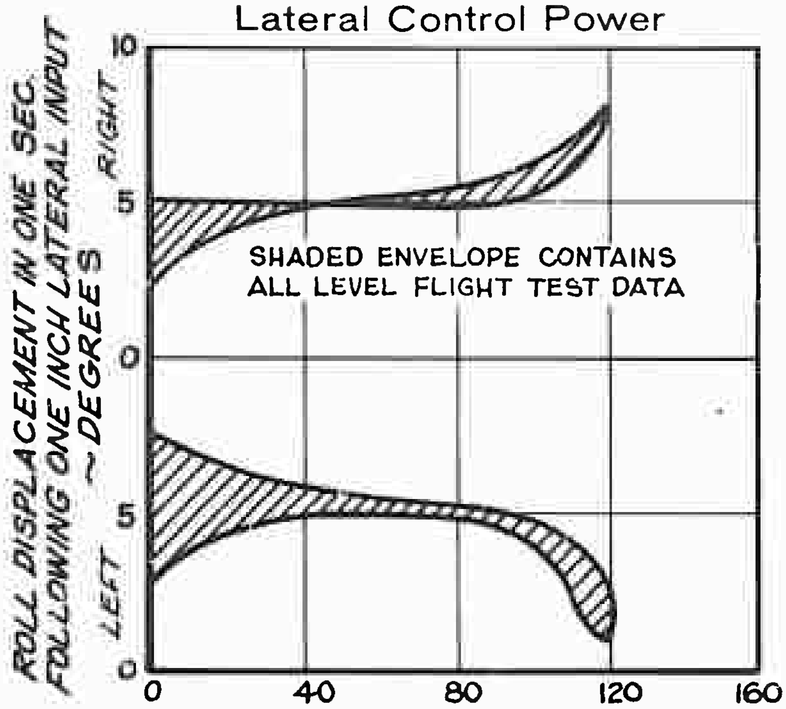
Lateral Response



helicopters. Qualitatively, the decrease in right lateral control response was not considered objectionable.

2.3.8.3 Lateral control power was defined by the roll displacement after 1 second following a 1-inch lateral input. The shaded envelope in figure S contains all level flight test data.

FIGURE S
Lateral Control Power



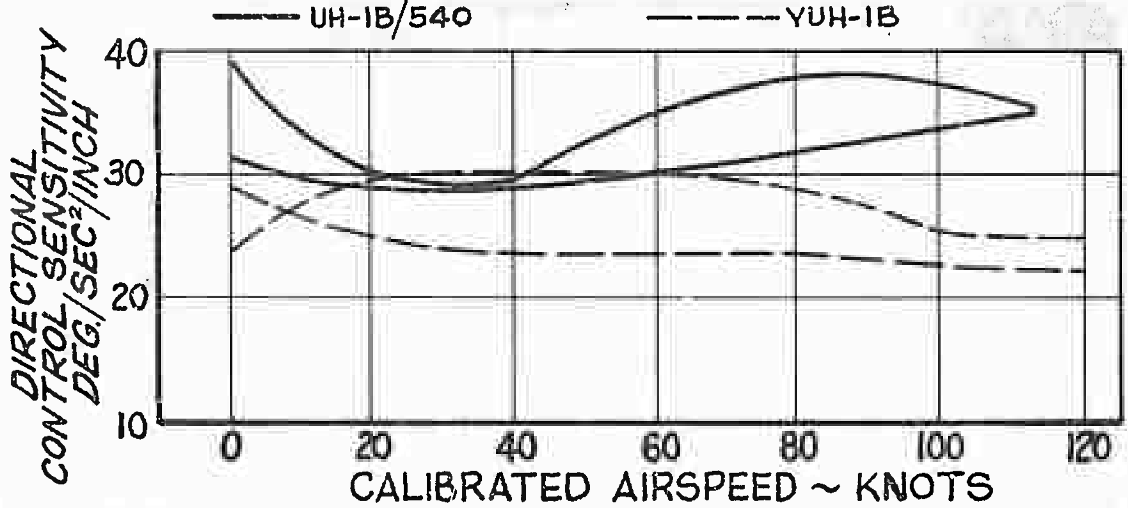
2.3.9 Directional Controllability

2.3.9.1 Directional control sensitivity was defined by the maximum yaw acceleration resulting from a 1-inch pedal step input. Directional control sensitivity is presented in figures 185 through 203, and summarized in figure 185, appendix I. Level flight sensitivity varied from approximately 26 to 38 degrees/second/second/inch. Sensitivity generally increased with airspeed but was essentially unaffected by gross weight or C.G. Sensitivity in an autorotation was slightly higher than in level flight but was not objectionably high. Sensitivity in a climb was essentially the same as in level flight at the same conditions. Time to maximum acceleration was 0.4 to 0.5 seconds. Figure T compares the directional control sensitivity of the UH-1B/540 with that of the standard UH-1B at similar conditions. In hover and at high speed, UH-1B/540 sensitivities were considerably higher than those of the standard UH-1B but were not objectionable.

2.3.9.2 Directional control response was defined by the maximum yaw

FIGURE T
Directional Sensitivity

TEST CONDITIONS	
YUH-1B	UH-1B/540
6000 LBS 5000 FT 323 RPM MID C.G.	8200 LBS 5000 FT 324 RPM AFT C.G.(134)



rate resulting from a 1-inch pedal input. Directional control response is presented in figures 204 through 222 and summarized in figure 204, appendix I. Level flight response ranged from 10 to 22 degrees/second/inch and generally decreased with airspeed. There was negligible difference in response with gross weight or C.G. change. Response in climb and response in autorotation were essentially the same as in level flight at the same conditions. Time to maximum rate was 0.5 to 1.2 seconds. Response in a hover was very high. Maximum rates following a left input were nearly twice as high as those obtained at forward flight conditions. Following a right input, yaw rate continued to increase until recovery was necessary. Peak rates were not attained. Figure U compares directional control response of the UH-1B/540 with that of the standard UH-1B at similar conditions. Response of the UH-1B/540 was considerably higher at all airspeeds but was not considered excessively high.

FIGURE U

Directional Response

TEST CONDITIONS	
YUH-1B	UH-1B/540
6000 LBS	8200 LBS
5000 FT	5000 FT
323 RPM	324 RPM
MID C.G.	AFT(134)C.G.

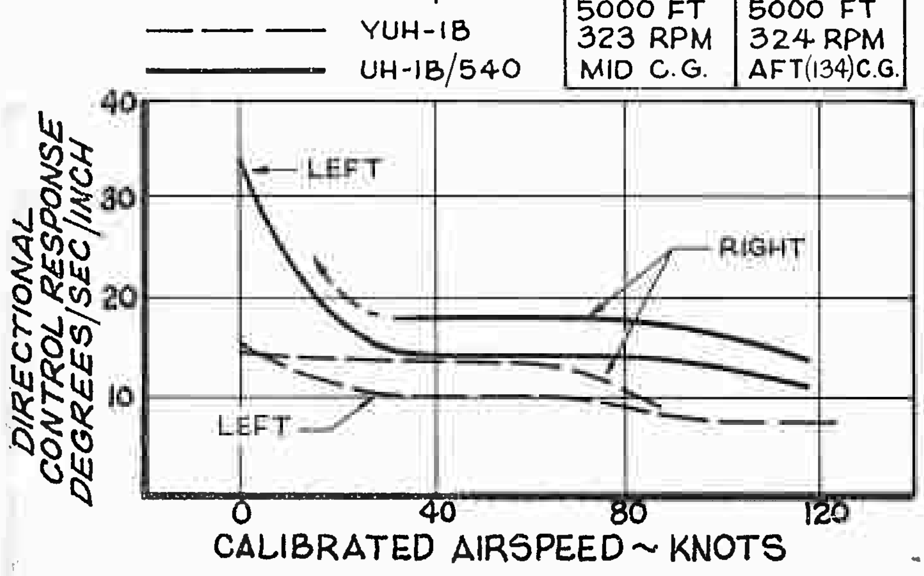
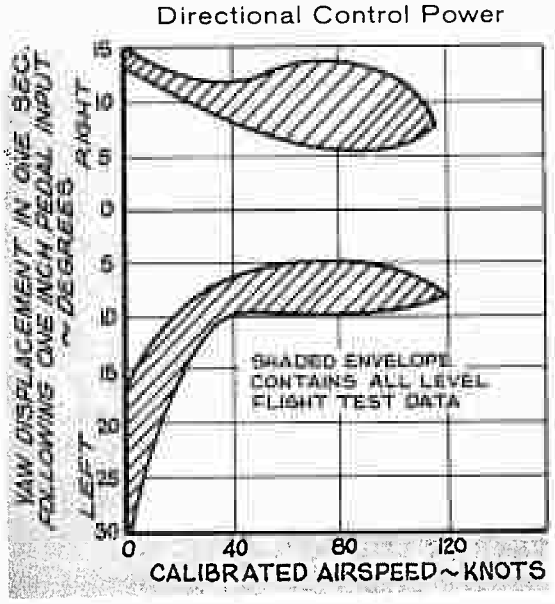


FIGURE V
Directional Control Power



2.3.9.5 Directional control power was defined by the yaw displacement 1 second after a 1-inch pedal input. Figure V summarizes the directional control power of the UH-1B/540. The shaded envelope contains all level flight test data.

2.4 MISCELLANEOUS

2.4.1 Power Avaliable

All summary performance values were based upon shaft horsepower available as defined in figures 224 through 226, appendix I. The power charts presented were calculated by using the curves and calculation methods presented in specification No. 104.28, T53-L-11 engine (reference 1). In order to calculate shaft horsepower available, certain installation power losses had to be assumed or measured. Certain minor losses, such as shaft horspower extracted from the gas producer section, rotor speed, and compressor air bleed were variable. Constant values of zero shaft horsepower extracted, 324 rpm, and 0.5-percent air bleed were assumed. The engine inlet of the UH-1B/540 was identical to that of the standard UH-1B. The same compressor inlet temperature rise and compressor inlet pressure ratio which were used to calculate operator's manual performance for the standard UH-1B were used in this report. The solid fairings for the engine inlet conditions in figure 223 were used. This produced essentially the same value for shaft horsepower available for the UH-1B/540 as for the standard UH-1B. The values for compressor inlet pressure ratio measured in flight during this program were identical to those measured in the "YUH-1B Category II Performance Test" (reference j). Both, however, were slightly different from the constant 1.000 used to calculate shaft horsepower available. The difference between the value measured and the value used was approximately 0.4 percent at 120 KCAS. This difference corresponded to about 4.5 shaft horsepower at 120 KCAS at sea level on a standard day. The performance values for the operator's manual for both the standard UH-1B and the UH-1B/540 were based upon slightly higher values of shaft horsepower available at high speed than indicated by recent flight test experience. The reasons for accepting this known discrepancy were:

a. The discrepancy was very small, within the accuracy of flight test data.

b. The operator's manual performance calculation was based on a specification engine. Individual production engine variations are much greater than this discrepancy.

c. Direct airframe performance comparisons of the UH-1B/540 and the standard UH-1B may be made without power available considerations.

2.4.2 Static Droop

2.4.2.1 Static droop was defined for hover and 65 KCAS at approximately 2500 feet pressure altitude and +10-degree C ambient temperature. Results of the static droop tests are presented in figure 228, appendix I.

2.4.2.2 Static droop characteristics of the test helicopter were unsatisfactory. The change in rotor speed with engine power output was objectionable at all airspeeds but particularly at 65 KCAS. To maintain a constant rotor speed during power changes required constant manipulation of the power turbine speed-select (beep) switch. For example, when making a landing approach by reducing engine power from a cruise setting of 450 SHP to 200 SHP, rotor speed increased approximately 6 rpm, from 324 rpm to 330 rpm, if the beep switch was not used. Undue pilot attention was required to maintain a constant rotor speed. If the poor static droop characteristics of the test helicopter are typical of the UH-1B/540, the mission effectiveness of the helicopter is degraded.

2.4.3 Pylon Motion

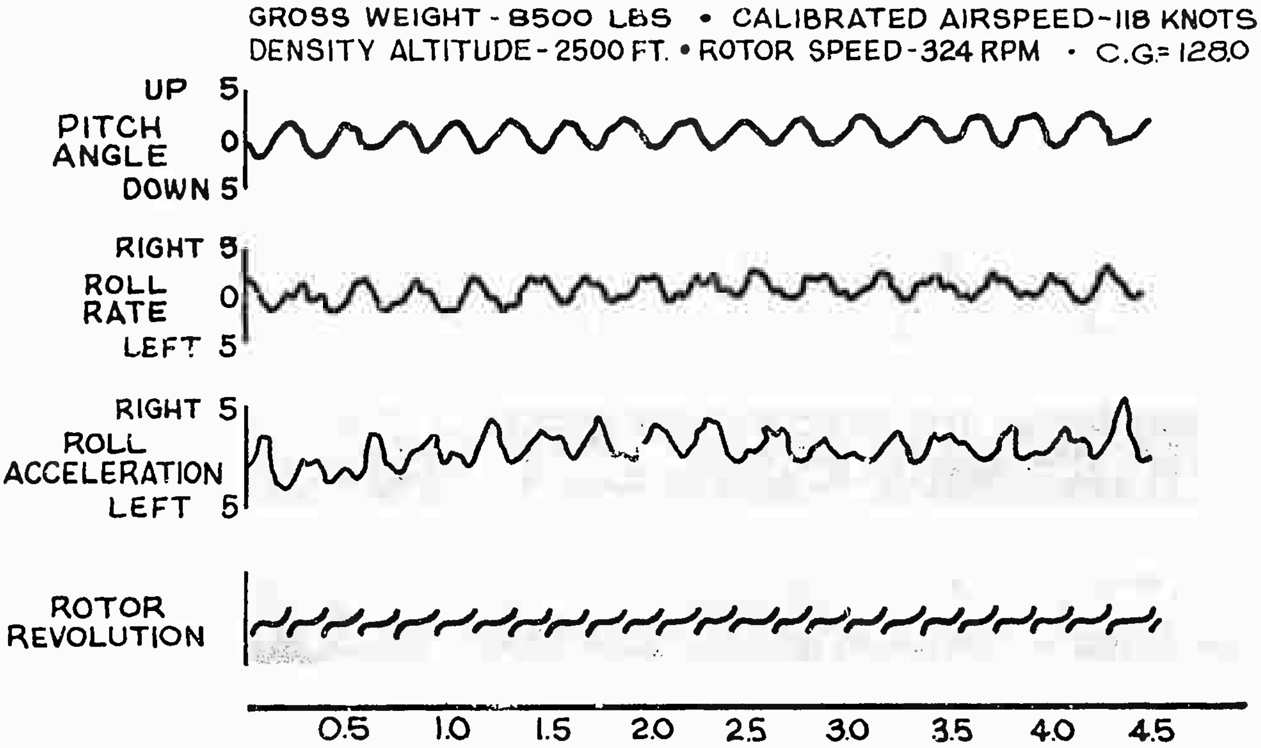
2.4.3.1 The test aircraft exhibited a condition of pylon motion which manifested itself as a high-amplitude, low-frequency oscillation described by various pilots as a "shuffle," "gallop," or "looseness." Fuselage reaction to the pylon motion was primarily a circular motion parallel to the rotor plane with a lesser magnitude vertical vibration superimposed.

2.4.3.2 Two distinct modes of pylon motion were evidenced. The first mode commonly called "pylon rock," was a self-damped vibration with a frequency of 1/2 per rev which could be pilot-induced or induced by turbulence. Once induced, this motion would self-damp in 3 to 4 cycles.

2.4.3.3 The second mode of pylon motion was objectionable to the point of being alarming. This mode of motion manifested itself in a motion similar to "pylon rock"; however, there were several significant differences. First, the frequency of motion was 2/3 per rev rather than 1/2 per rev. Second, the motion was self-induced and could not be induced by the pilot. Third, the motion was self-sustaining or neutrally damped. Finally, this mode of motion was not experienced during turbulence but only during stabilized powered flight in extremely calm air.

2.4.3.4 The undamped 2/3-per rev pylon motion was exhibited by two other UH-1B/540 helicopters available to this activity for investigation. Each helicopter exhibited the motion under similar flight conditions and, qualitatively, to a similar degree of severity. The test helicopter used for this Phase D evaluation was not properly instrumented to permit analysis of the pylon motion in detail; however, the frequency of the motion may be seen in figure W. The cause of this condition remains to be defined by the contractor. The effect upon component life is not defined. This condition is a deficiency with safety-of-flight implications.

FIGURE W
Undamped Pylon Motion



2.4.4 Airspeed Calibration

2.4.4.1 In addition to the standard helicopter airspeed system, the test helicopter was equipped with a test (boom) system. The boom system was installed for greater airspeed sensitivity and accuracy, particularly in the lower speed range. Both systems were calibrated by referring to a trailing bomb of known accuracy suspended from the helicopter. Results of the airspeed calibrations were presented in figures 229 through 231, appendix I.

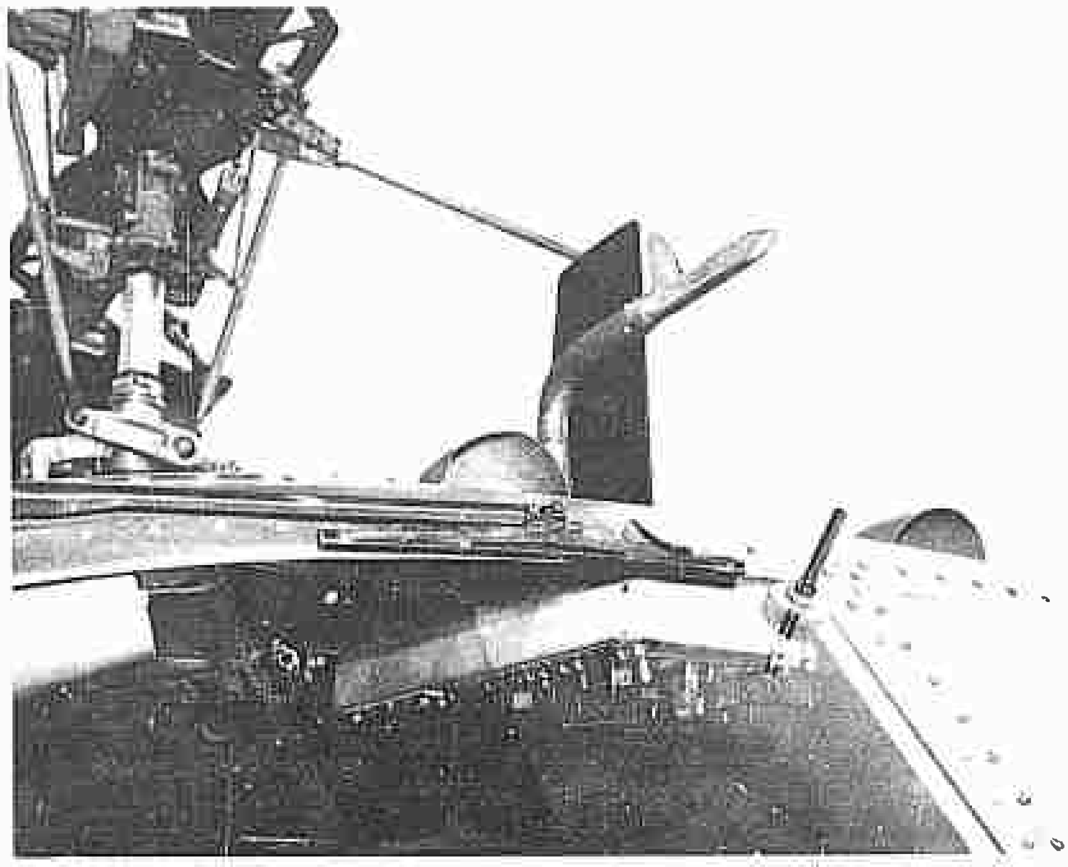


Photo 4 - Pitot Tube and Free Air Installation

2.4.4.2 The position error of the standard airspeed system in level flight was negative at indicated airspeeds greater than 47 knots. The standard system indicated up to 5 knots faster airspeed than the calibrated airspeed. In a climb near the airspeed for maximum rate of climb and in autorotation near the airspeed for minimum rate of descent, the position error of the standard airspeed system was less than 3 knots. The position error of the test (boom) airspeed system ranged from +2 to +4 knots and was identical for level flight, climb, and autorotation.

SECTION 3

APPENDICES

Appendix I

TEST DATA

FIGURE NO. 1
HOVERING PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
TAKEOFF RATED POWER

NOTES:

1. TAKEOFF RATED SHAFT HORSEPOWER AVAILABLE FOR IN GROUND EFFECT HOVER FOR PERIODS LESS THAN 2 MINUTES OBTAINED FROM FIGURE NO. 225
2. SHAFT HORSEPOWER REQUIRED TO HOVER DERIVED FROM FIGURE NO. 4
3. ROTOR SPEED = 324 RPM

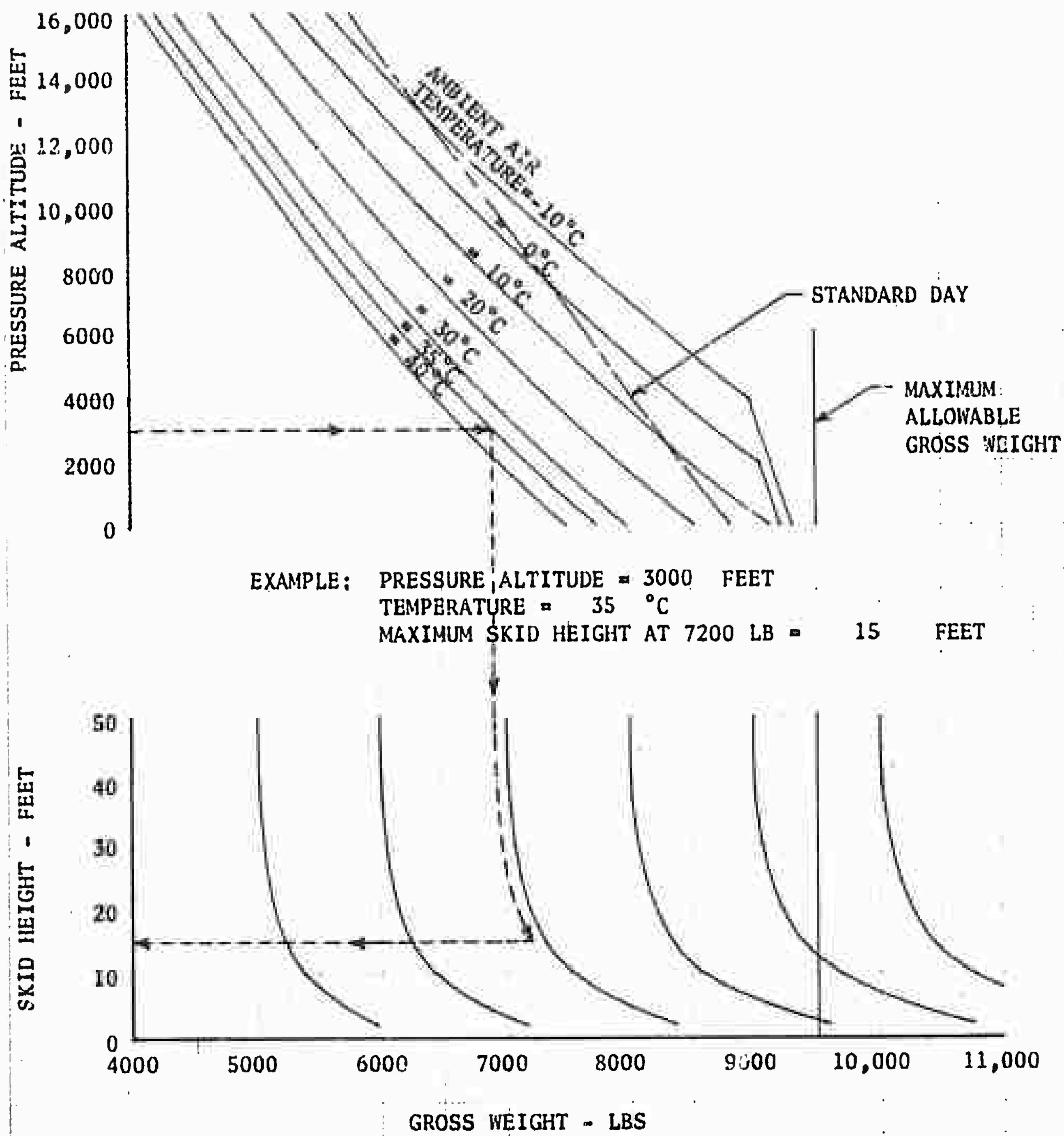


FIGURE NO. 2
HOVERING PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
TAKEOFF RATED POWER

NOTES:

1. TAKEOFF RATED SHAFT HORSEPOWER AVAILABLE FOR IN GROUND EFFECT HOVER FOR PERIODS MORE THAN 2 MINUTES OBTAINED FROM FIGURE NO. 223 AND 226
2. SHAFT HORSEPOWER REQUIRED TO HOVER DERIVED FROM FIGURE NO. 4
3. ROTOR SPEED = 324 RPM

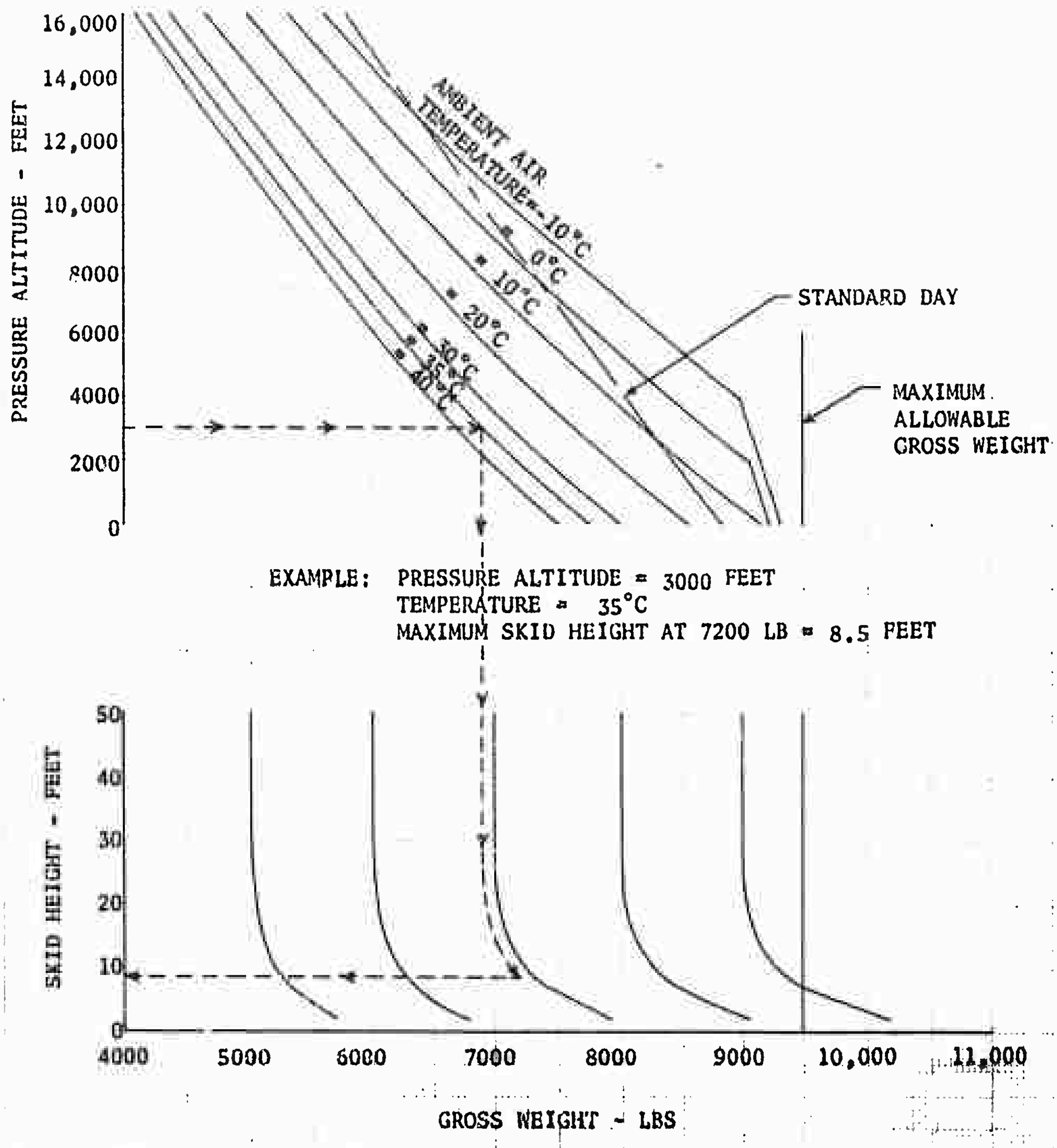
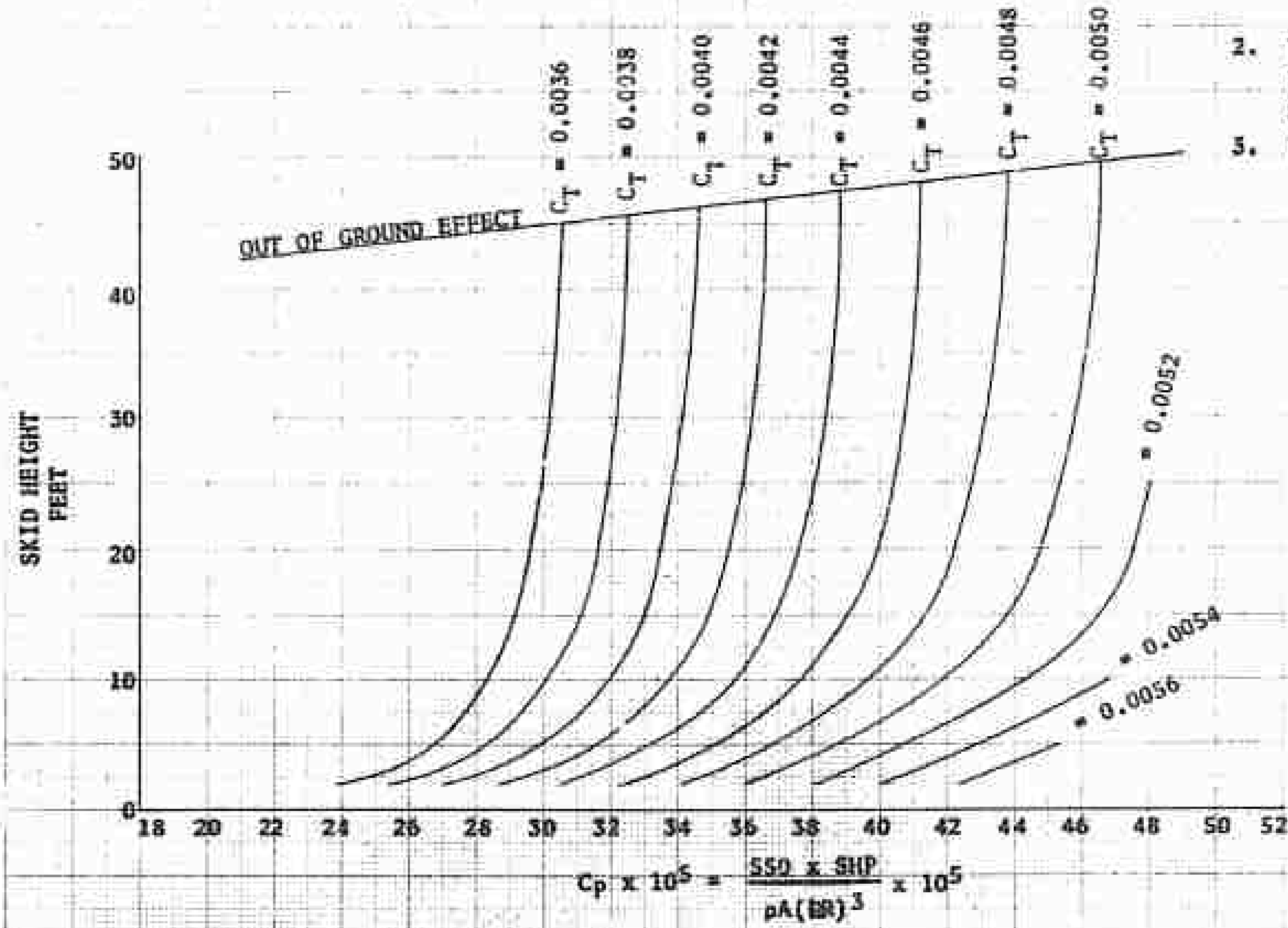


FIGURE NO. 3
NON-DIMENSIONAL HOVERING PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542



NOTES:
1. CURVES DERIVED FROM FIGURES 5 THROUGH 10
2. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET
3. WIND LESS THAN 3 KNOTS

FIGURE NO. 4
NON-DIMENSIONAL HOVERING PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. CURVES DERIVED FROM FIGURES 5 THROUGH 10
2. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET
3. WIND LESS THAN 3 KNOTS
4. OGE = OUT OF GROUND EFFECT

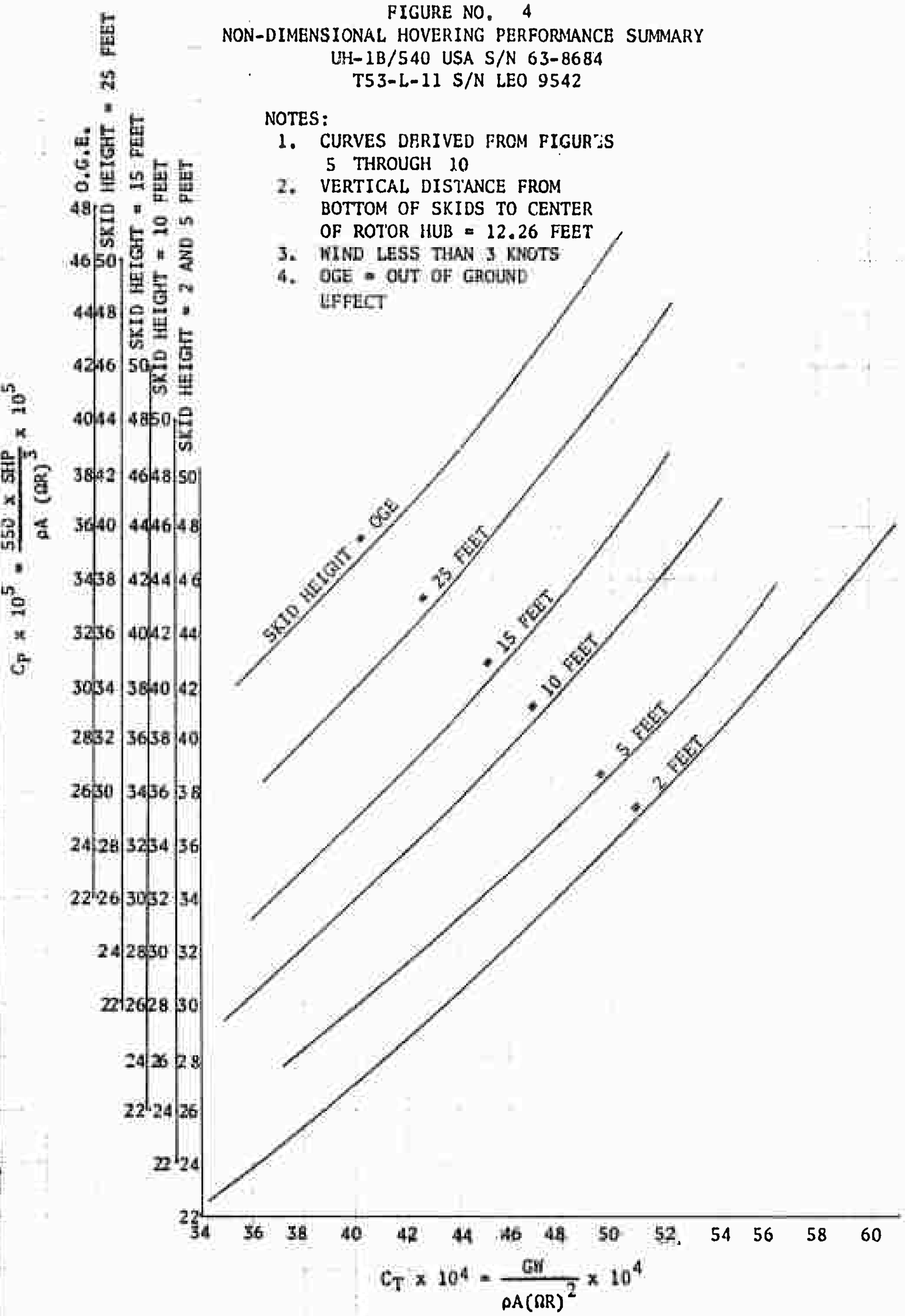


FIGURE NO. 5
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 2 FEET

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:

1. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
2. WIND LESS THAN 3 KNOTS
3. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET

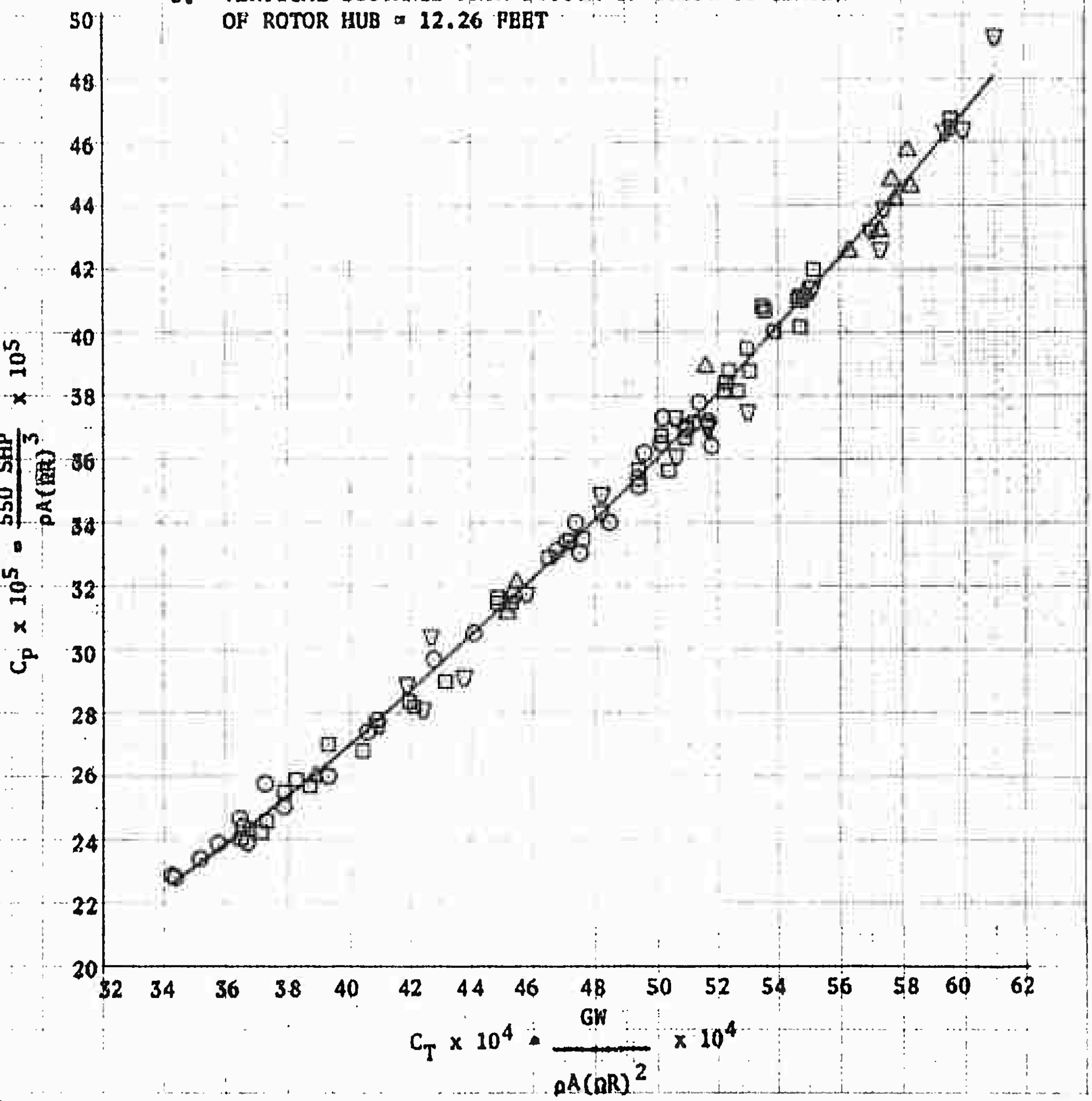


FIGURE NO. 6
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 5 FEET

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:

1. SHADED SYMBOLS DENOTE TETHERED HOVERING TECHNIQUE
2. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
3. WIND LESS THAN 3 KNOTS
4. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF HUB = 12.26 FEET

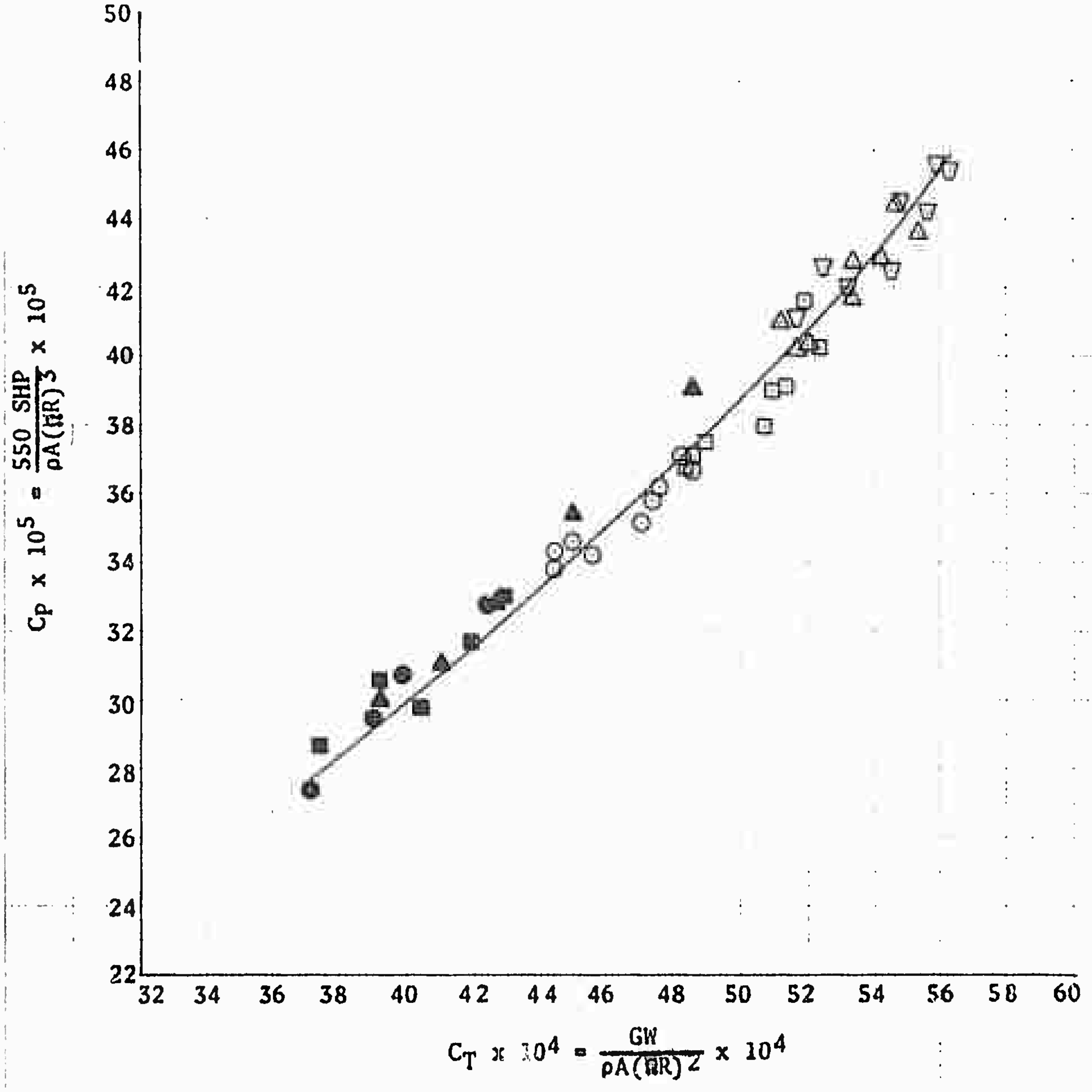


FIGURE NO. 7
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 10 FEET

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:

1. SHADED SYMBOLS DENOTE TETHERED HOVERING TECHNIQUE
2. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
3. WIND LESS THAN 3 KNOTS
4. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET

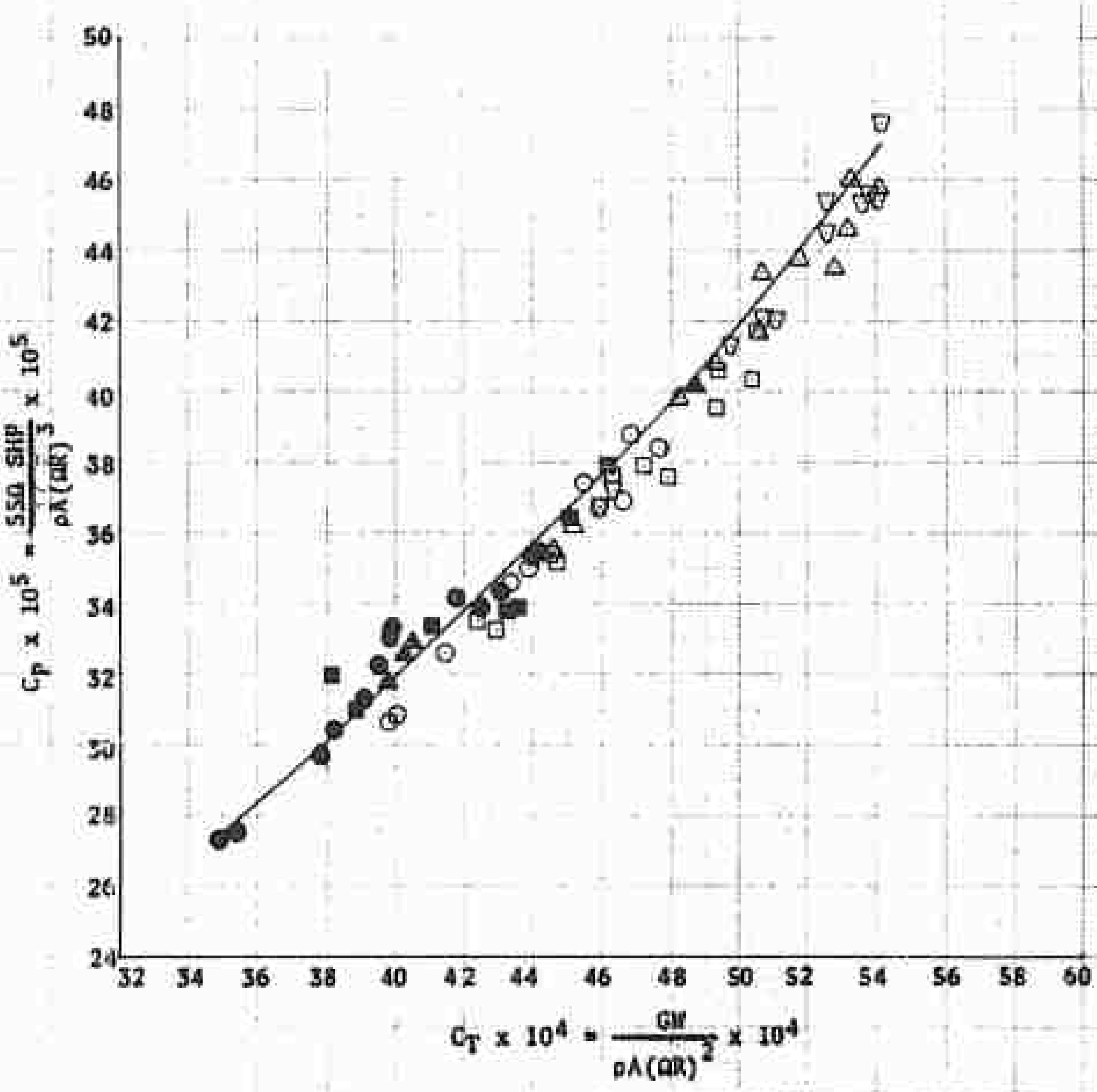


FIGURE NO. 8
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 15 FEET

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:
1. SHADED SYMBOLS DENOTE TETHERED HOVERING TECHNIQUE
2. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
3. WIND LESS THAN 3 KNOTS
4. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET

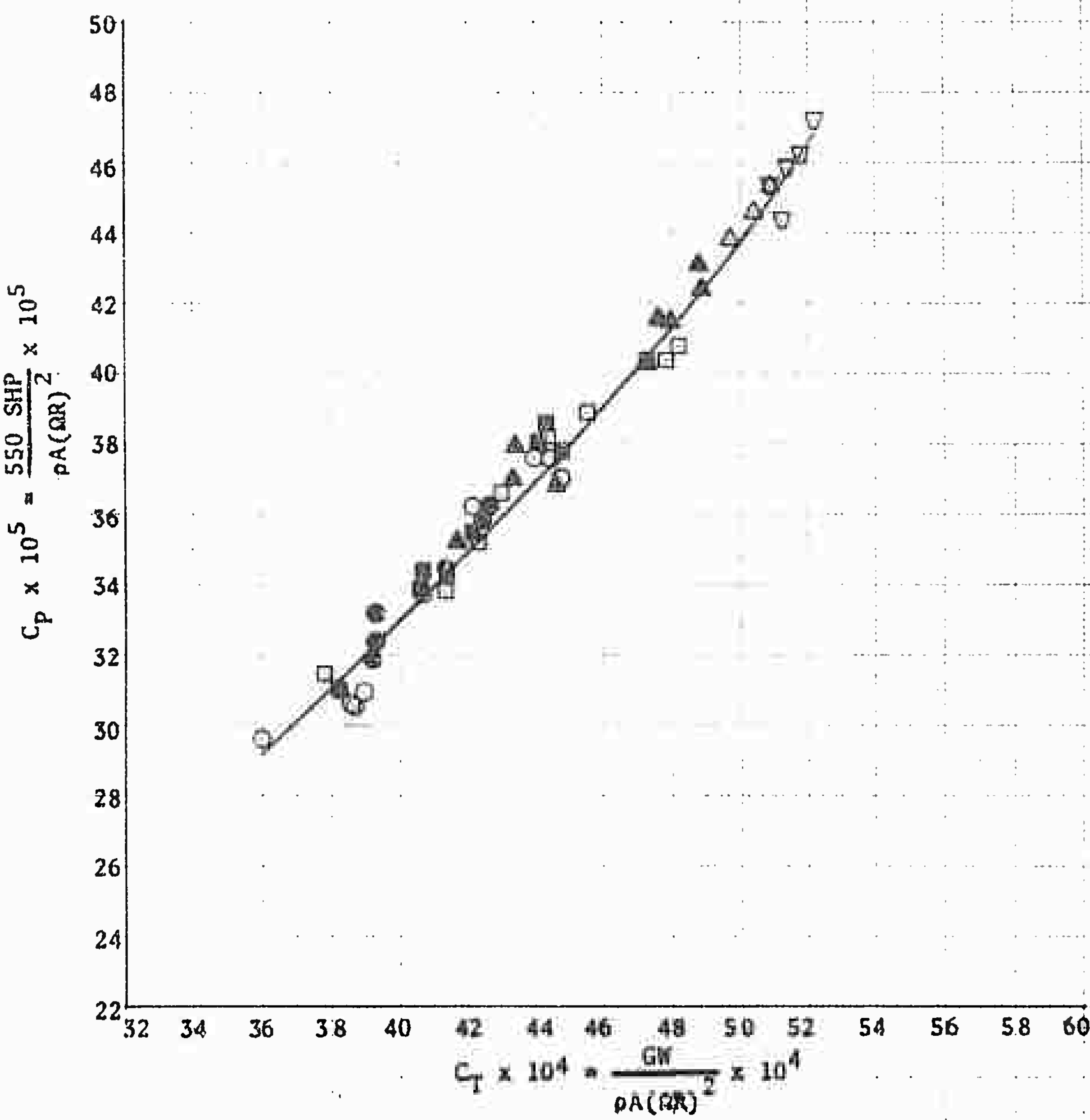


FIGURE NO. 9
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 25 FEET

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:
1. SHADED SYMBOLS DENOTE TETHERED HOVERING TECHNIQUE
2. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
3. WIND LESS THAN 3 KNOTS
4. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET

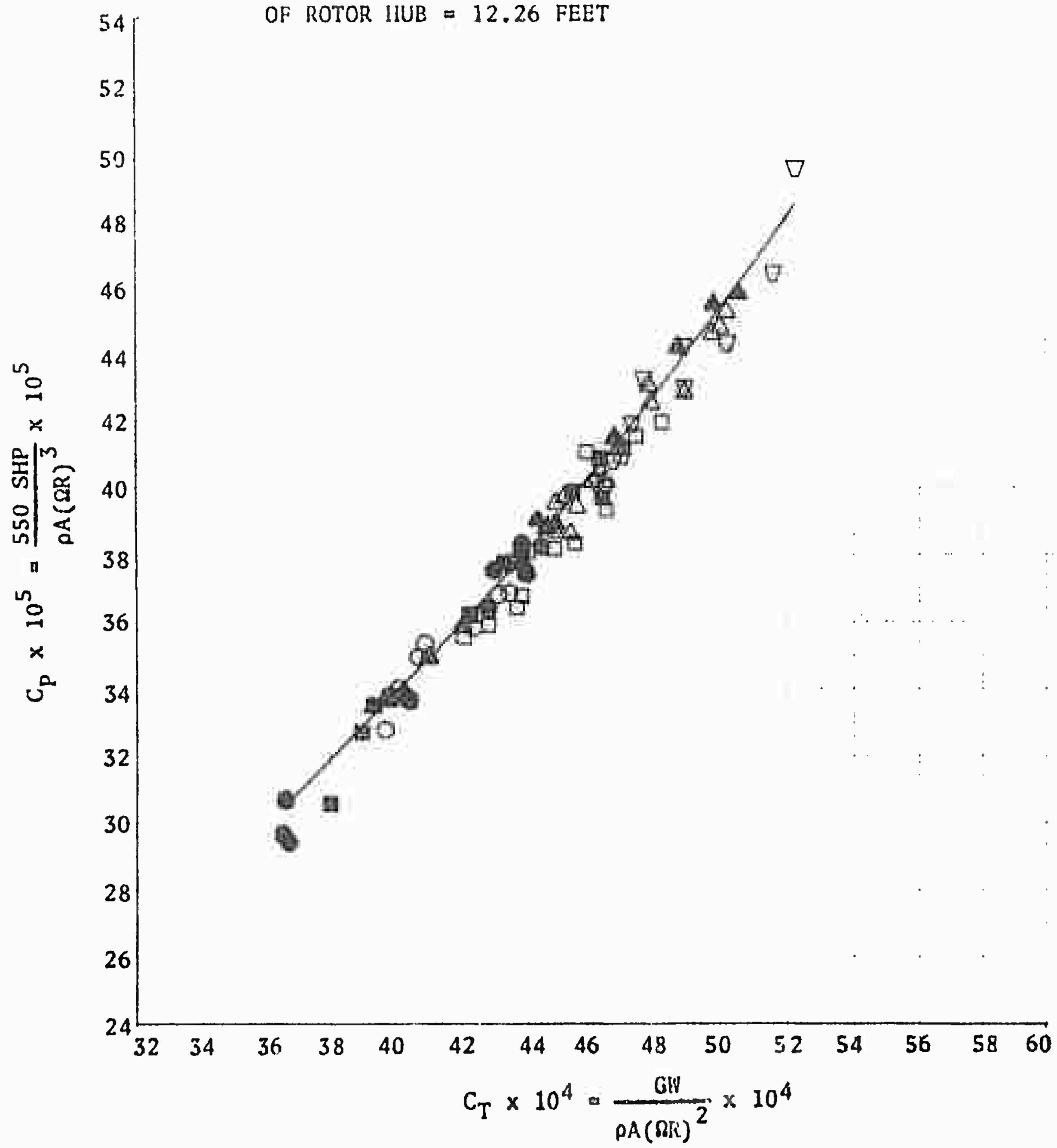


FIGURE NO. 10
NON-DIMENSIONAL HOVERING PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SKID HEIGHT = 50 AND 65 FEET
(OUT OF GROUND EFFECT)

SYM	ROTOR SPEED RPM
○	324
□	314
△	304
▽	300

NOTES:
1. SHADED SYMBOLS DENOTE TETHERED HOVERING TECHNIQUE
2. OPEN SYMBOLS DENOTE FREE FLIGHT HOVERING TECHNIQUE
3. WIND LESS THAN 3 KNOTS
4. VERTICAL DISTANCE FROM BOTTOM OF SKIDS TO CENTER OF ROTOR HUB = 12.26 FEET

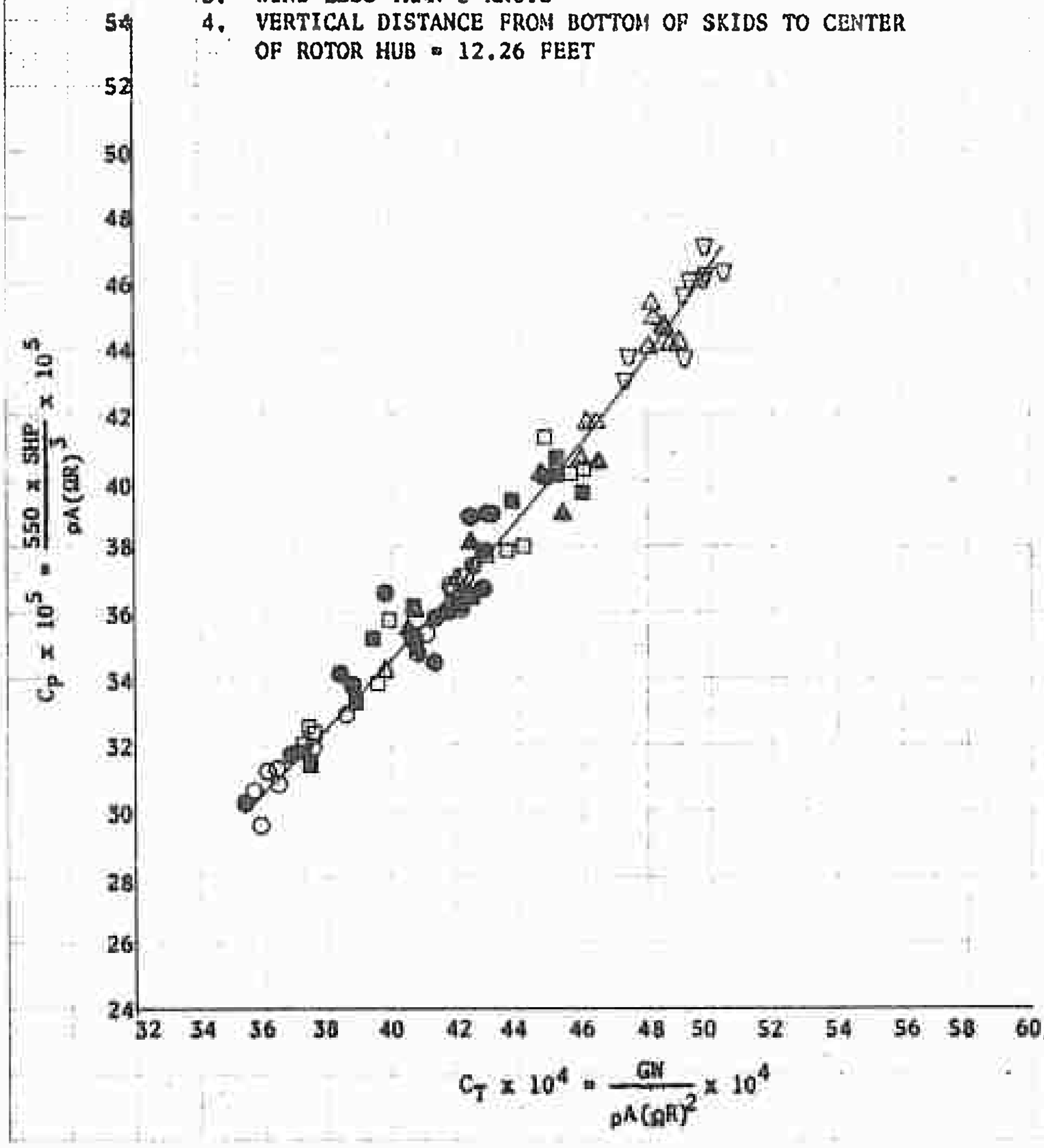
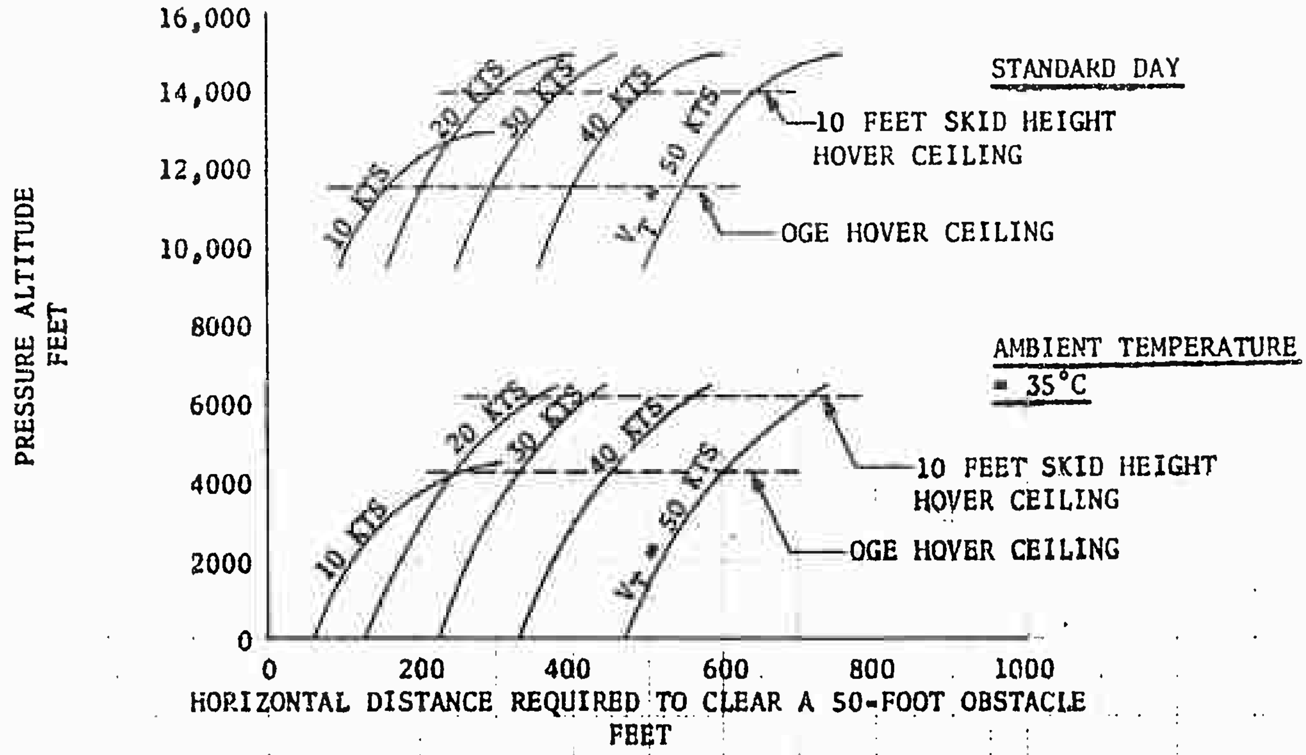


FIGURE NO. 11
TAKEOFF PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. ROTOR SPEED = 324 RPM
2. WIND LESS THAN 4 KNOTS
3. CURVES DERIVED FROM FIGURES NO. 1, 13 AND 225
4. V_T = CLIMB-OUT TRUE AIRSPEED
5. OGE = OUT OF GROUND EFFECT

GROSS WEIGHT = 6600 LBS



GROSS WEIGHT = 7500 LBS

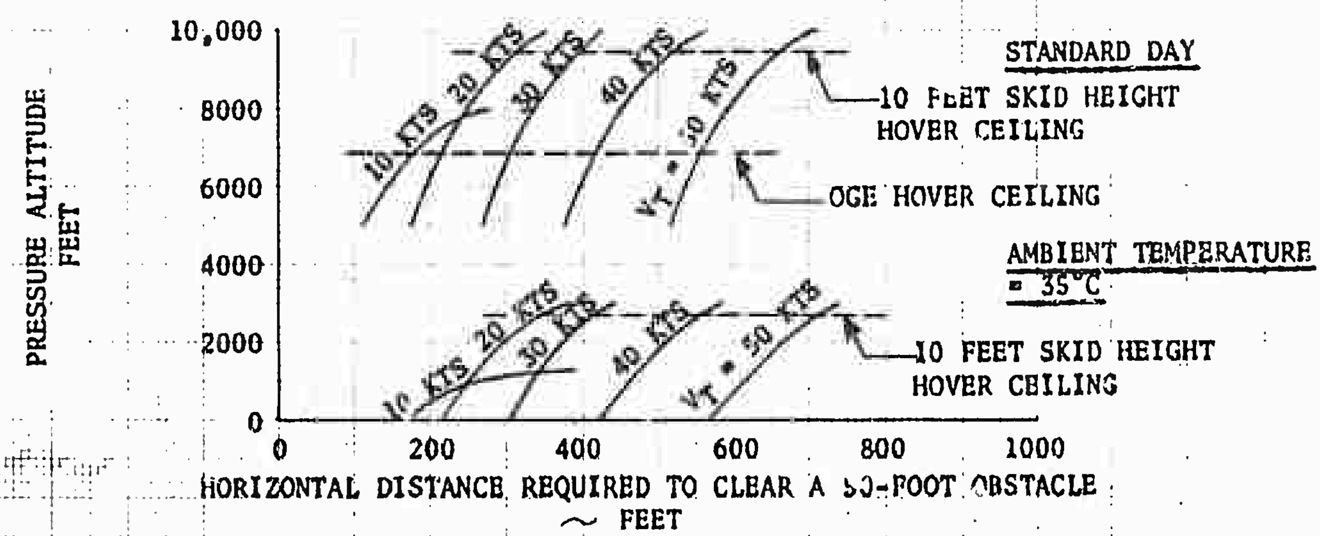
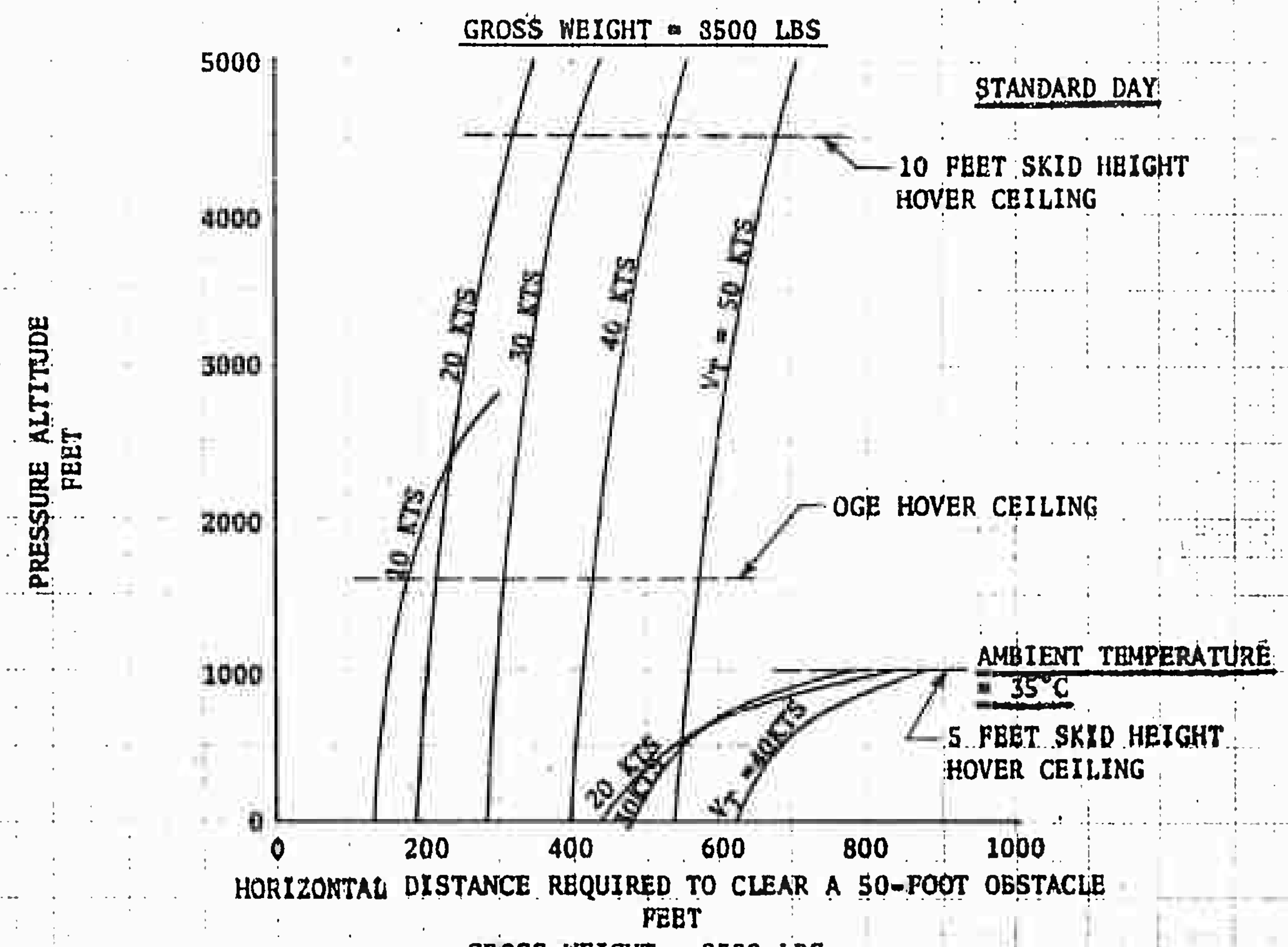


FIGURE NO. 12
TAKEOFF PERFORMANCE SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. ROTOR SPEED = 324 RPM
2. WIND LESS THAN 4 KNOTS
3. CURVES DERIVED FROM FIGURES NO. 1, 13 AND 225
4. V_T = CLIMB-OUT TRUE AIRSPEED
5. OGE= OUT OF GROUND EFFECT



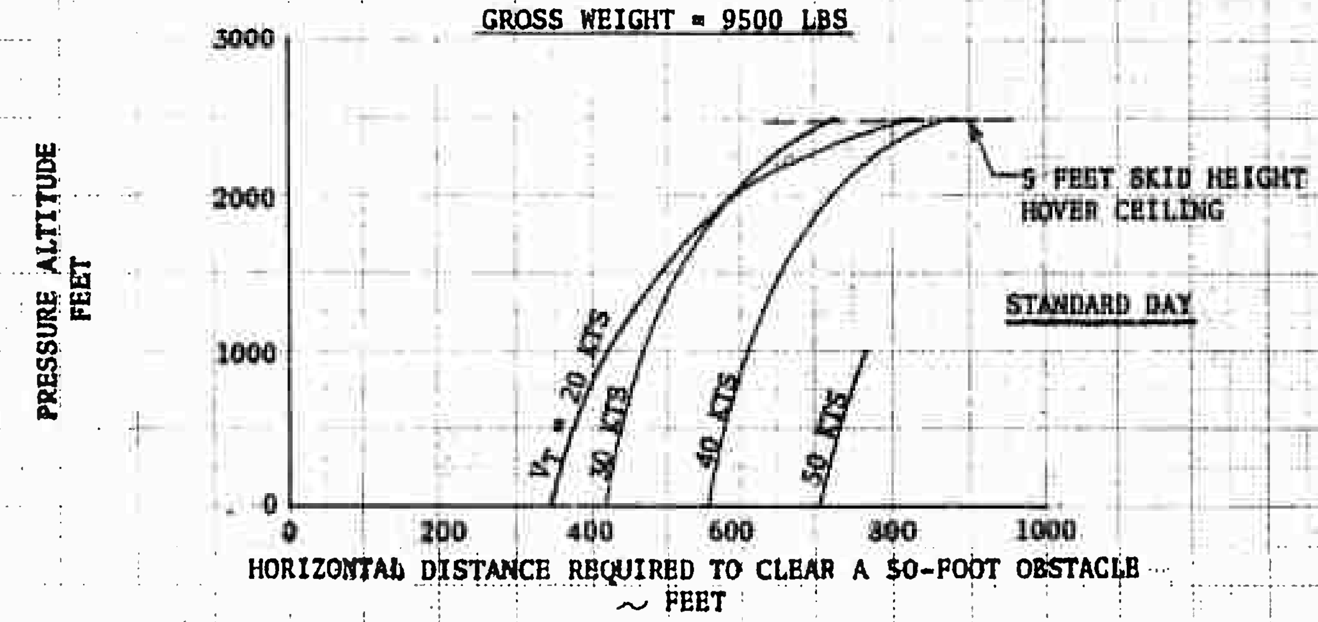


FIGURE NO. 13

NON-DIMENSIONAL TAKEOFF PERFORMANCE SUMMARY

UH-1B/540 USA S/N 63-8684

T53-L-11 S/N LEO 9542

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

NOTES:

1. CURVES OBTAINED FROM FIGURES NO. 14 THROUGH 20
2. WIND LESS THAN 4 KNOTS
3. ΔC_p=(C_p AVAILABLE) - (C_p REQUIRED TO HOVER AT 2 FEET)
4. V_T = TRUE CLIMBOUT AIRSPEED

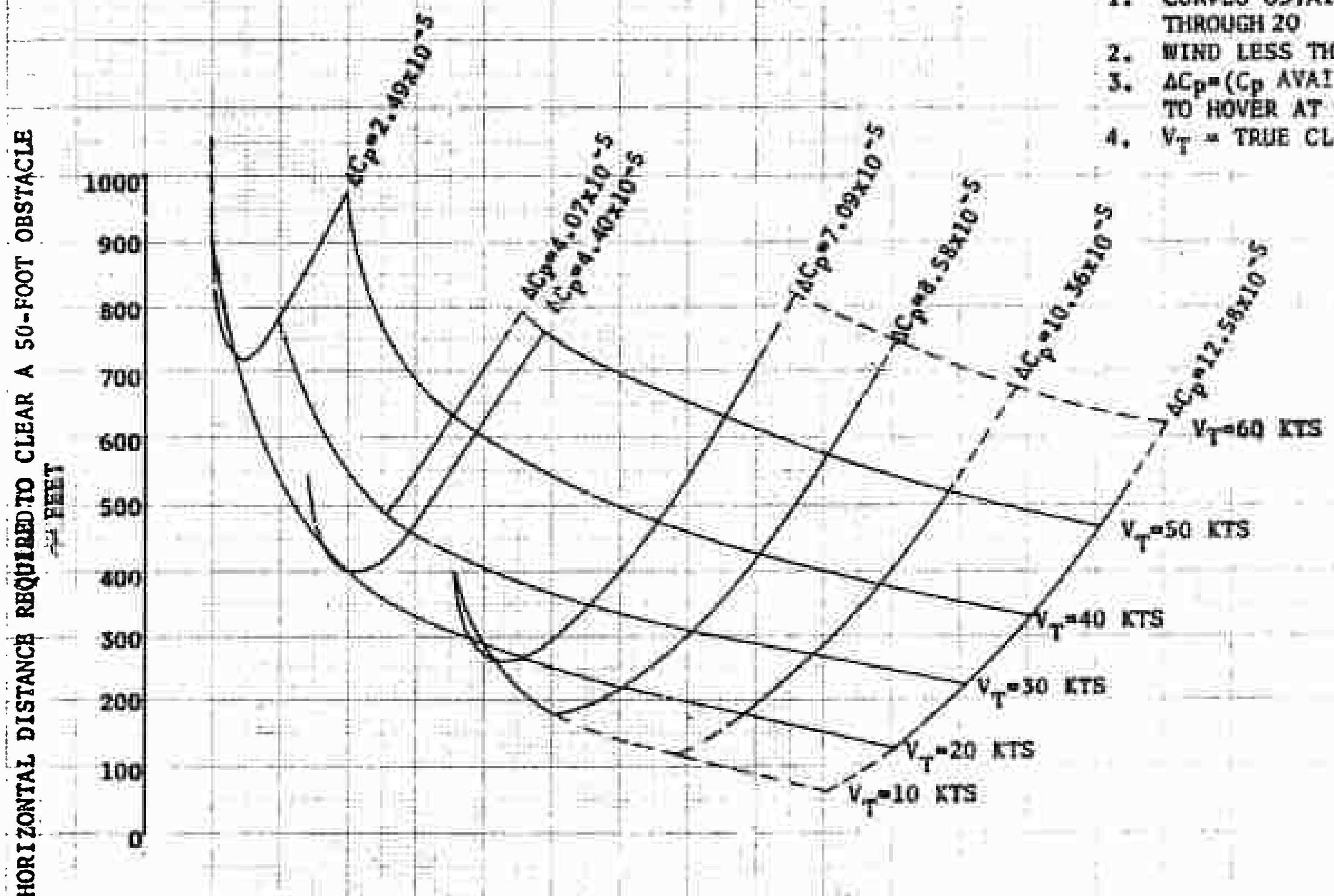


FIGURE NO. 14
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 328. RPM
GROSS WEIGHT = 7430 LBS
FREE AIR TEMPERATURE = +1.46°C
PRESSURE ALTITUDE = 9760 FEET
WIND VELOCITY = <4 KNOTS
$\Delta C_p = 2.49 \times 10^{-5}$

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

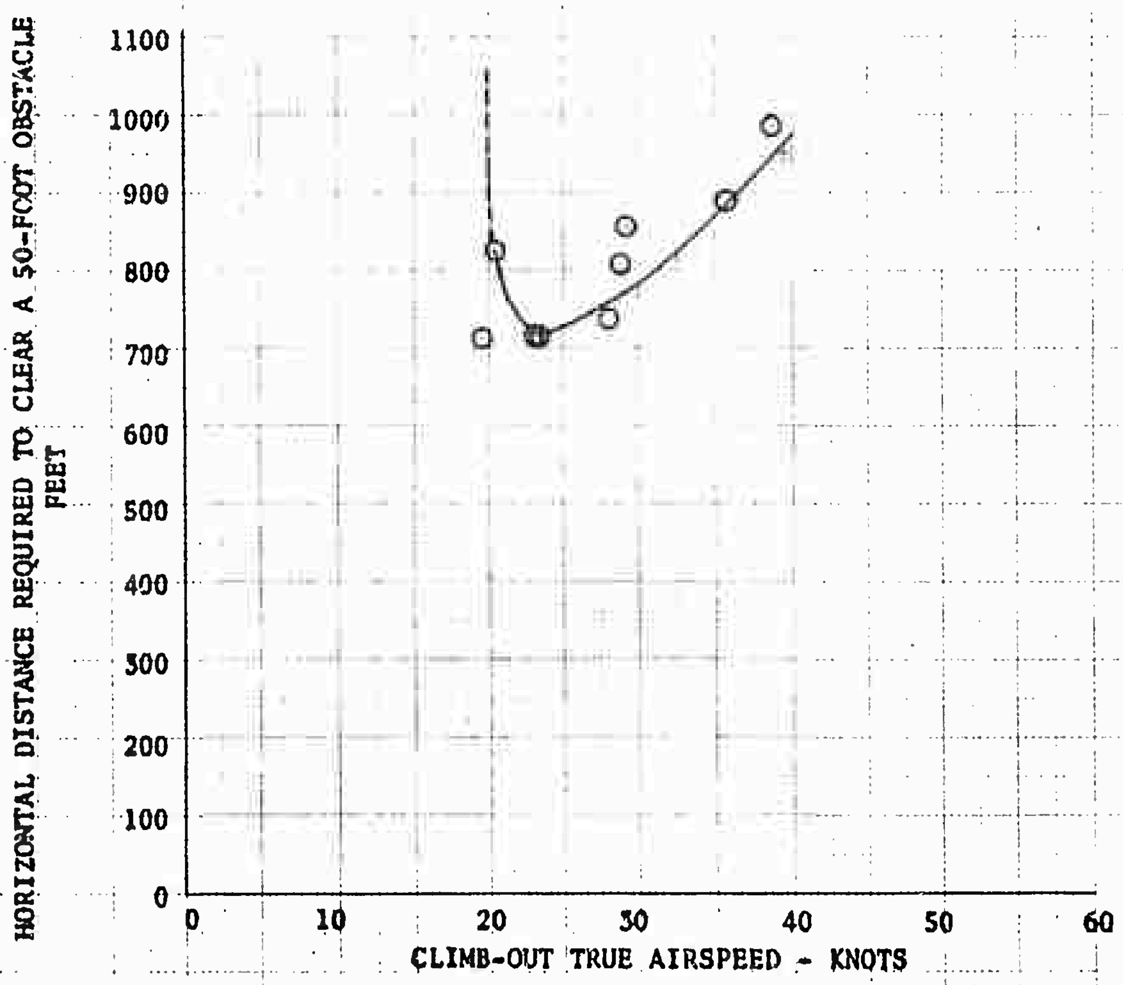


FIGURE NO. 15
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 323 RPM
GROSS WEIGHT = 7560 LBS
FREE AIR TEMPERATURE = -1.77°C
PRESSURE ALTITUDE = 9500 FEET
WIND VELOCITY = <4 KNOTS
$\Delta C_p = 4.07 \times 10^{-5}$

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

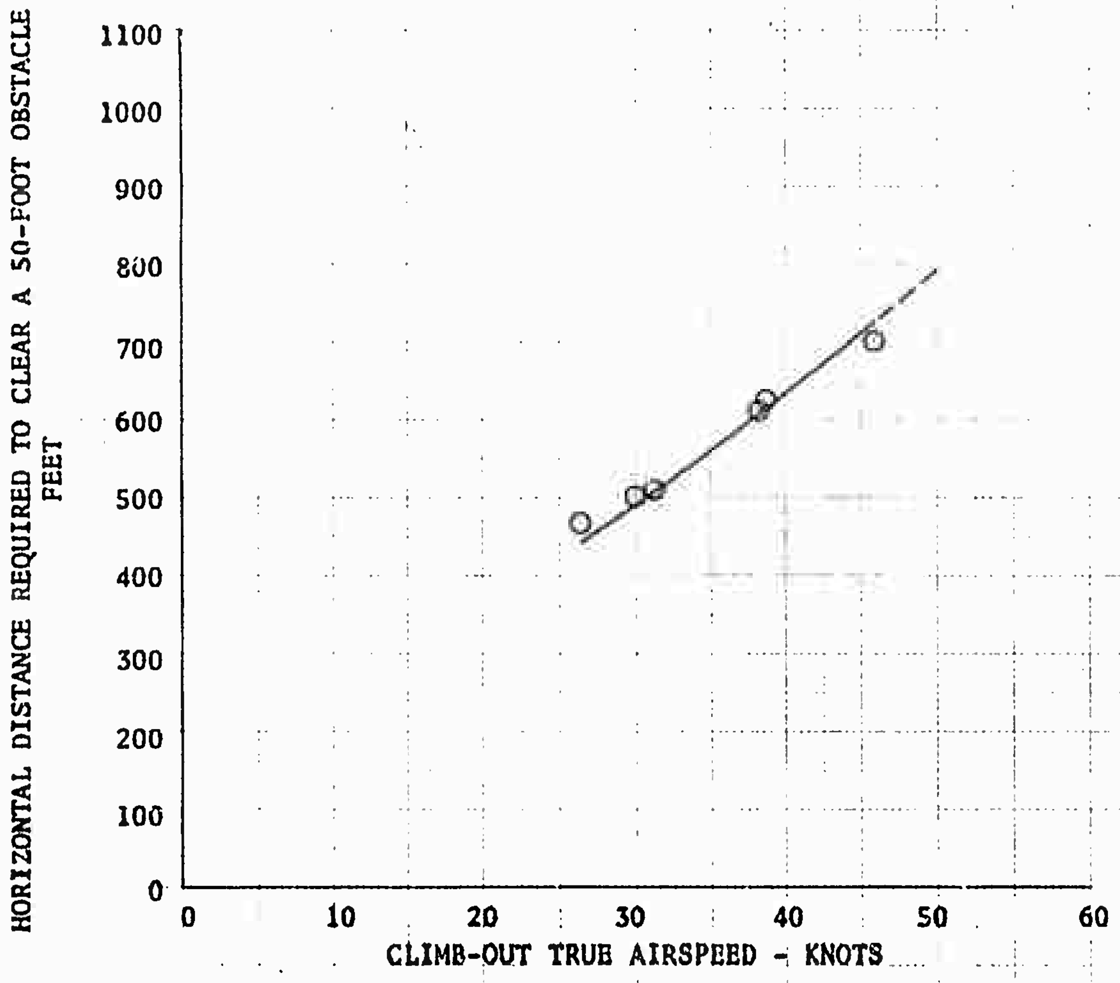


FIGURE NO. 16
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 324 RPM
GROSS WEIGHT = 7590 LBS
FREE AIR TEMPERATURE = -5.23°C
PRESSURE ALTITUDE = 9700 FEET
WIND VELOCITY = <4 KNOTS
ΔC_P = 4.30 X 10^{-5}

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

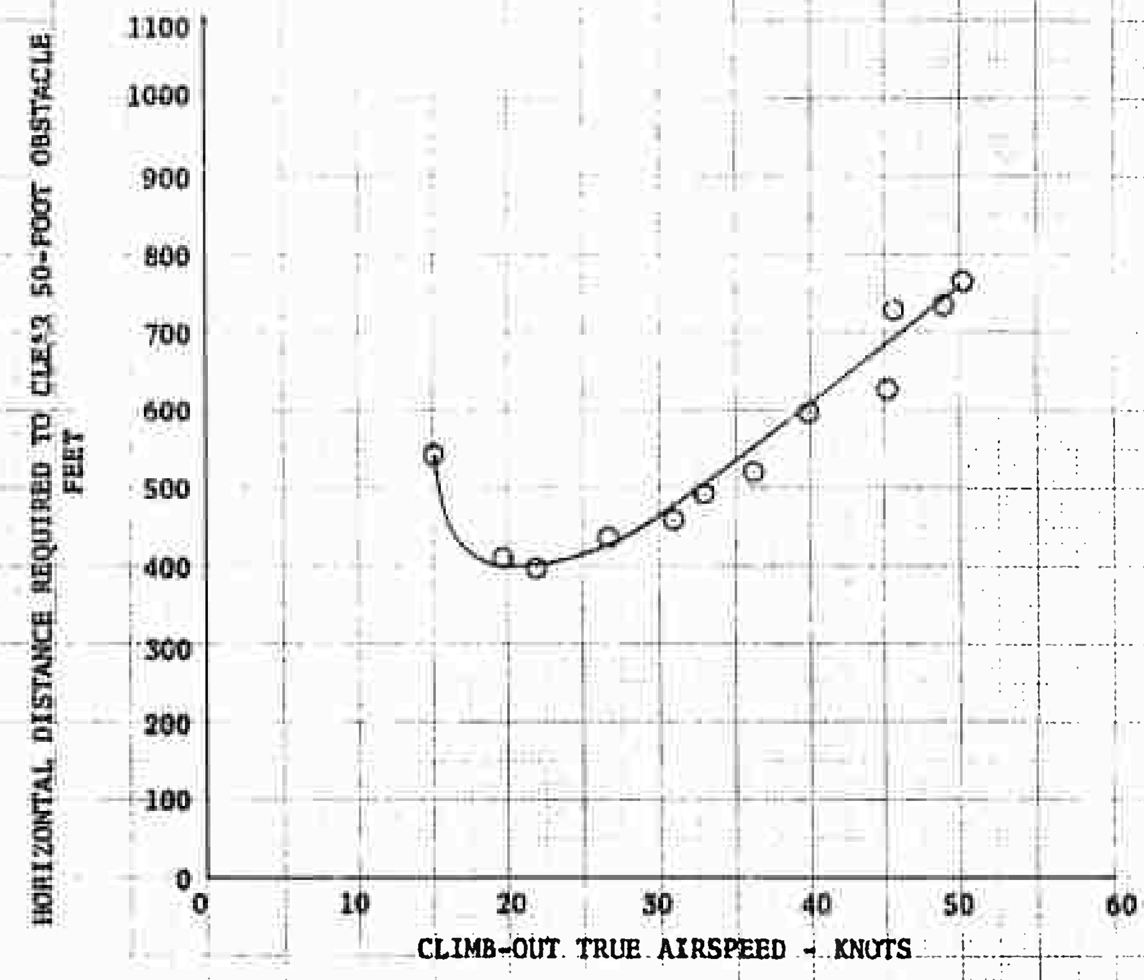


FIGURE NO. 17
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 323 RPM
GROSS WEIGHT = 7226 LBS
FREE AIR TEMPERATURE = -4.16°C
PRESSURE ALTITUDE = 9680 FEET
WIND VELOCITY = <4 KNOTS
$\delta C_p = 7.093 \times 10^{-5}$

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

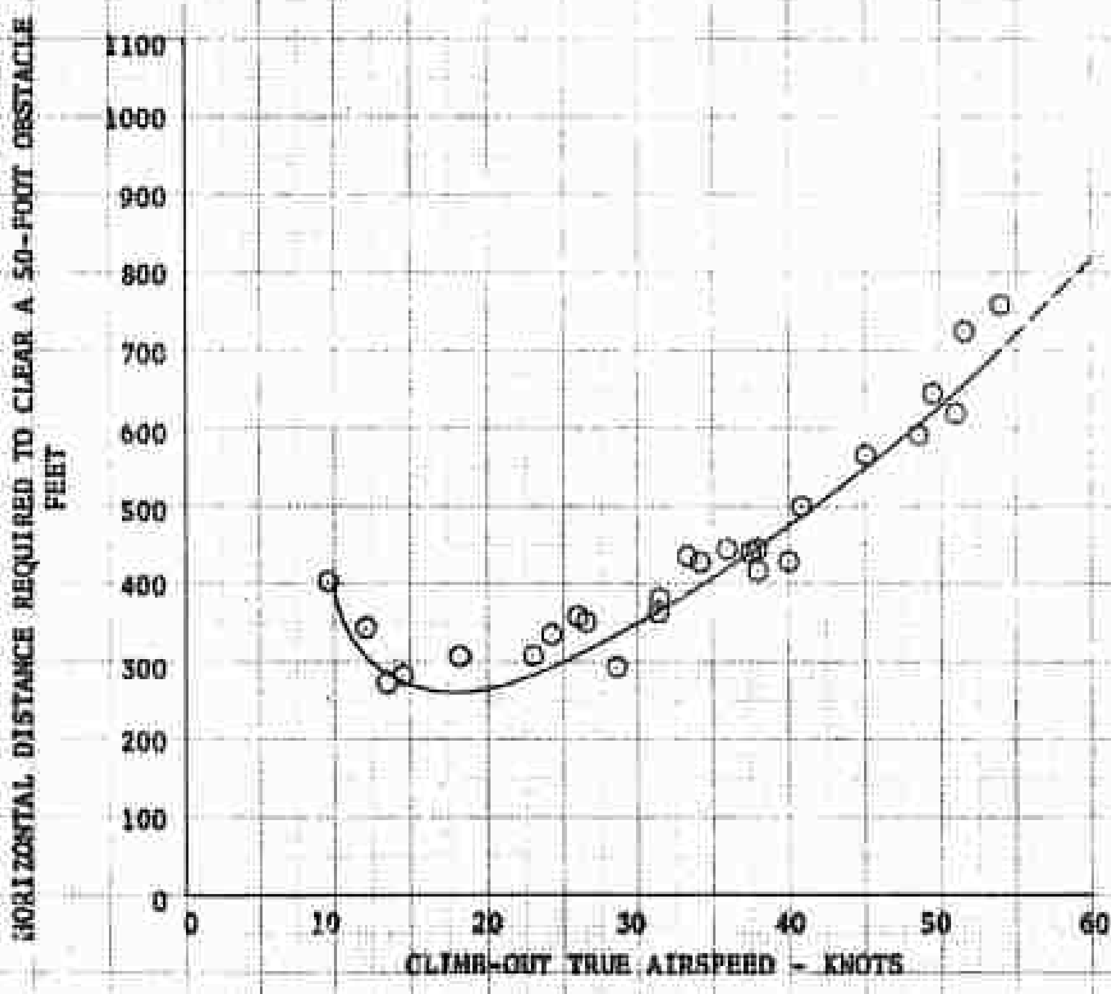


FIGURE NO. 18
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 323. RPM
GROSS WEIGHT = 6680 LBS
FREE AIR TEMPERATURE = -1.12°C
PRESSURE ALTITUDE = 8629 FEET
WIND VELOCITY = <4 KNOTS
$\Delta C_p = 8.585 \times 10^{-5}$

TWO FEET SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

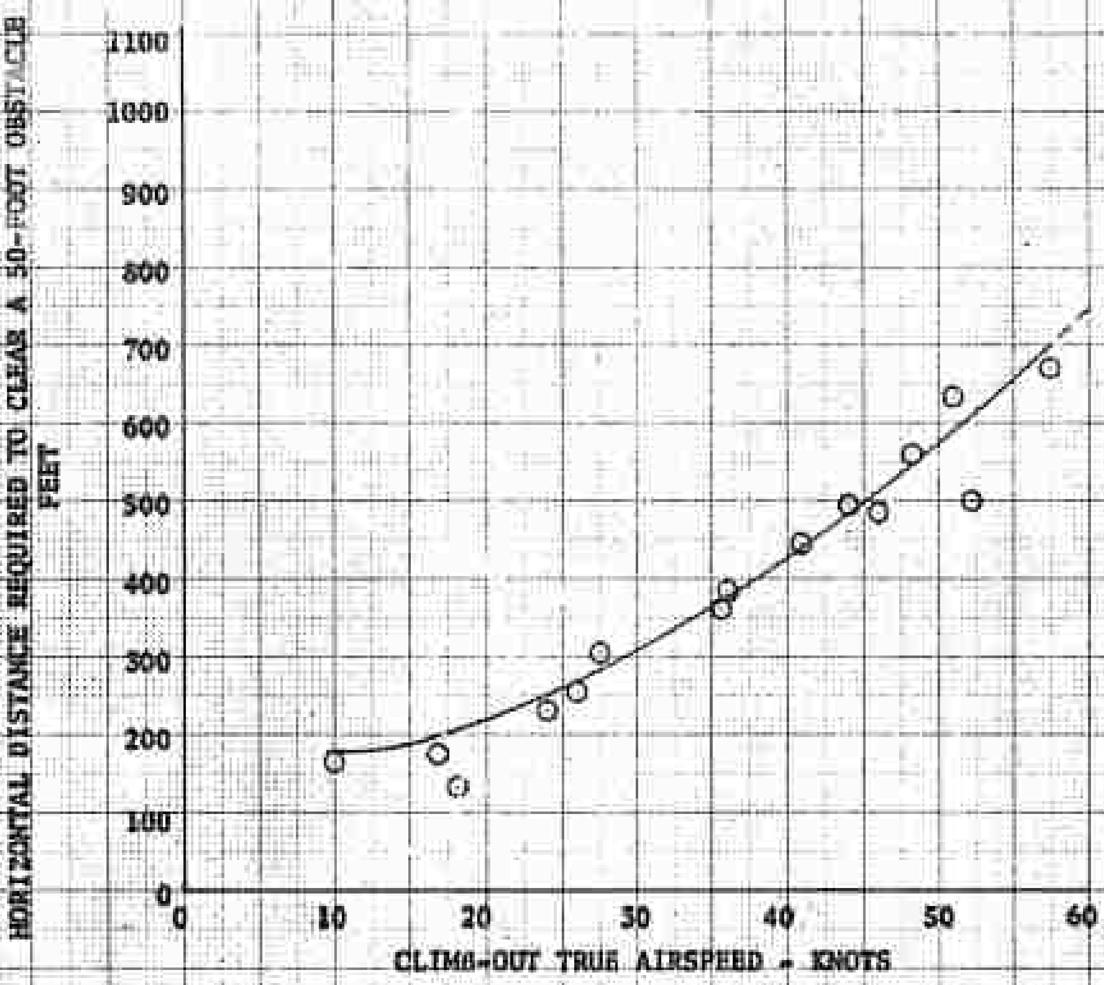


FIGURE NO. 19
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 323.4 RPM
GROSS WEIGHT = 6310 LBS
FREE AIR TEMPERATURE = +1.5°C
PRESSURE ALTITUDE = 9610 FEET
WIND VELOCITY = <4 KNOTS
ΔC_p = 10.364×10^{-5}

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

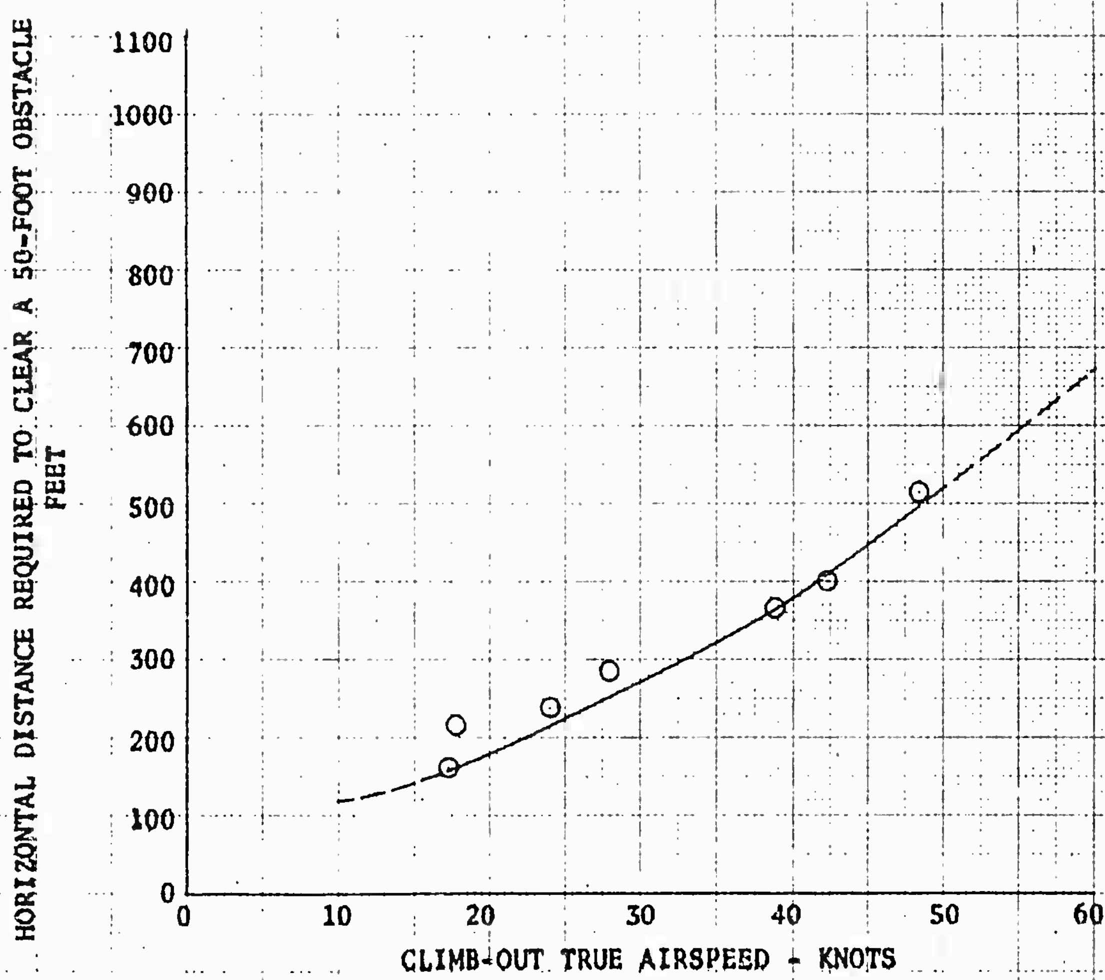


FIGURE NO. 20
TAKEOFF PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

ROTOR SPEED = 323.4 RPM
GROSS WEIGHT = 6090 LBS
FREE AIR TEMPERATURE = -2.69°C
PRESSURE ALTITUDE = 9620 FEET
WIND VELOCITY = <4 KNOTS
ΔC_p = 12.58×10^{-5}

TWO FOOT SKID HEIGHT LEVEL ACCELERATION TECHNIQUE

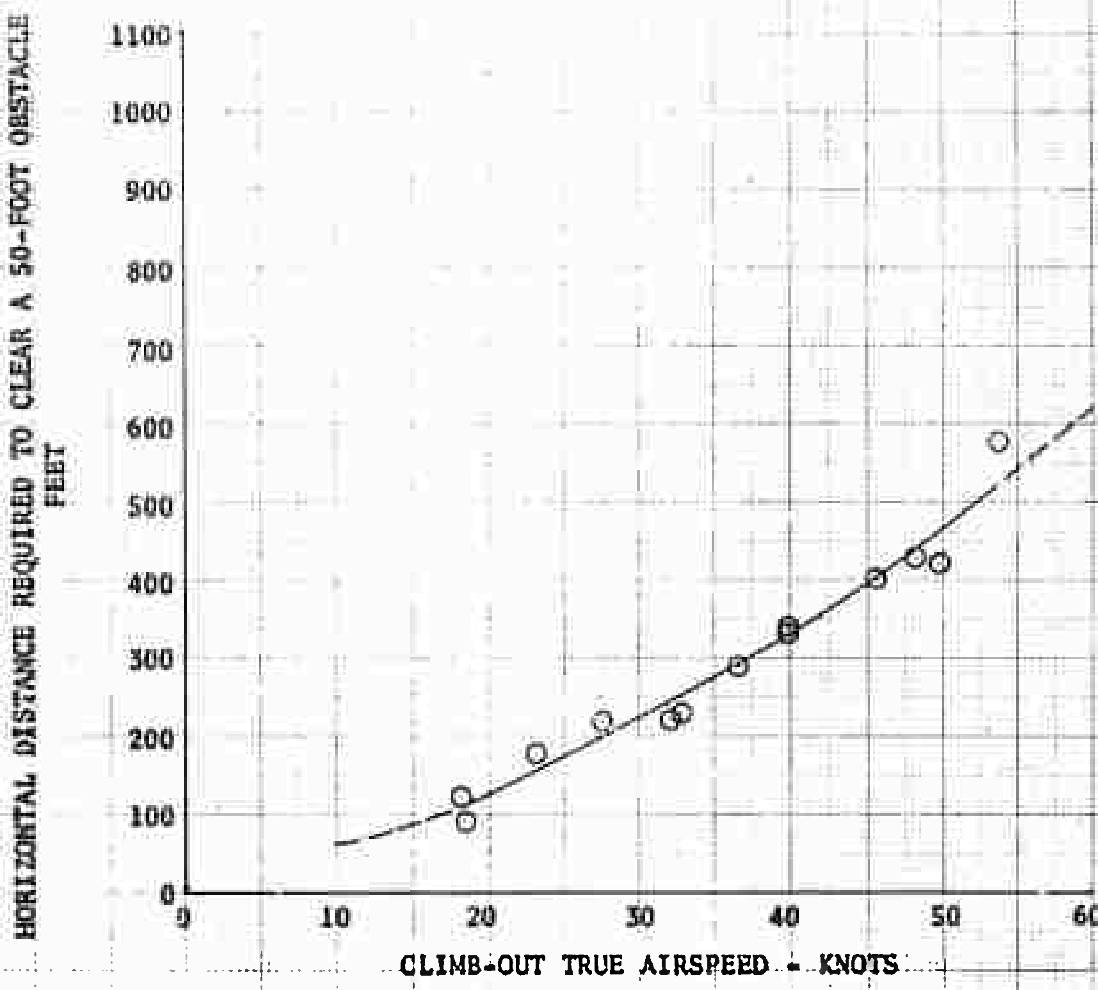


FIGURE NO. 21
CLIMB PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

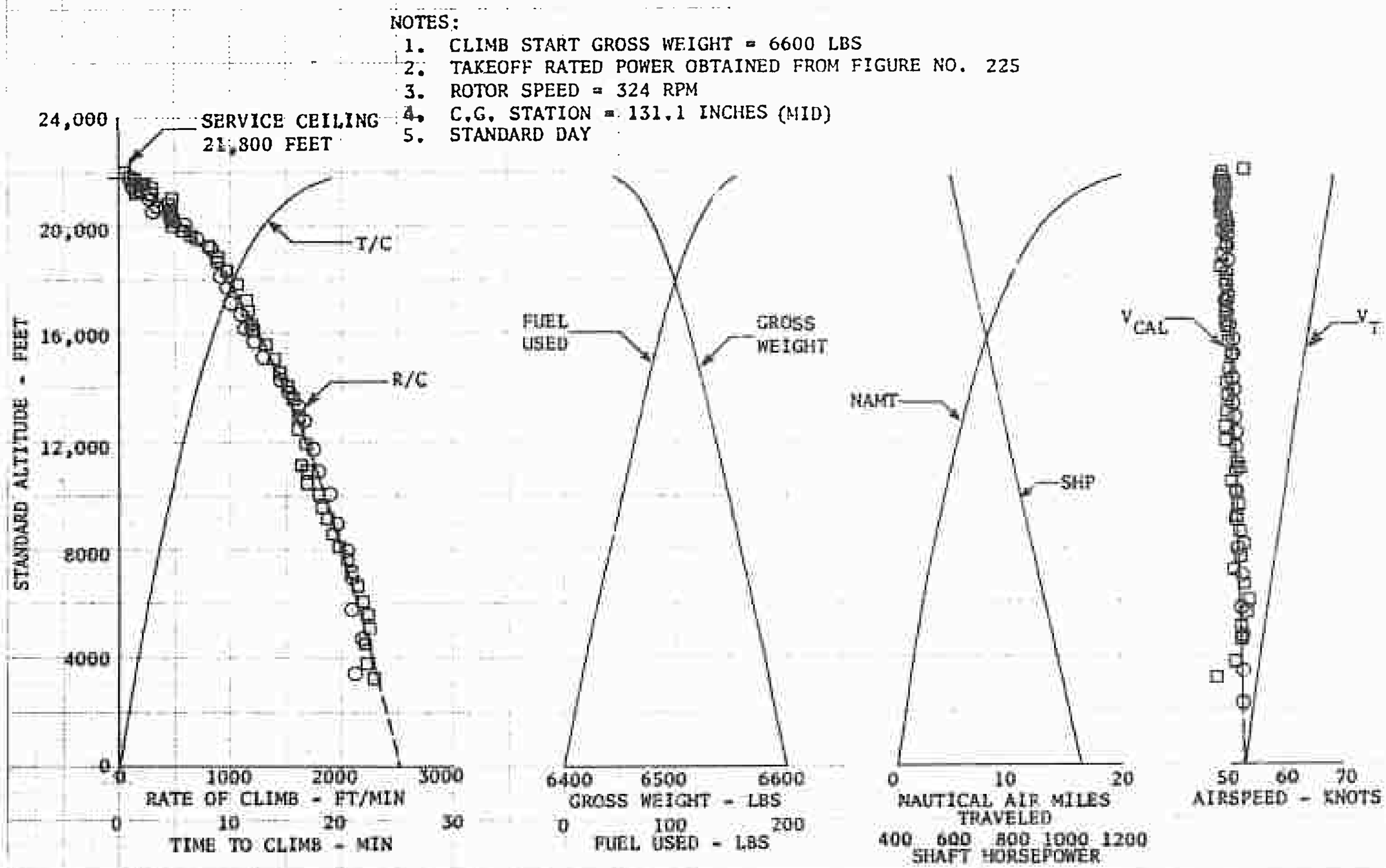


FIGURE NO. 22
CLIMB PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. CLIMB START GROSS WEIGHT = 7500 LBS
2. TAKEOFF RATED POWER OBTAINED FROM FIGURE NO. 225
3. ROTOR SPEED = 324 RPM
4. C.G. STATION = 131.2 INCHES (MID)
5. STANDARD DAY

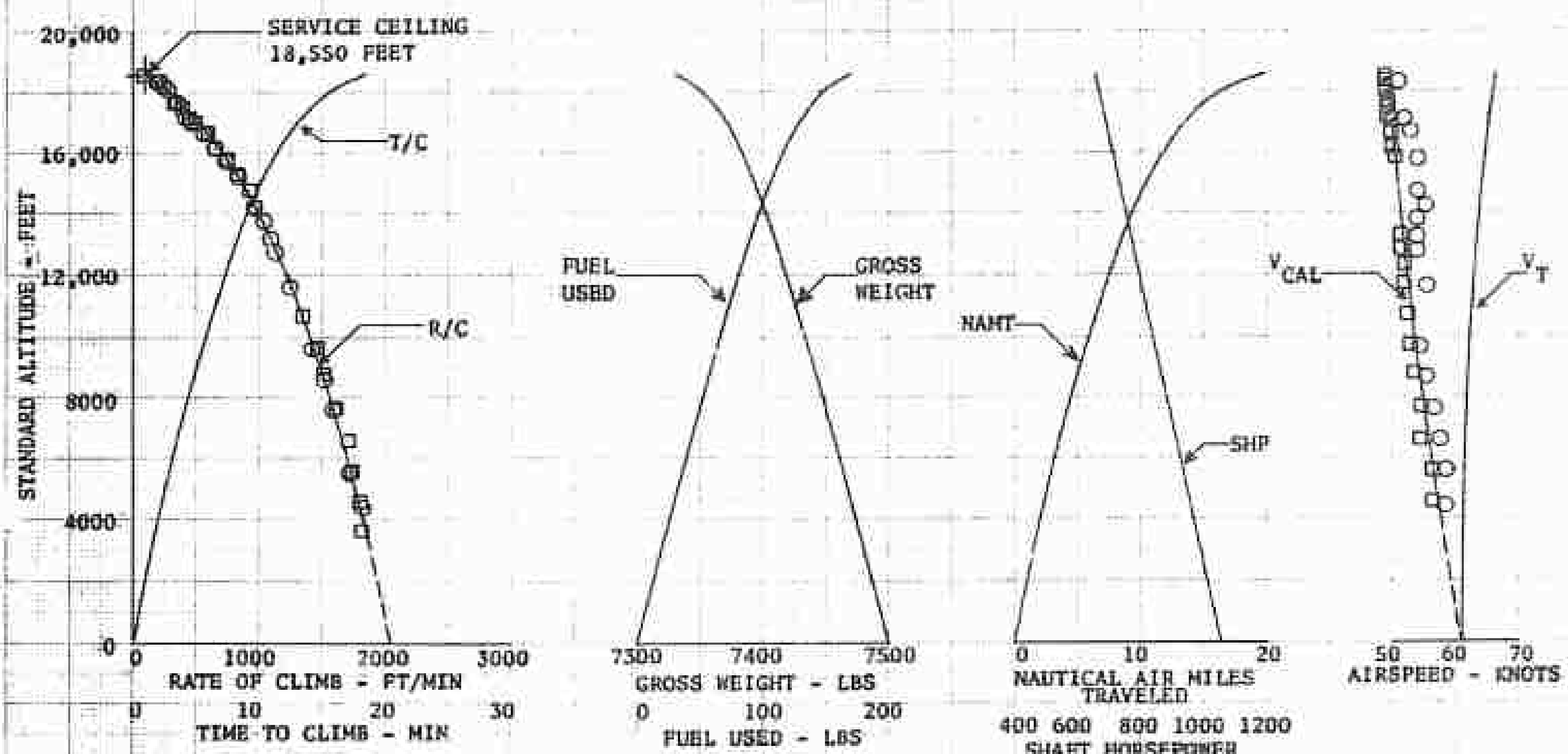
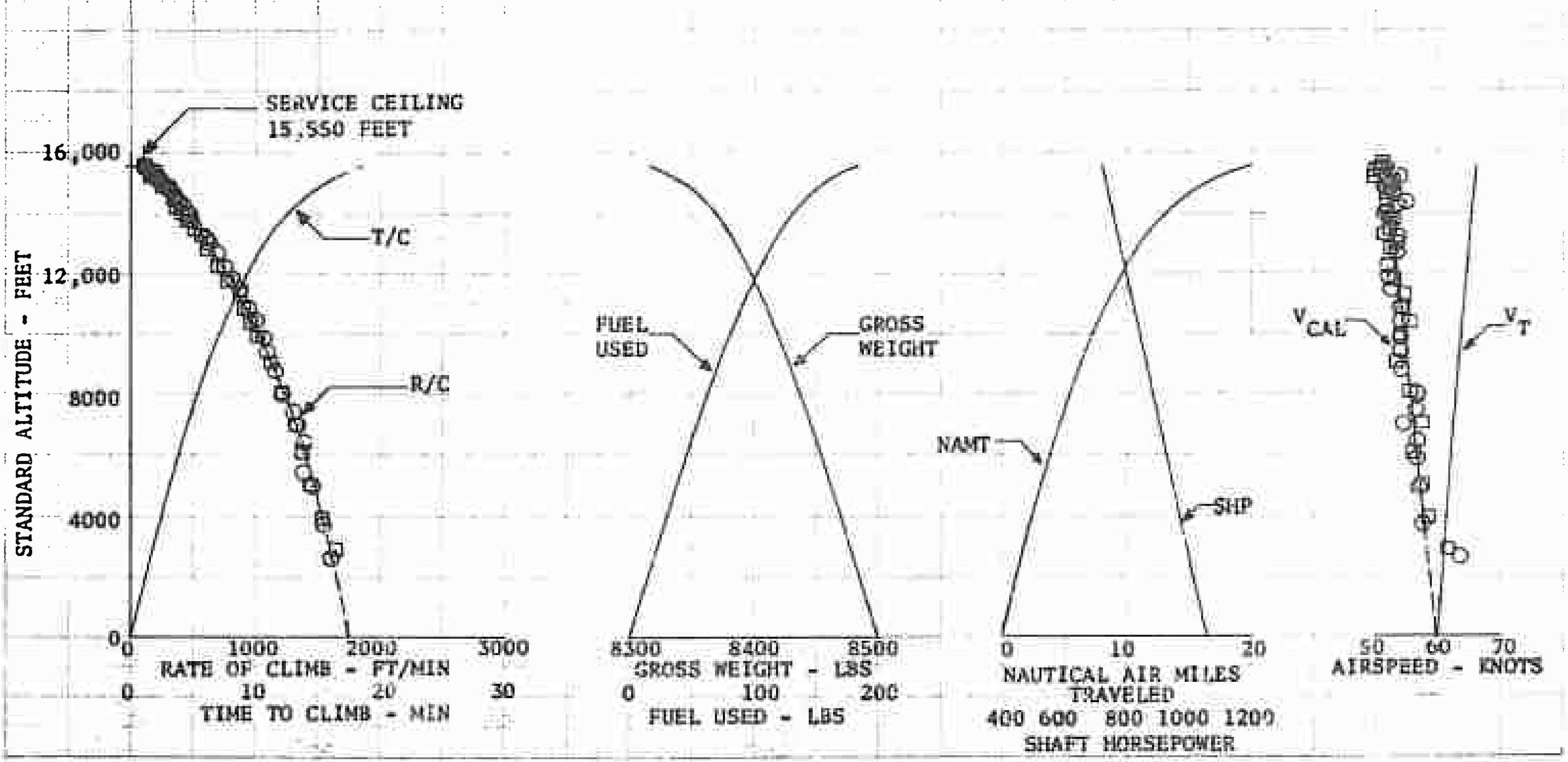


FIGURE NO 23
CLIMB PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. CLIMB START GROSS WEIGHT = 8500 LBS
2. TAKEOFF RATED POWER OBTAINED FROM FIGURE NO. 225
3. ROTOR SPEED = 324 RPM
4. C.G. STATION = 131.15 INCHES (MID)
5. STANDARD DAY



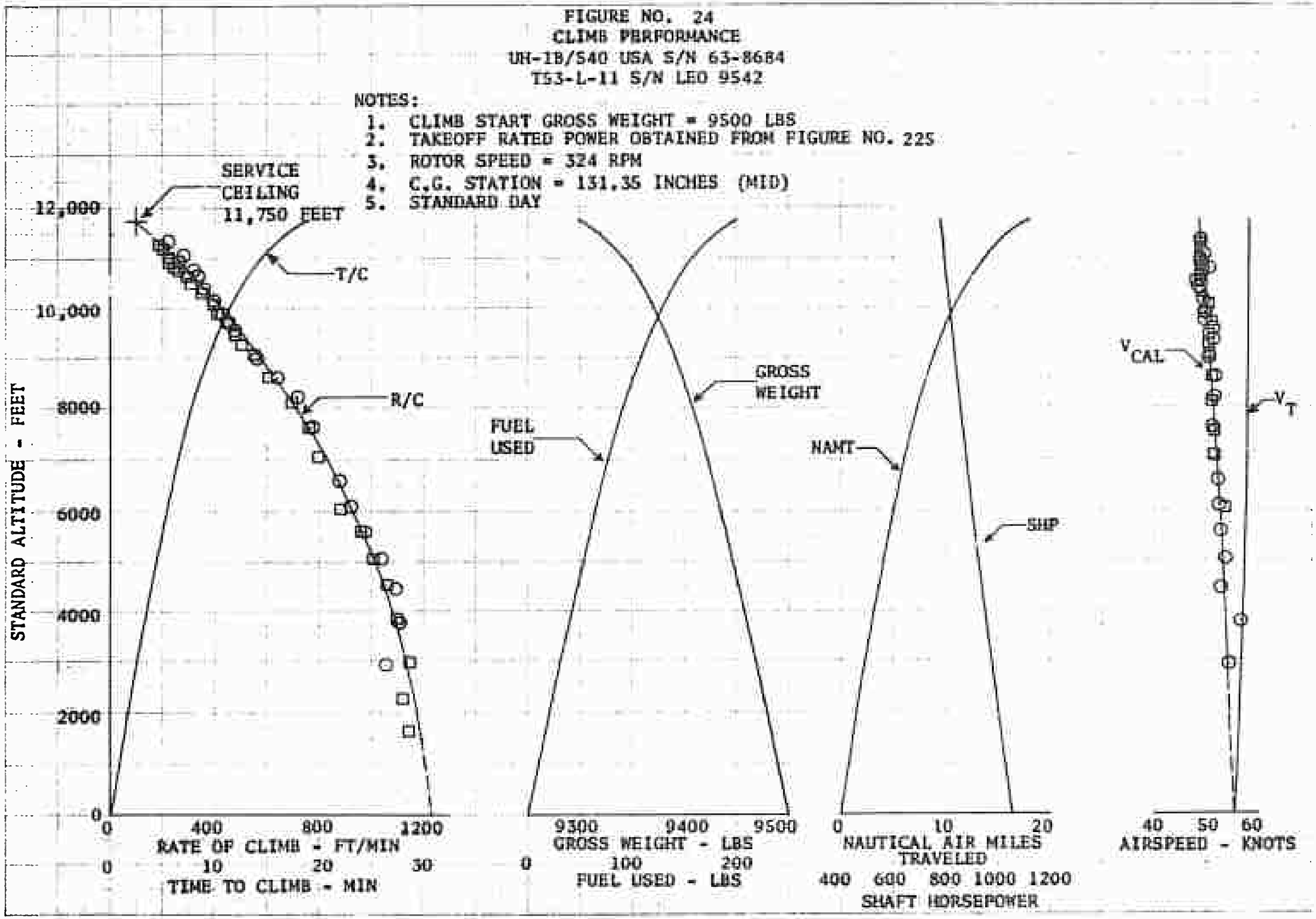
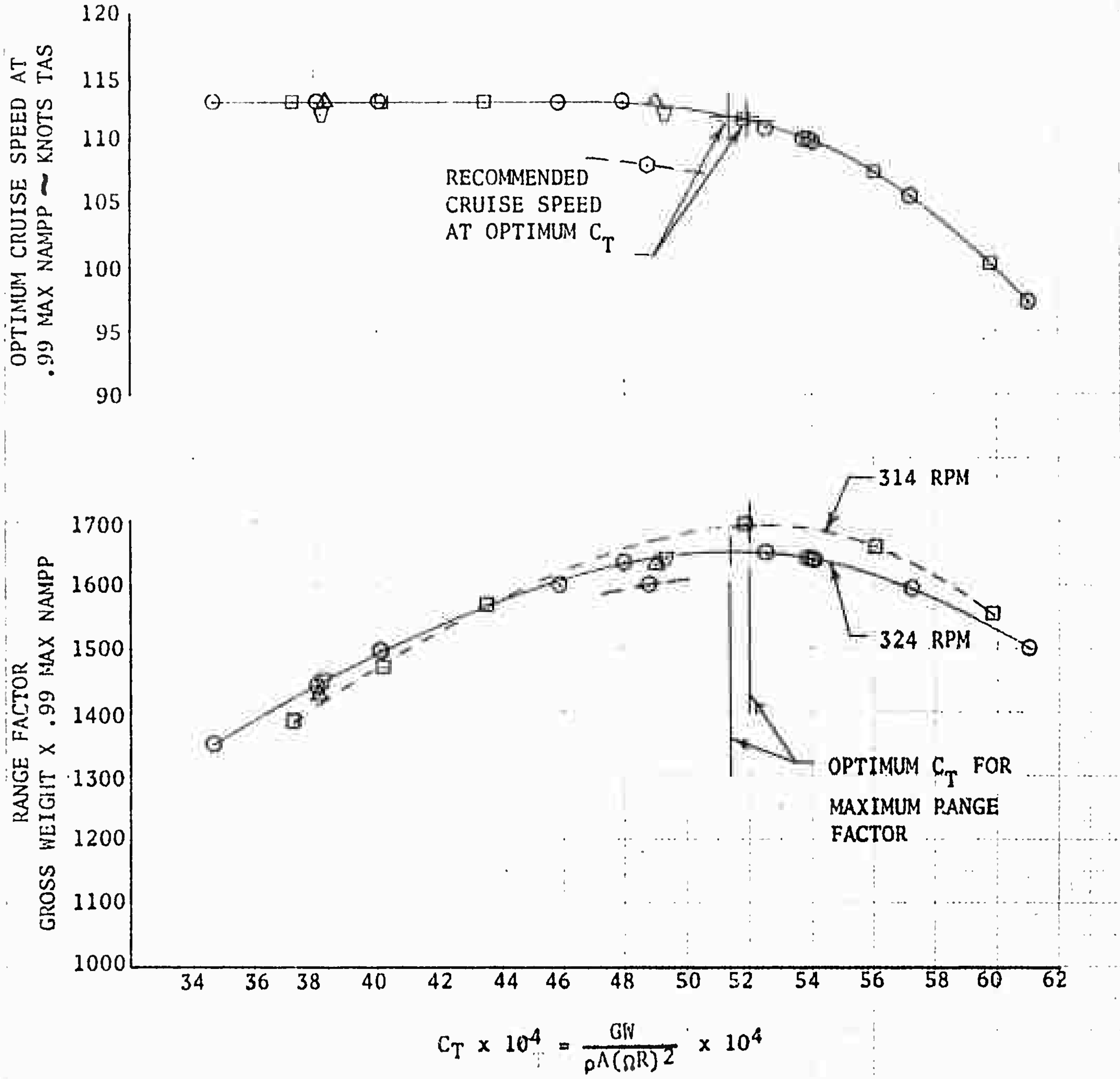


FIGURE NO. 24
CLIMB PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
NOTES:
1. CLIMB START GROSS WEIGHT = 9500 LBS
2. TAKEOFF RATED POWER OBTAINED FROM FIGURE NO. 225
3. ROTOR SPEED = 324 RPM
4. C.G. STATION = 131.35 INCHES (MID)
5. STANDARD DAY
SERVICE CEILING 11,750 FEET
T/C
R/C
FUEL USED
GROSS WEIGHT
NAMT
SHP
V_{CAL}
V_T
STANDARD ALTITUDE - FEET
0
2000
4000
6000
8000
10,000
12,000
0 400 800 1200
RATE OF CLIMB - FT/MIN
0 10 20 30
TIME TO CLIMB - MIN
9300 9400 9500
GROSS WEIGHT - LBS
0 100 200
FUEL USED - LBS
0 10 20
NAUTICAL AIR MILES TRAVELED
400 600 800 1000 1200
SHAFT HORSEPOWER
40 50 60
AIRSPEED - KNOTS

FIGURE NO. 25
LEVEL FLIGHT SUMMARY
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

SYM	RPM	CONFIGURATION
○	324	MID C.G.
□	314	MID C.G.
△	324	FWD C.G.
▽	324	AFT C.G.
⬡	324	CARGO DOORS OFF (MID C.G.)

NOTE: POINTS OBTAINED FROM FIGURES NO. 29 THROUGH 50



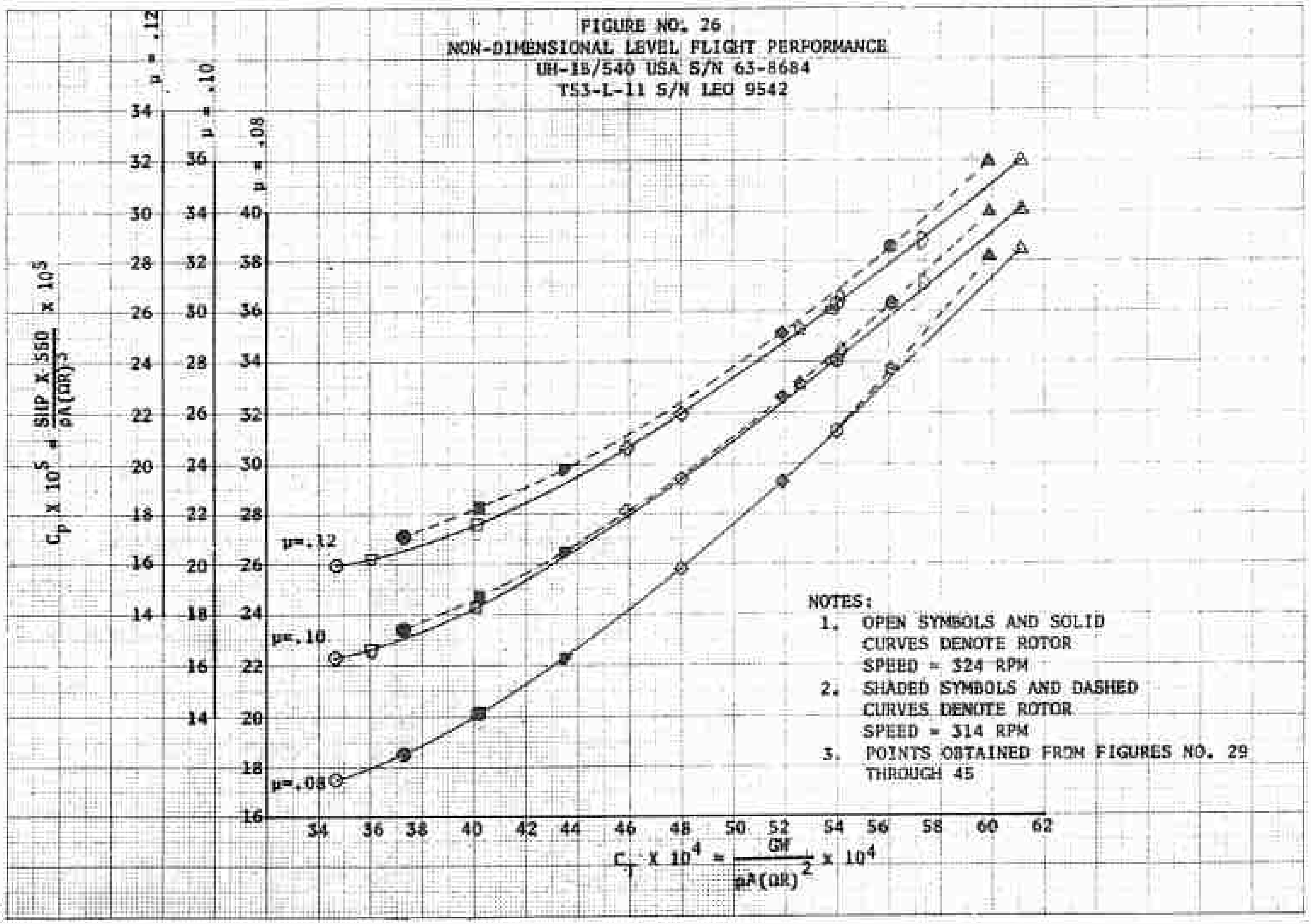
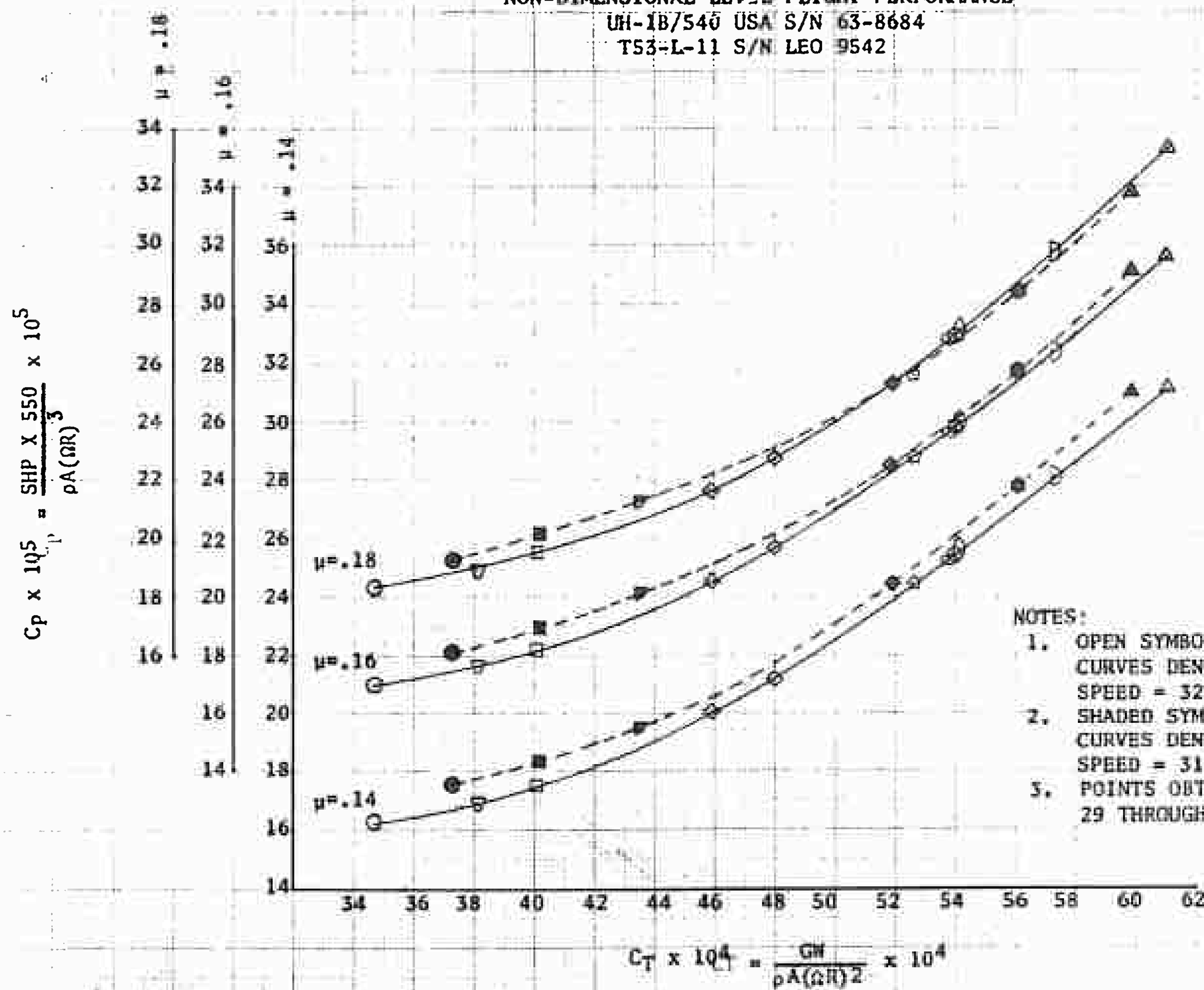


FIGURE NO. 26
NON-DIMENSIONAL LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

FIGURE NO. 27
NON-DIMENSIONAL LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542



NOTES:
1. OPEN SYMBOLS AND SOLID CURVES DENOTE ROTOR SPEED = 324 RPM
2. SHADED SYMBOLS AND DASHED CURVES DENOTE ROTOR SPEED = 314 RPM
3. POINTS OBTAINED FROM FIGURES NO. 29 THROUGH 45

FIGURE NO. 28
NON-DIMENSIONAL LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LE 09542

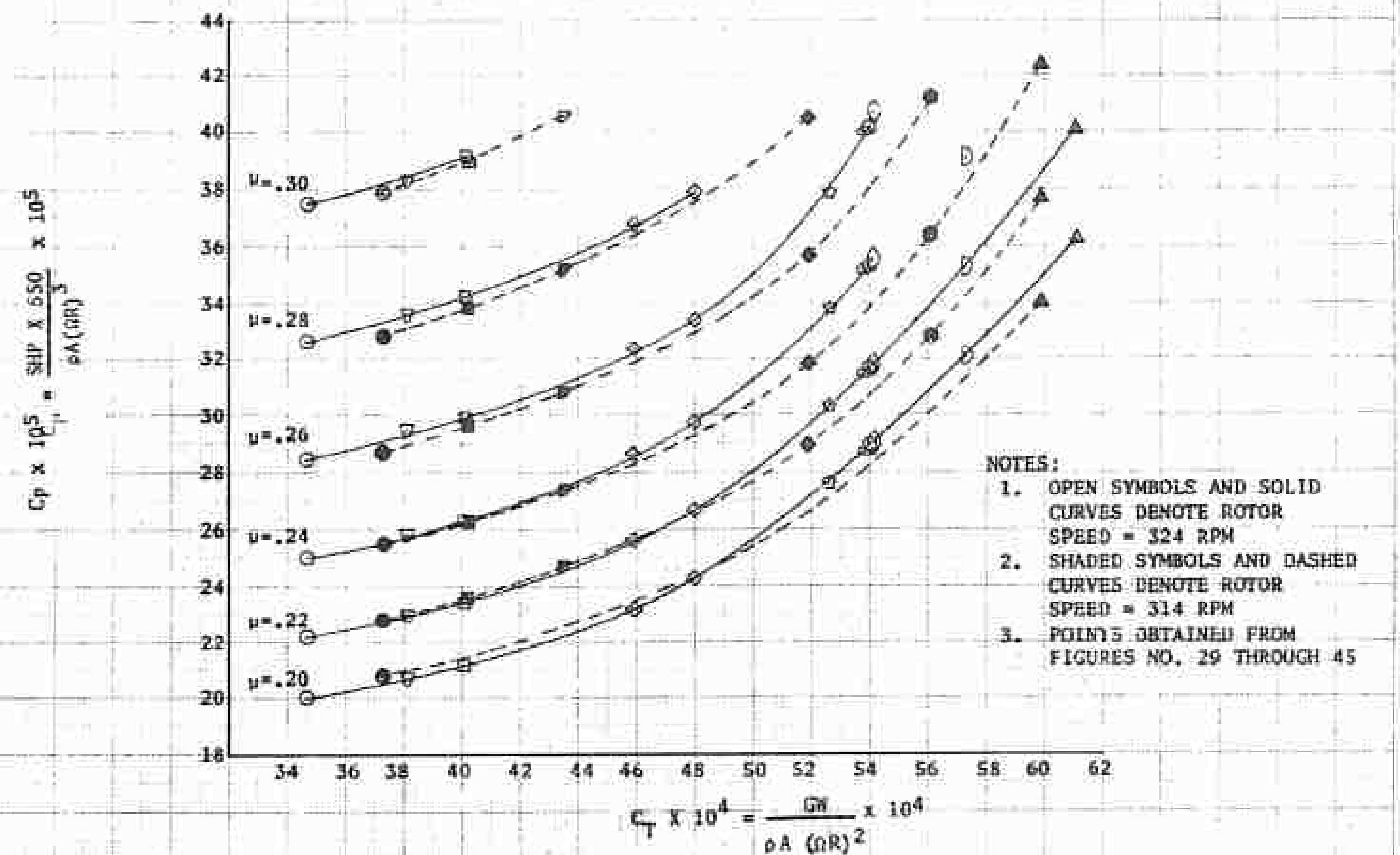


FIGURE NO. 29
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.6(MID)	6495	2480	324	.00347

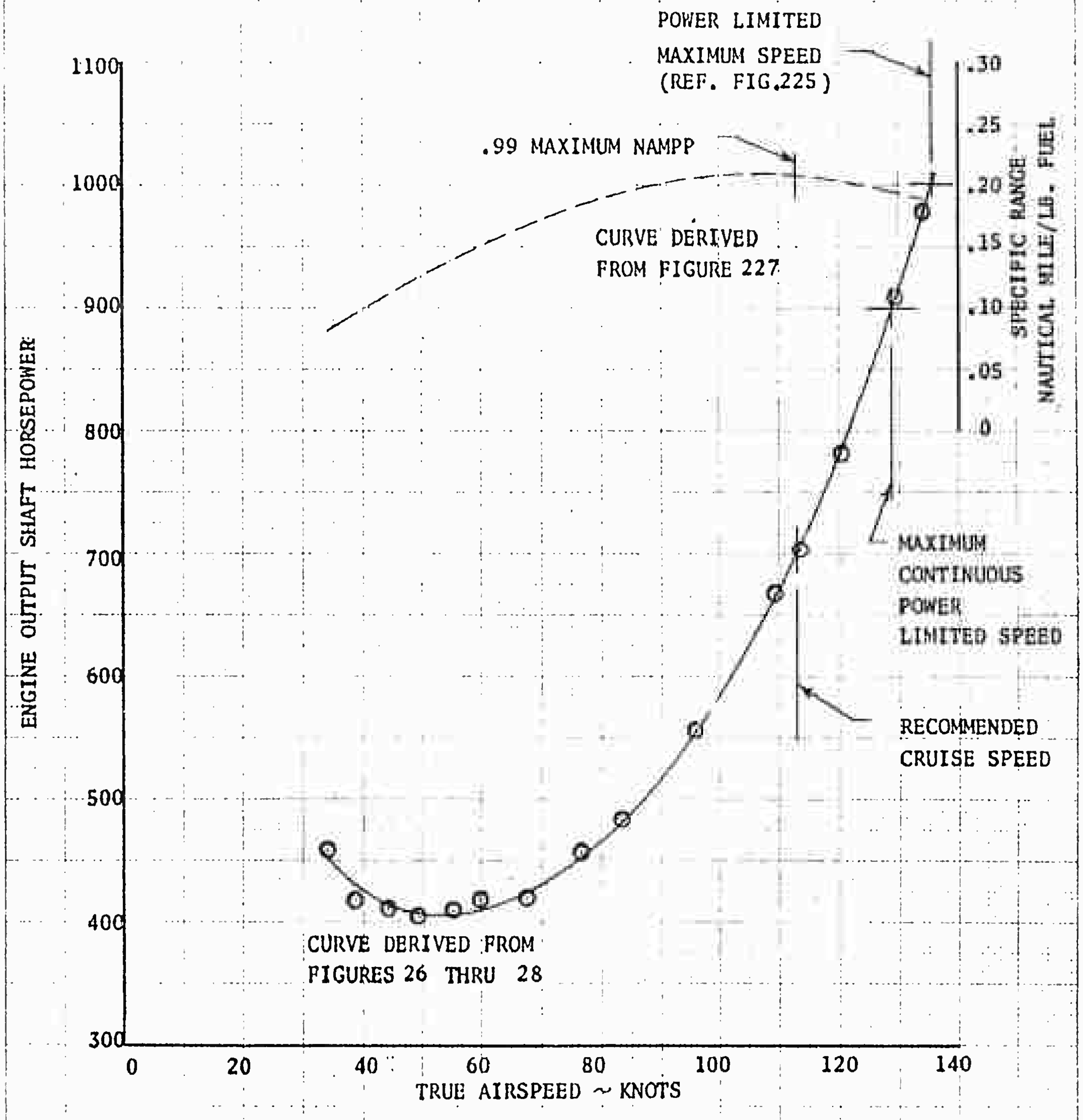


FIGURE NO. 30
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.0(MID)	6565	2675	315	.00373

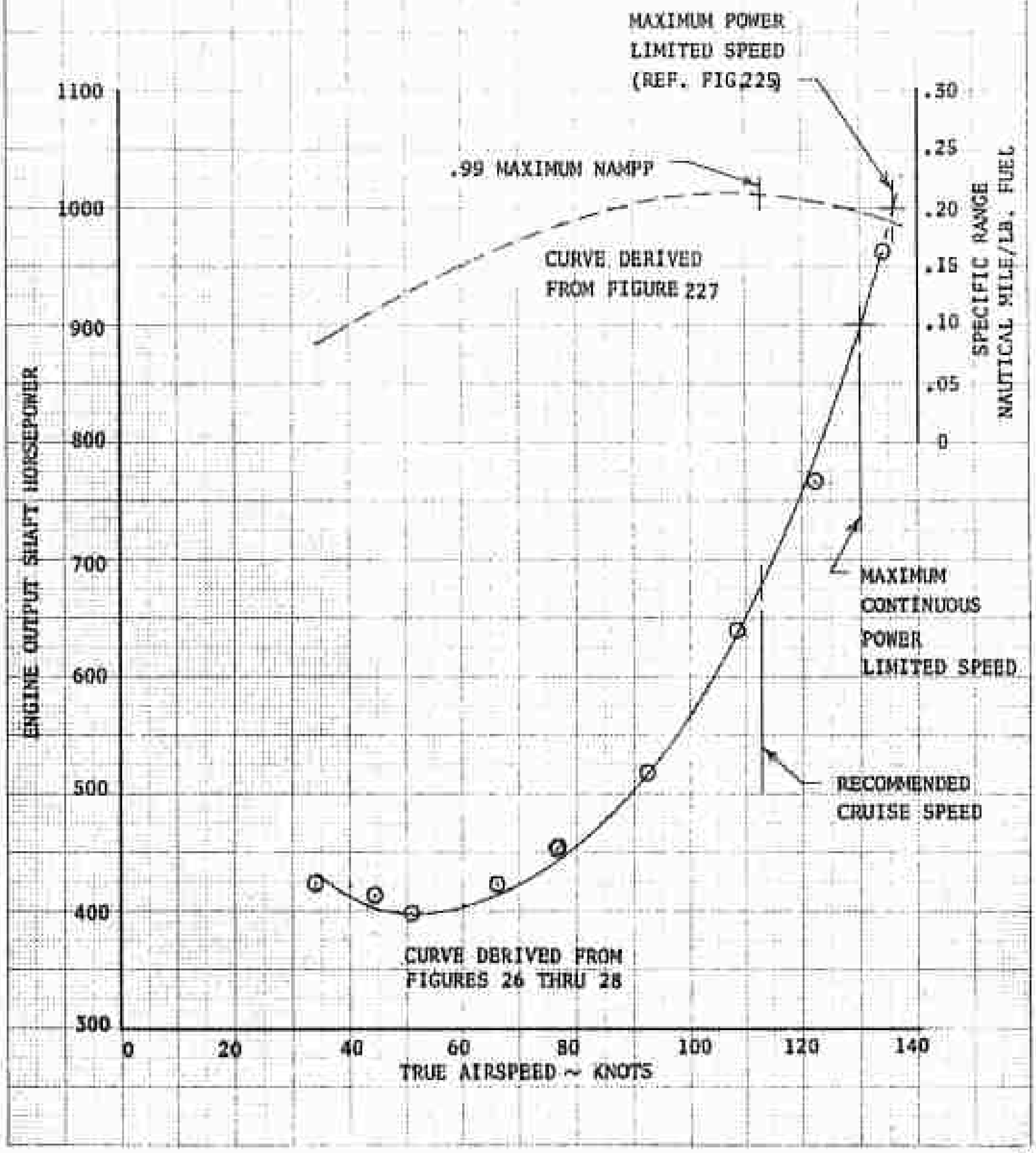


FIGURE NO. 31
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.1(MID)	6510	5485	324	.00381

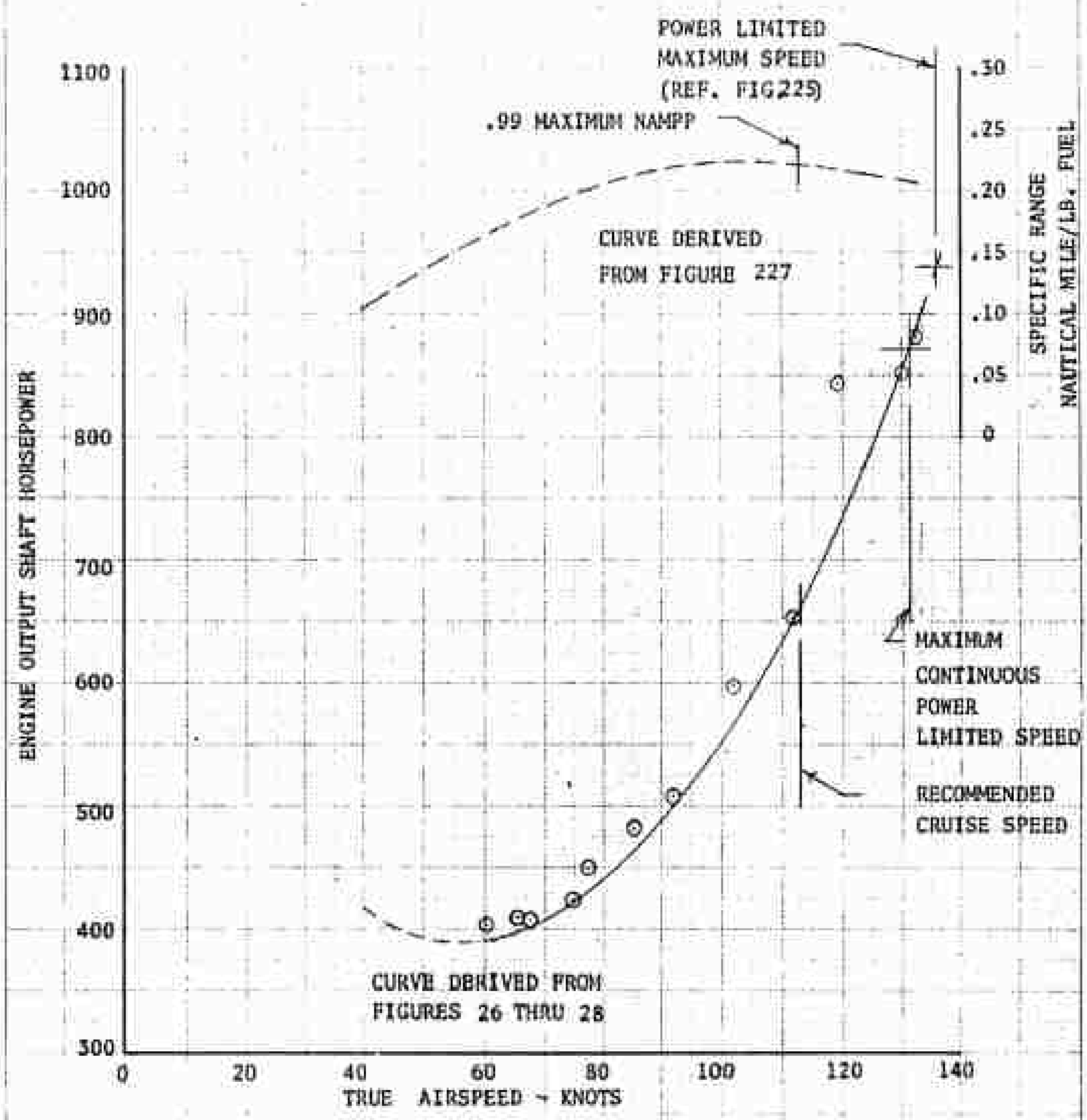


FIGURE NO. 32
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.8(MID)	6620	6625	324	.00401

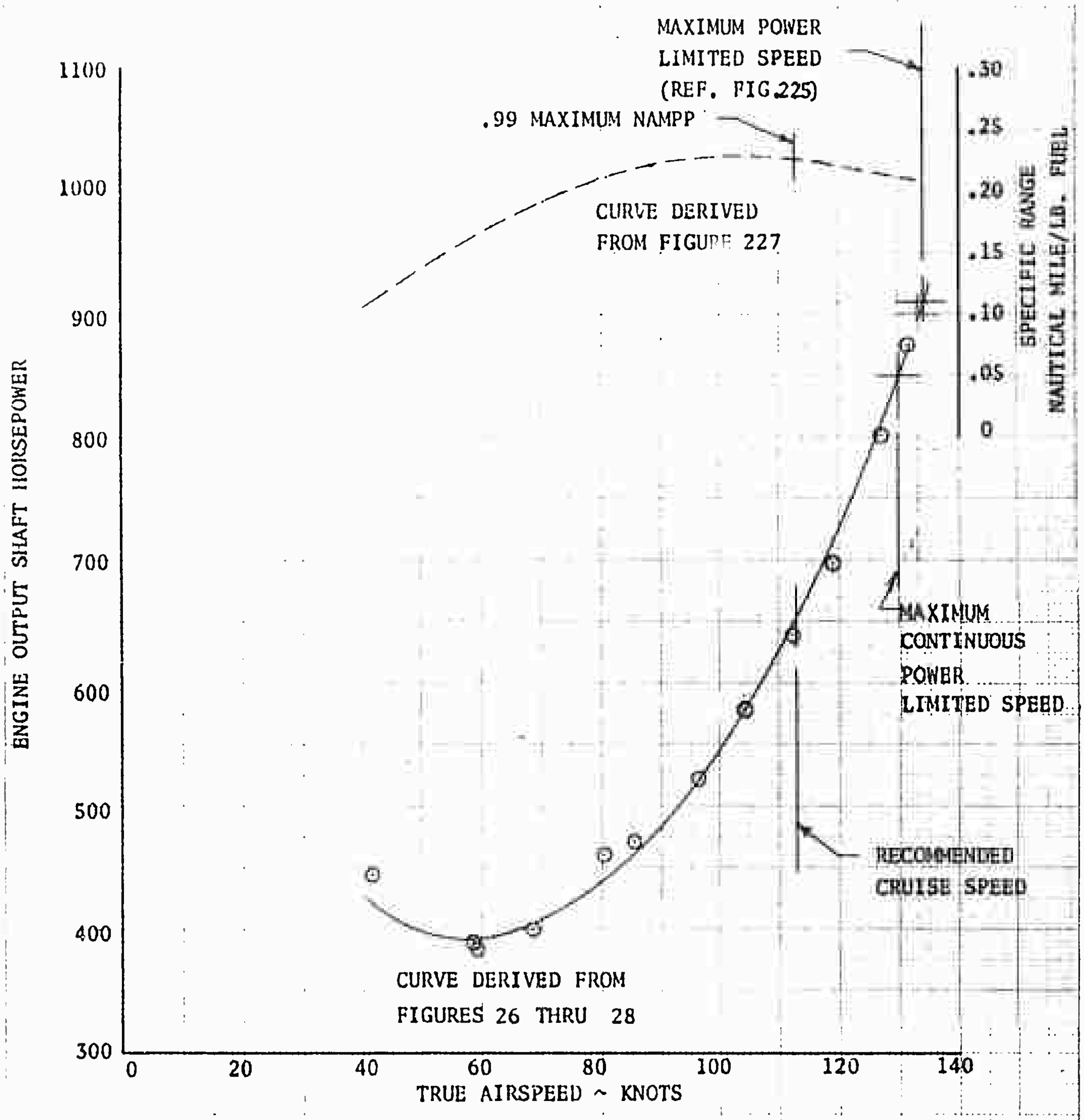


FIGURE NO. 33
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.6(MID)	6555	5225	315	.00402

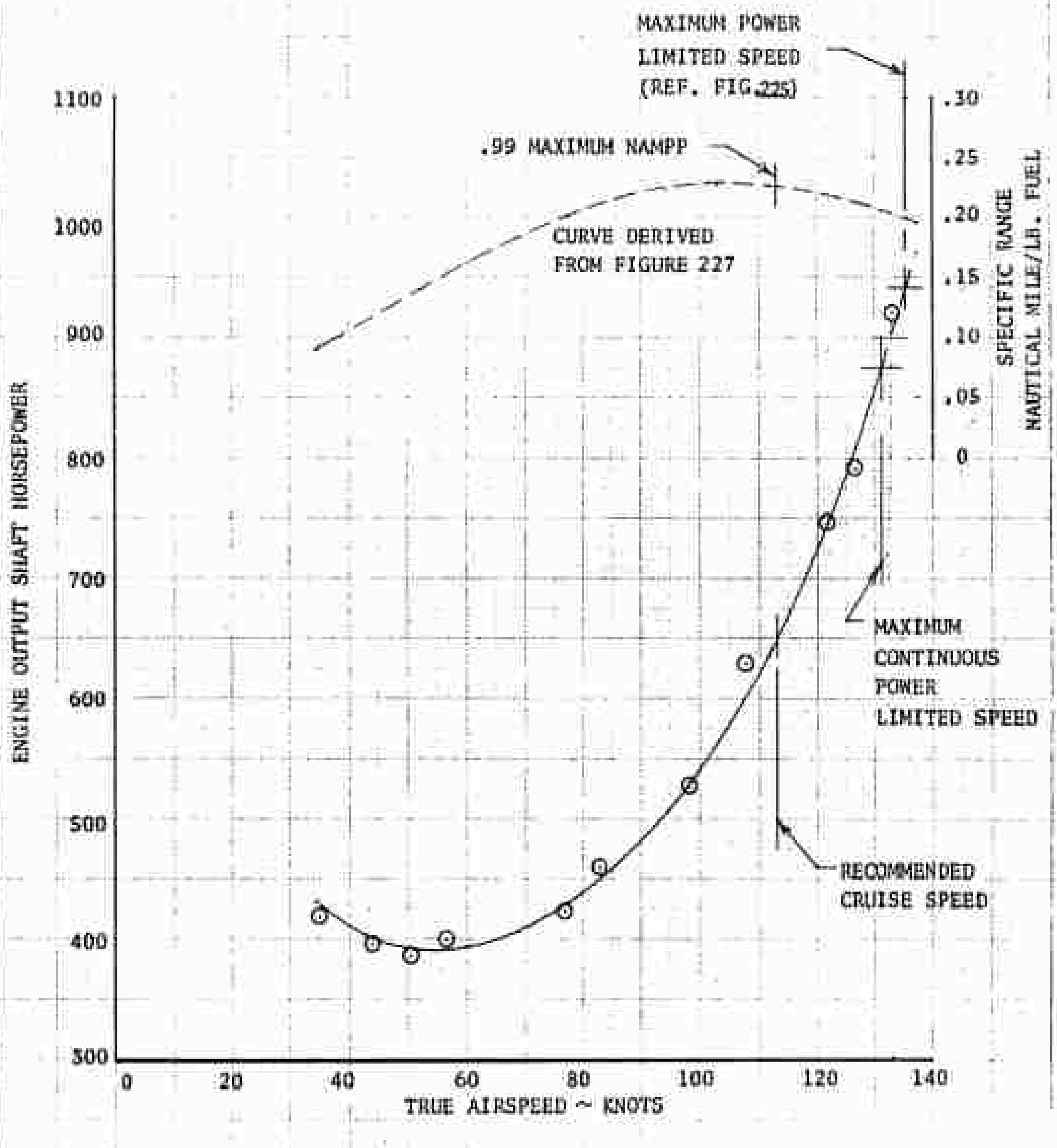


FIGURE NO. 34
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.1(MID)	6745	6810	314	.00435

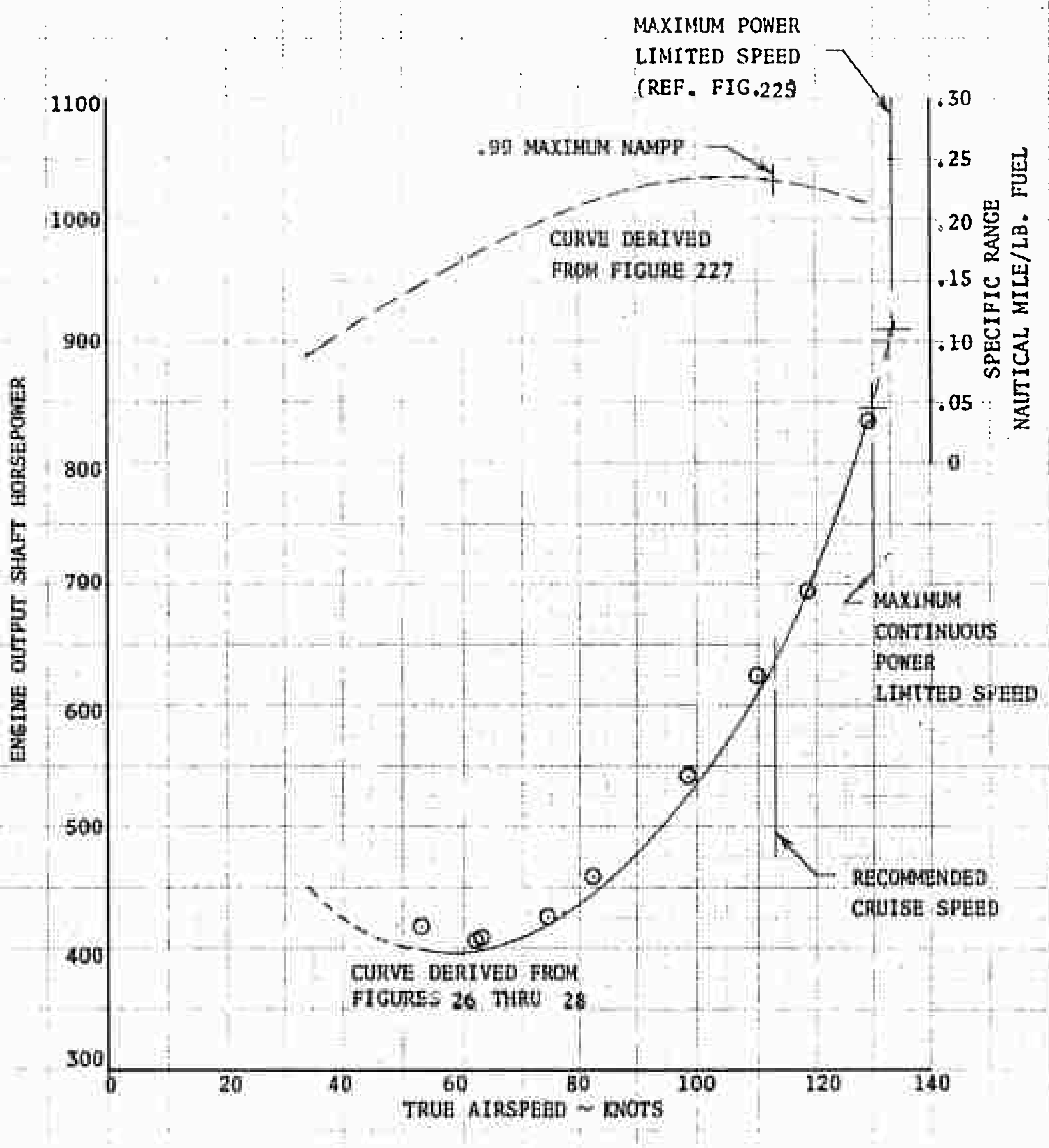


FIGURE NO. 35
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 6308684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.8(MID)	6600	11,060	324	.00459

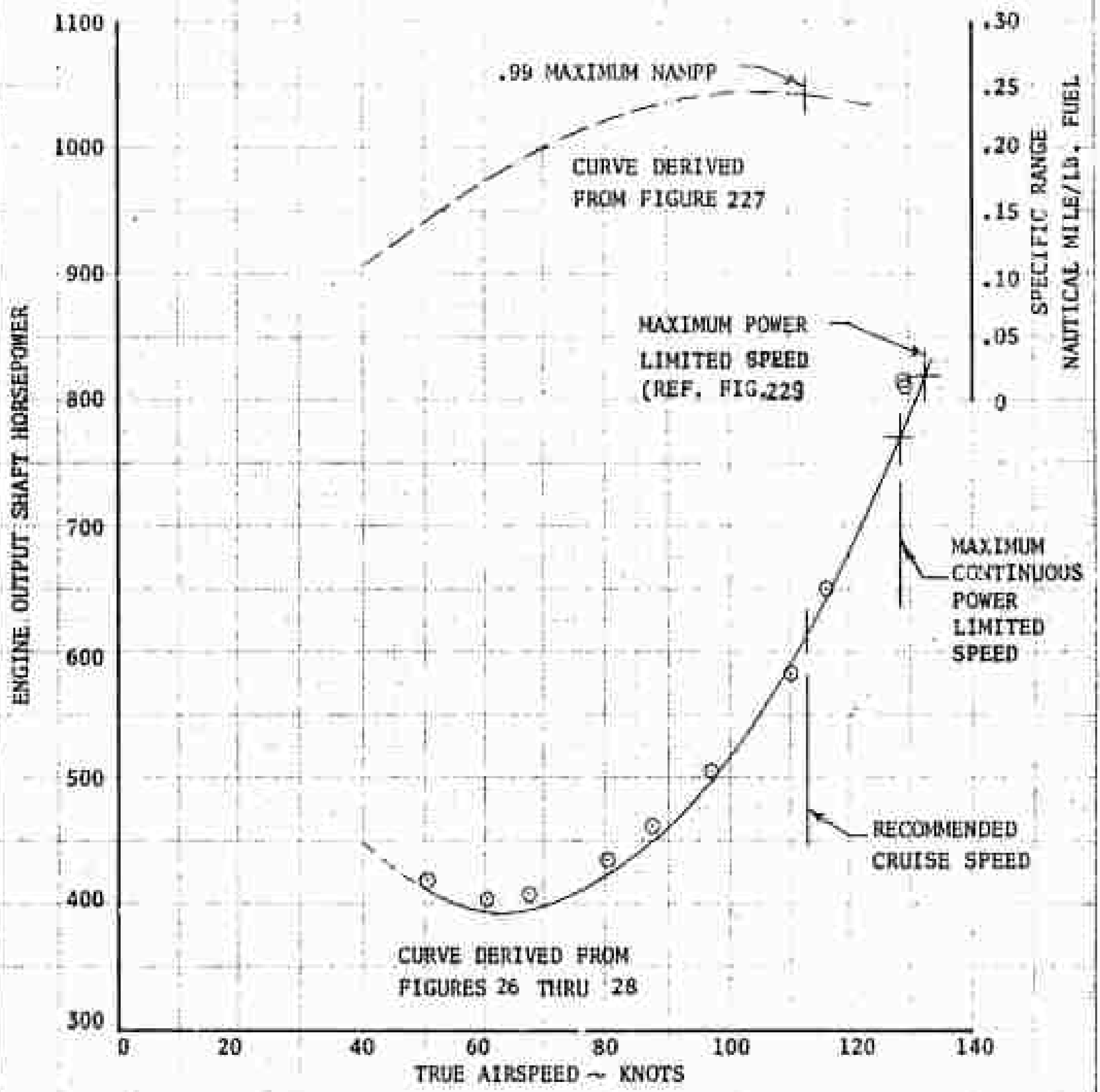
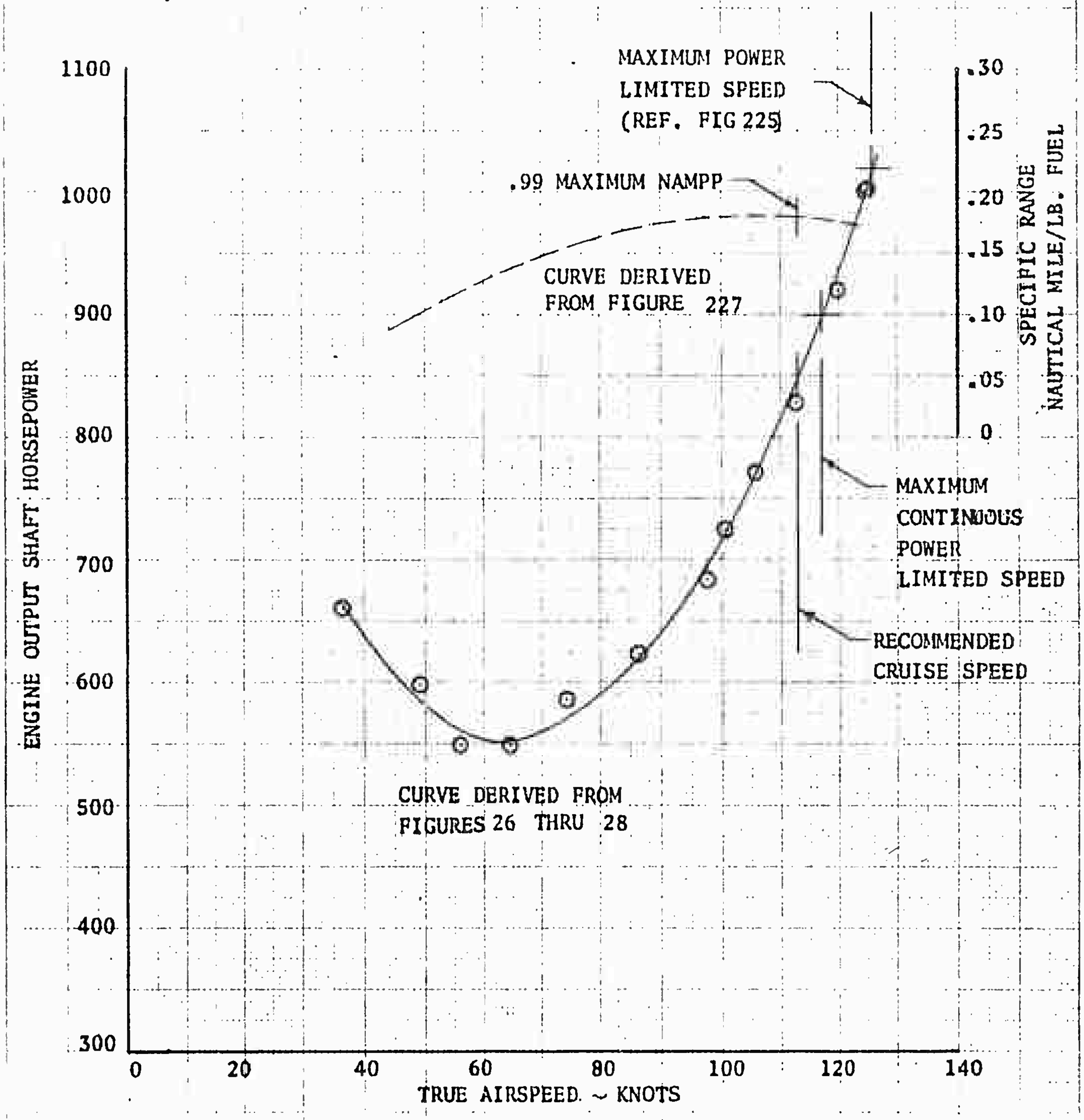


FIGURE NO. 36
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 8542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.2(MID)	9170	1780	324	.00480



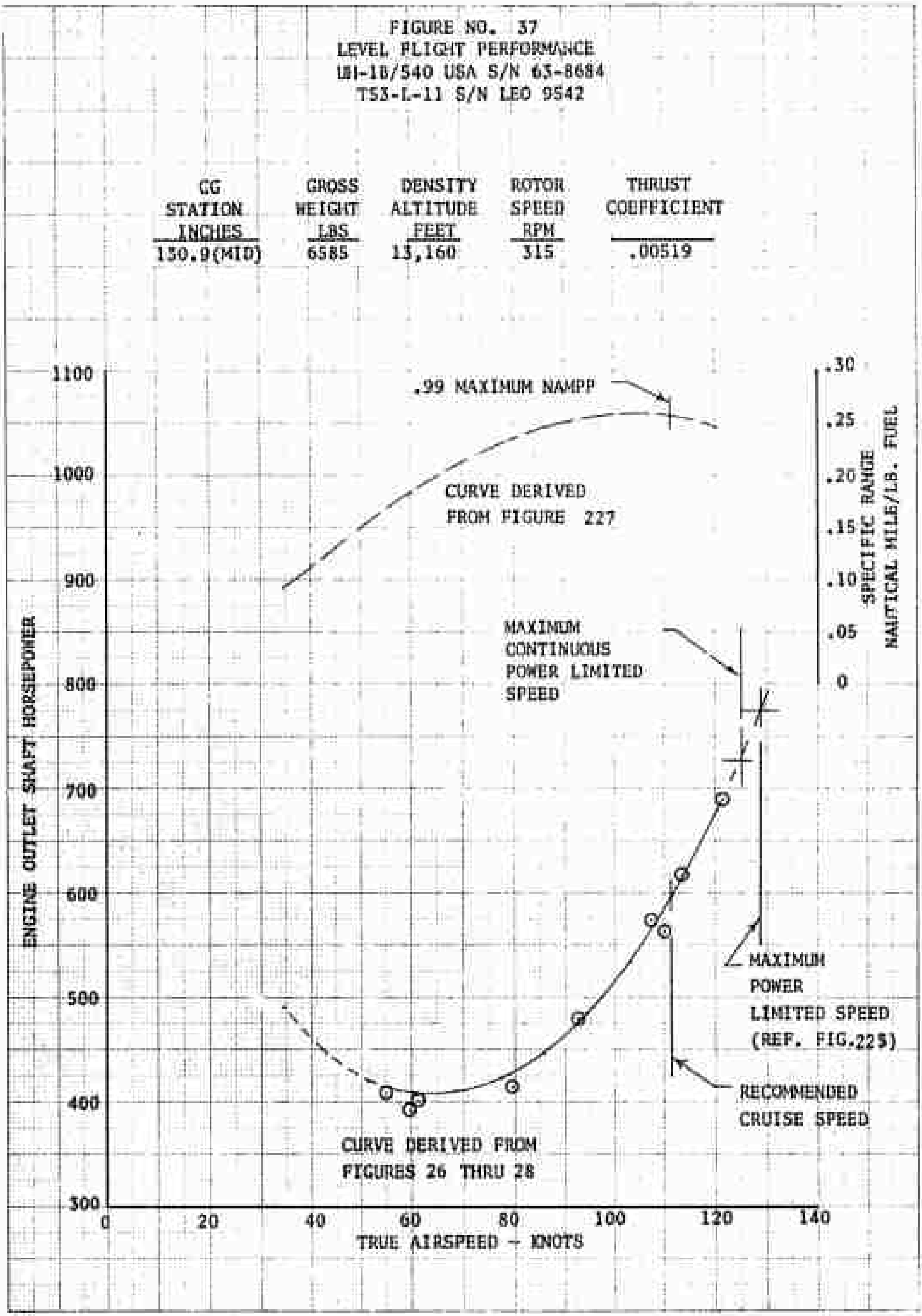


FIGURE NO. 37
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
CG STATION INCHES
130.9(MID)
GROSS WEIGHT LBS
6585
DENSITY ALTITUDE FEET
13,160
ROTOR SPEED RPM
315
THRUST COEFFICIENT
.00519
.99 MAXIMUM NAMPP
CURVE DERIVED FROM FIGURE 227
MAXIMUM CONTINUOUS POWER LIMITED SPEED
MAXIMUM POWER LIMITED SPEED (REF. FIG.225)
RECOMMENDED CRUISE SPEED
CURVE DERIVED FROM FIGURES 26 THRU 28
ENGINE OUTLET SHAFT HORSEPOWER
SPECIFIC RANGE NAUTICAL MILE/LB. FUEL
TRUE AIRSPEED - KNOTS
1100
1000
900
800
700
600
500
400
300
0
20
40
60
80
100
120
140
.30
.25
.20
.15
.10
.05
0

FIGURE NO. 38
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.0(MID)	8210	8425	324	.00526

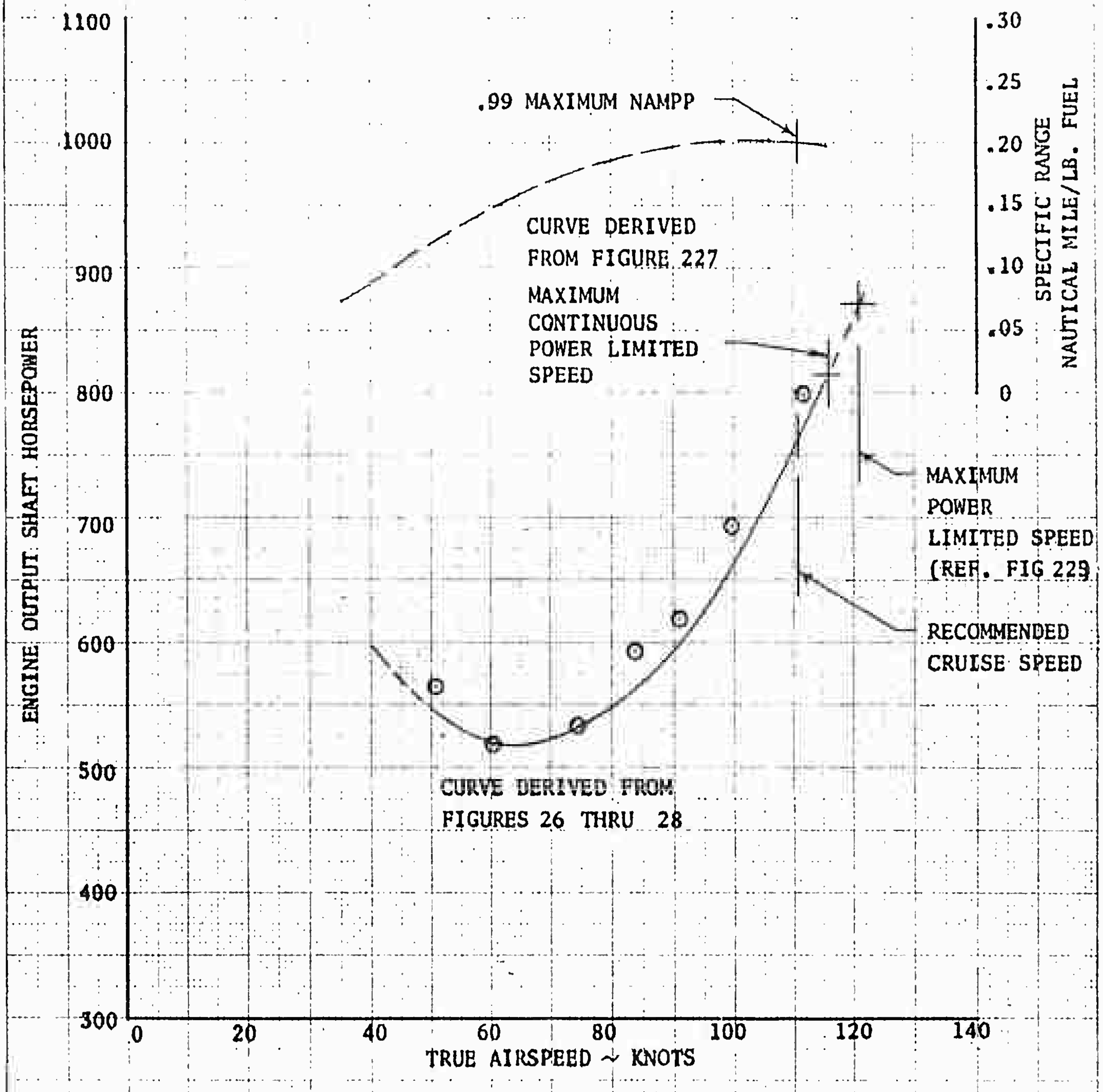


FIGURE NO. 39
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.0(MID)	6620	15,850	324	.00538

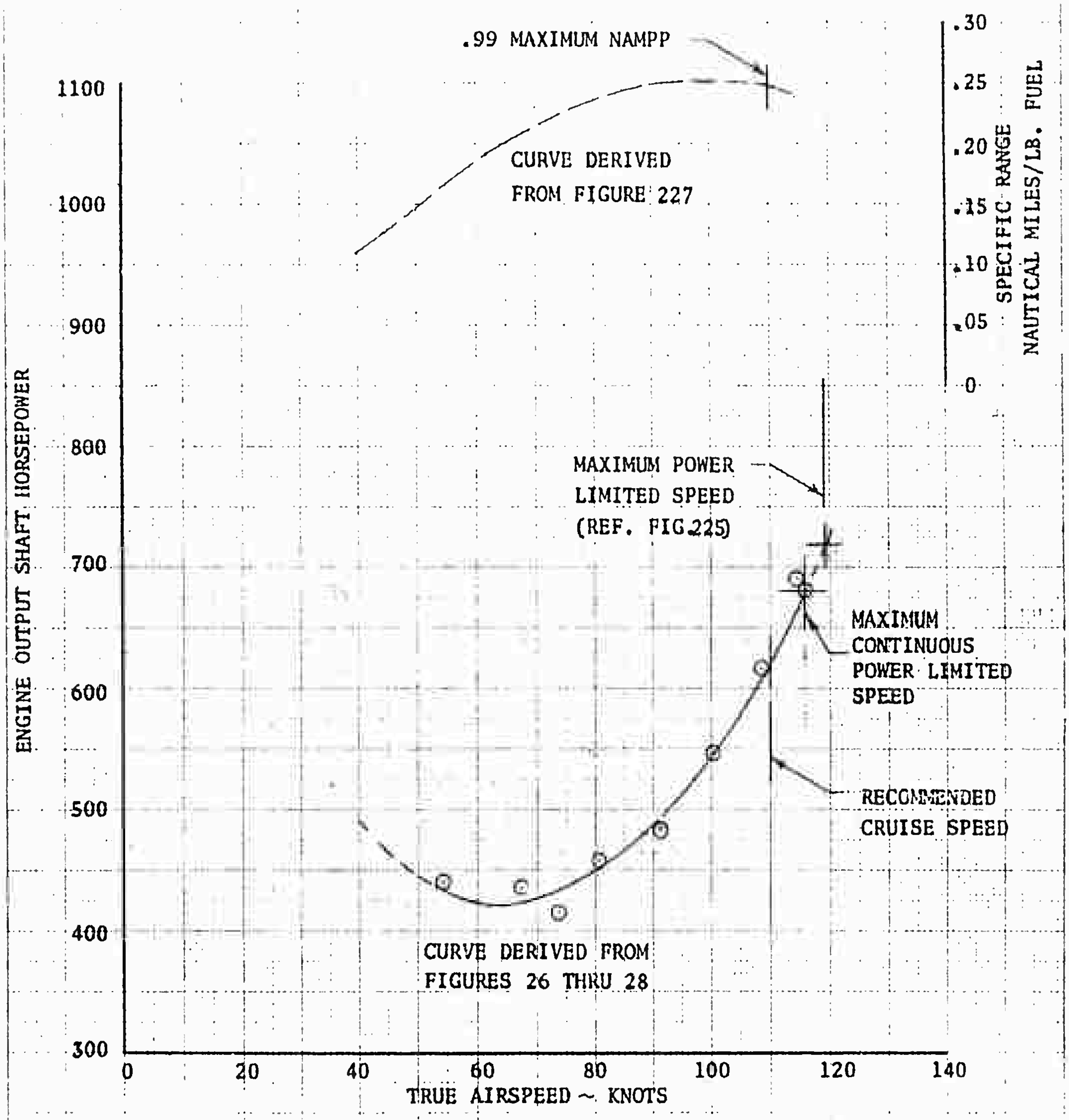


FIGURE NO. 40
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.9(MID)	8550	7965	324	.00540

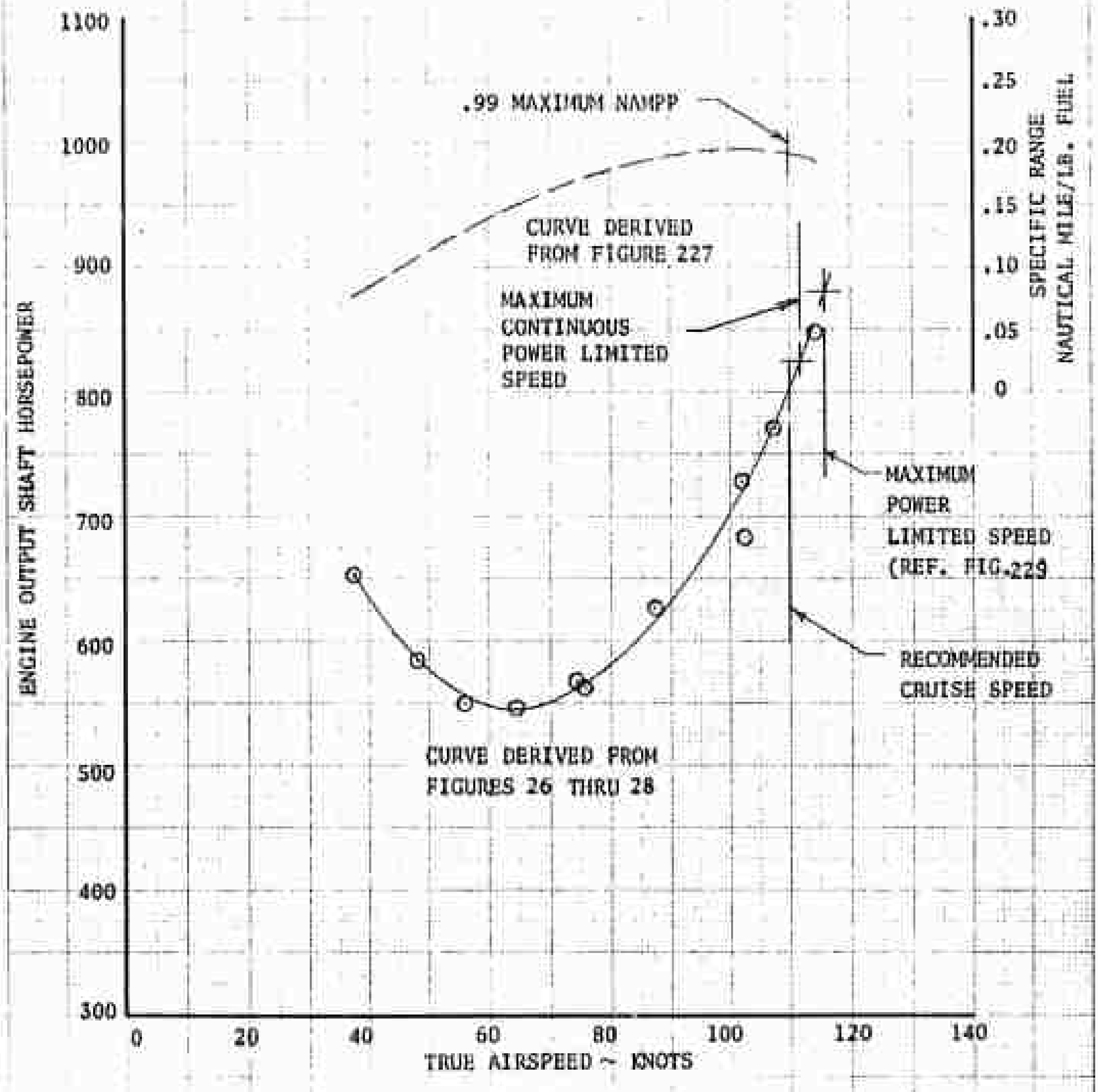


FIGURE NO. 41
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.2(MID)	9190	5710	324	.00541

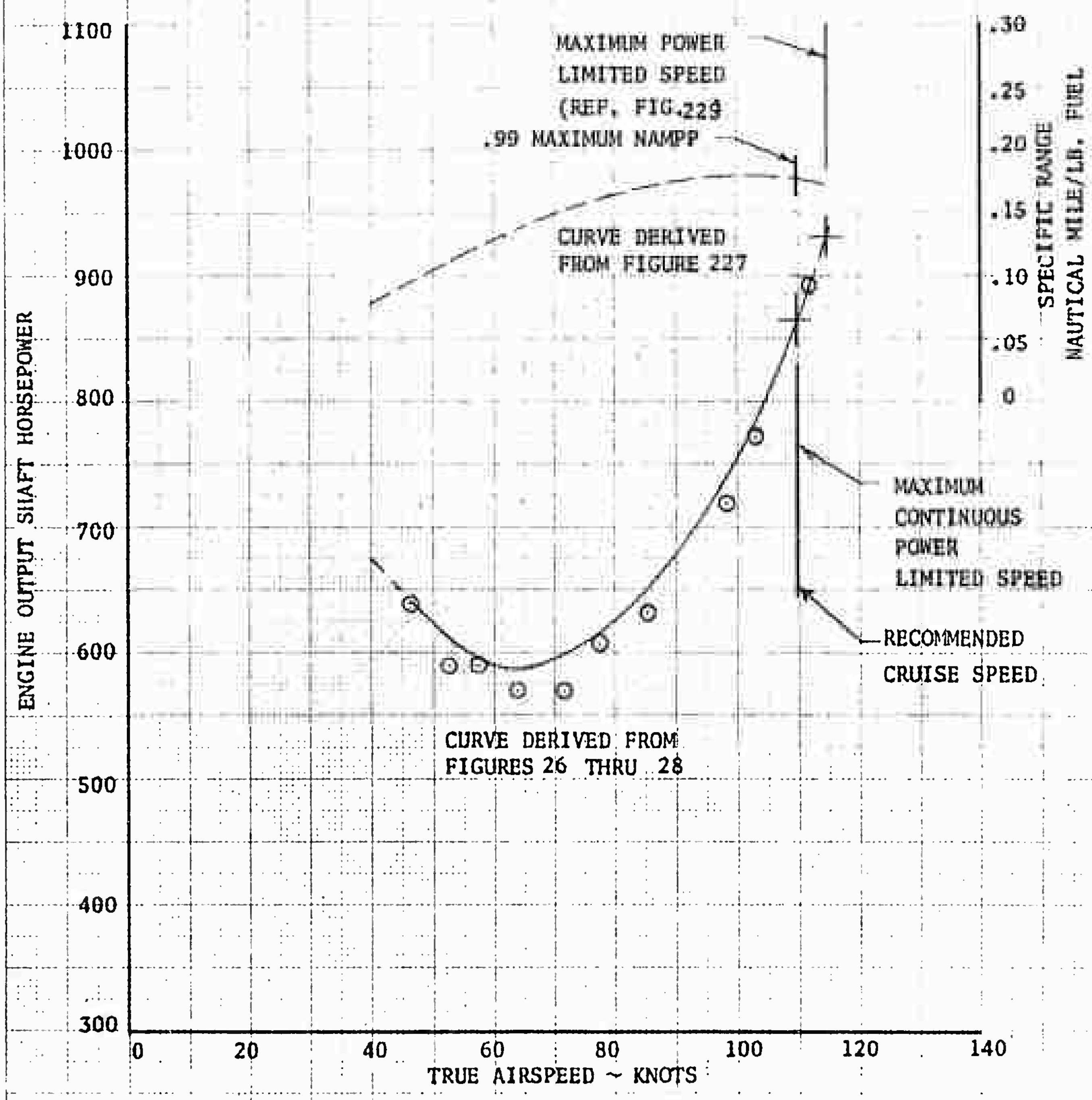
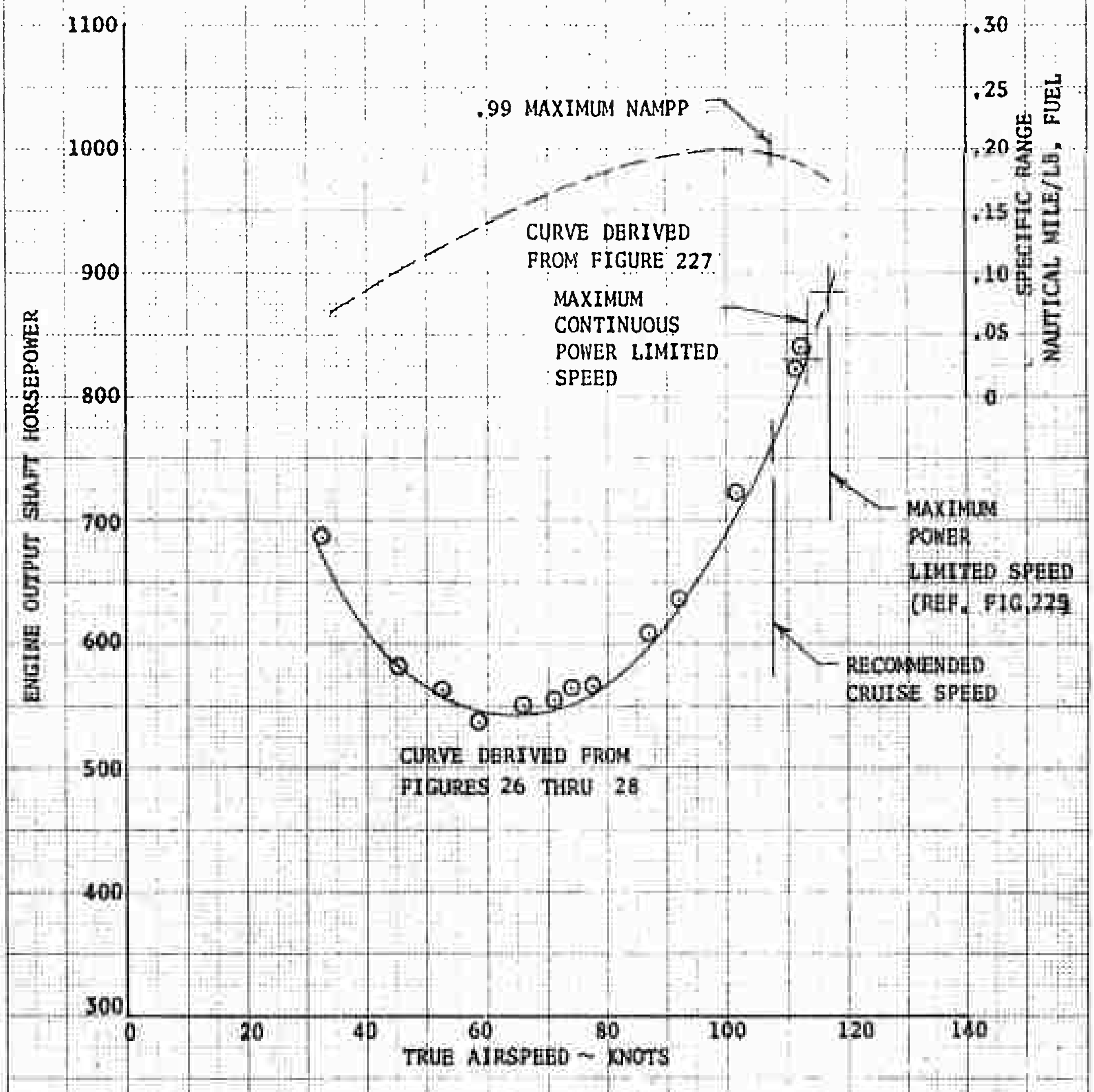


FIGURE NO. 42
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.0(MID)	8425	7845	314	.00561



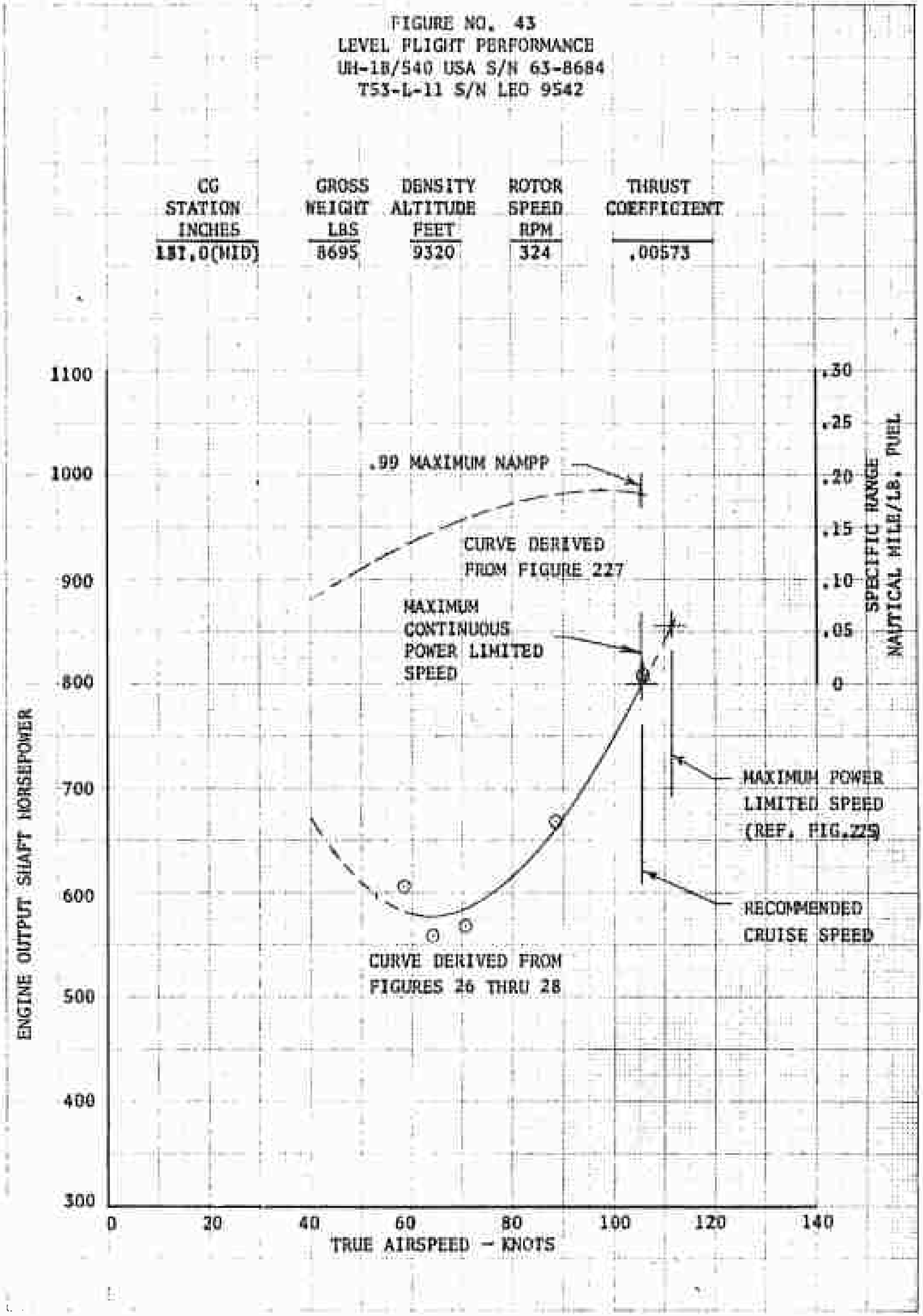


FIGURE NO. 43
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
CG STATION INCHES
131.0(MID)
GROSS WEIGHT LBS
8695
DENSITY ALTITUDE FEET
9320
ROTOR SPEED RPM
324
THRUST COEFFICIENT
.00573
.99 MAXIMUM NAMPP
CURVE DERIVED FROM FIGURE 227
MAXIMUM CONTINUOUS POWER LIMITED SPEED
MAXIMUM POWER LIMITED SPEED (REF. FIG.225)
RECOMMENDED CRUISE SPEED
CURVE DERIVED FROM FIGURES 26 THRU 28
ENGINE OUTPUT SHAFT HORSEPOWER
SPECIFIC RANGE NAUTICAL MILE/LB. FUEL
TRUE AIRSPEED - KNOTS
1100
1000
900
800
700
600
500
400
300
0
20
40
60
80
100
120
140
.30
.25
.20
.15
.10
.05
0

FIGURE NO. 44
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LED 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
130.8(MID)	8495	9640	314	.00599

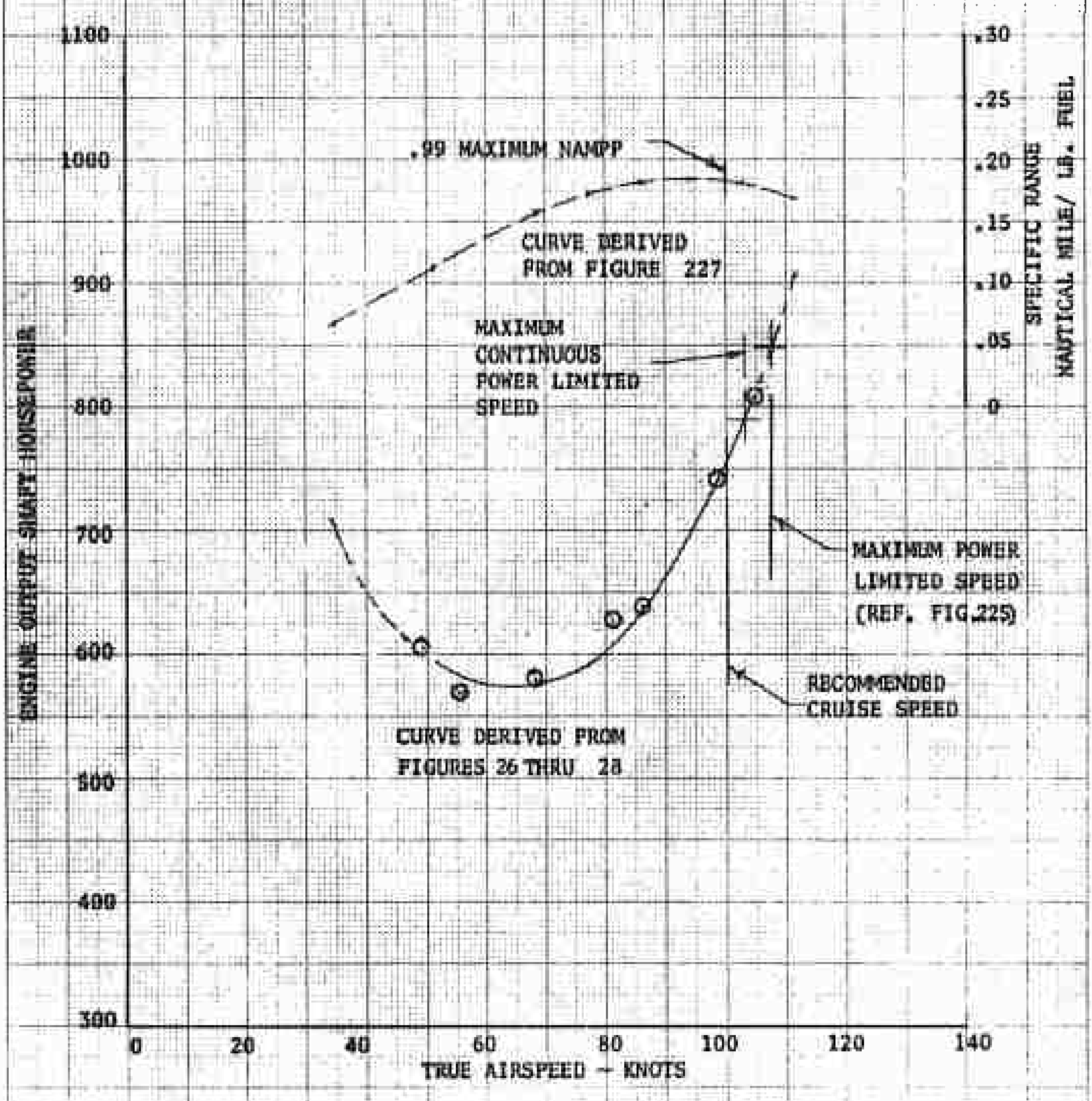


FIGURE NO. 45
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
131.2(MID)	9190	9660	324	.00611

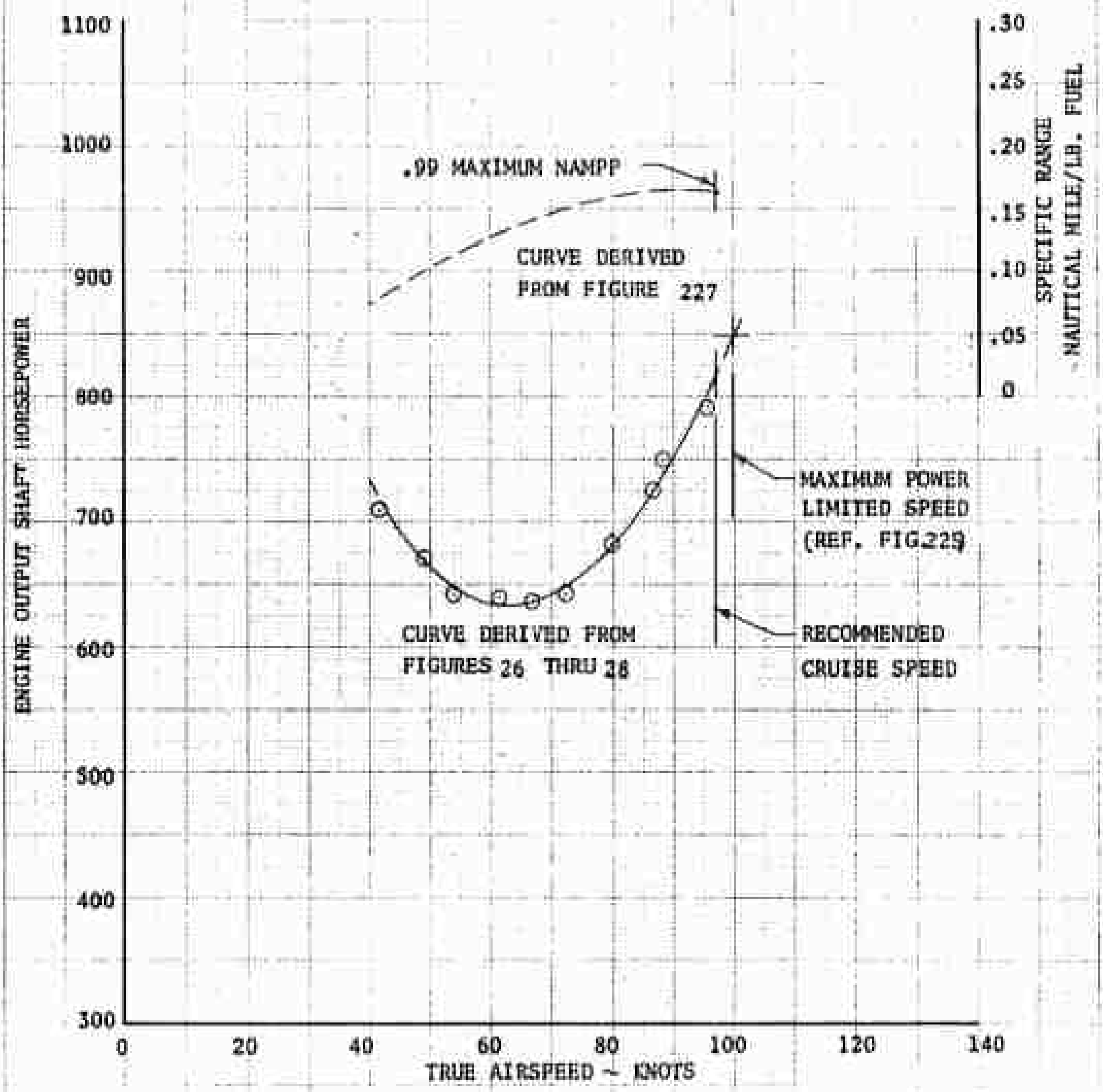
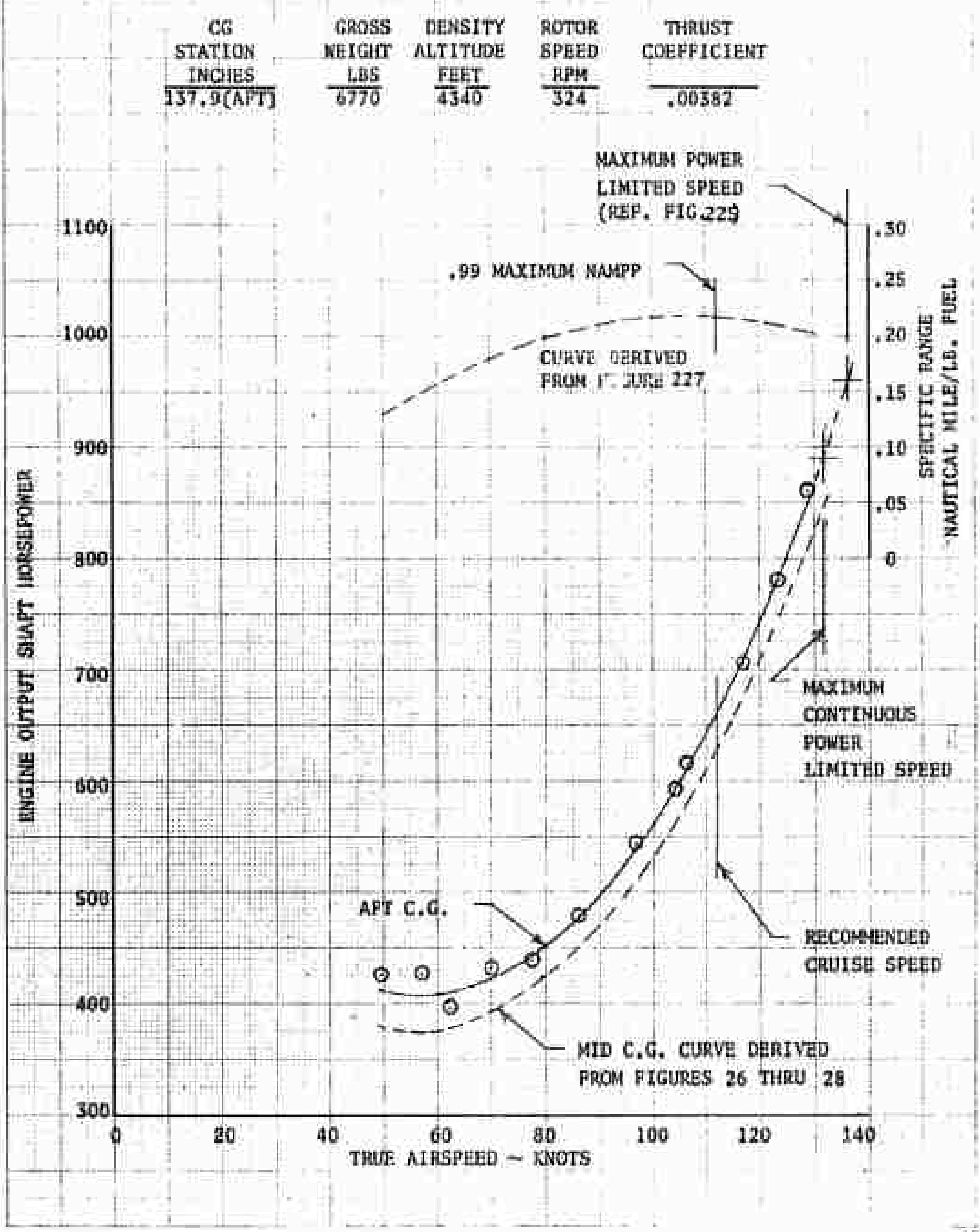


FIGURE NO. 46
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542



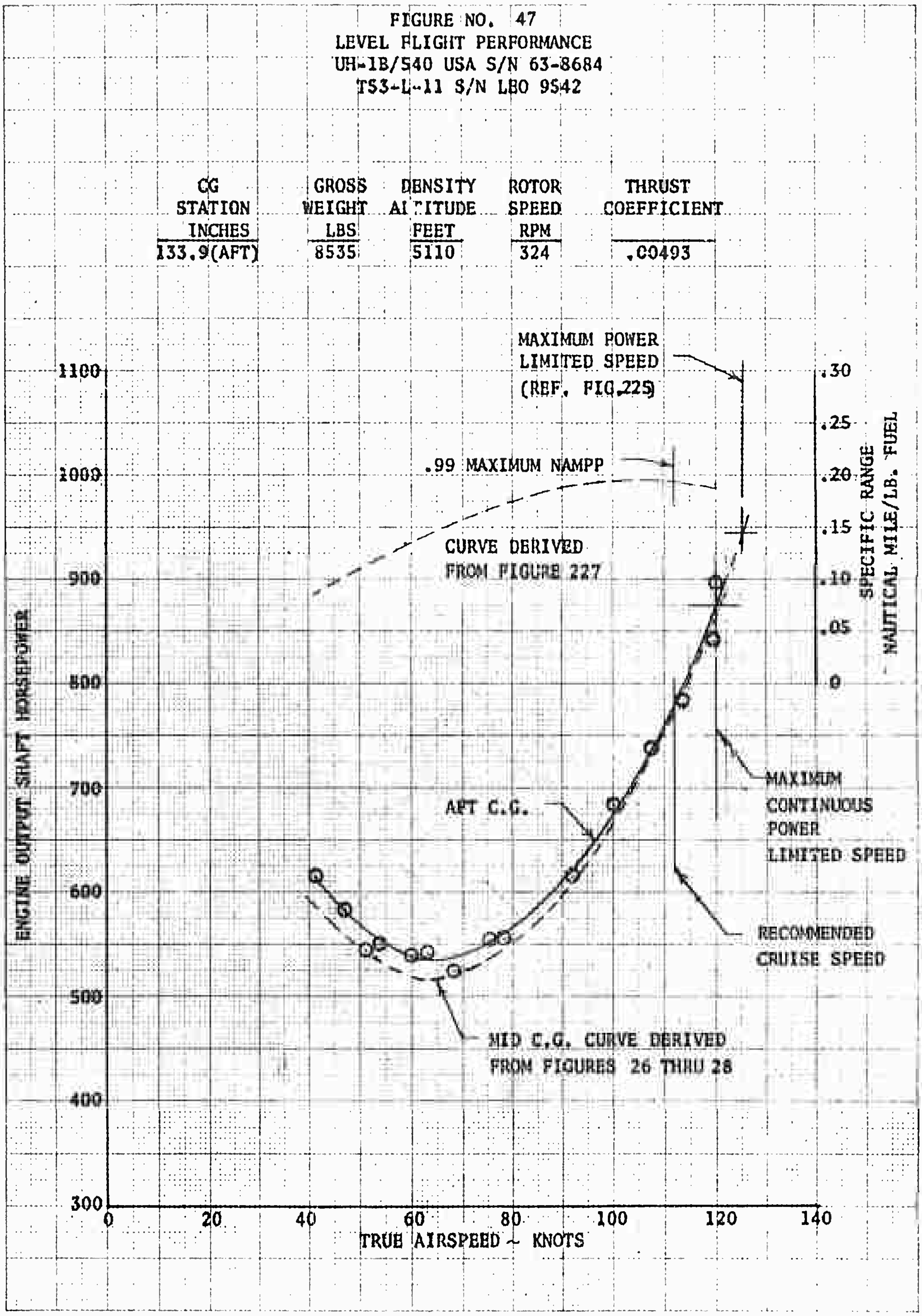


FIGURE NO. 47
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
CG STATION INCHES
133.9(AFT)
GROSS WEIGHT LBS
8535
DENSITY ALTITUDE FEET
5110
ROTOR SPEED RPM
324
THRUST COEFFICIENT
.00493
MAXIMUM POWER LIMITED SPEED (REF. FIG.225)
.99 MAXIMUM NAMPP
CURVE DERIVED FROM FIGURE 227
MAXIMUM CONTINUOUS POWER LIMITED SPEED
RECOMMENDED CRUISE SPEED
AFT C.G.
MID C.G. CURVE DERIVED FROM FIGURES 26 THRU 28
ENGINE OUTPUT SHAFT HORSEPOWER
SPECIFIC RANGE NAUTICAL MILE/LB. FUEL
TRUE AIRSPEED ~ KNOTS
300
400
500
600
700
800
900
1000
1100
0
20
40
60
80
100
120
140
0
.05
.10
.15
.20
.25
.30

FIGURE NO. 48
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
126.0(FWD)	6620	5190	324	.00383

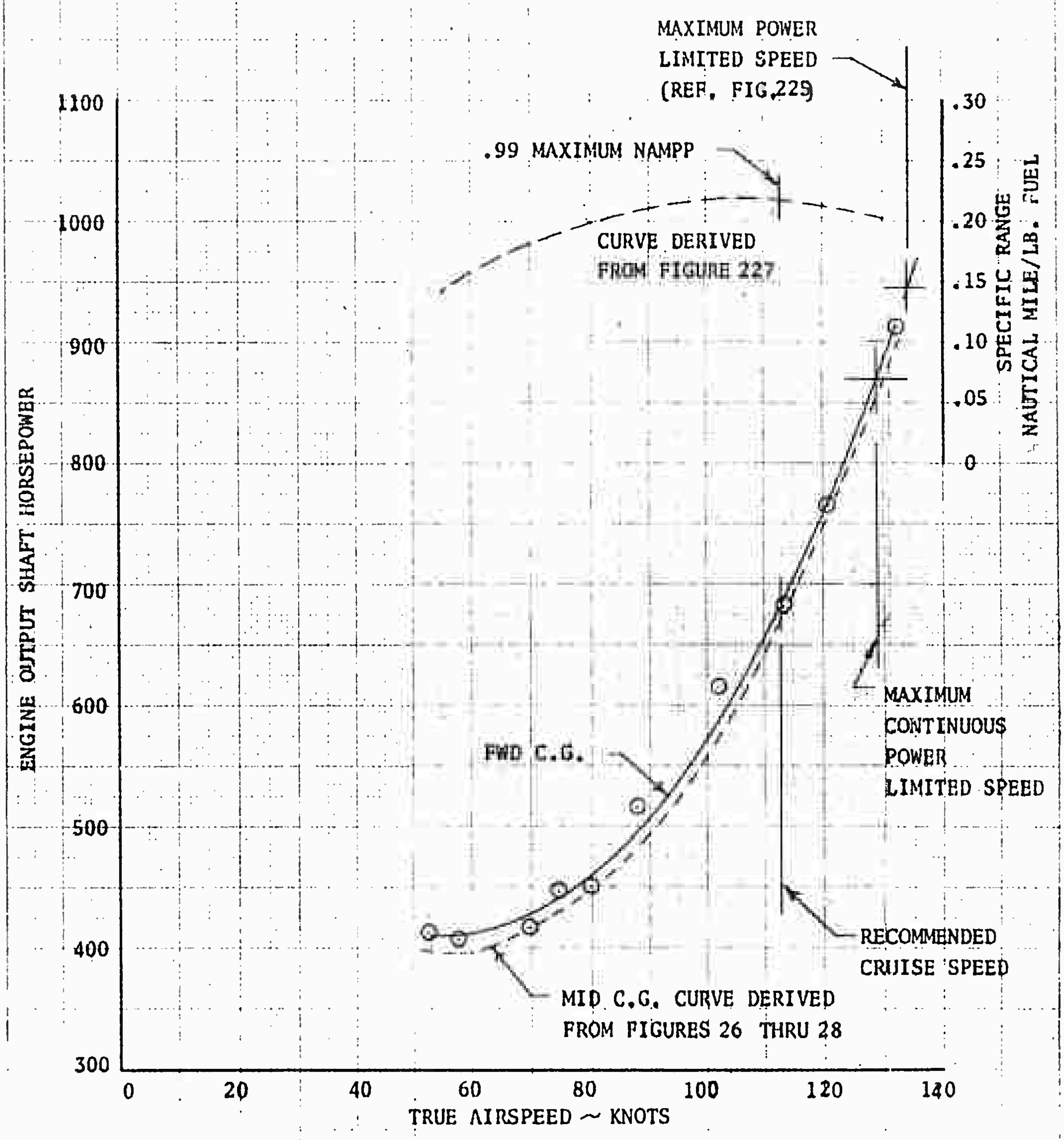
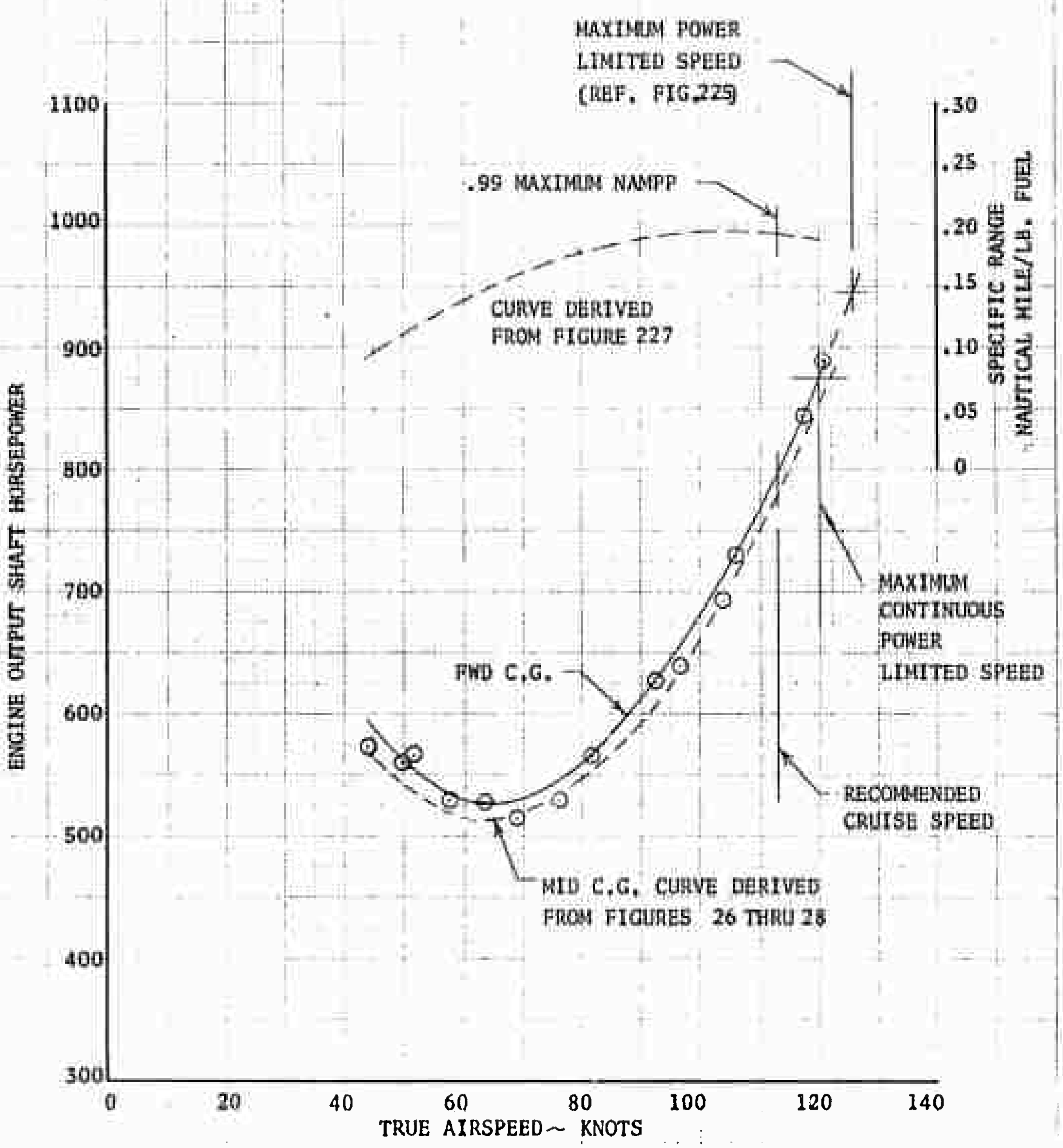


FIGURE NO. 49
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

CG STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	THRUST COEFFICIENT
125.9(FWD)	8460	5165	324	.00490



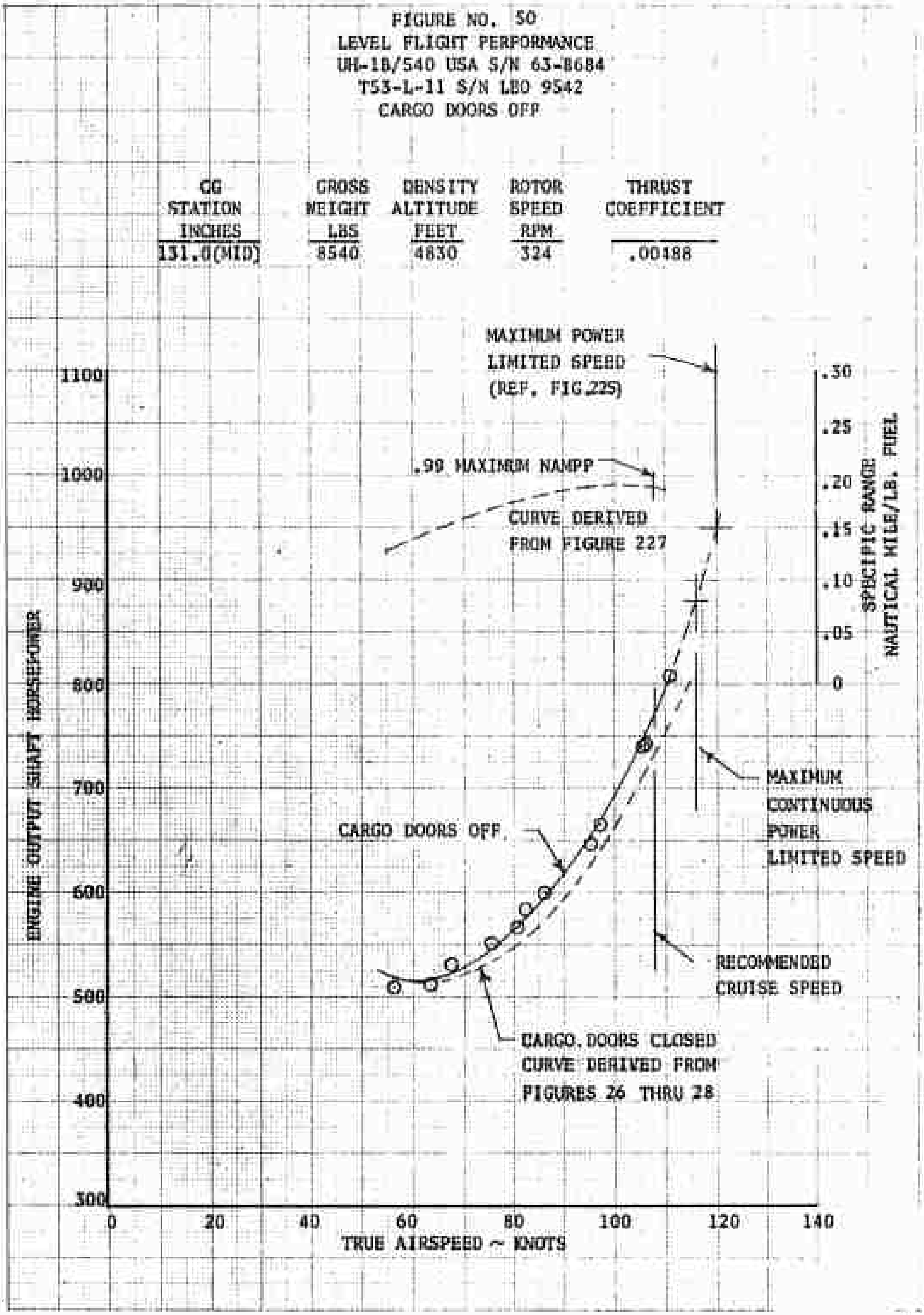


FIGURE NO. 50
LEVEL FLIGHT PERFORMANCE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542
CARGO DOORS OFF
CG STATION INCHES
131.0(MID)
GROSS WEIGHT LBS
8540
DENSITY ALTITUDE FEET
4830
ROTOR SPEED RPM
324
THRUST COEFFICIENT
.00488
MAXIMUM POWER LIMITED SPEED (REF. FIG.225)
.99 MAXIMUM NAMPP
CURVE DERIVED FROM FIGURE 227
MAXIMUM CONTINUOUS POWER LIMITED SPEED
CARGO DOORS OFF
RECOMMENDED CRUISE SPEED
CARGO DOORS CLOSED CURVE DERIVED FROM FIGURES 26 THRU 28
ENGINE OUTPUT SHAFT HORSEPOWER
SPECIFIC RANGE NAUTICAL MILE/LB. FUEL
TRUE AIRSPEED ~ KNOTS
1100
1000
900
800
700
600
500
400
300
.30
.25
.20
.15
.10
.05
0
0
20
40
60
80
100
120
140

FIGURE NO. 51
AUTOROTATIONAL DESCENT PERFORMANCE
UH-1B/540 USA S/N 63-8684

ROTOR SPEED = 324 RPM

GROSS WEIGHT MORE THAN 8100 LB

SYM	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET
◇	8185	5000
⬠	8215	5000
○	8320	5000
□	8440	5600
▽	8450	5000
△	8700	5000
0	8960	5000
⬡	9250	5000
△	8185	10000
○	8215	10000
○	8490	10000
□	8725	10000
◇	9250	10000

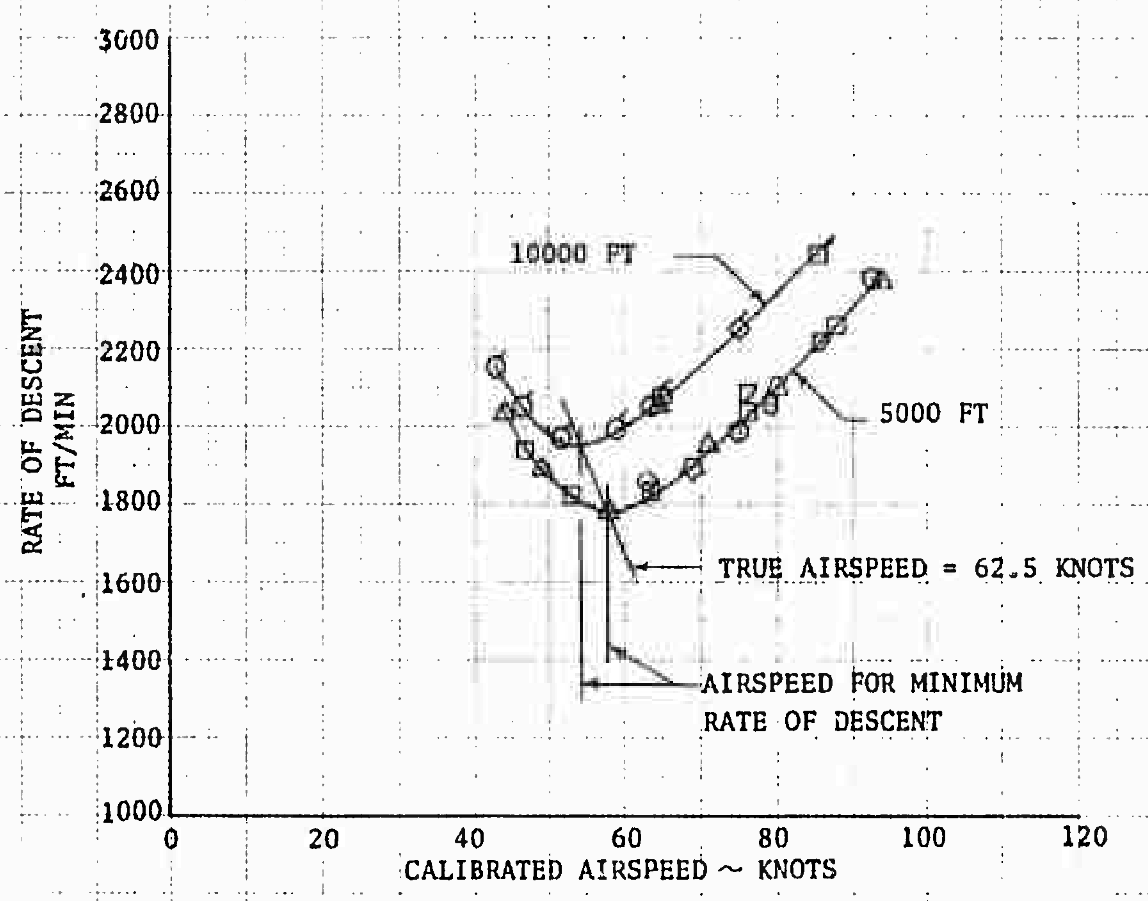


FIGURE NO. 52
AUTOROTATIONAL DESCENT PERFORMANCE
UH-1B/540 USA S/N 63-8684

ROTOR SPEED = 324 RPM

GROSS WEIGHT LESS THAN 6550 LB

SYM	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET
△	6348	5000
◇	6377	5000
○	6382	5000
□	6548	5000
○ (flagged)	6200	10000
△ (flagged)	6350	10000
□ (flagged)	6350	10000
◇ (flagged)	6375	10000

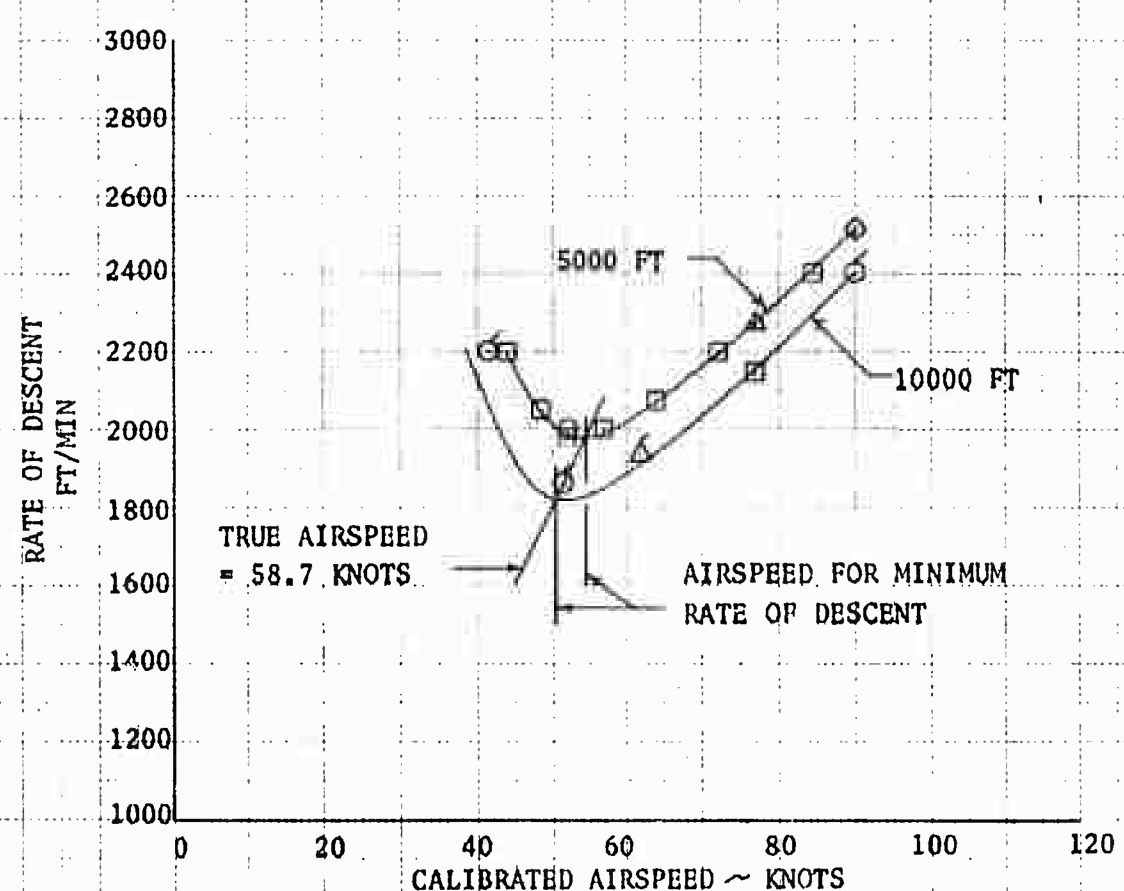


FIGURE NO. 53
AUTOROTATIONAL DESCENT PERFORMANCE
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	CALIBRATED AIRSPEED KNOTS
○	8450	131.0(MID)	5000	65
□	9280	131.0(MID)	5000	70

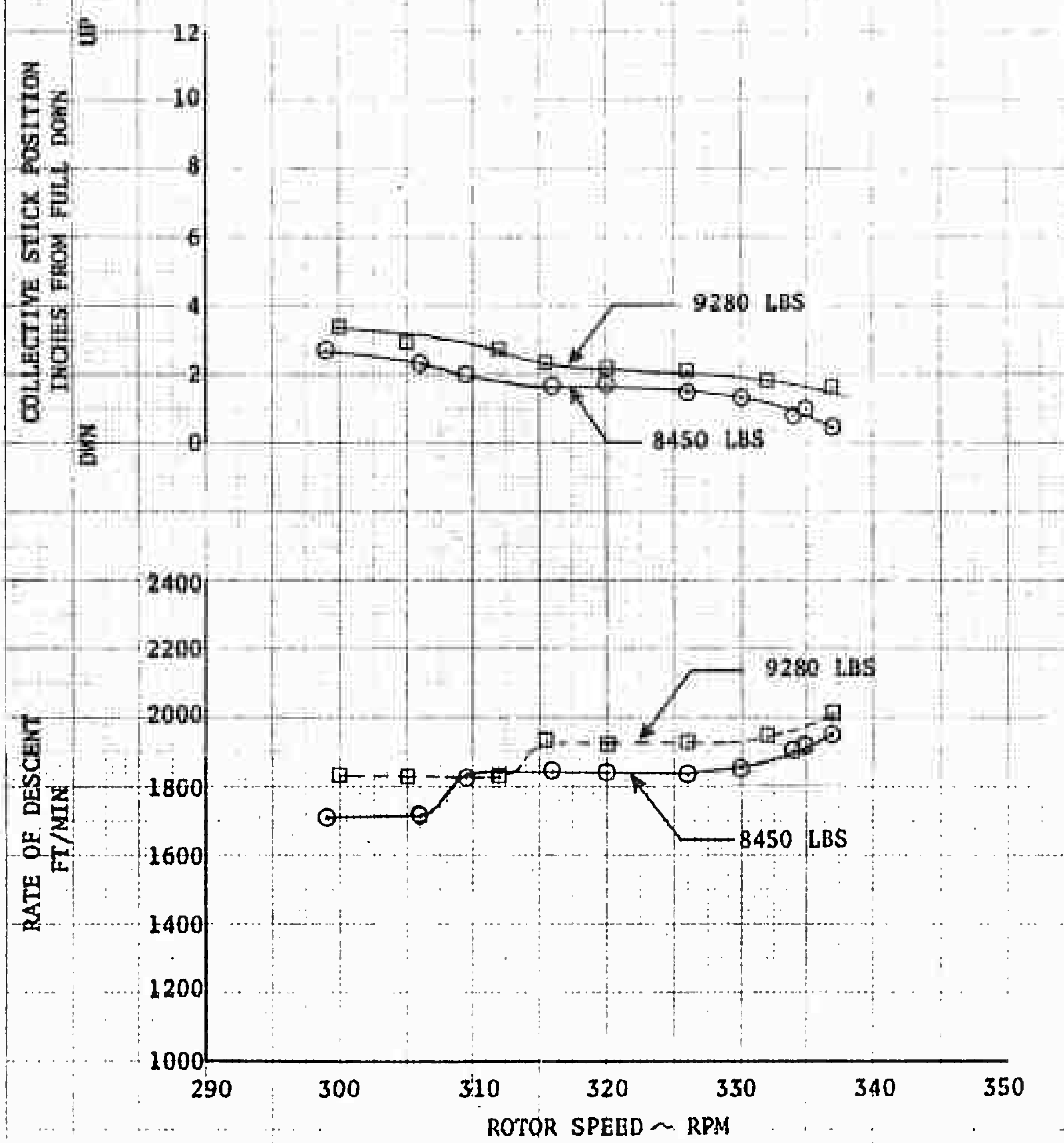


FIGURE NO. 54
SUMMARY LONGITUDINAL CONTROL GRADIENTS IN LEVEL FLIGHT
UH-1B/540 USA S/N 63-6864

AVG GROSS WEIGHT	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
9245	126.3 (FWD)	5000	324	54A
9175	131.8 (AFT)	5000	324	54A
8125	125.8 (FWD)	5000	324	54B
8300	133.8 (AFT)	5000	324	54B
6785	126.0 (FWD)	5000	324	54C
6715	135.7 (AFT)	5000	324	54C
6625	137.6 (AFT)	5000	324	54C

NOTE: CURVES DERIVED FROM FIGURES NO. 55 THROUGH 57.

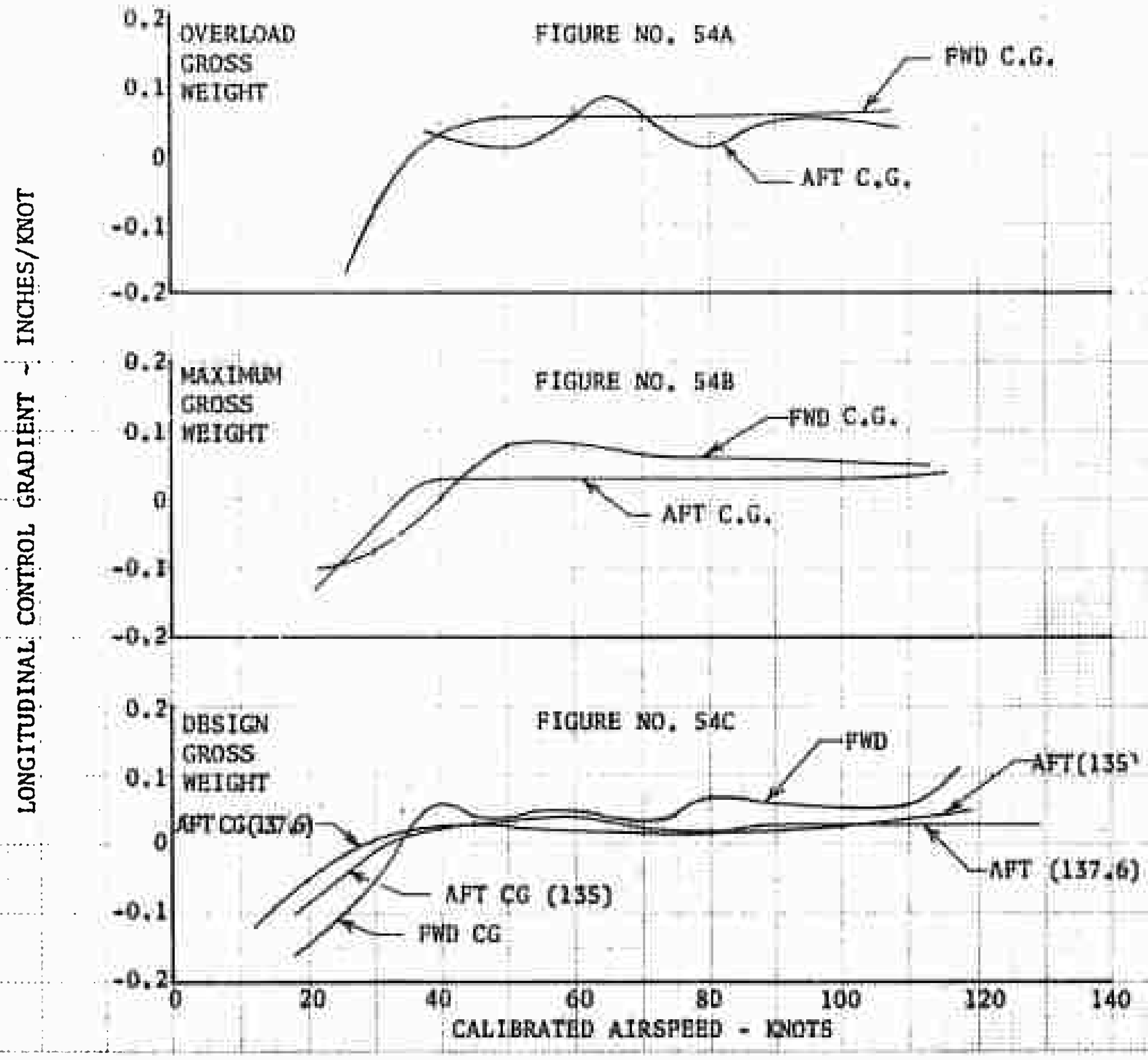


FIGURE NO. 55
CONTROL POSITIONS IN LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

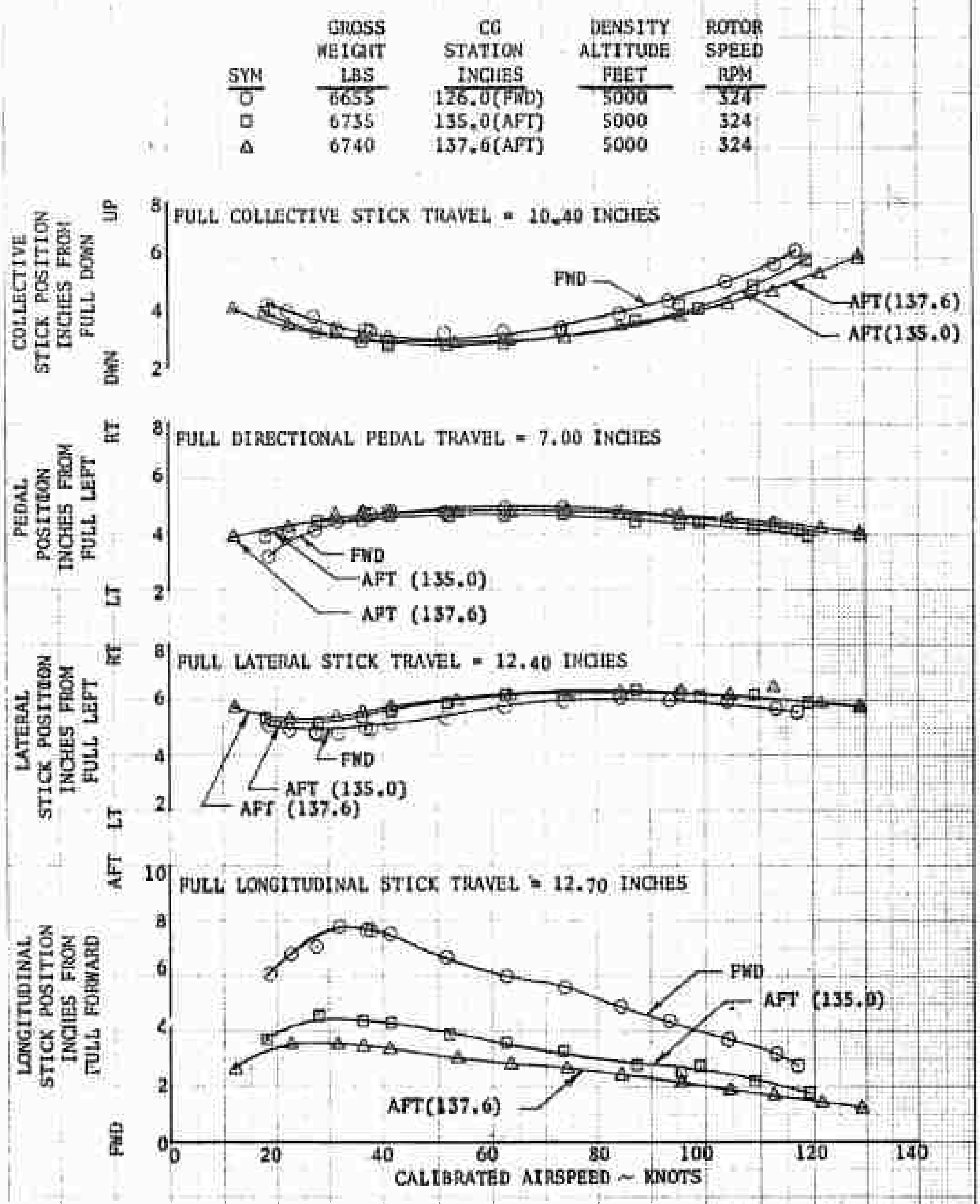


FIGURE NO. 56
CONTROL POSITIONS IN LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
O	8190	126.1(FWD)	5000	324
□	8220	133.6(AFT)	5000	324

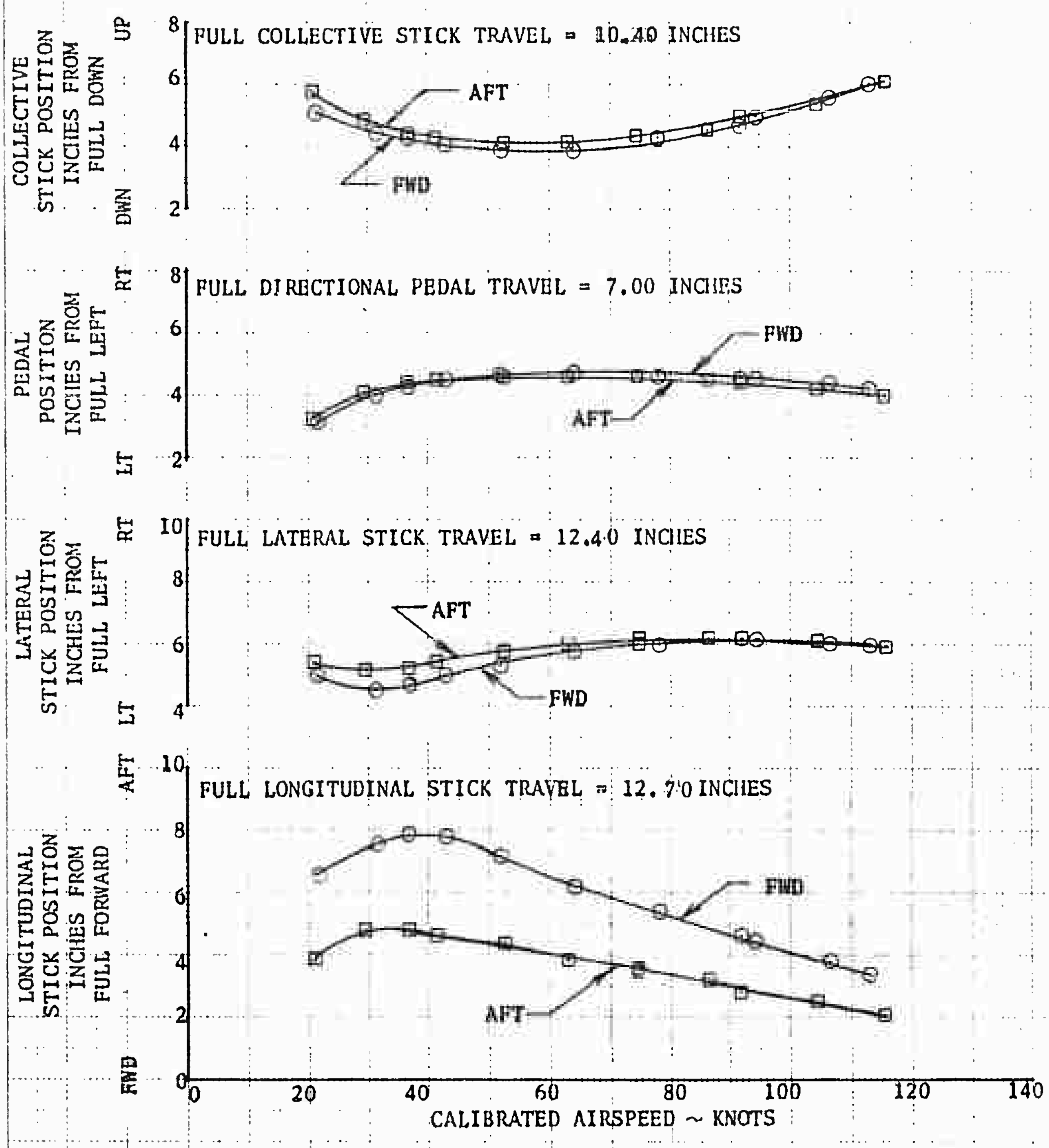


FIGURE NO. 57
CONTROL POSITIONS IN LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
O	9185	126.3(FWD)	5000	324
□	9265	131.3(AFT)	5000	324

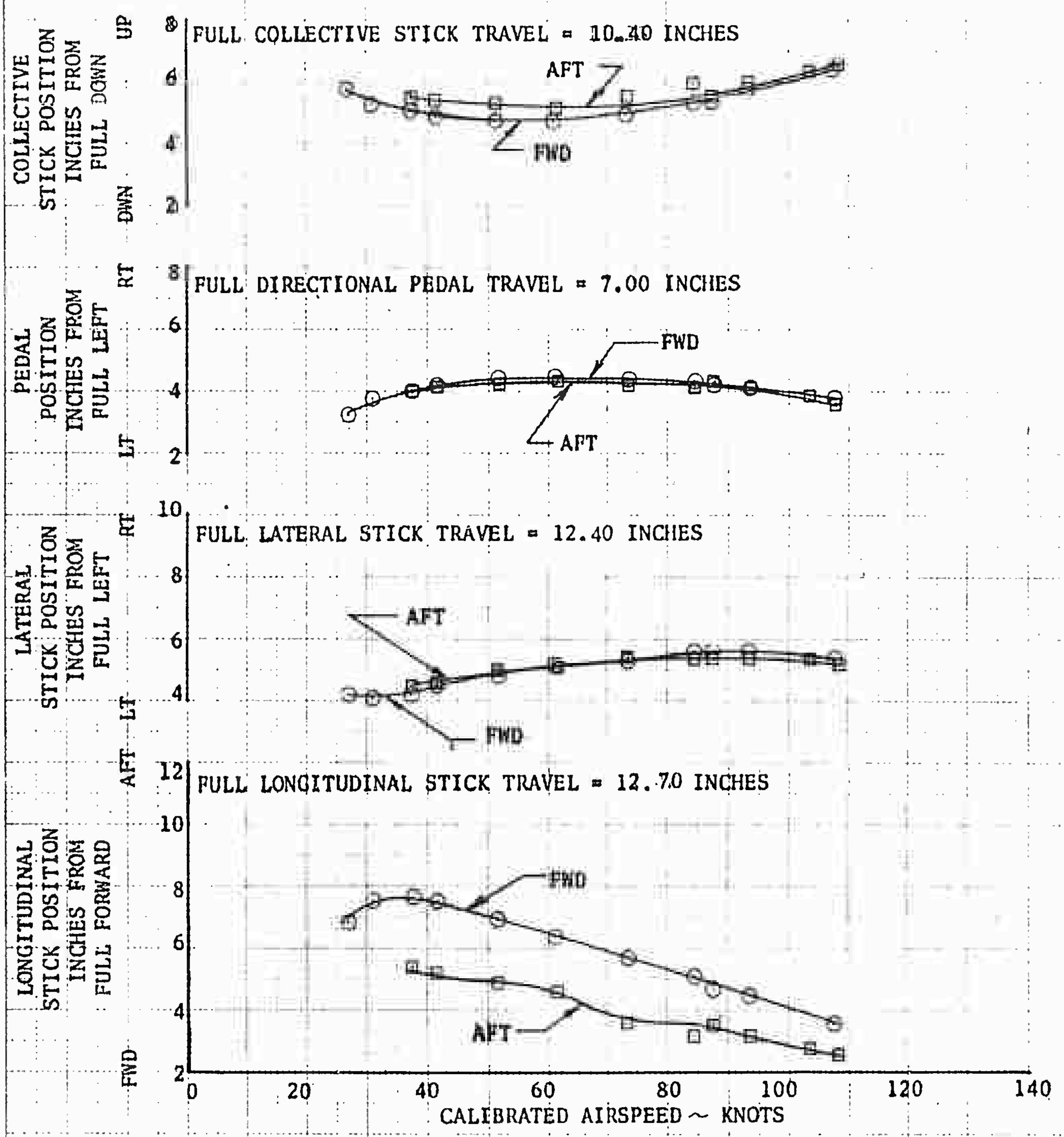


FIGURE NO. 58
CONTROL POSITIONS IN CLIMBING FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	6655	126.0(FWD)	5000	324
□	6735	135.0(AFT)	5000	324
△	6740	137.6(AFT)	5000	324

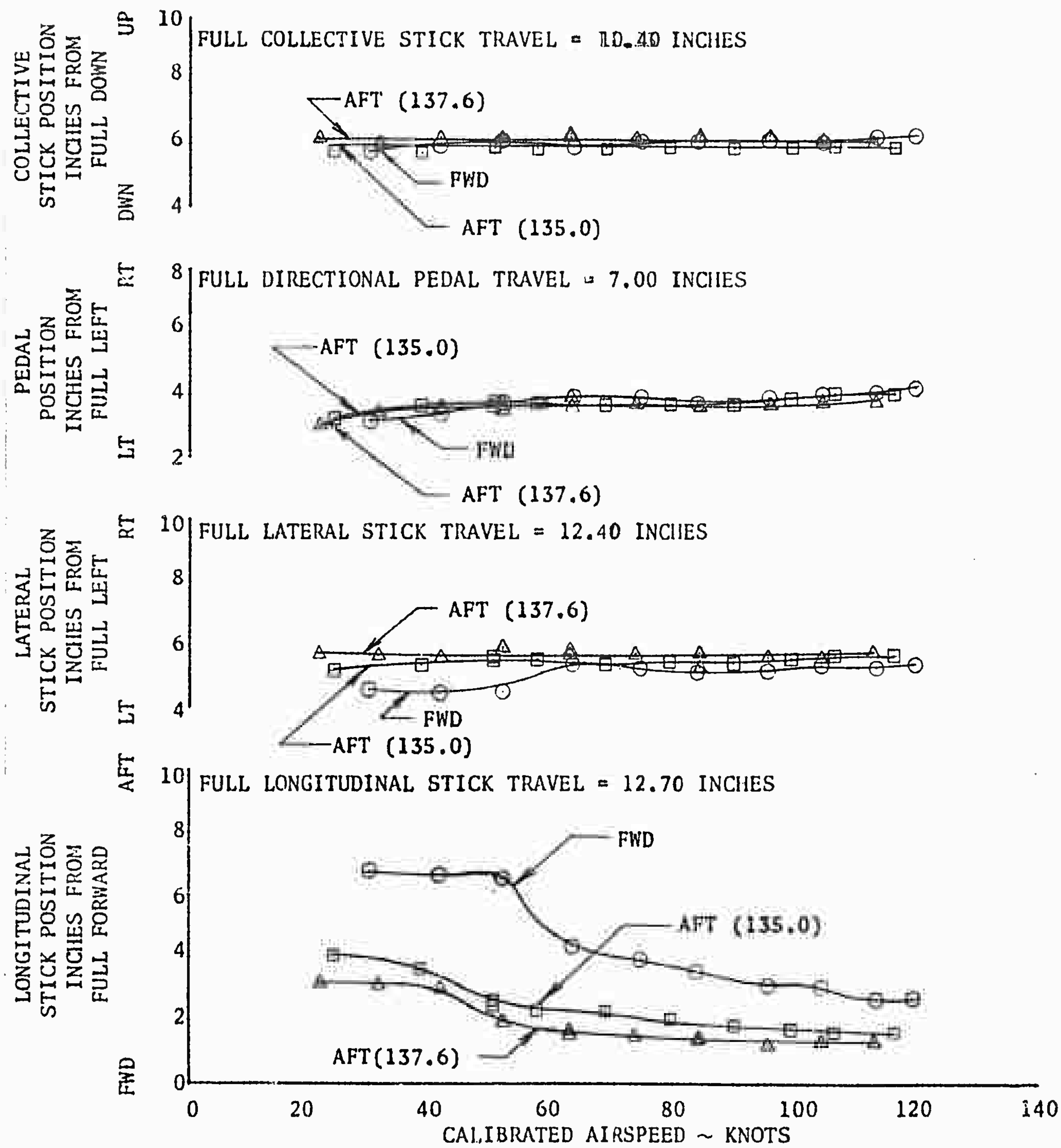


FIGURE NO. 59
CONTROL POSITIONS IN CLIMBING FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	8190	126.1(FWD)	5000	324
□	8220	133.6(AFT)	5000	324

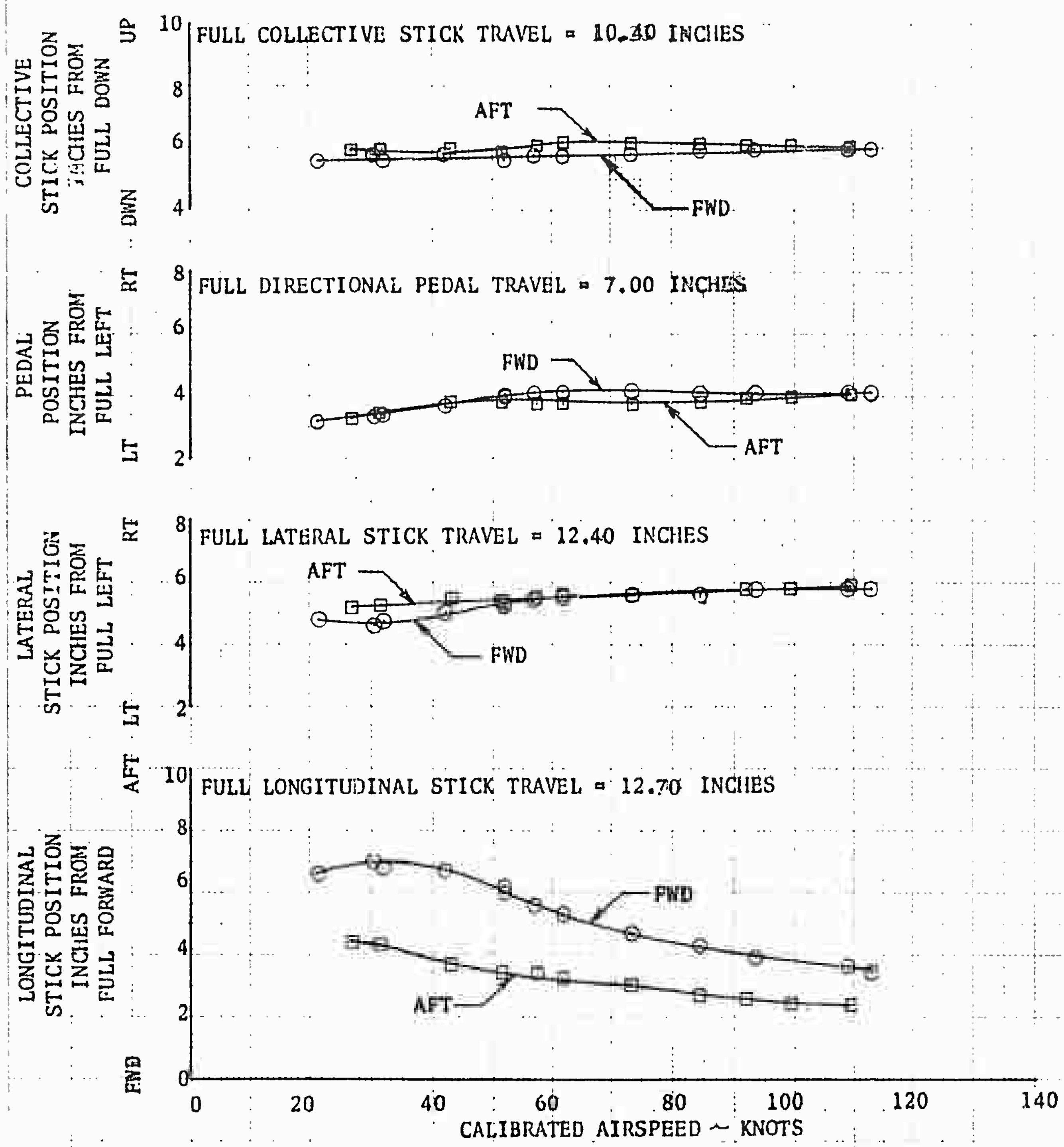


FIGURE NO. 60
CONTROL POSITIONS IN CLIMBING FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	9185	126.3(FWD)	5000	324
□	9165	131.8(AFT)	5000	324

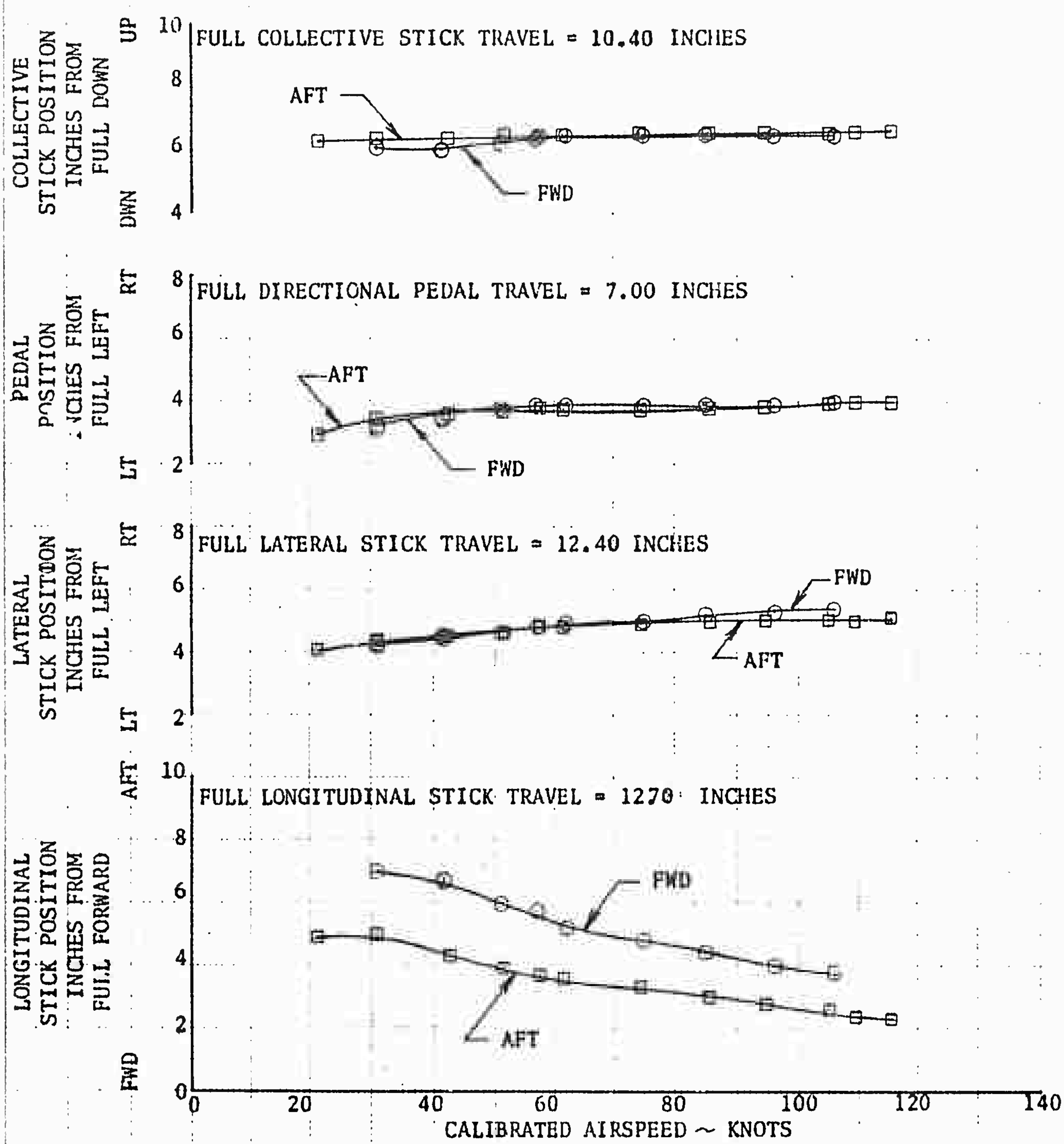


FIGURE NO. 61
CONTROL POSITIONS IN AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	6655	126.0(FWD)	5000	324
□	6735	135.0(AFT)	5000	324
△	6760	137.6(AFT)	5000	324

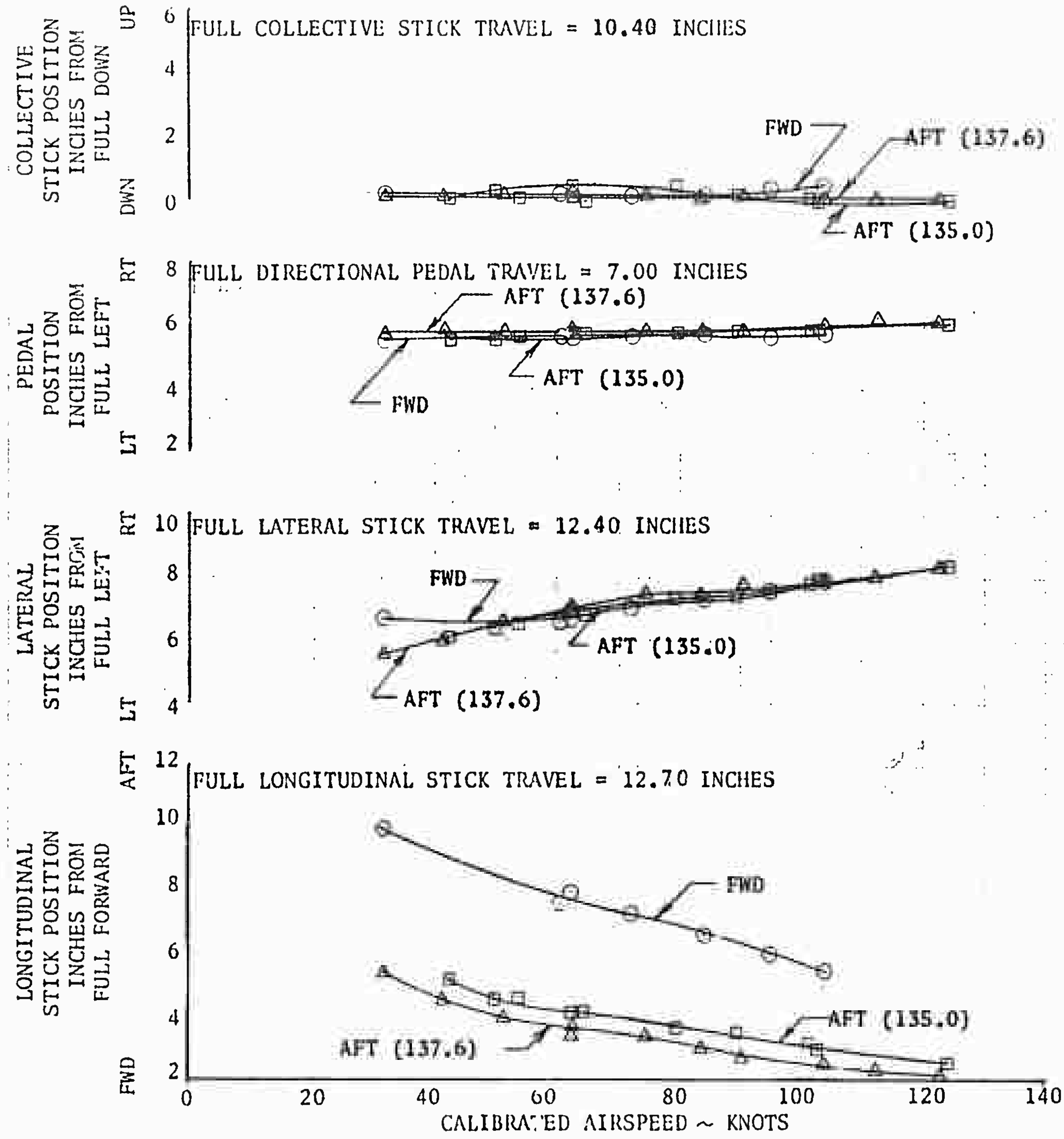


FIGURE NO. 62
CONTROL POSITIONS IN AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	8190	126.1(FWD)	5000	324
□	8220	133.6(AFT)	5000	324

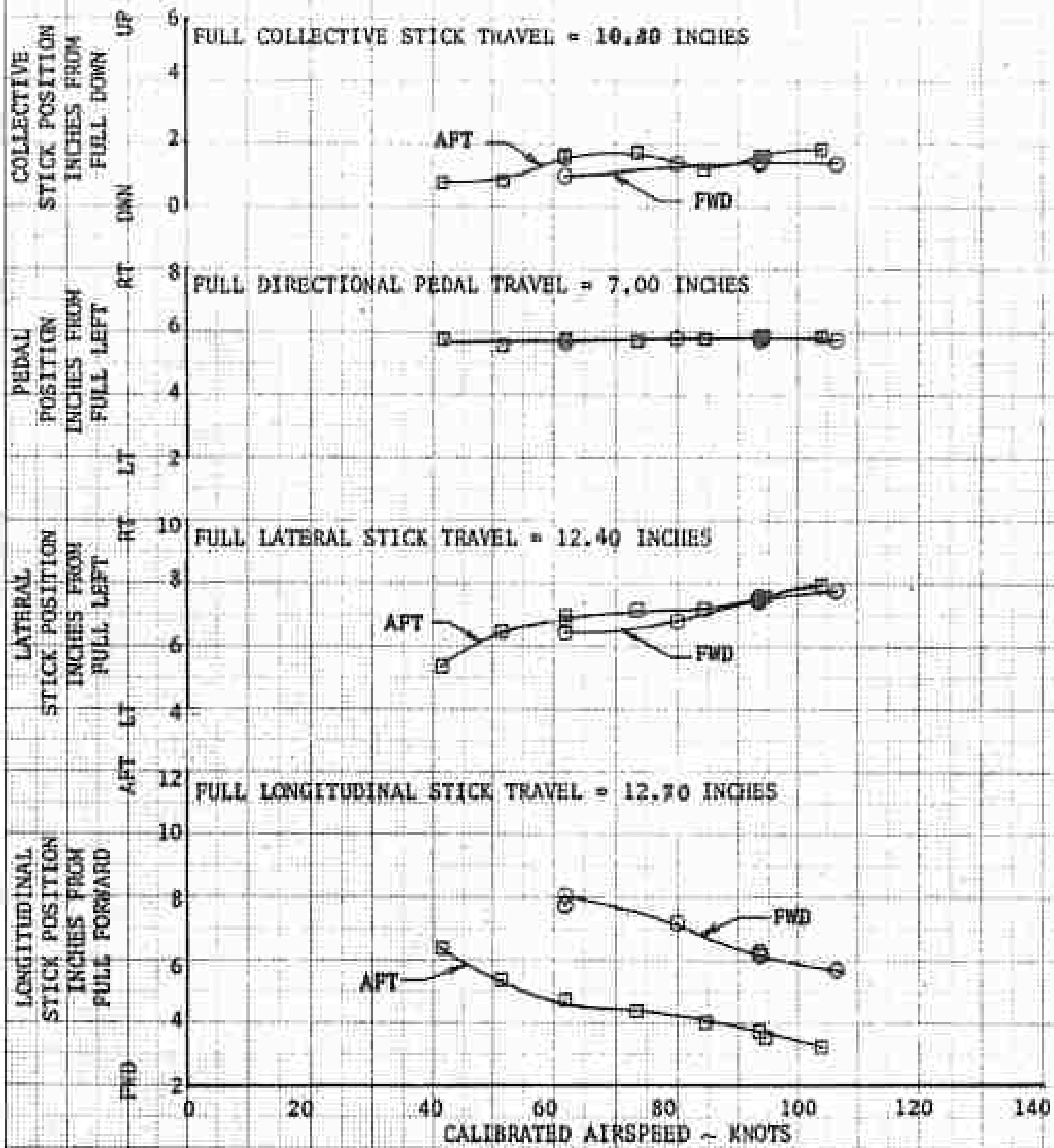


FIGURE NO. 63
CONTROL POSITIONS IN AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	9185	126.3(FWD)	5000	324
□	9165	131.8(AFT)	5000	324

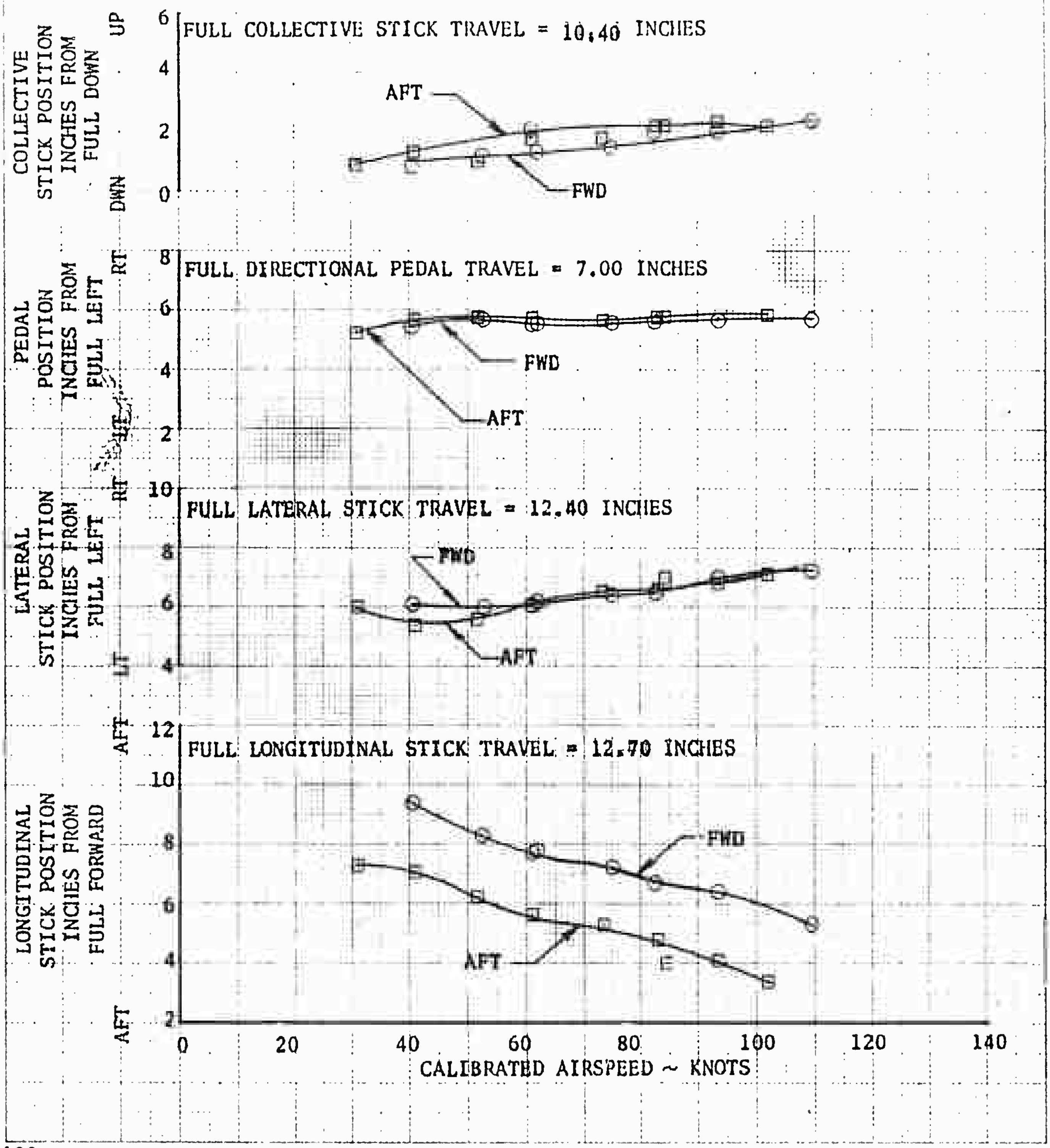


FIGURE NO. 64
STATIC LONGITUDINAL STABILITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	AVG GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
○	6785	126.0 (FWD)	5000	324	64 C
□	6715	135.0 (AFT)	5000	324	64 C
◇	6625	137.6 (AFT)	5000	324	64 C
⊿	8125	125.8 (FWD)	5000	324	64 B
☆	8300	133.8 (AFT)	5000	324	64 B
△	9245	126.3 (FWD)	5000	324	64 A
⏢	9175	131.8 (AFT)	5000	324	64 A

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 65 THROUGH 85 .
2. SHADED SYMBOLS DENOTE CLIMB.
3. FLAGGED SYMBOLS DENOTE AUTOROTATION.
4. LONGITUDINAL CONTROL GRADIENTS READ AT TRIM POINT

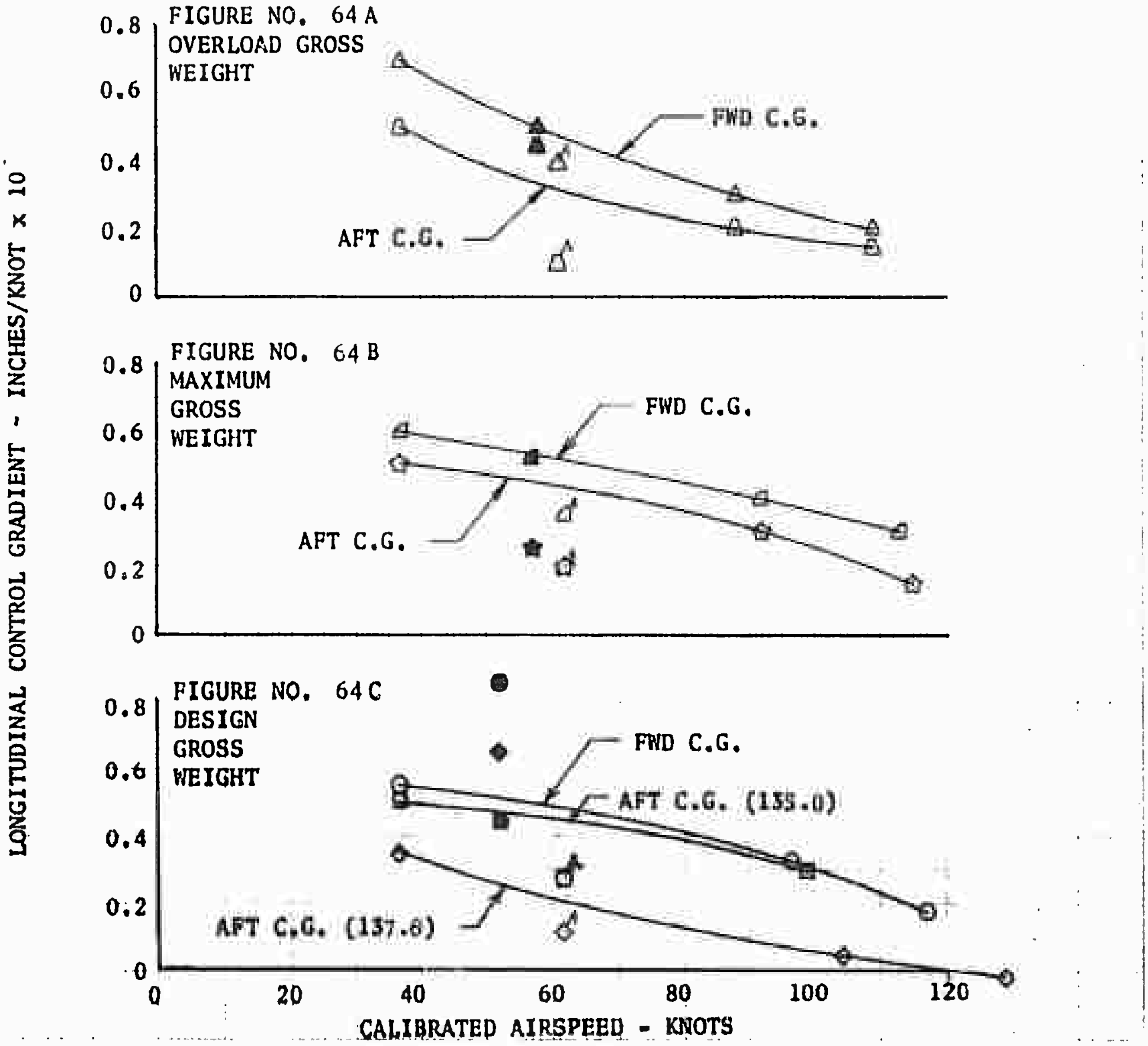


FIGURE NO. 65
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6655	126.0(FWD)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

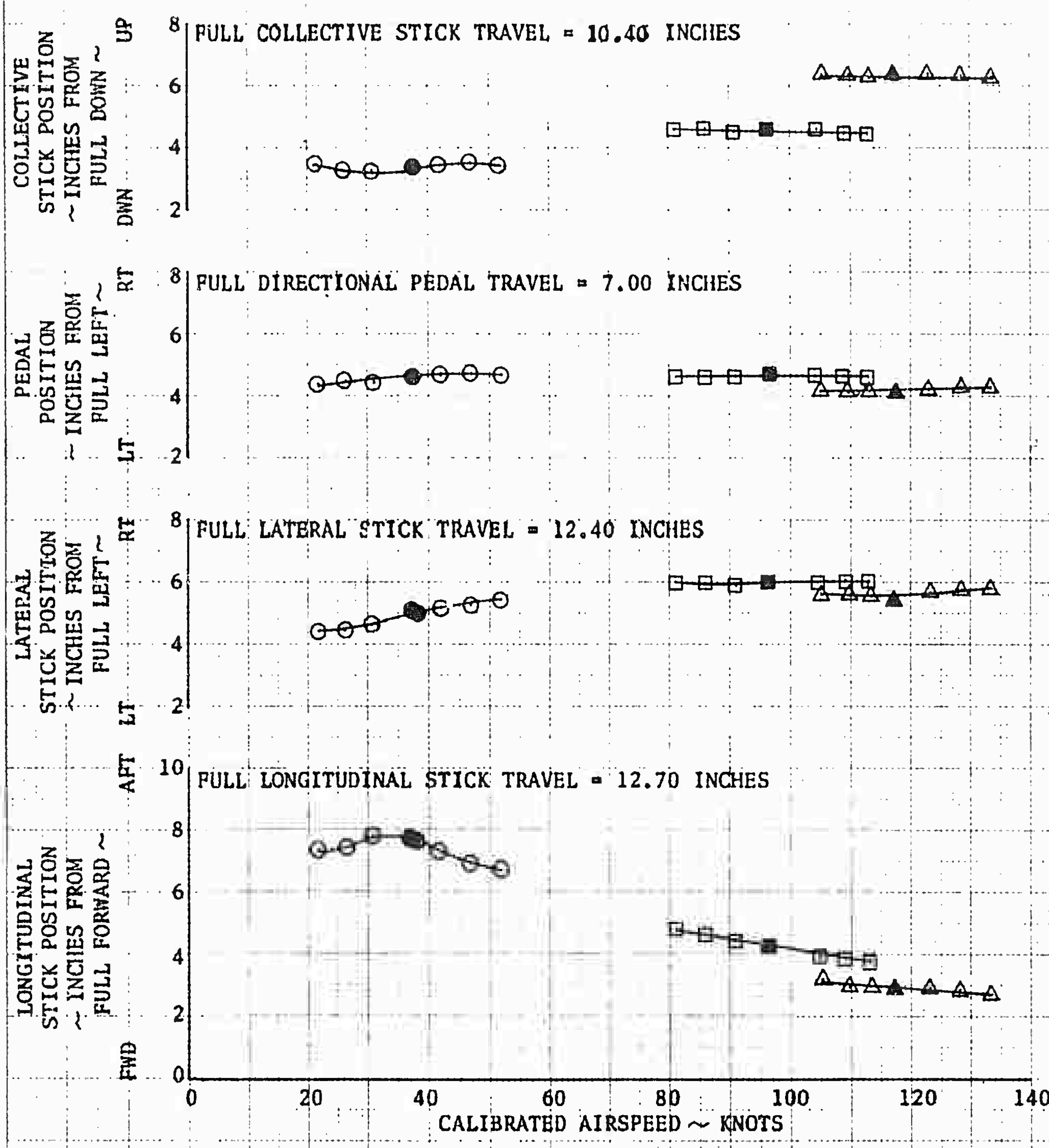


FIGURE NO. 66
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6735	135.0(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

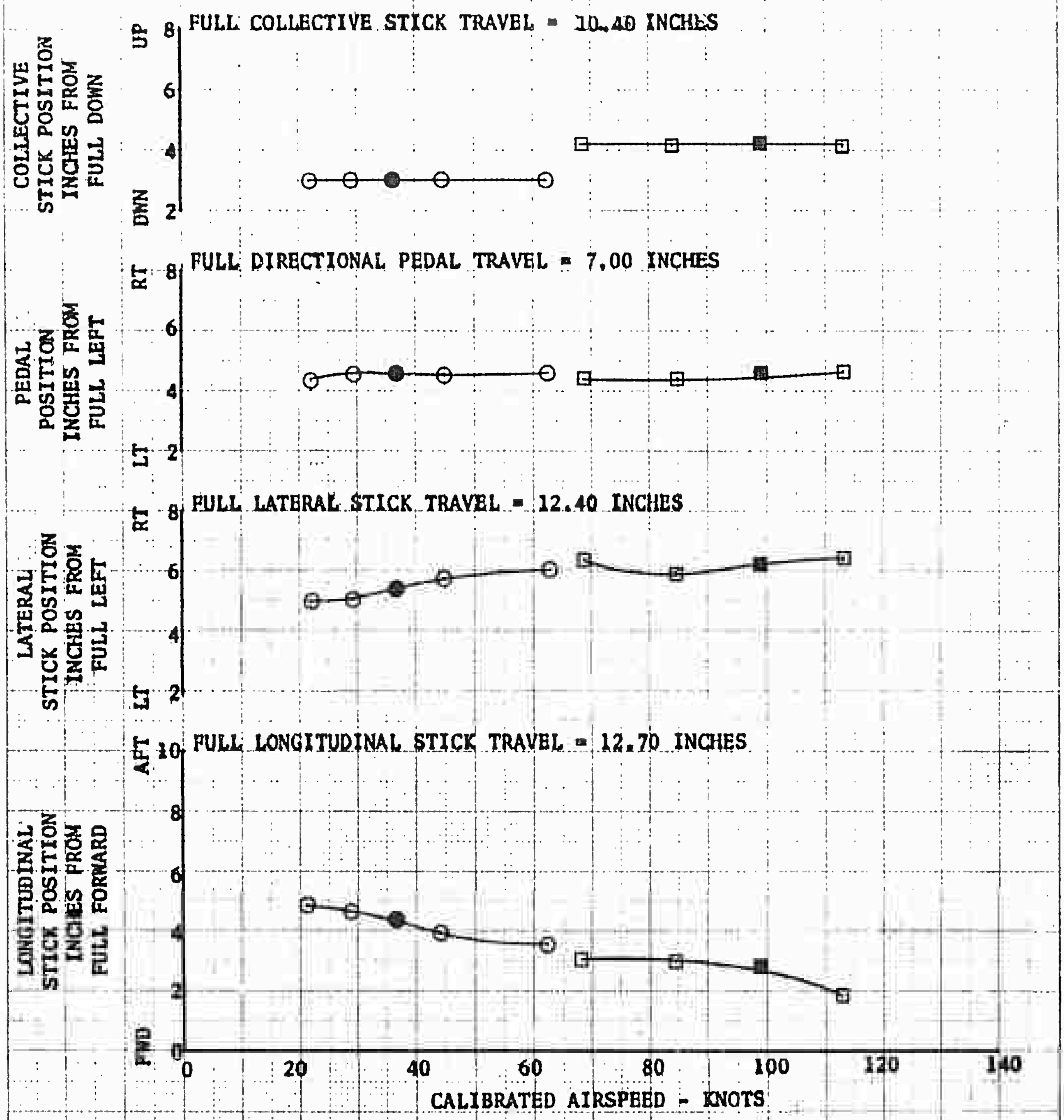


FIGURE NO. 67
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6740	137.6(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

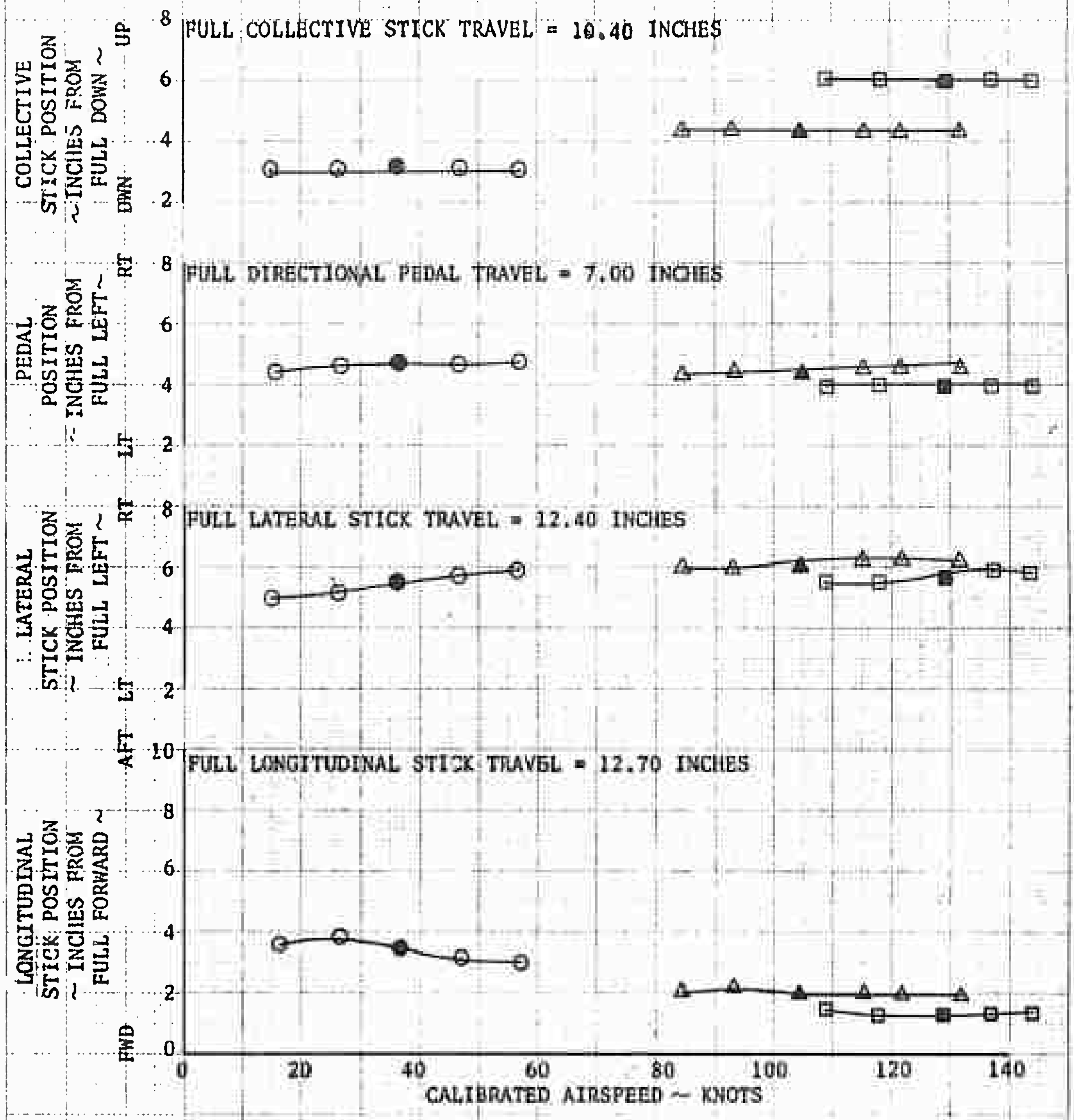


FIGURE NO. 68
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
8190	126.1(FWD)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

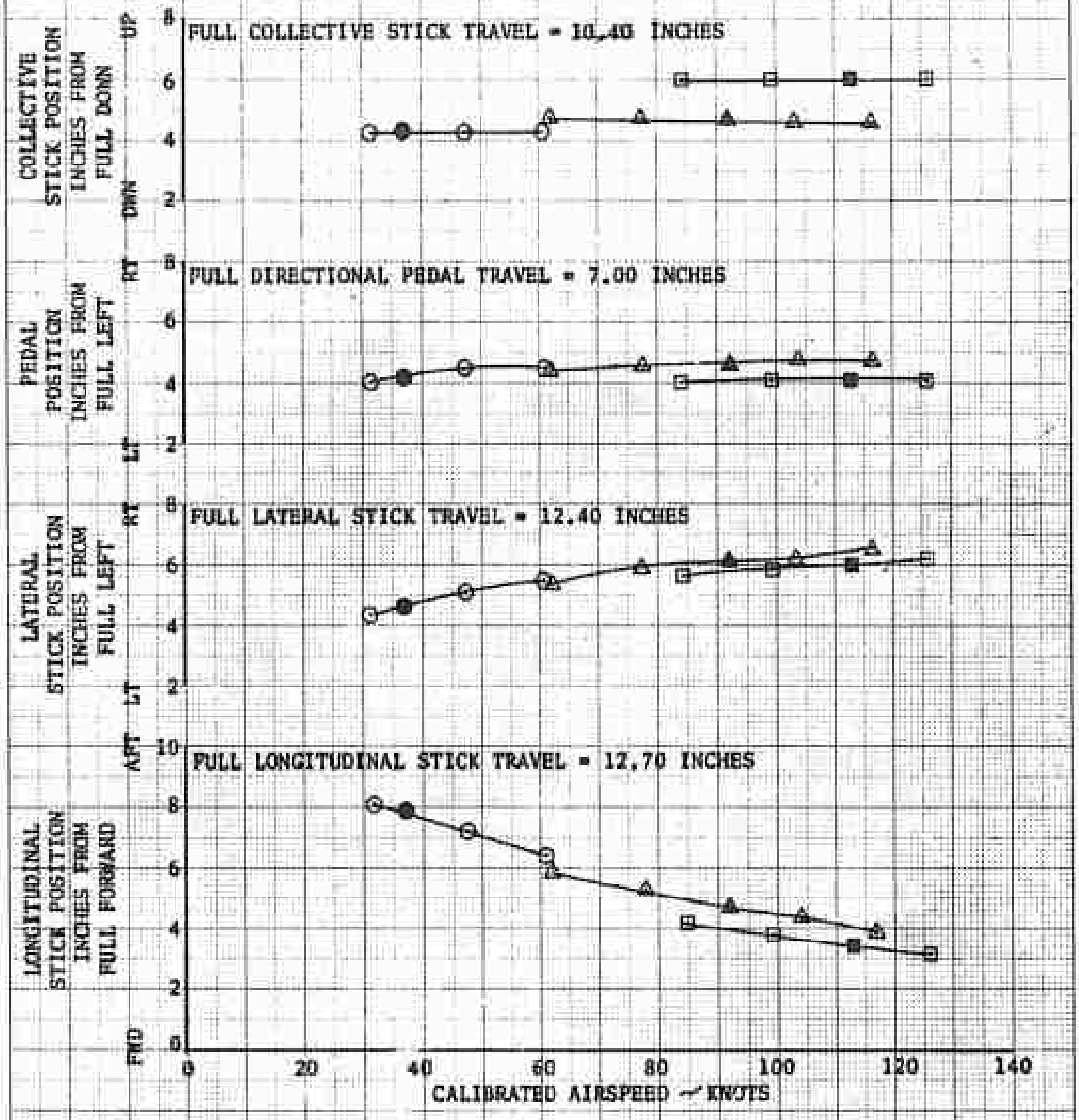


FIGURE NO. 69
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
8220	136.6(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

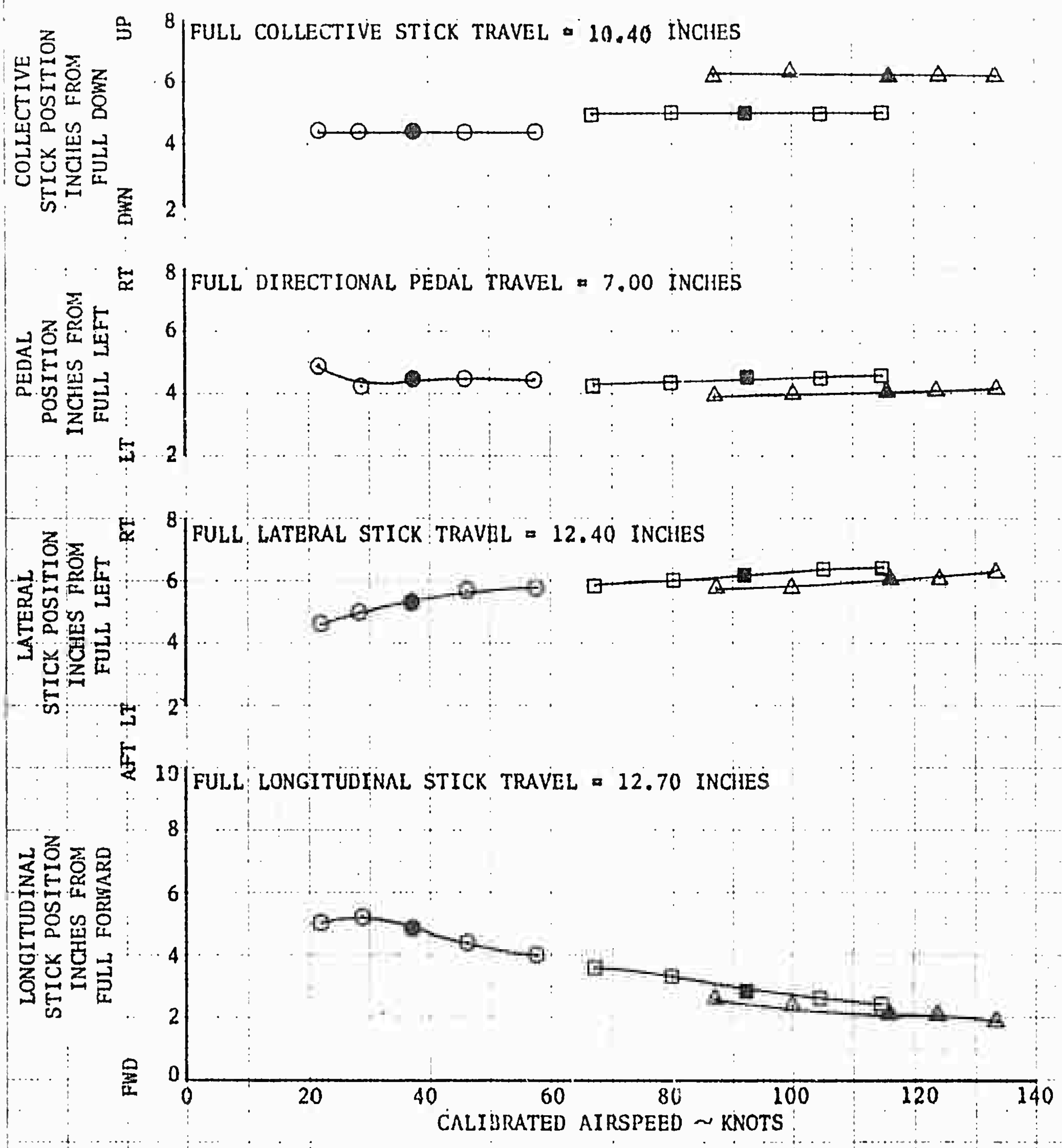


FIGURE NO. 70
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9185	126.3(FWD)	5030	324

SHADED SYMBOLS DENOTE TRIM POINTS

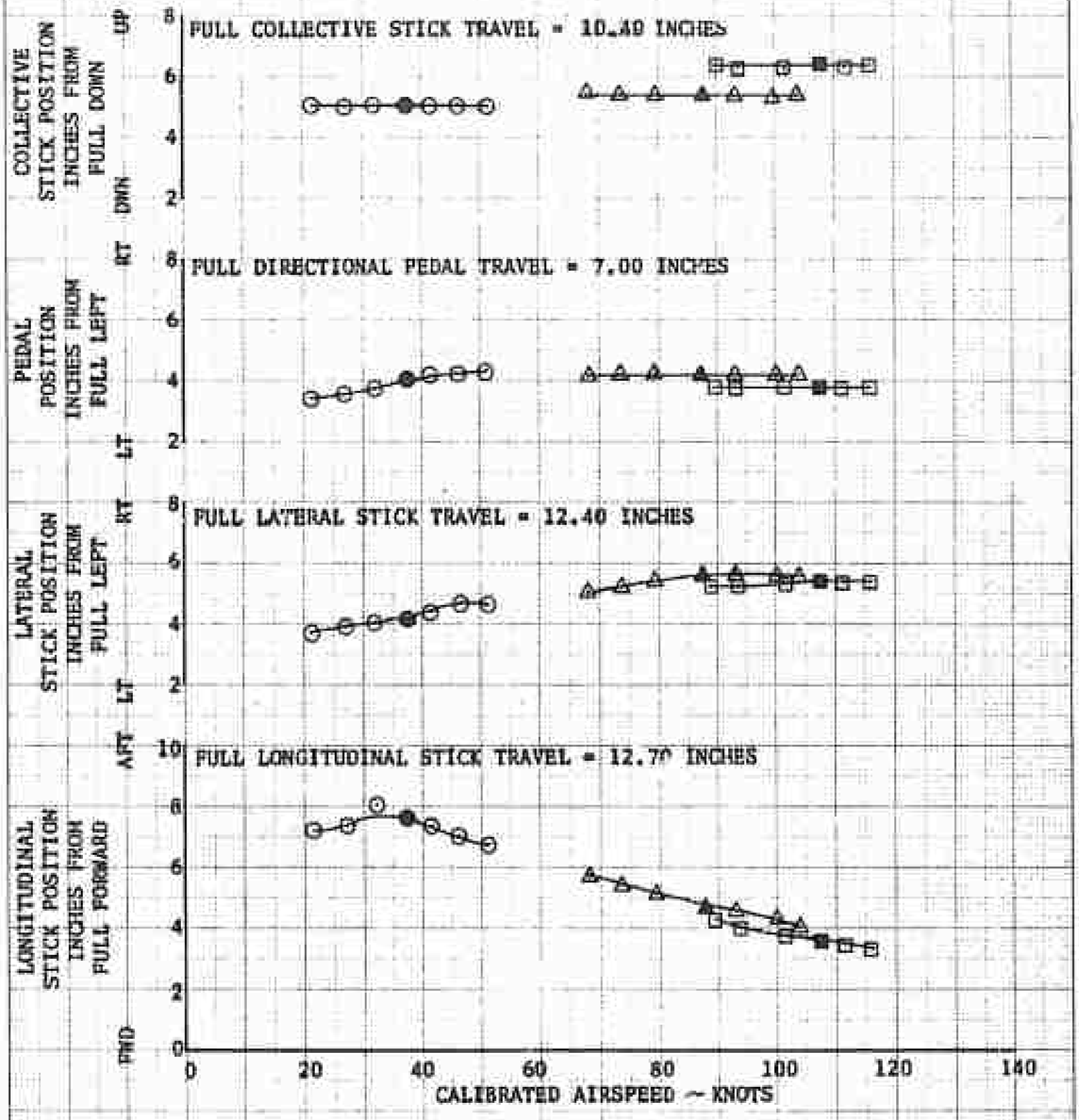


FIGURE NO. 71
STATIC LONGITUDINAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9265	131.3(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

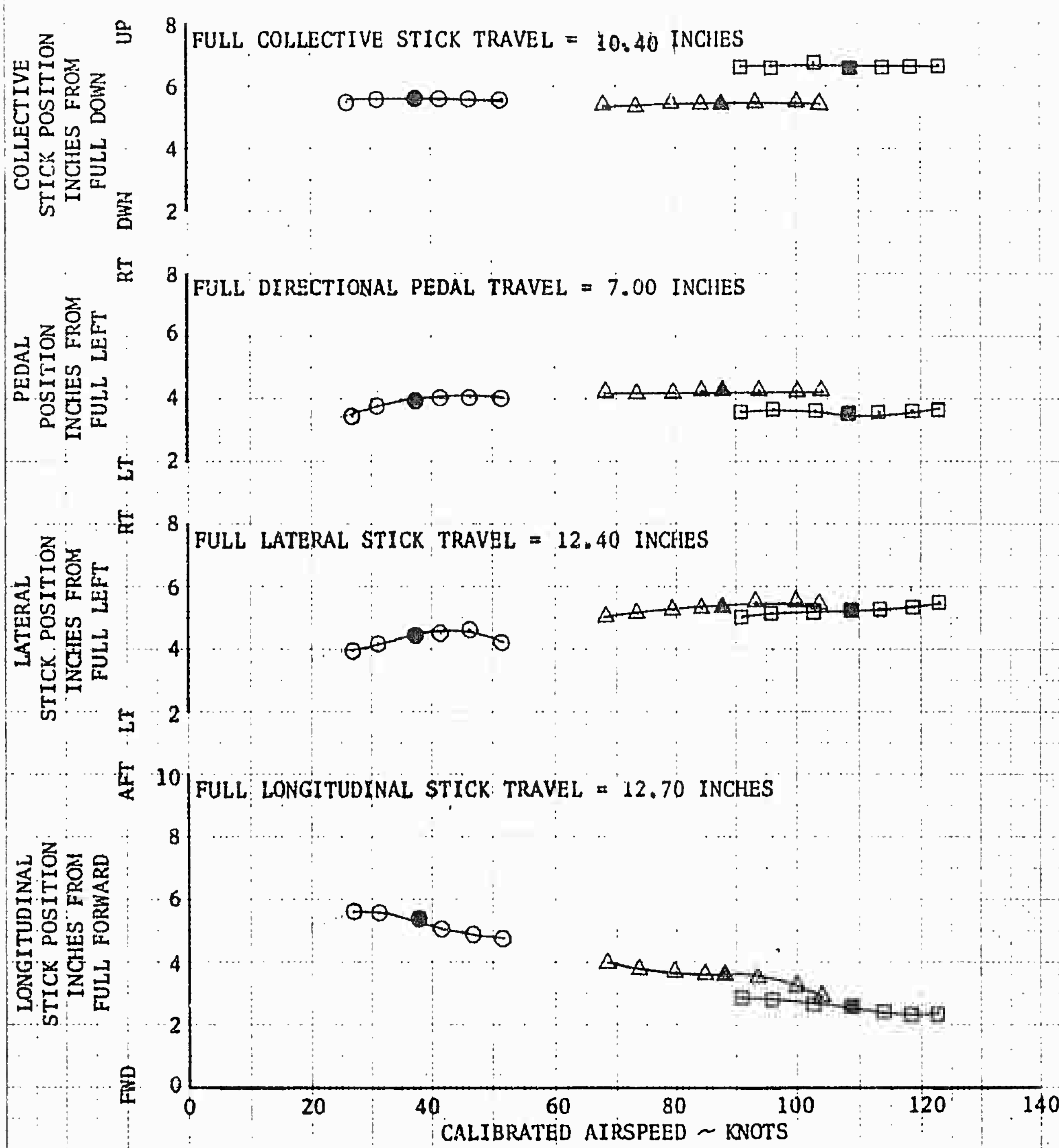


FIGURE NO. 72
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6655	126.0(FWD)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

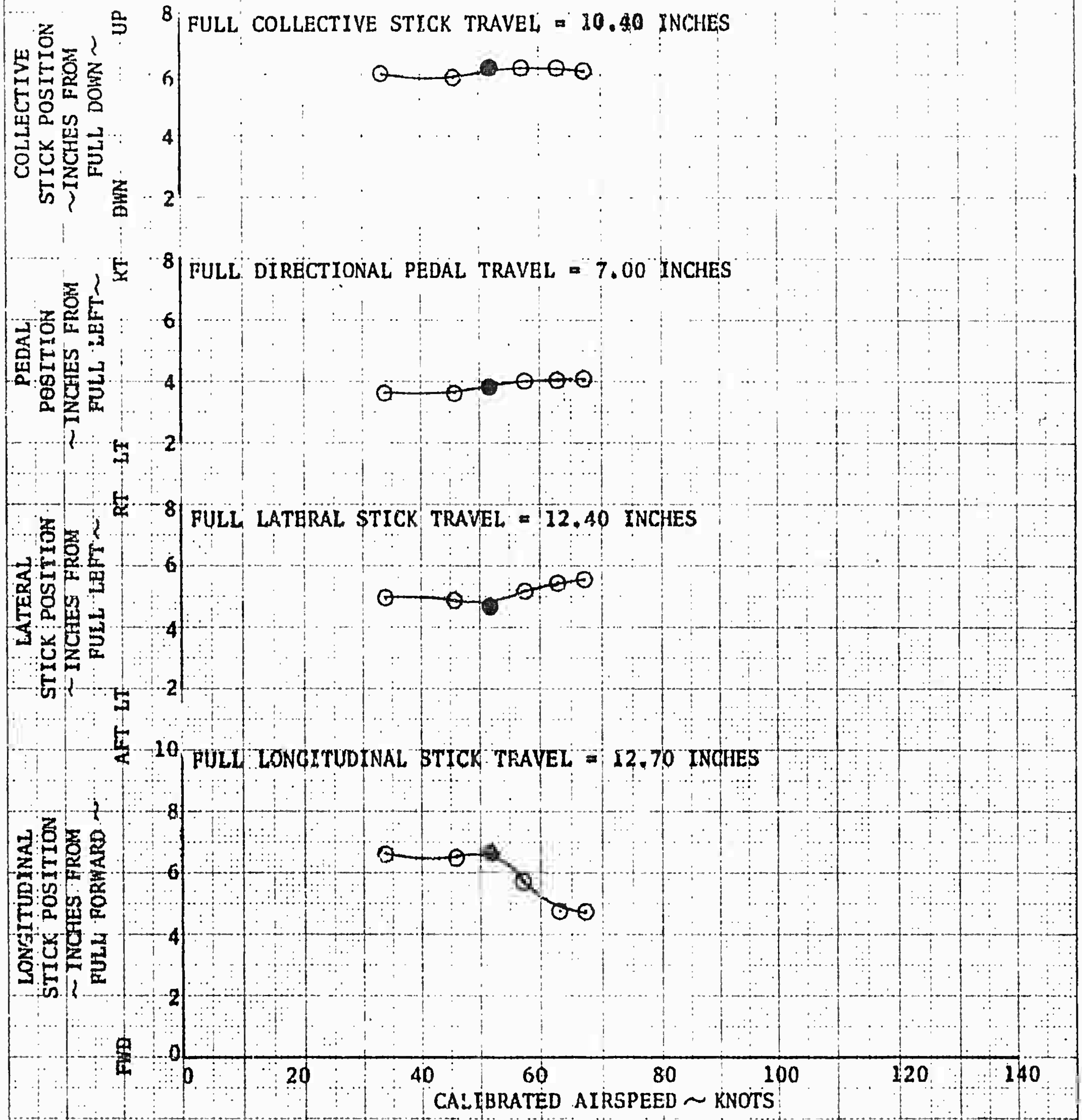


FIGURE NO. 73
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6735	135.0(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

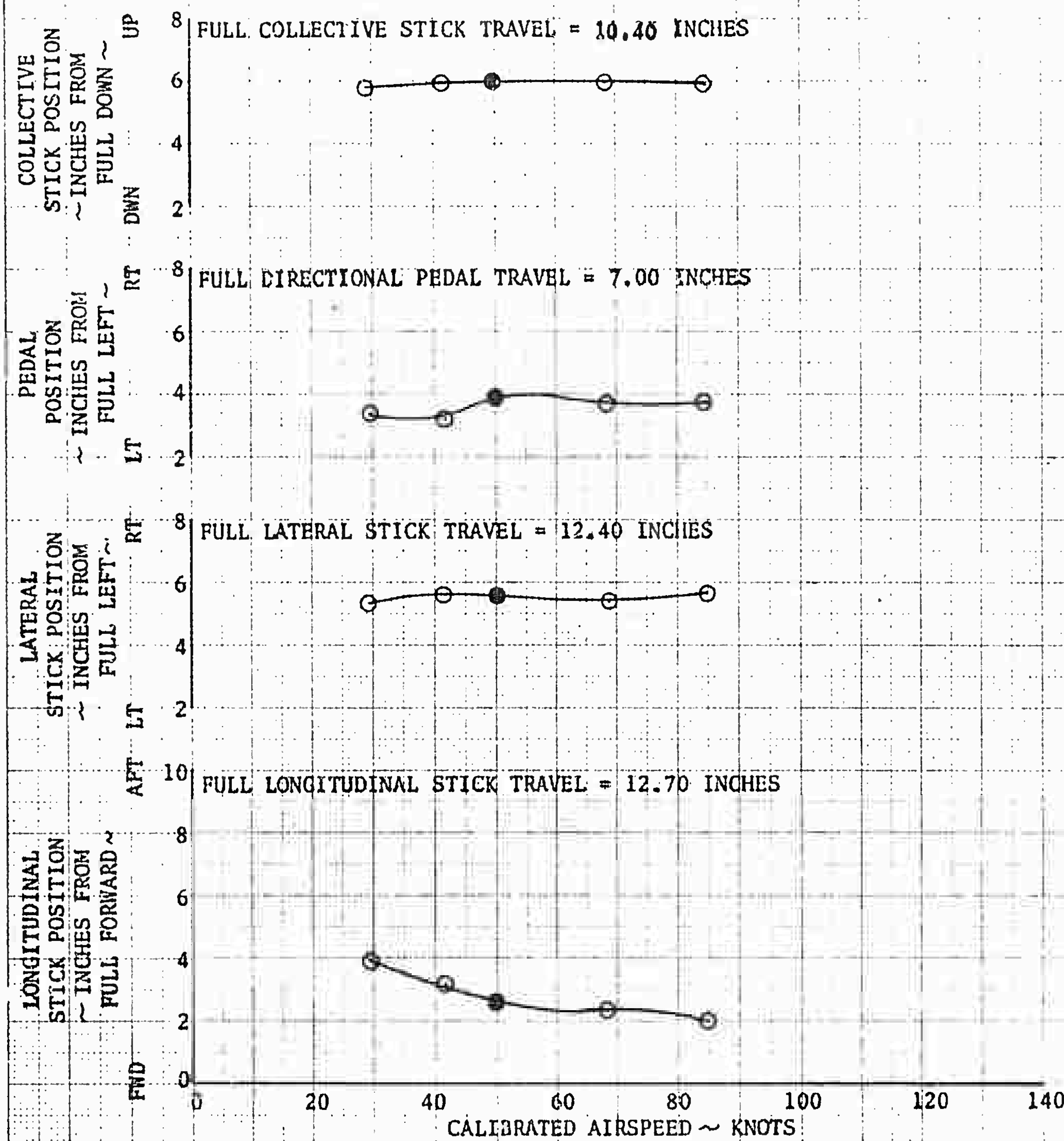


FIGURE NO. 74
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SHADED SYMBOLS DENOTE TRIM POINT

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6760	137.6(AFT)	5000	324

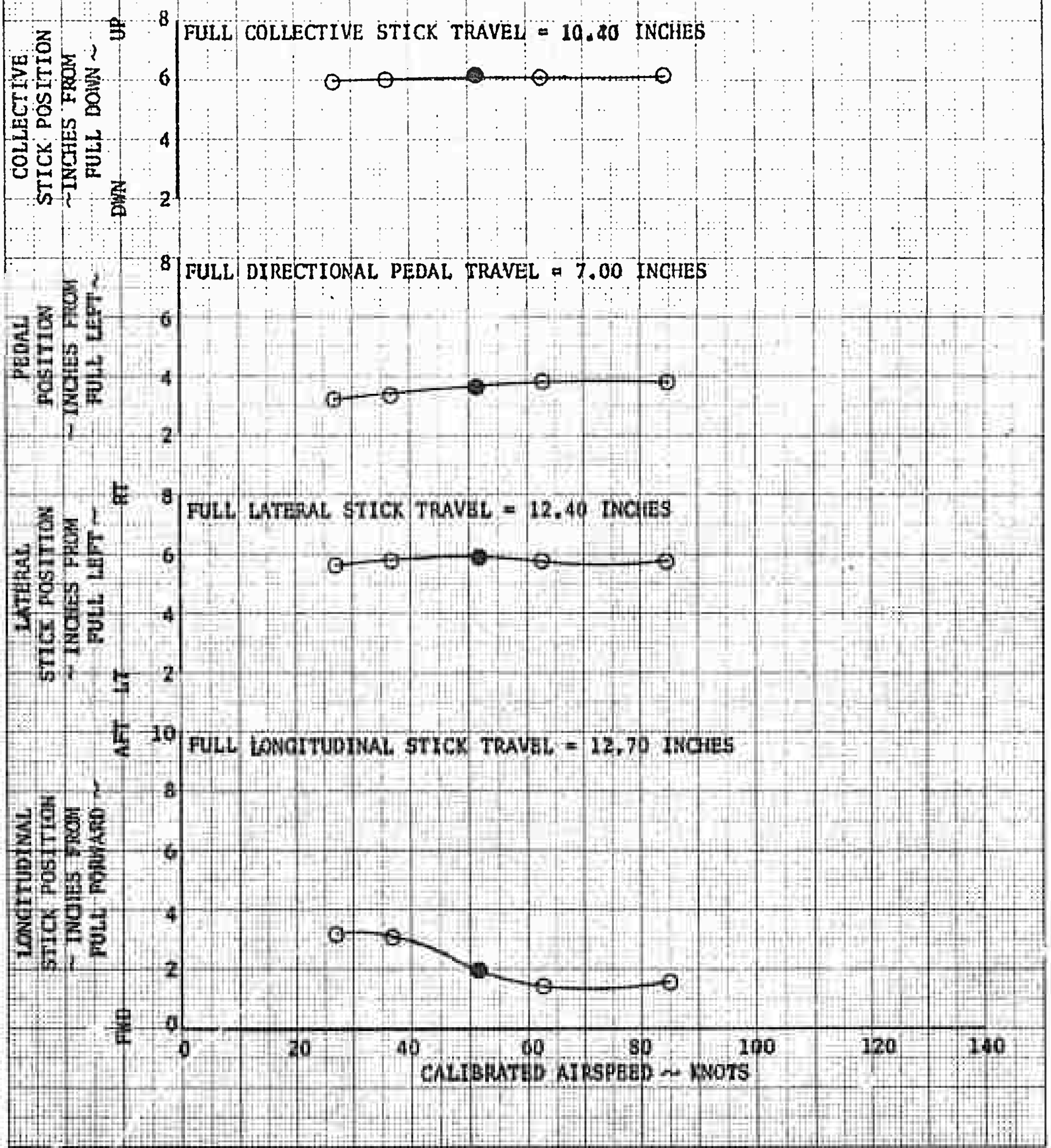
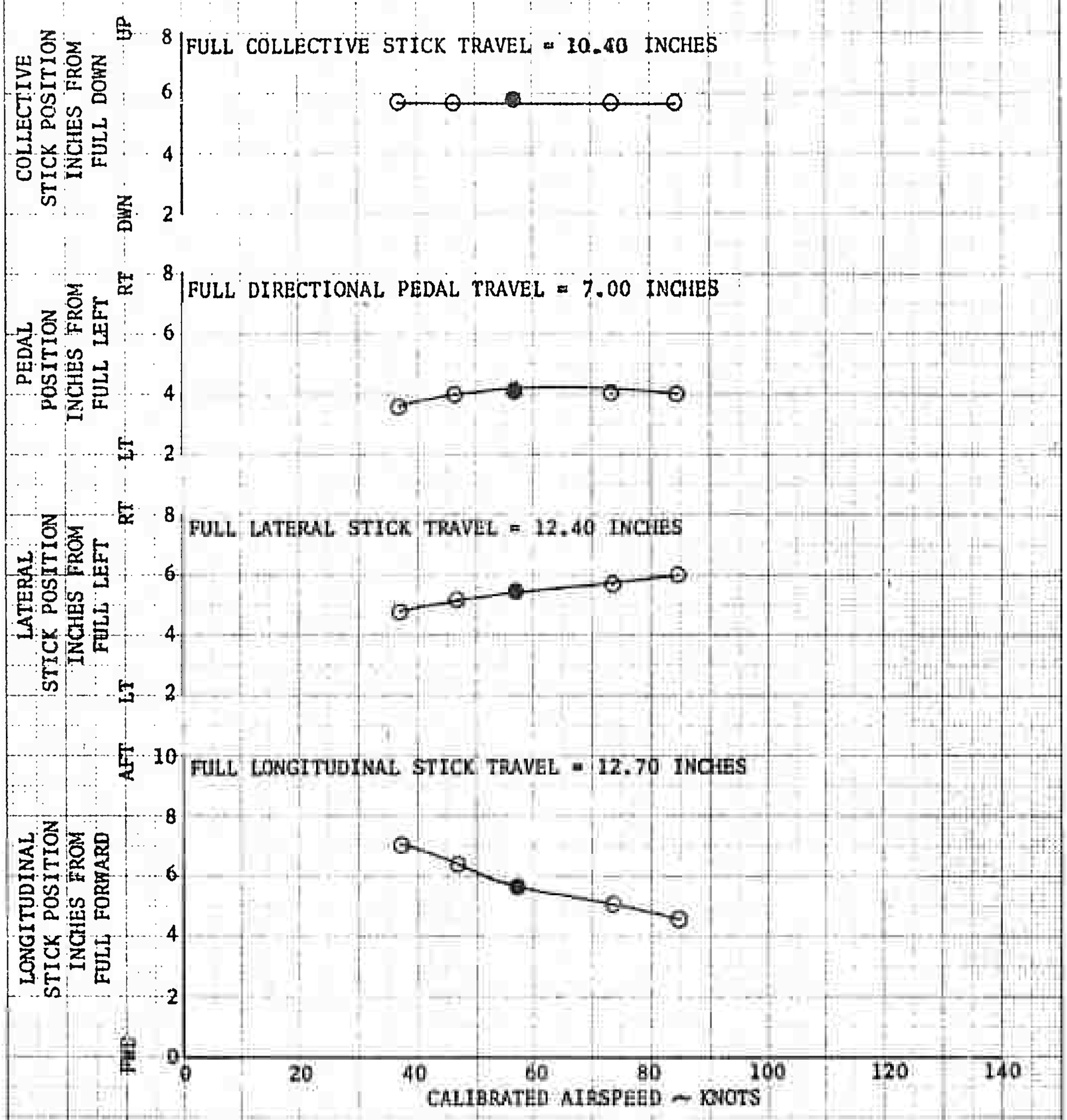


FIGURE NO. 75
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
8190	126.1(FWD)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS



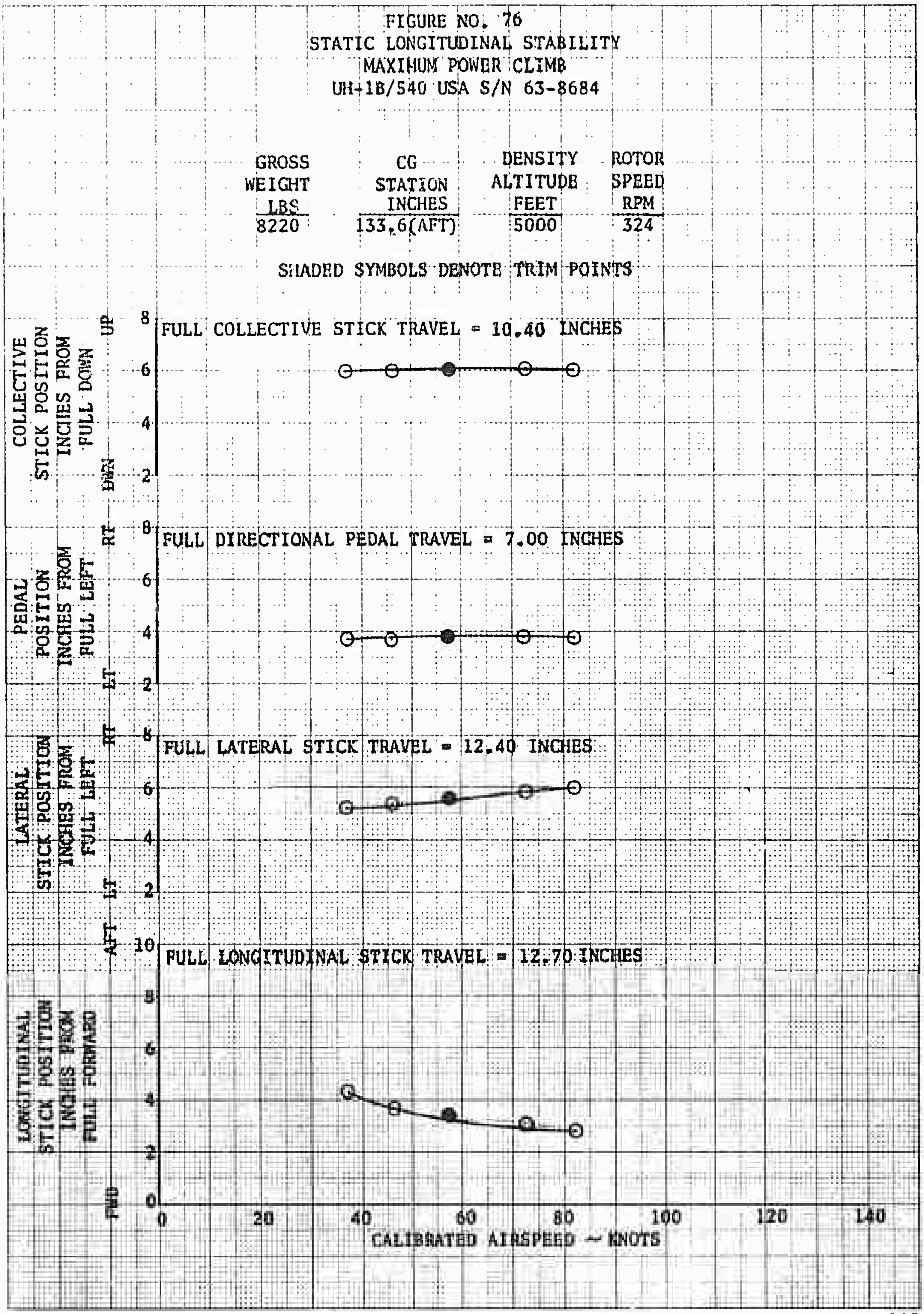


FIGURE NO. 76
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684
GROSS WEIGHT LBS 8220
CG STATION INCHES 133.6(AFT)
DENSITY ALTITUDE FEET 5000
ROTOR SPEED RPM 324
SHADED SYMBOLS DENOTE TRIM POINTS
FULL COLLECTIVE STICK TRAVEL = 10.40 INCHES
COLLECTIVE STICK POSITION INCHES FROM FULL DOWN
UP
DWN
FULL DIRECTIONAL PEDAL TRAVEL = 7.00 INCHES
PEDAL POSITION INCHES FROM FULL LEFT
RT
LT
FULL LATERAL STICK TRAVEL = 12.40 INCHES
LATERAL STICK POSITION INCHES FROM FULL LEFT
RT
LT
FULL LONGITUDINAL STICK TRAVEL = 12.70 INCHES
LONGITUDINAL STICK POSITION INCHES FROM FULL FORWARD
AFT
FWD
CALIBRATED AIRSPEED ~ KNOTS

FIGURE NO. 77
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9185	126.3(FWD)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

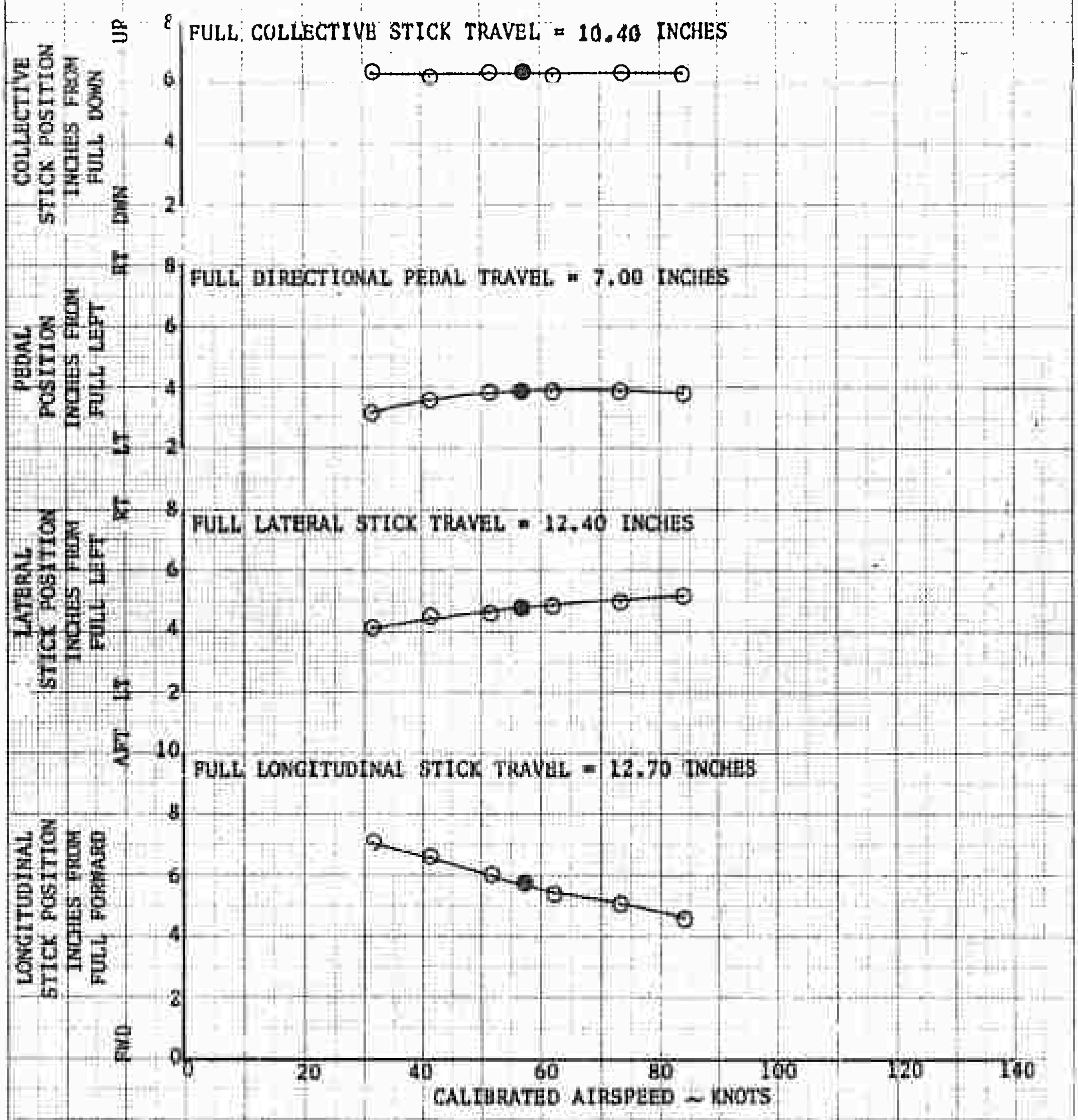
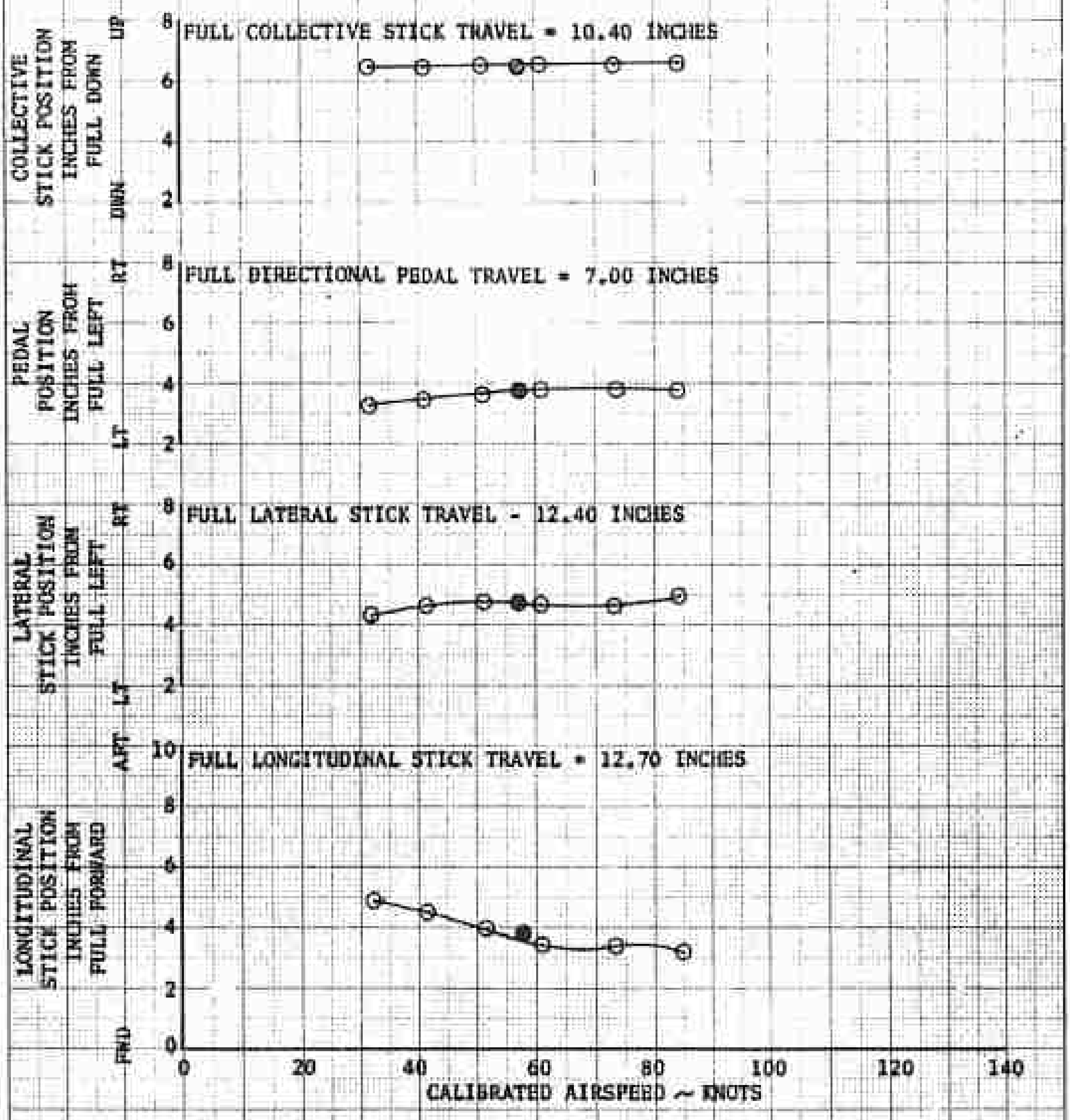


FIGURE NO. 78
STATIC LONGITUDINAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9165	131.8(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS



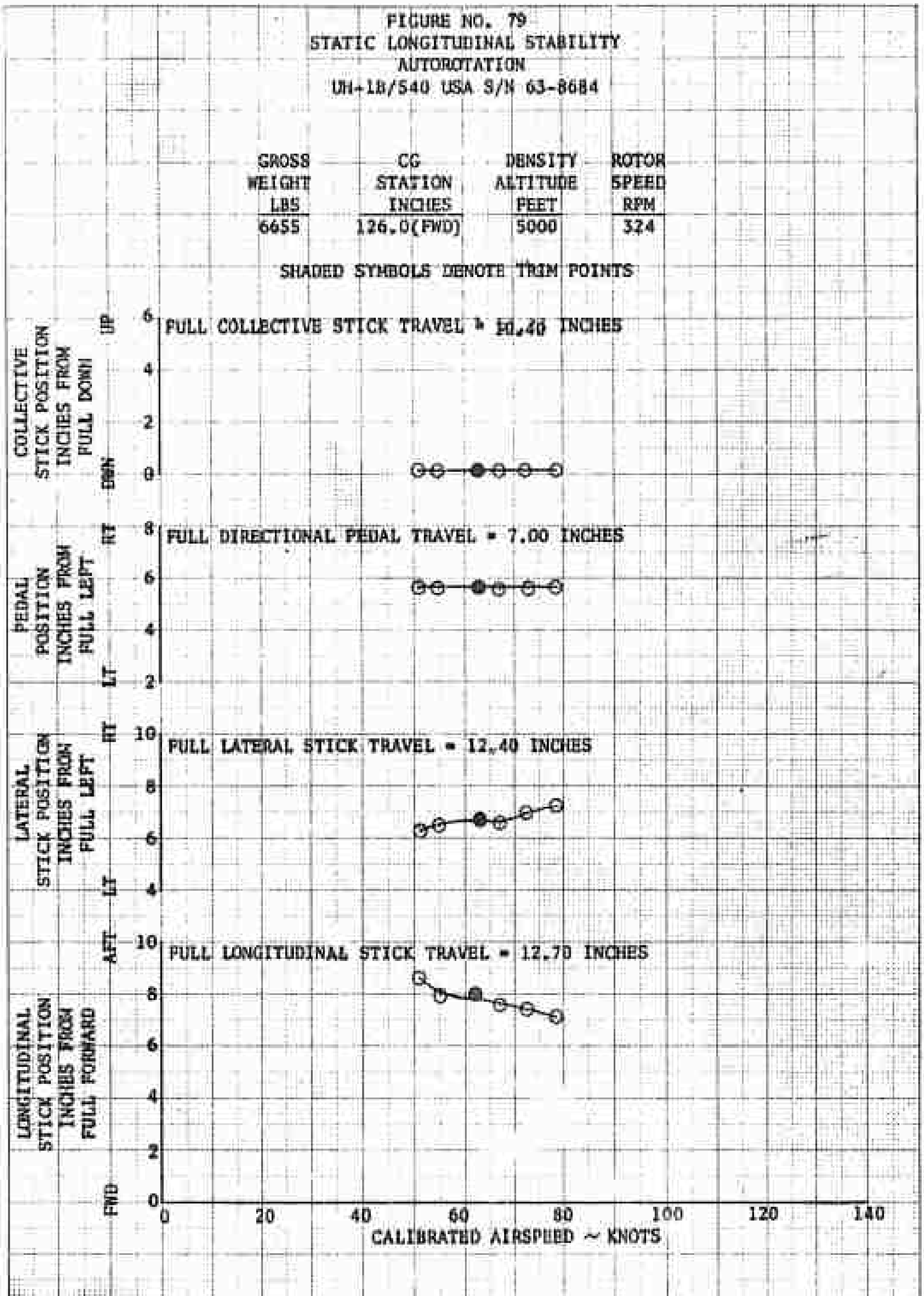


FIGURE NO. 79
STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684
GROSS WEIGHT LBS
6655
CG STATION INCHES
126.0(FWD)
DENSITY ALTITUDE FEET
5000
ROTOR SPEED RPM
324
SHADED SYMBOLS DENOTE TRIM POINTS
FULL COLLECTIVE STICK TRAVEL = 11.40 INCHES
FULL DIRECTIONAL PEDAL TRAVEL = 7.00 INCHES
FULL LATERAL STICK TRAVEL = 12.40 INCHES
FULL LONGITUDINAL STICK TRAVEL = 12.70 INCHES
COLLECTIVE STICK POSITION INCHES FROM FULL DOWN
UP
DWN
PEDAL POSITION INCHES FROM FULL LEFT
RT
LT
LATERAL STICK POSITION INCHES FROM FULL LEFT
RT
LT
LONGITUDINAL STICK POSITION INCHES FROM FULL FORWARD
AFT
FWD
CALIBRATED AIRSPEED ~ KNOTS
0
20
40
60
80
100
120
140

FIGURE NO. 80
STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6735	135.0(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS

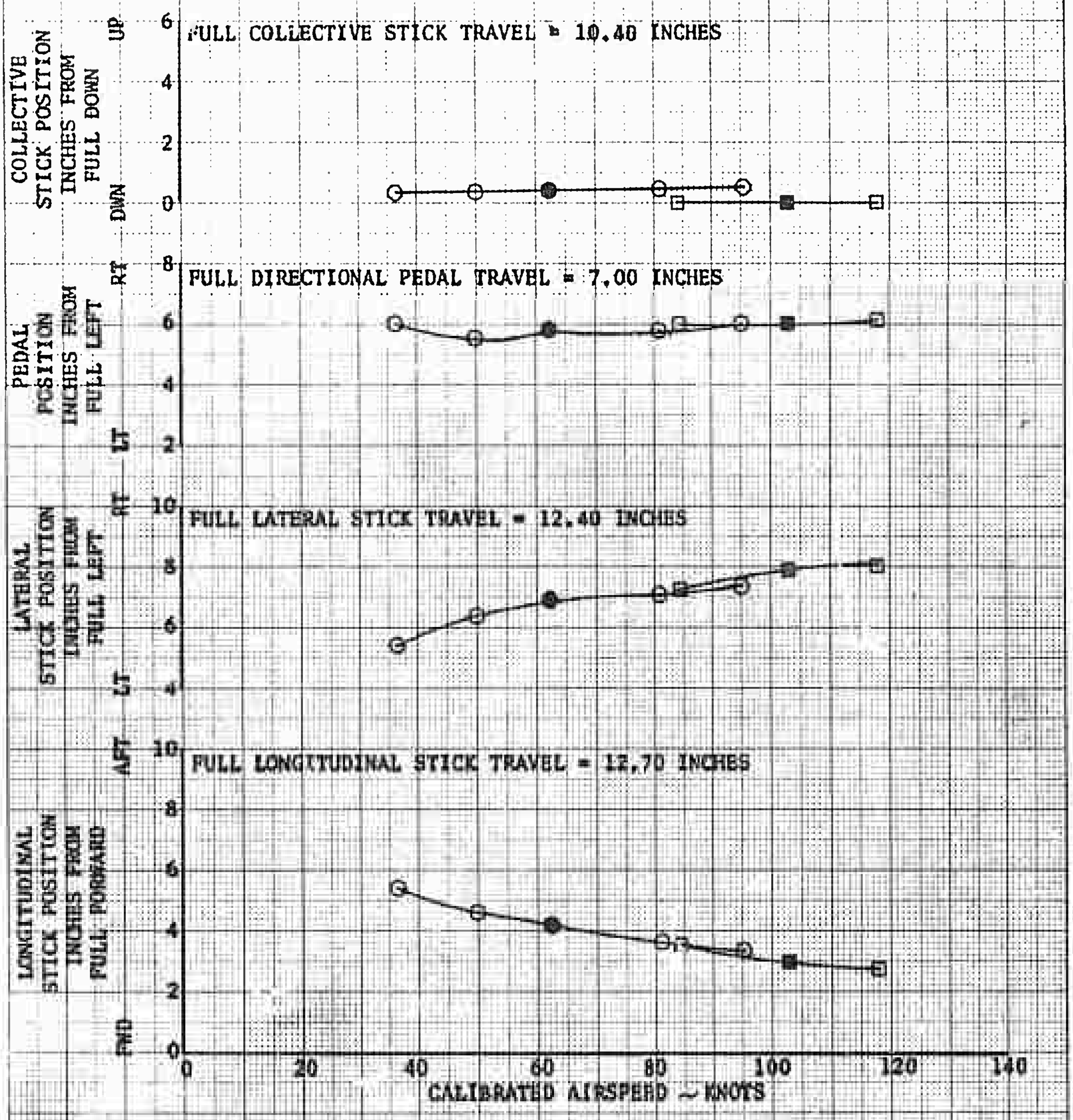
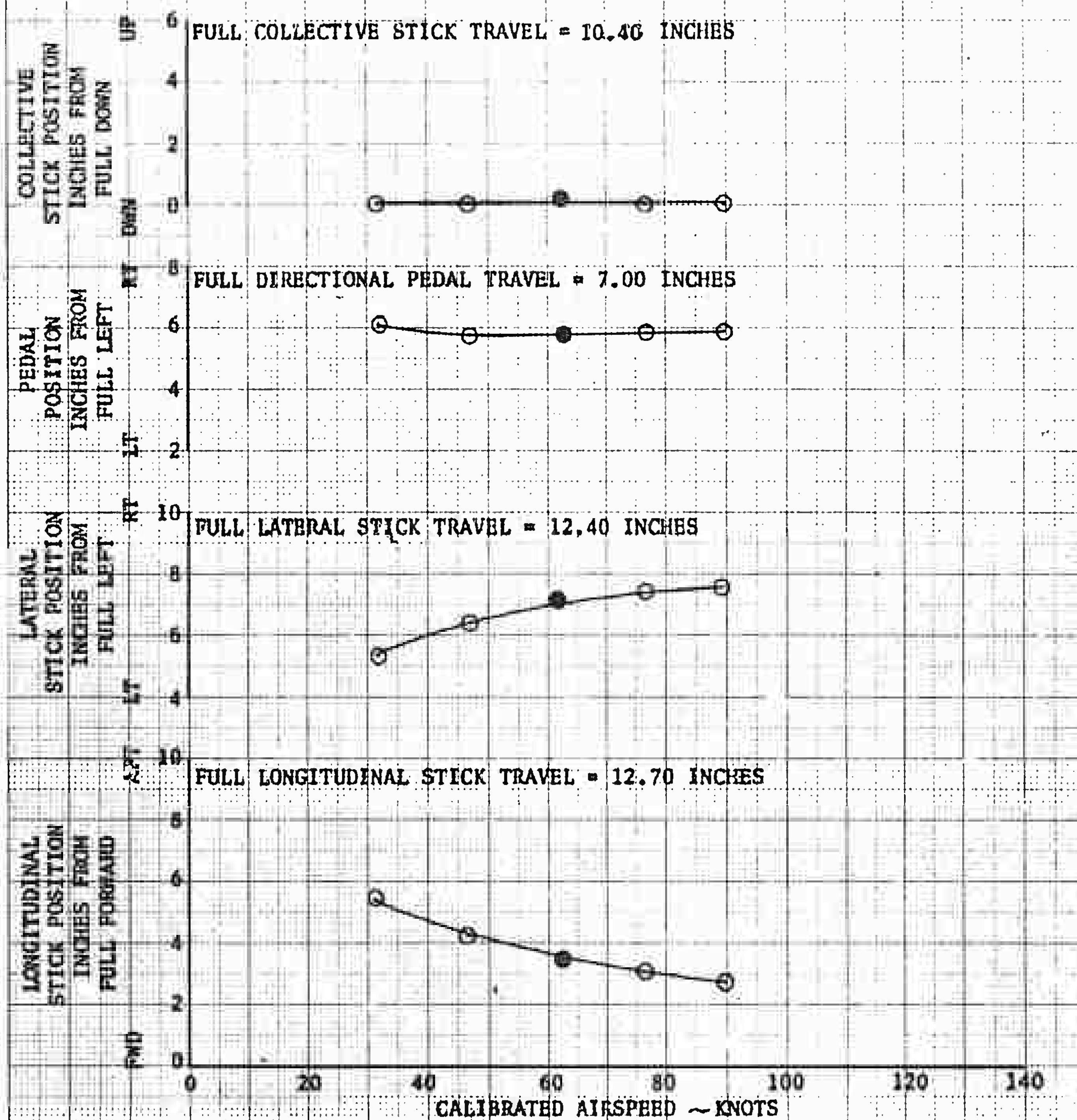


FIGURE NO. 81
STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
6760	137.6(AFT)	5000	324

SHADED SYMBOLS DENOTE TRIM POINTS



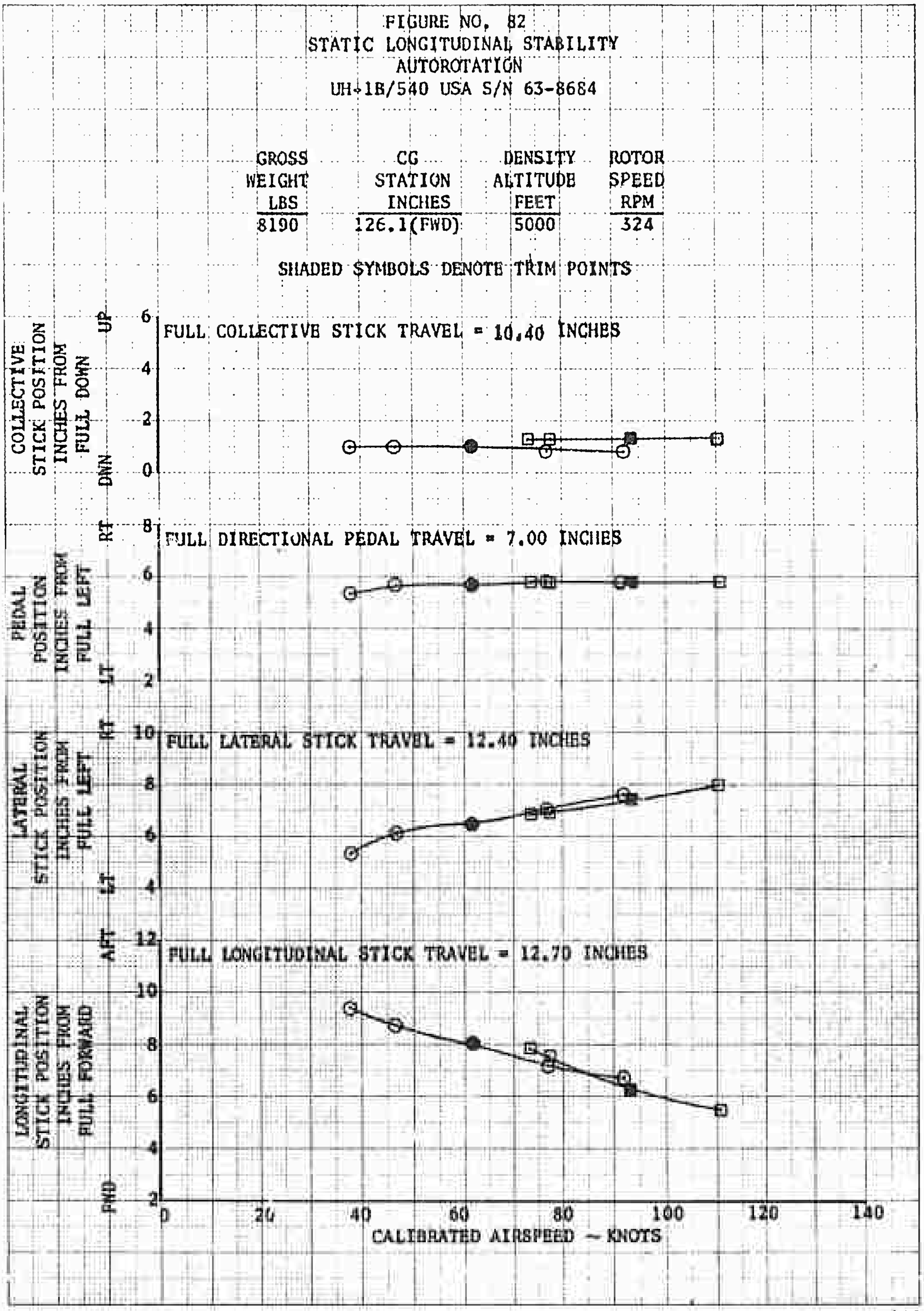


FIGURE NO. 82
STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684
GROSS WEIGHT LBS
8190
CG STATION INCHES
126.1(FWD)
DENSITY ALTITUDE FEET
5000
ROTOR SPEED RPM
324
SHADED SYMBOLS DENOTE TRIM POINTS
COLLECTIVE STICK POSITION INCHES FROM FULL DOWN
UP
DWN
FULL COLLECTIVE STICK TRAVEL = 10.40 INCHES
PEDAL POSITION INCHES FROM FULL LEFT
RT
LT
FULL DIRECTIONAL PEDAL TRAVEL = 7.00 INCHES
LATERAL STICK POSITION INCHES FROM FULL LEFT
FULL LATERAL STICK TRAVEL = 12.40 INCHES
LONGITUDINAL STICK POSITION INCHES FROM FULL FORWARD
AFT
FWD
FULL LONGITUDINAL STICK TRAVEL = 12.70 INCHES
CALIBRATED AIRSPEED ~ KNOTS

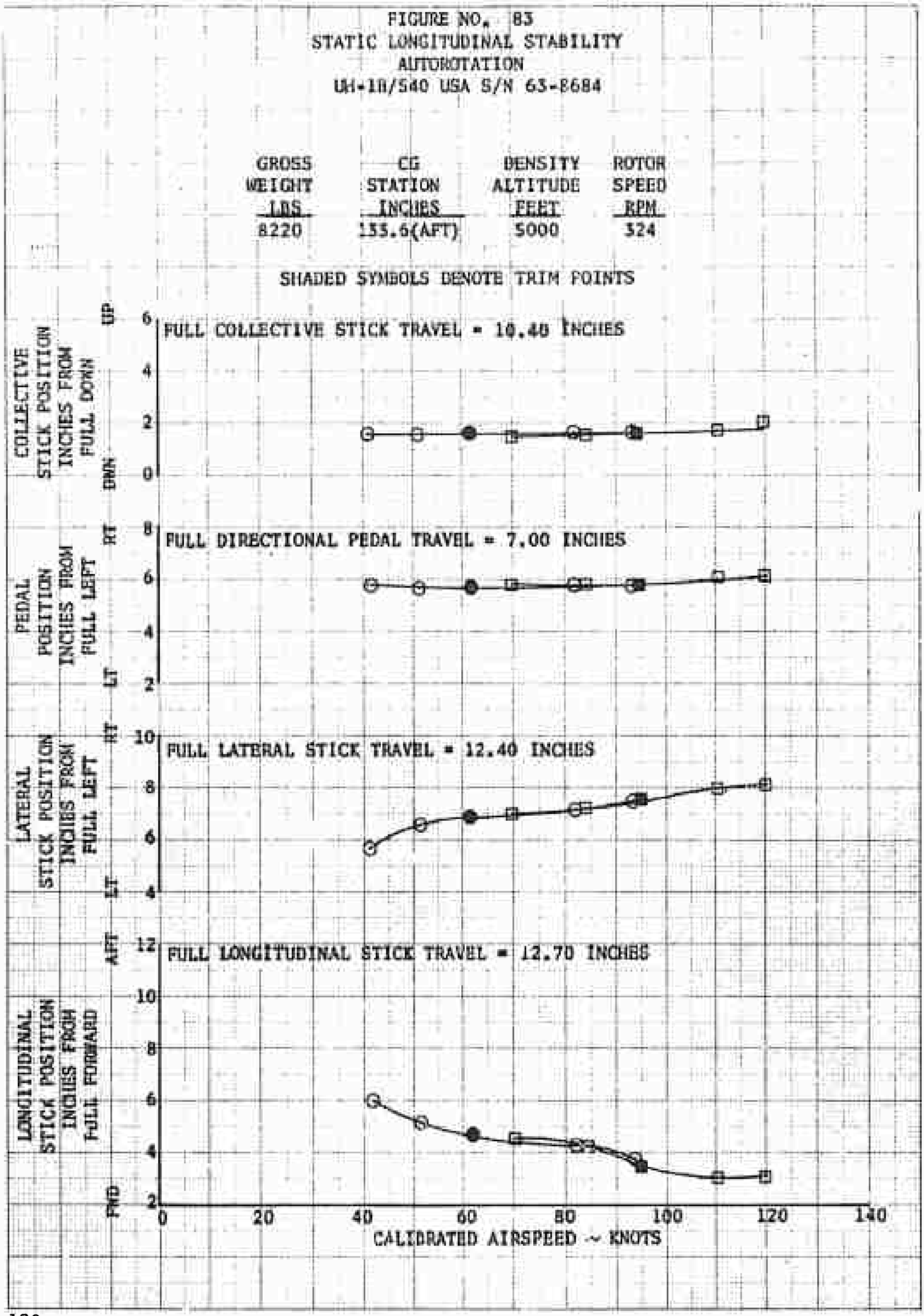
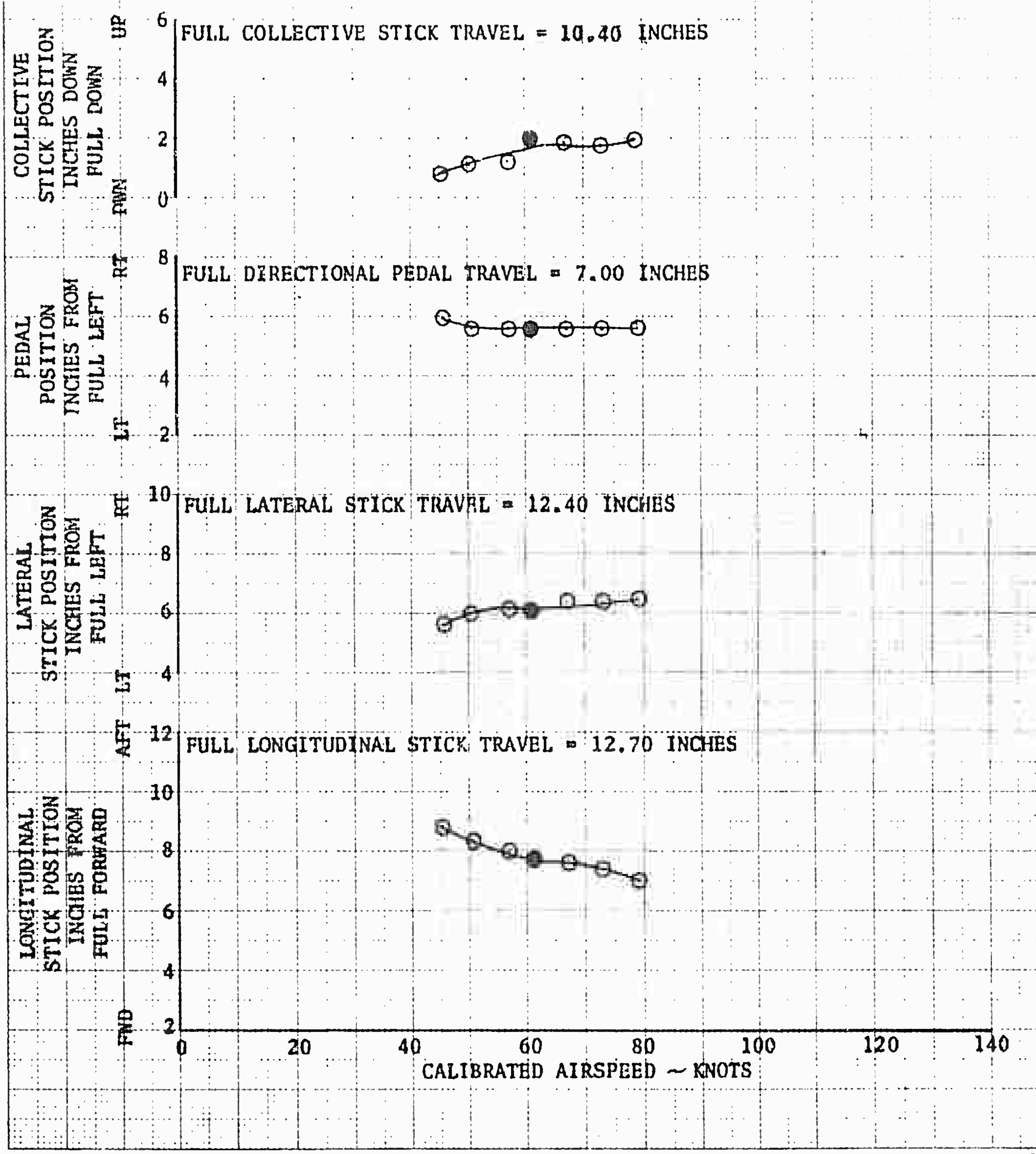


FIGURE NO. 83
STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684
GROSS WEIGHT LBS
8220
CG STATION INCHES
133.6(AFT)
DENSITY ALTITUDE FEET
5000
ROTOR SPEED RPM
324
SHADED SYMBOLS DENOTE TRIM POINTS
FULL COLLECTIVE STICK TRAVEL = 10.40 INCHES
COLLECTIVE STICK POSITION INCHES FROM FULL DOWN
UP
DWN
FULL DIRECTIONAL PEDAL TRAVEL = 7.00 INCHES
PEDAL POSITION INCHES FROM FULL LEFT
RT
LT
FULL LATERAL STICK TRAVEL = 12.40 INCHES
LATERAL STICK POSITION INCHES FROM FULL LEFT
RT
LT
FULL LONGITUDINAL STICK TRAVEL = 12.70 INCHES
LONGITUDINAL STICK POSITION INCHES FROM FULL FORWARD
AFT
FWD
CALIBRATED AIRSPEED ~ KNOTS

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9185	126.3(FWD)	5000	324

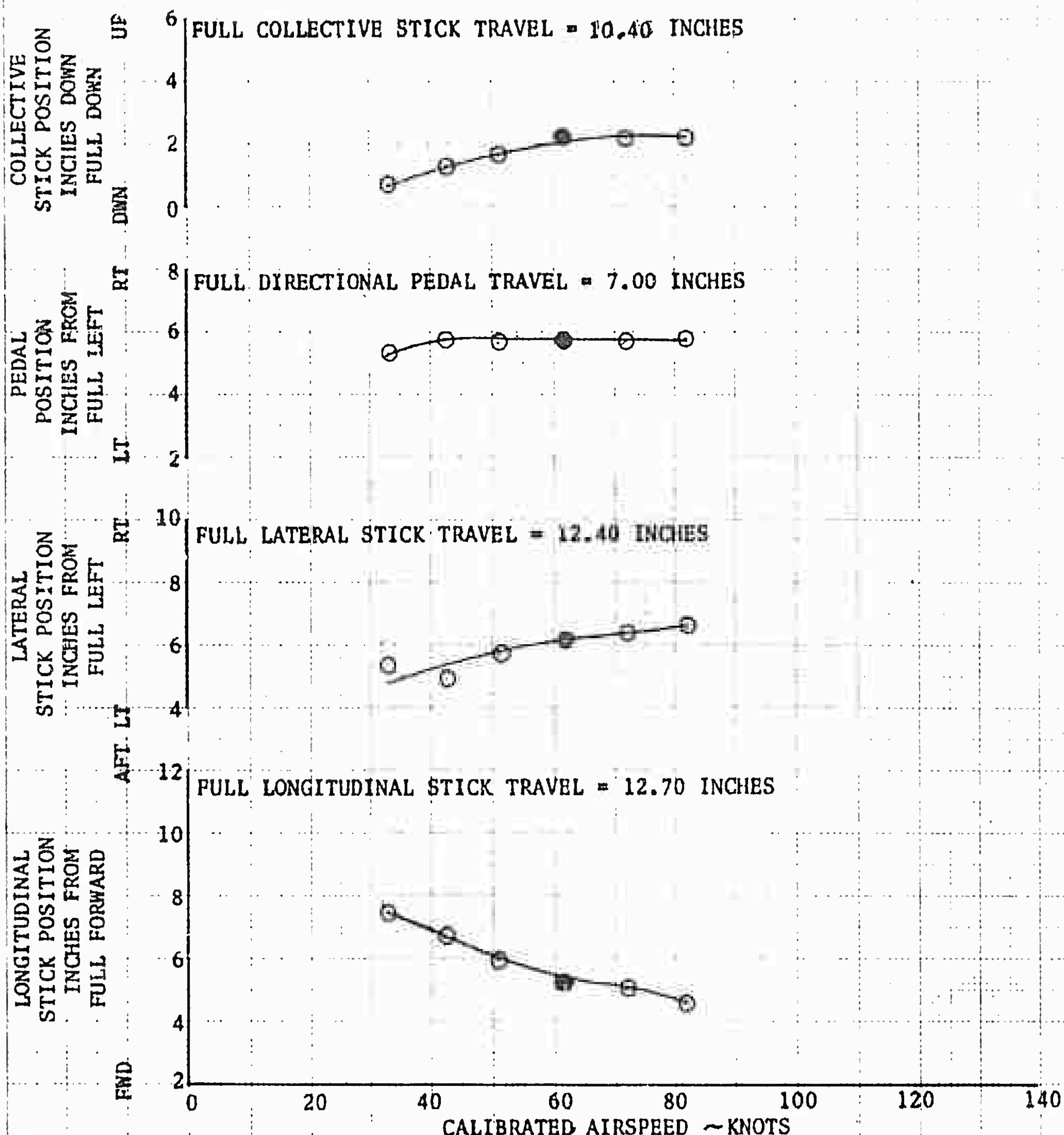
SHADED SYMBOLS DENOTE TRIM POINTS



STATIC LONGITUDINAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
9165	131.8(AFT)	5000	324

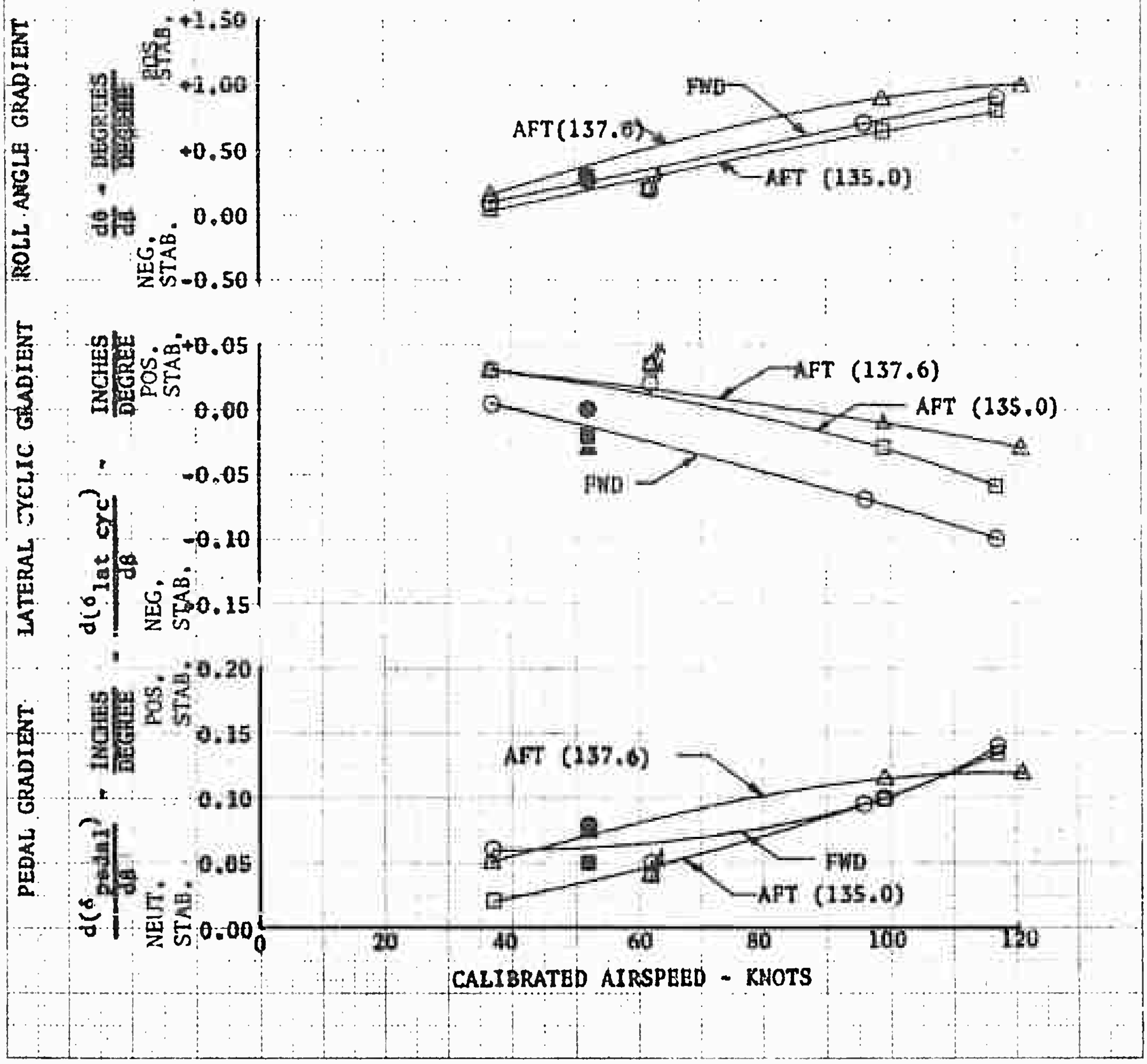
SHADED SYMBOLS DENOTE TRIM POINTS



STATIC LATERAL-DIRECTIONAL STABILITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	AVG GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	6785	126.0(FWD)	5000	324
□	6715	135.0(AFT)	5000	324
△	6625	137.6(AFT)	5000	324

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 89 THROUGH 91, 98 AND 101
2. SHADED SYMBOLS DENOTE CLIMB
3. FLAGGED SYMBOLS DENOTE AUTOROTATION



UH-1B/540 USA S/N 63-8684

SYM	AVG GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	8125	125.8(FWD)	5000	324
□	8300	133.8(AFT)	5000	324

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 92 THROUGH 94, 99, AND 102
2. SHADED SYMBOLS DENOTE CLIMB
3. FLAGGED SYMBOLS DENOTE AUTOROTATION

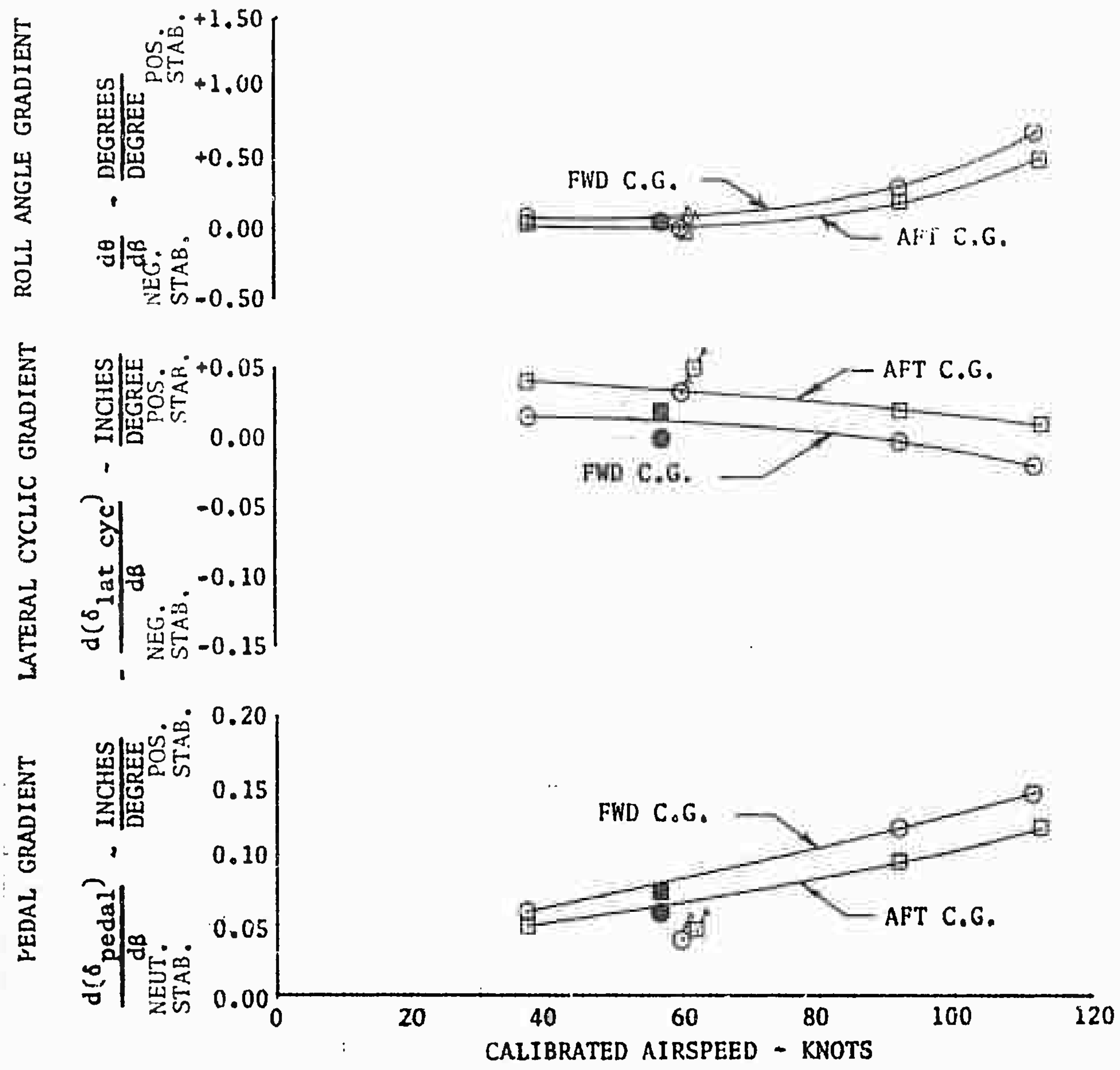


FIGURE NO. 88
STATIC LATERAL-DIRECTIONAL STABILITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	AVG GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	9245	126.3(FWD)	5000	324
□	9175	131.8(AFT)	5000	324

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 95 THROUGH 97, 100 AND 103
2. SHADED SYMBOLS DENOTE CLIMB
3. FLAGGED SYMBOLS DENOTE AUTOROTATION

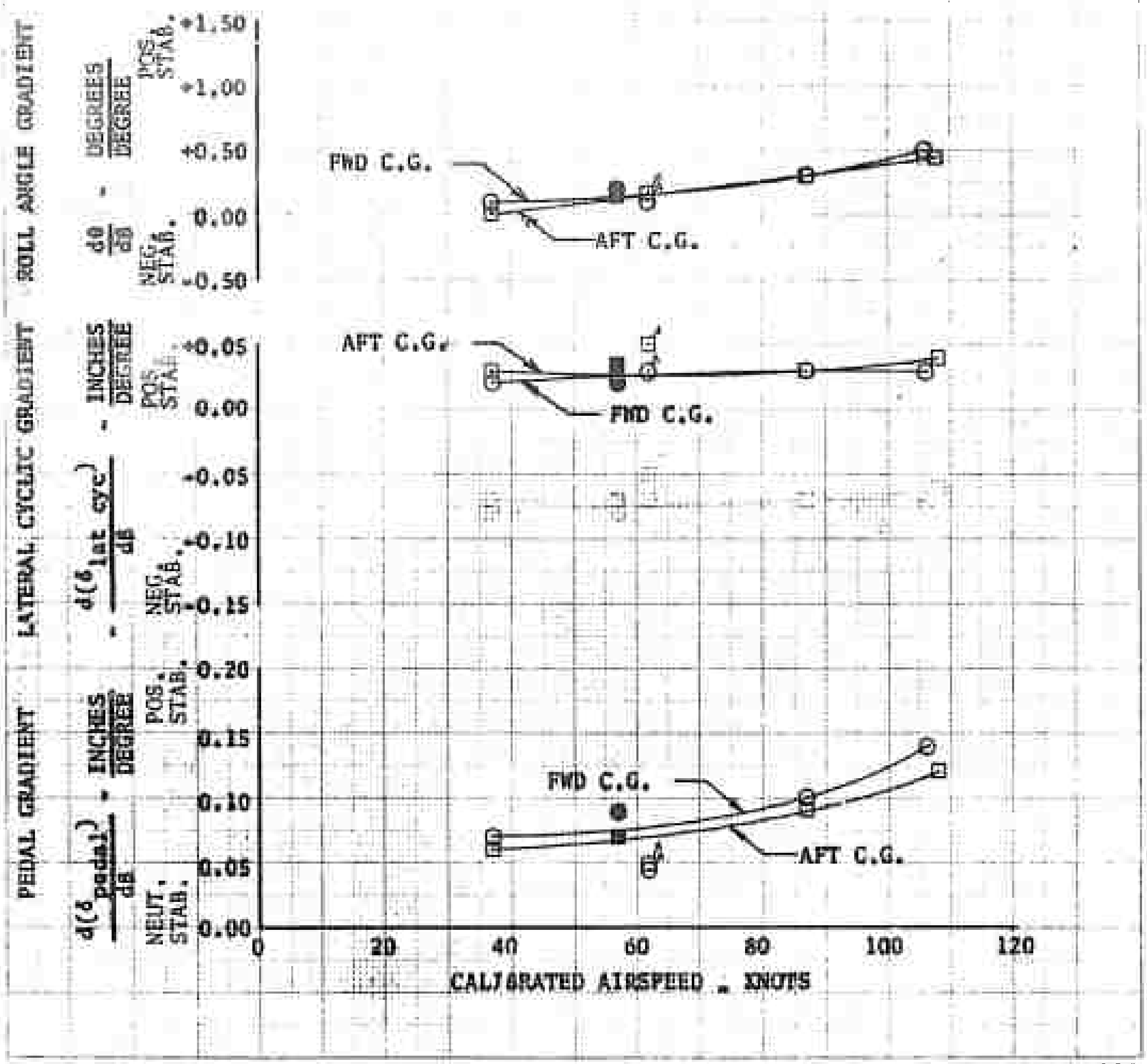


FIGURE NO. 89
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	6785	126.0(FWD)	5000	324	35
□	6715	135.0(AFT)	5000	324	35
△	6625	137.6(AFT)	5000	324	35

SHADED SYMBOLS DENOTE TRIM POINT

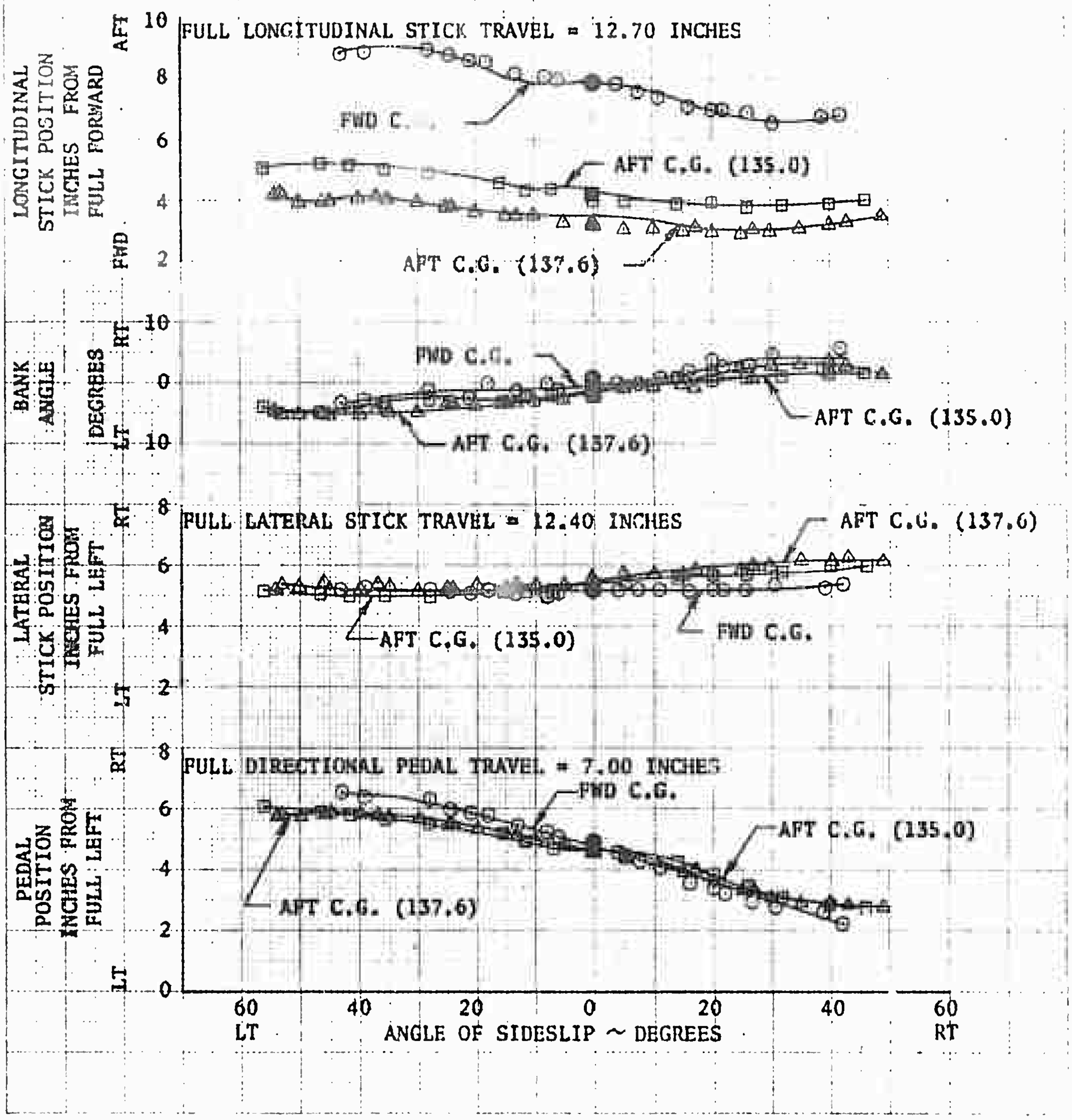


FIGURE NO. 90
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	6785	126.0(FWD)	5000	324	96
□	6715	135.0(AFT)	5000	324	99
△	6625	137.6(AFT)	5000	324	99

SHADED SYMBOLS DENOTE TRIM POINT

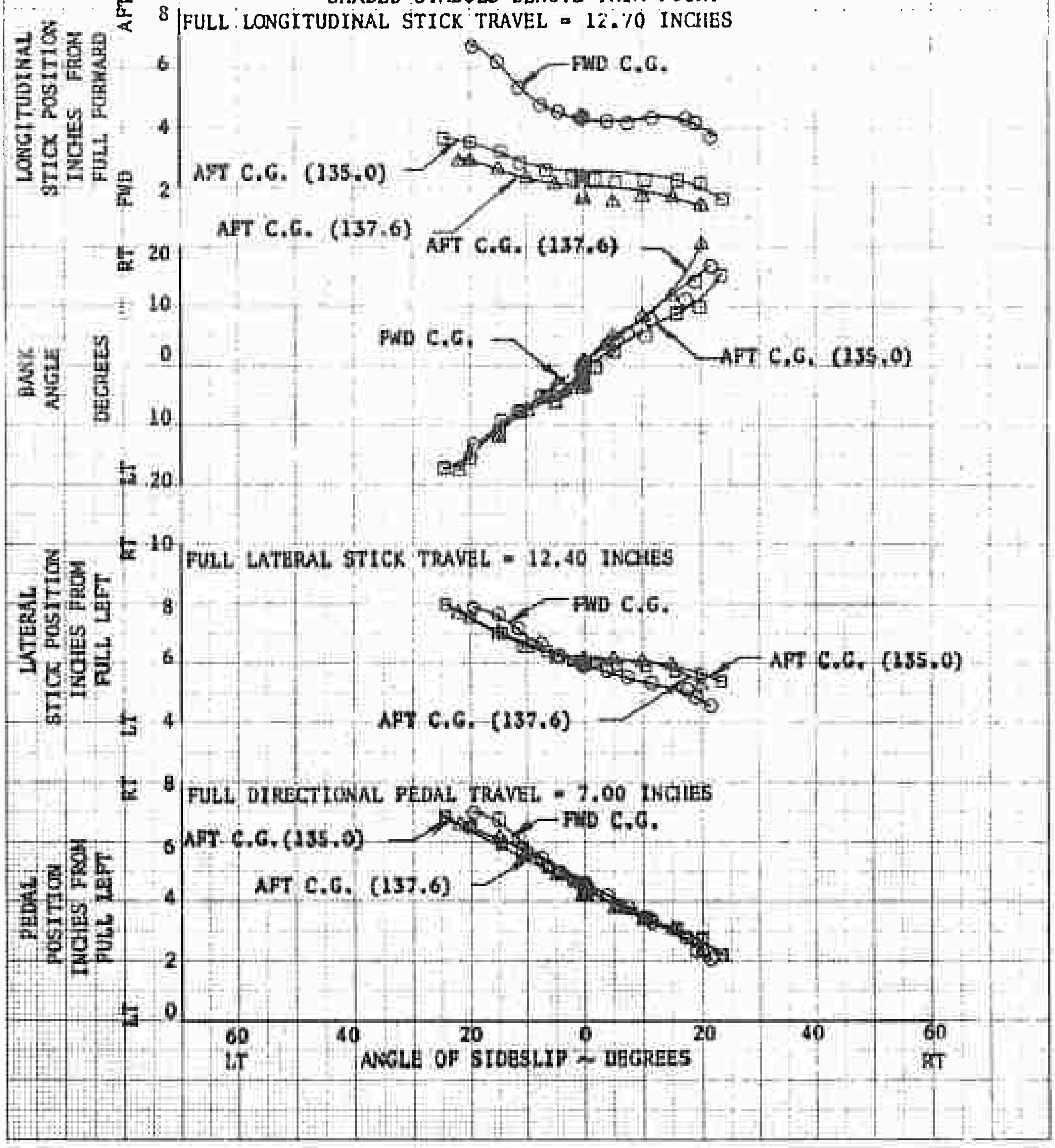


FIGURE NO. 91
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	6785	126.0(FWD)	5000	324	117
□	6715	135.0(AFT)	5000	324	117
△	6625	137.6(AFT)	5000	324	121

SHADED SYMBOL DENOTE TRIM POINTS

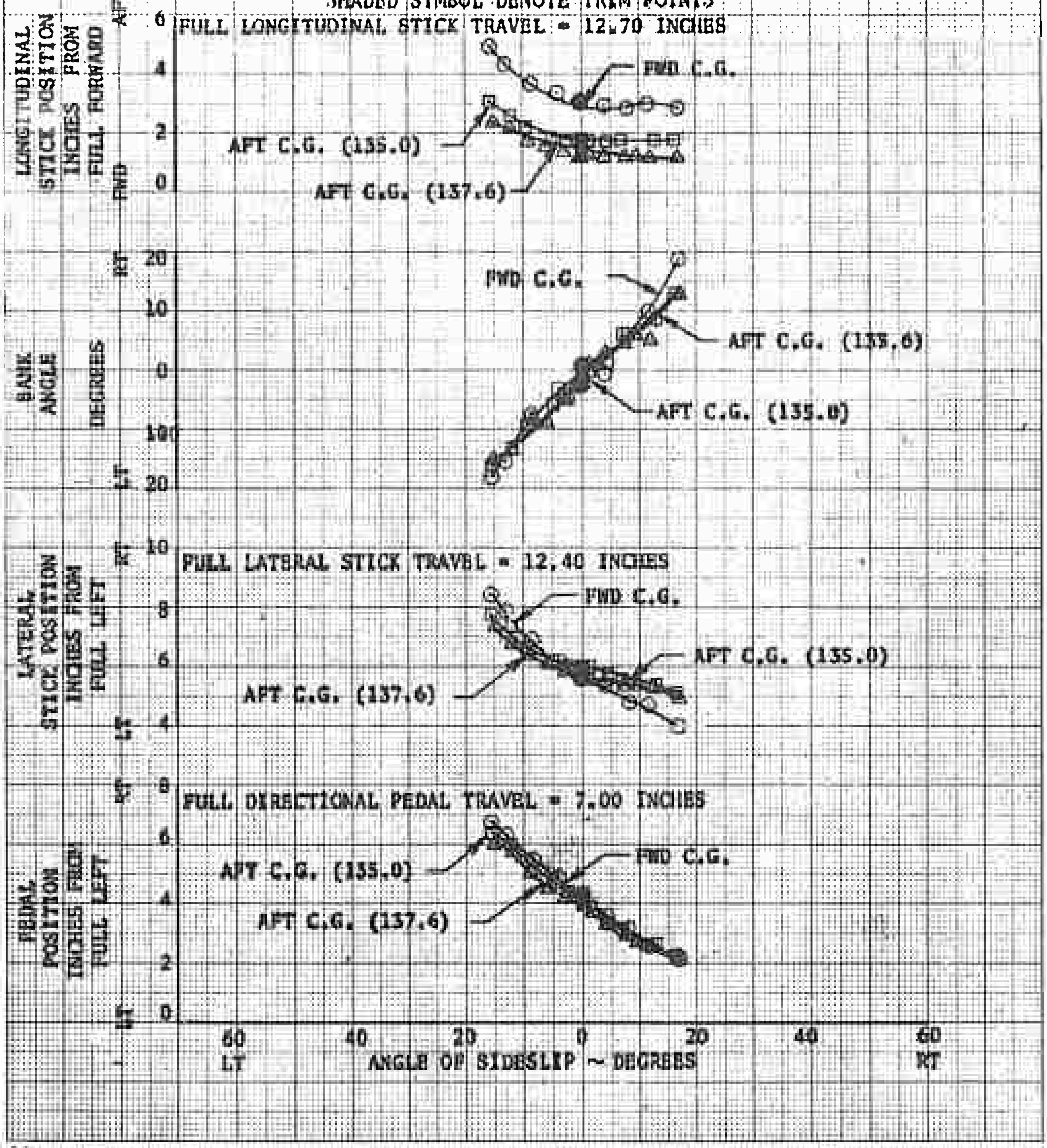


FIGURE NO. 92
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	37
□	8300	133.8(AFT)	5000	324	37

SHADED SYMBOLS DENOTE TRIM POINTS

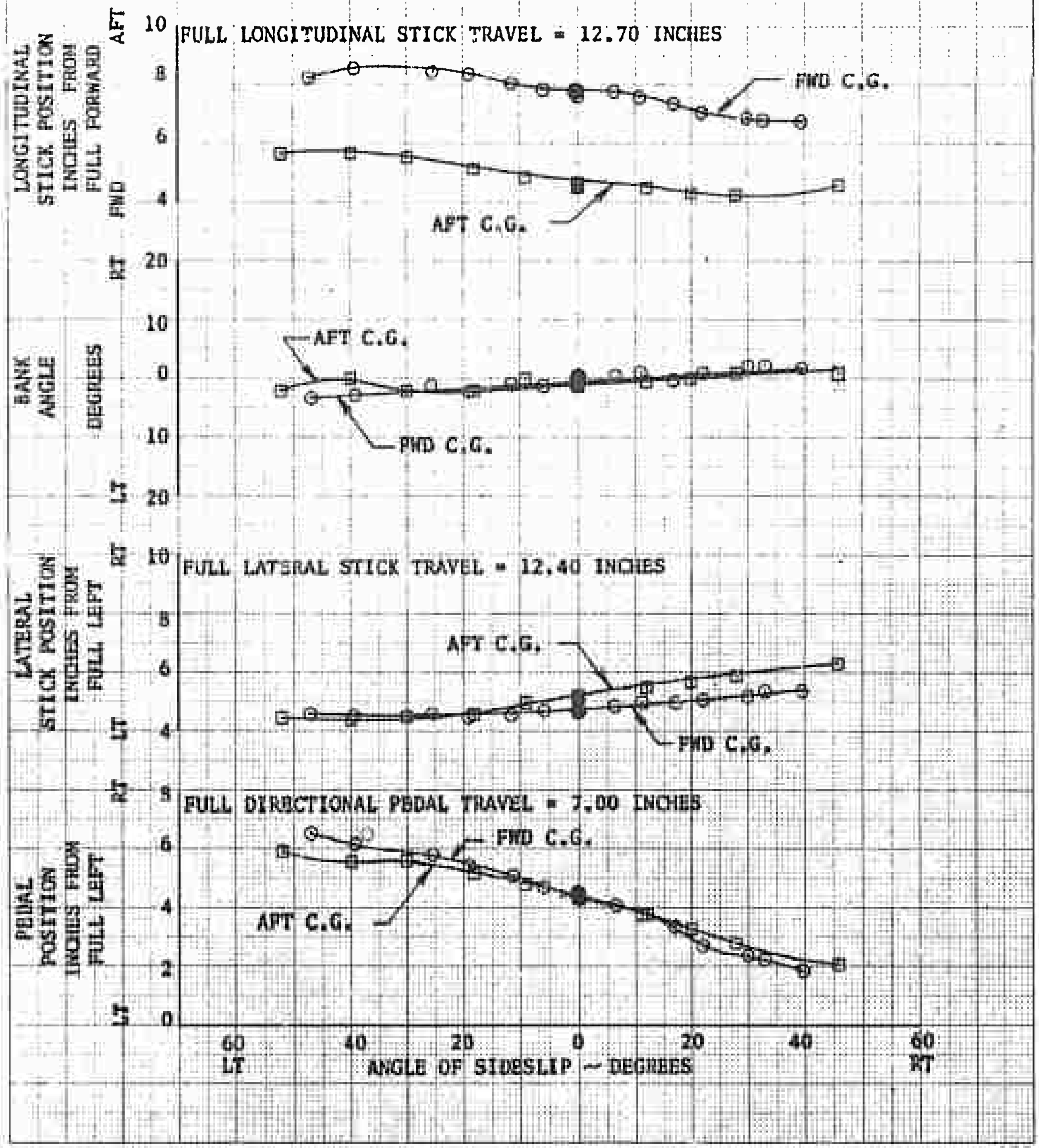


FIGURE NO. 93
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	92
□	8300	133.8(AFT)	5000	324	92

SHADED SYMBOLS DENOTE TRIM POINTS

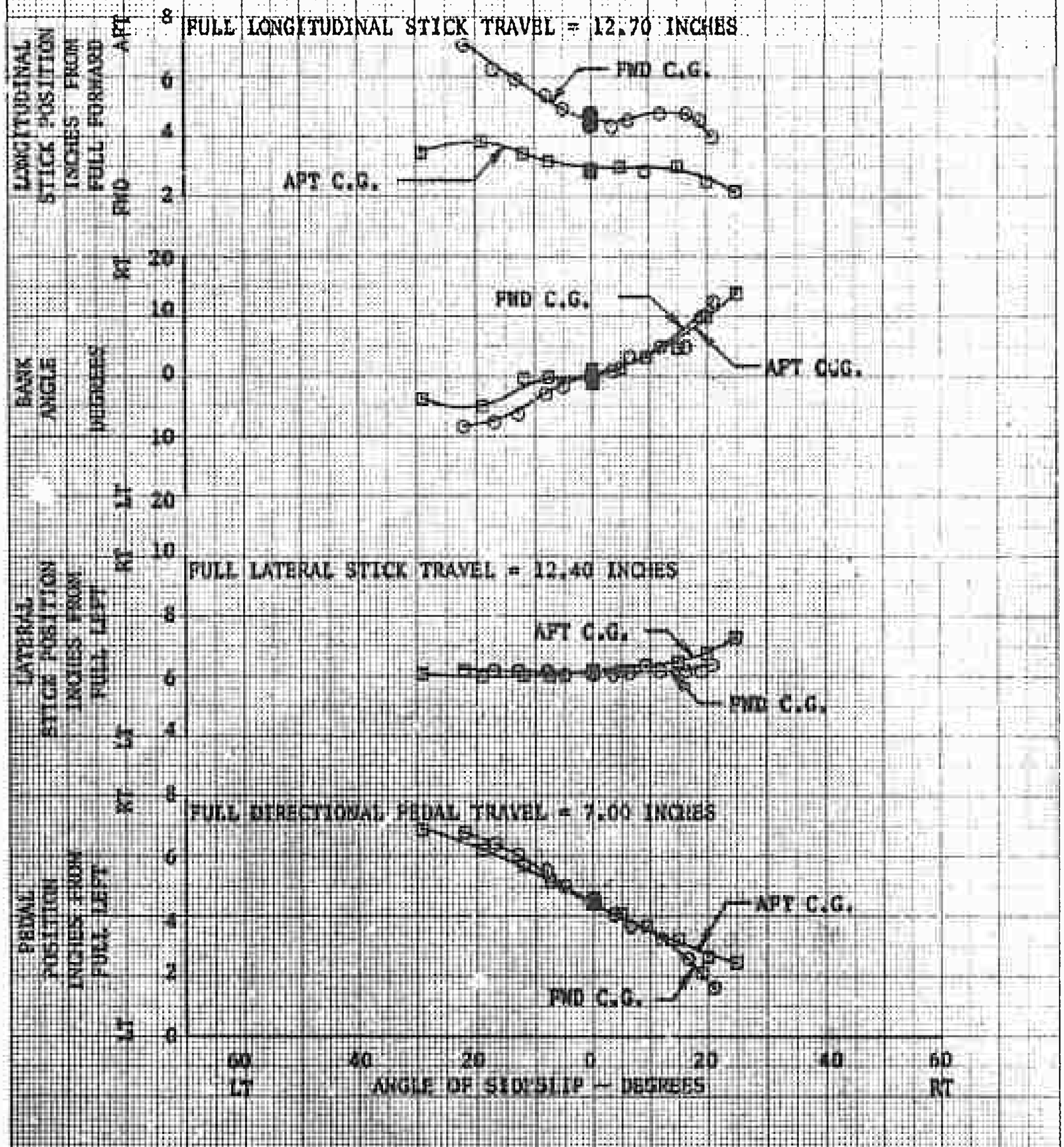


FIGURE NO. 98
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	113
□	8300	133.8(AFT)	5000	324	113

SHADED SYMBOLS DENOTE TRIM POINTS

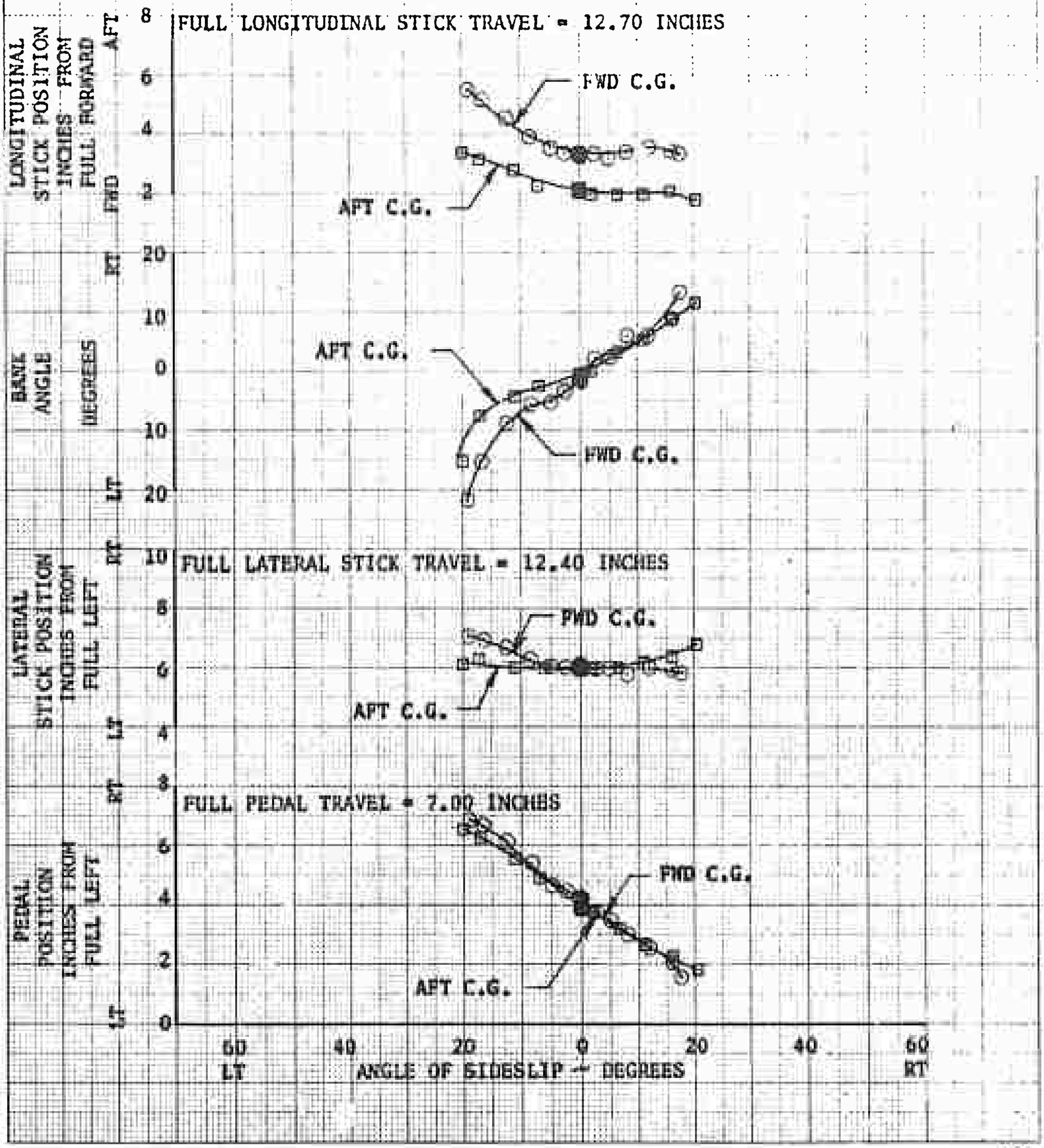


FIGURE NO. 95
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	9245	126.3(FWD)	5000	324	37
□	9175	131.8(AFT)	5000	324	37

SHADED SYMBOLS DENOTE TRIM POINTS

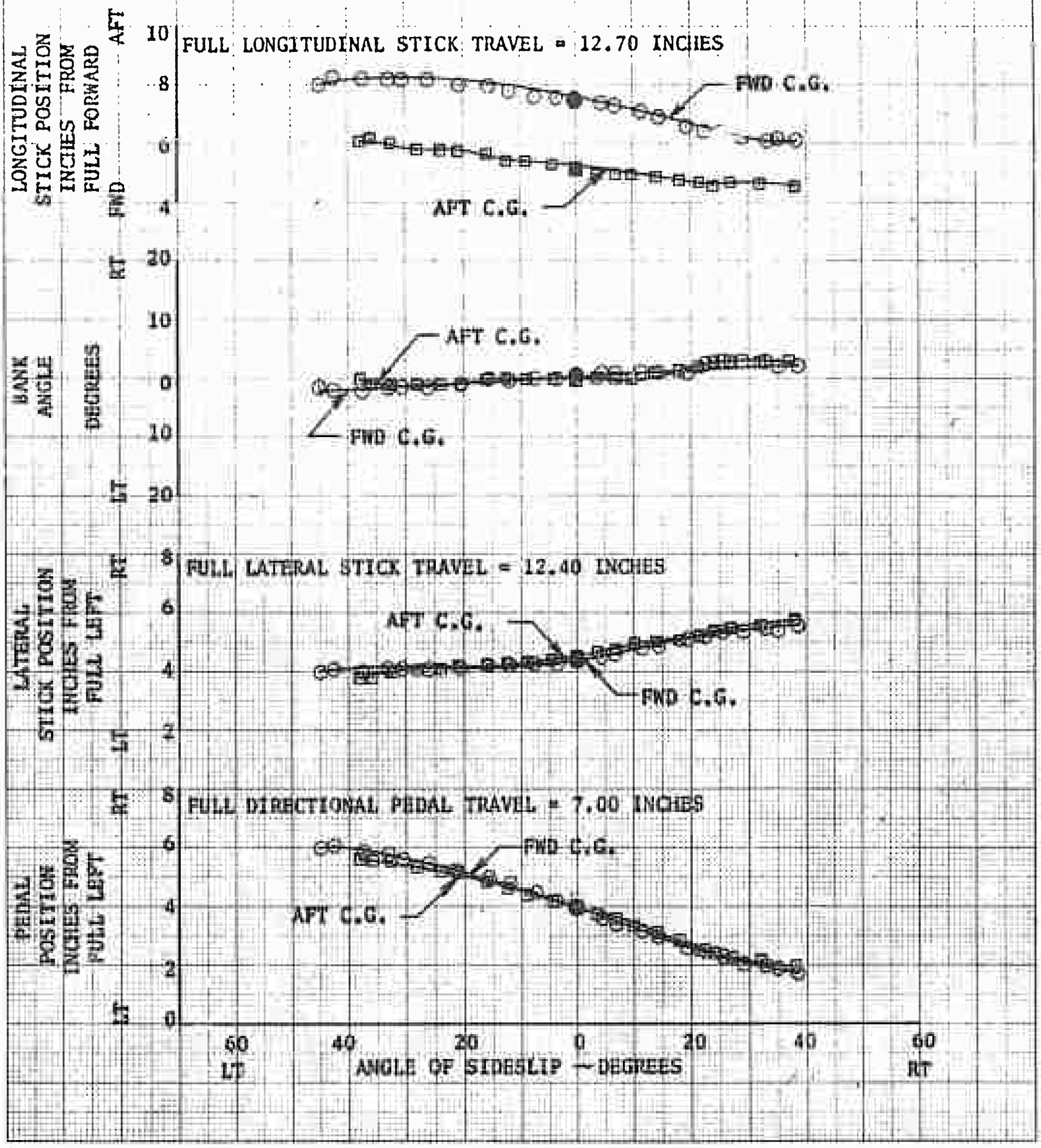


FIGURE NO. 96
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	9245	126.3(FWD)	5000	324	88
□	9175	131.8(AFT)	5000	324	88

SHADED SYMBOLS DENOTE TRIM POINTS

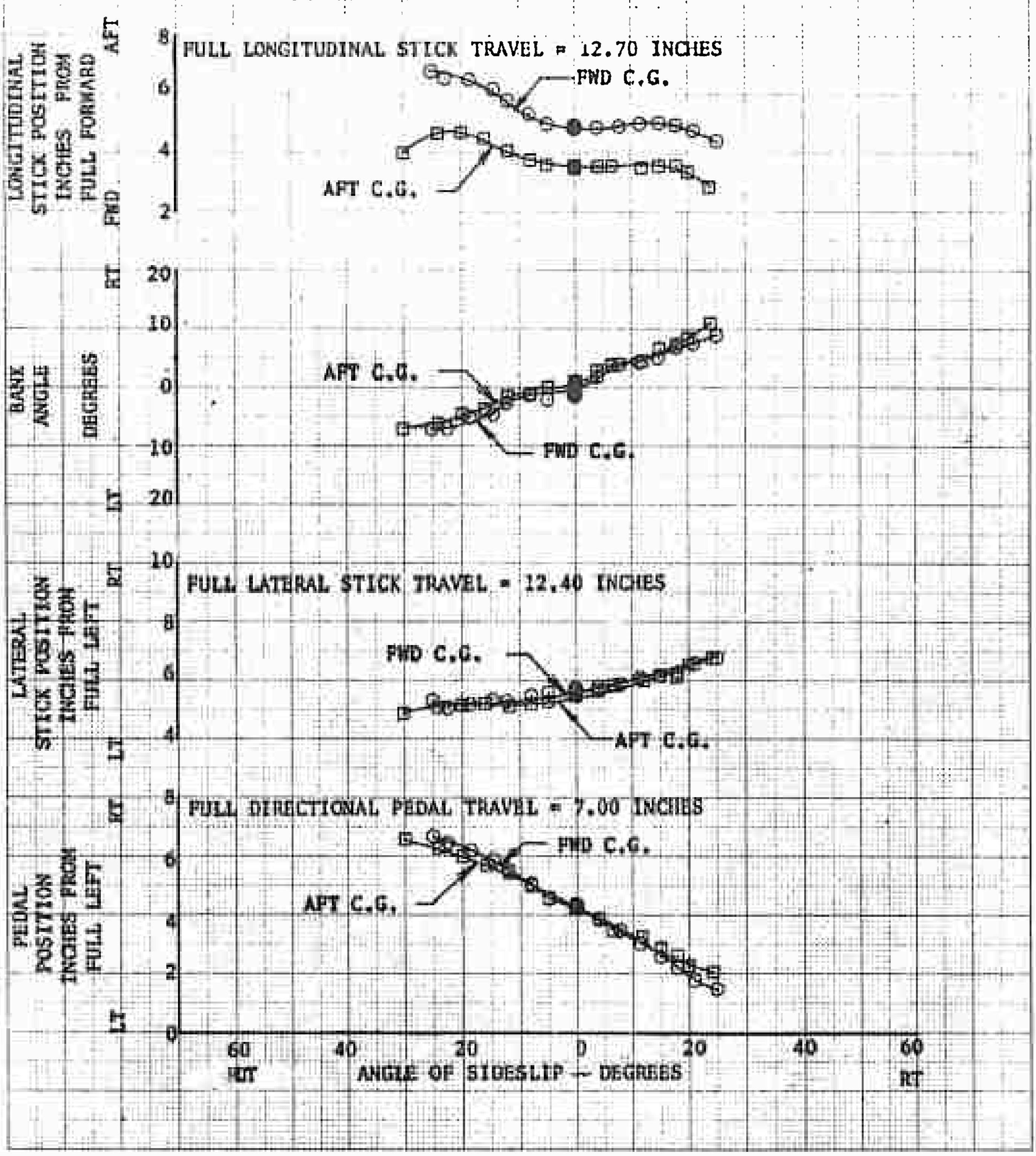


FIGURE NO. 97
STATIC LATERAL-DIRECTIONAL STABILITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	9245	126.3(FWD)	5000	324	107
□	9175	131.8(AFT)	5000	324	107

SHADED SYMBOLS DENOTE TRIM POINTS

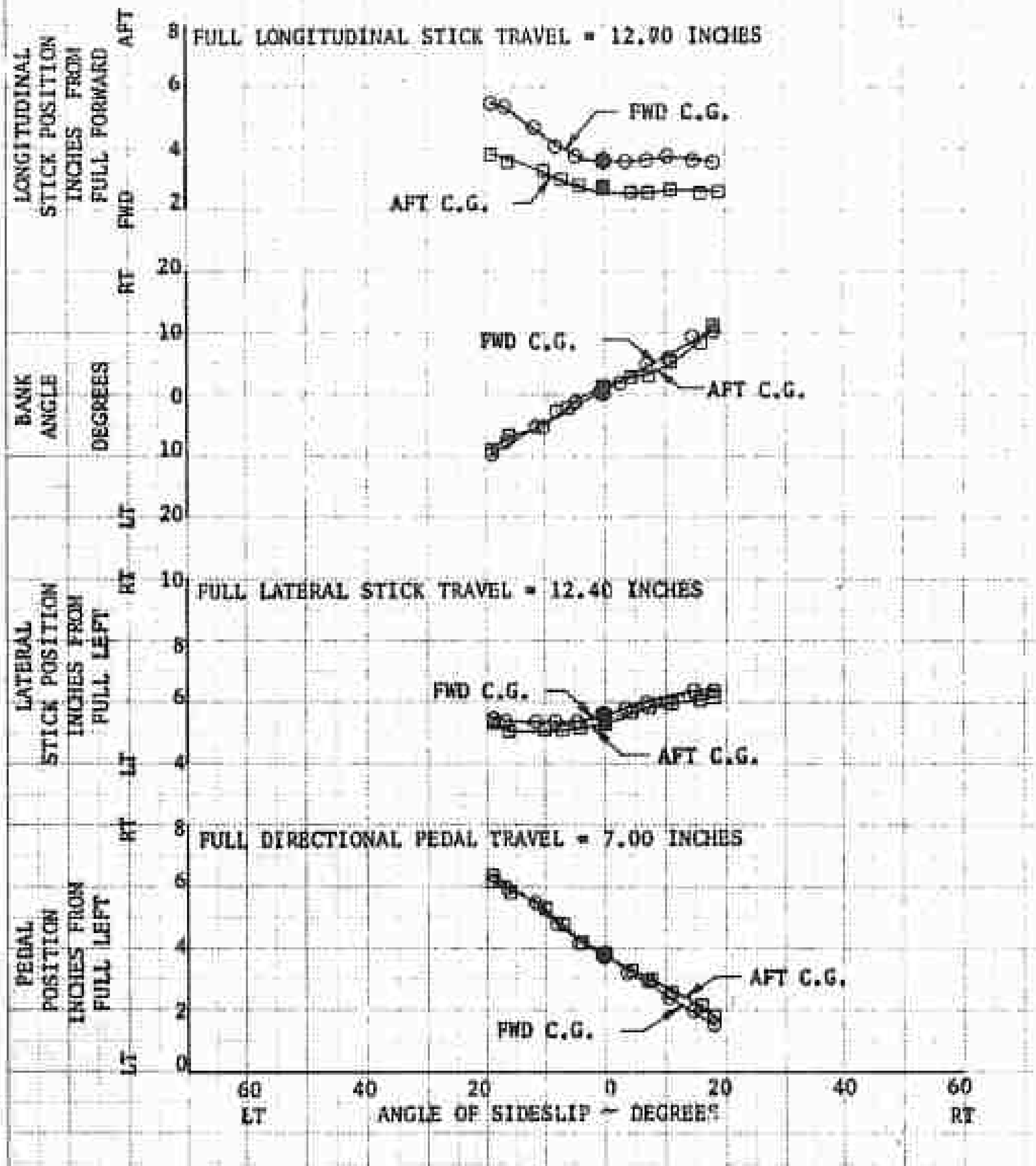


FIGURE NO. 98
STATIC LATERAL-DIRECTIONAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	6785	126.0(FWD)	5000	324	52
□	6715	135.0(AFT)	5000	324	52
△	6625	137.6(AFT)	5000	324	52

SHADED SYMBOLS DENOTE TRIM POINTS

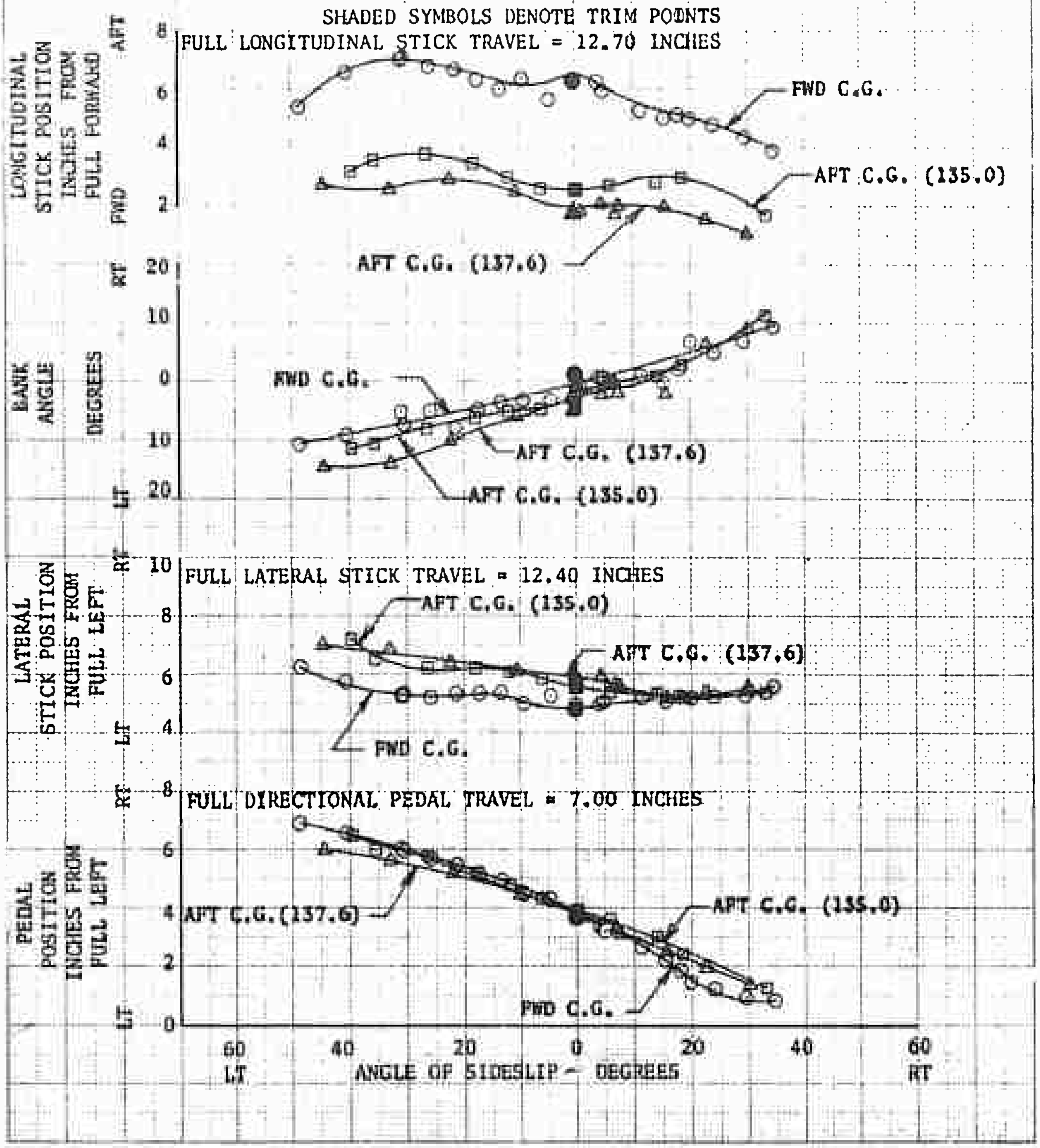


FIGURE NO. 99
STATIC LATERAL-DIRECTIONAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	57
□	8300	133.8(AFT)	5000	324	57

SHADED SYMBOLS DENOTE TRIM POINTS

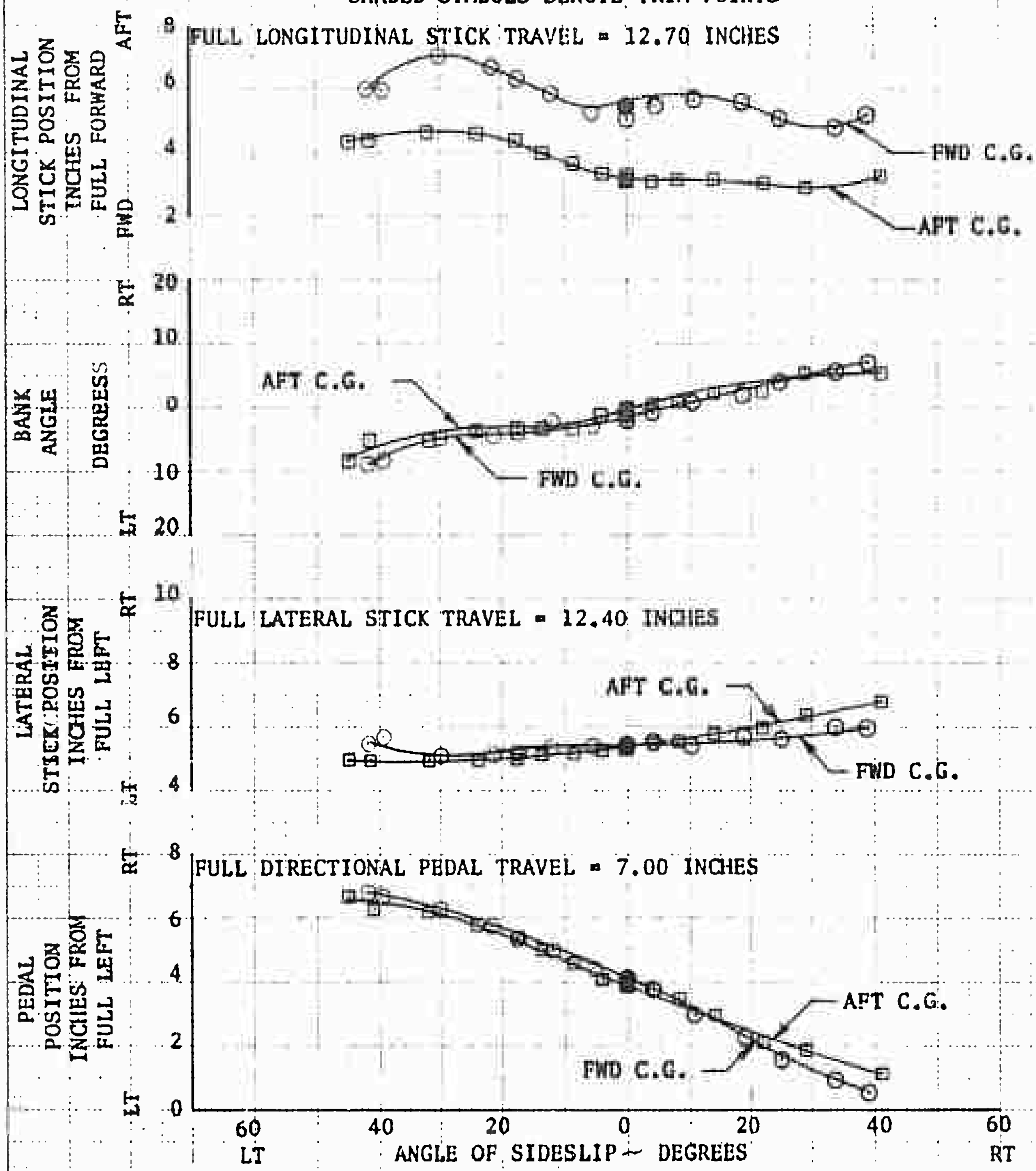


FIGURE NO. 100
STATIC LATERAL-DIRECTIONAL STABILITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	9245	126.3(FWD)	5000	324	57
□	9175	131.8(AFT)	5000	324	57

SHADED SYMBOLS DENOTE TRIM POINTS

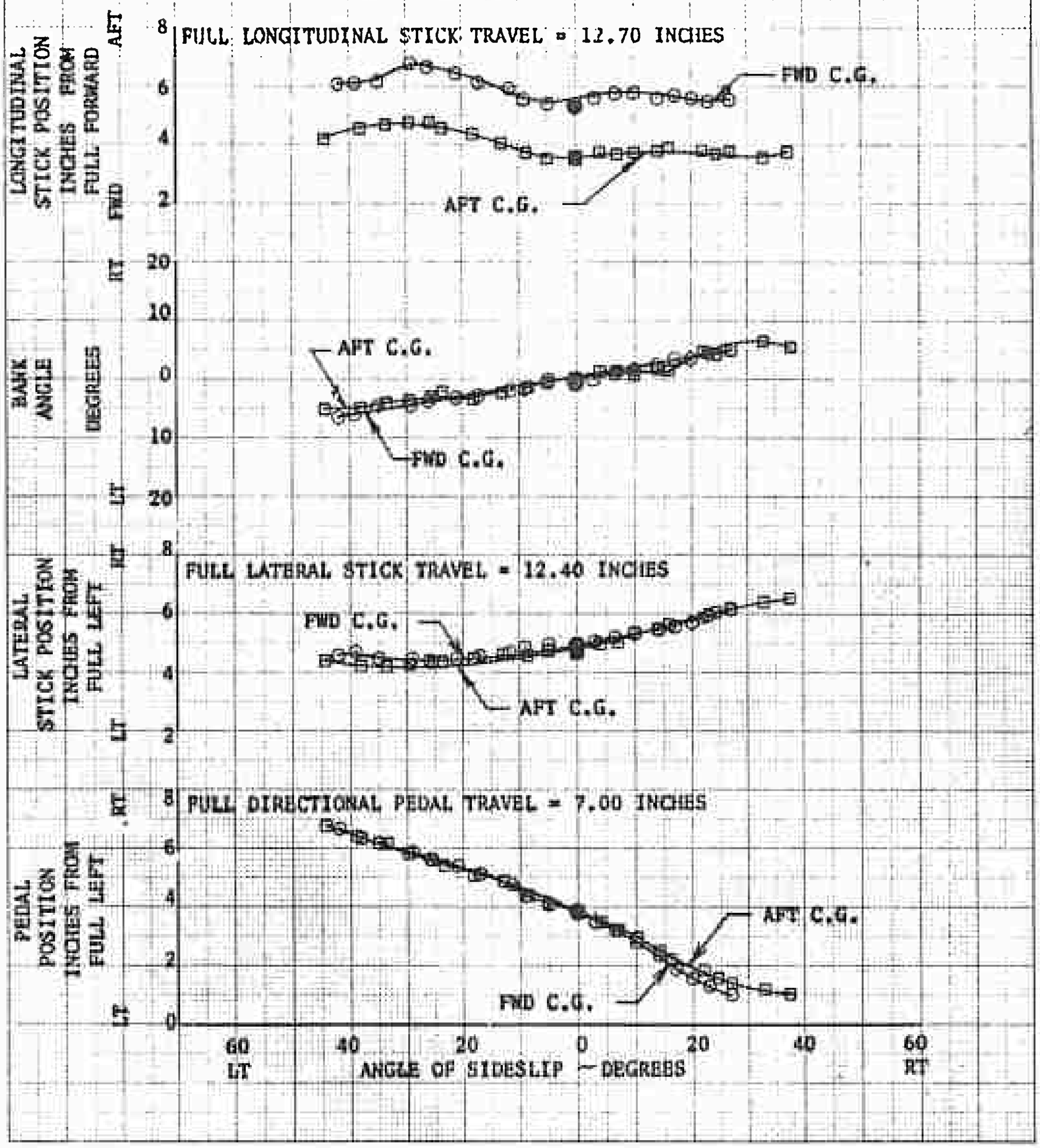


FIGURE NO. 101
STATIC LATERAL-DIRECTIONAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	6785	126.0(FWD)	5000	324	60
□	6715	135.0(AFT)	5000	324	60
△	6625	137.6(AFT)	5000	324	60

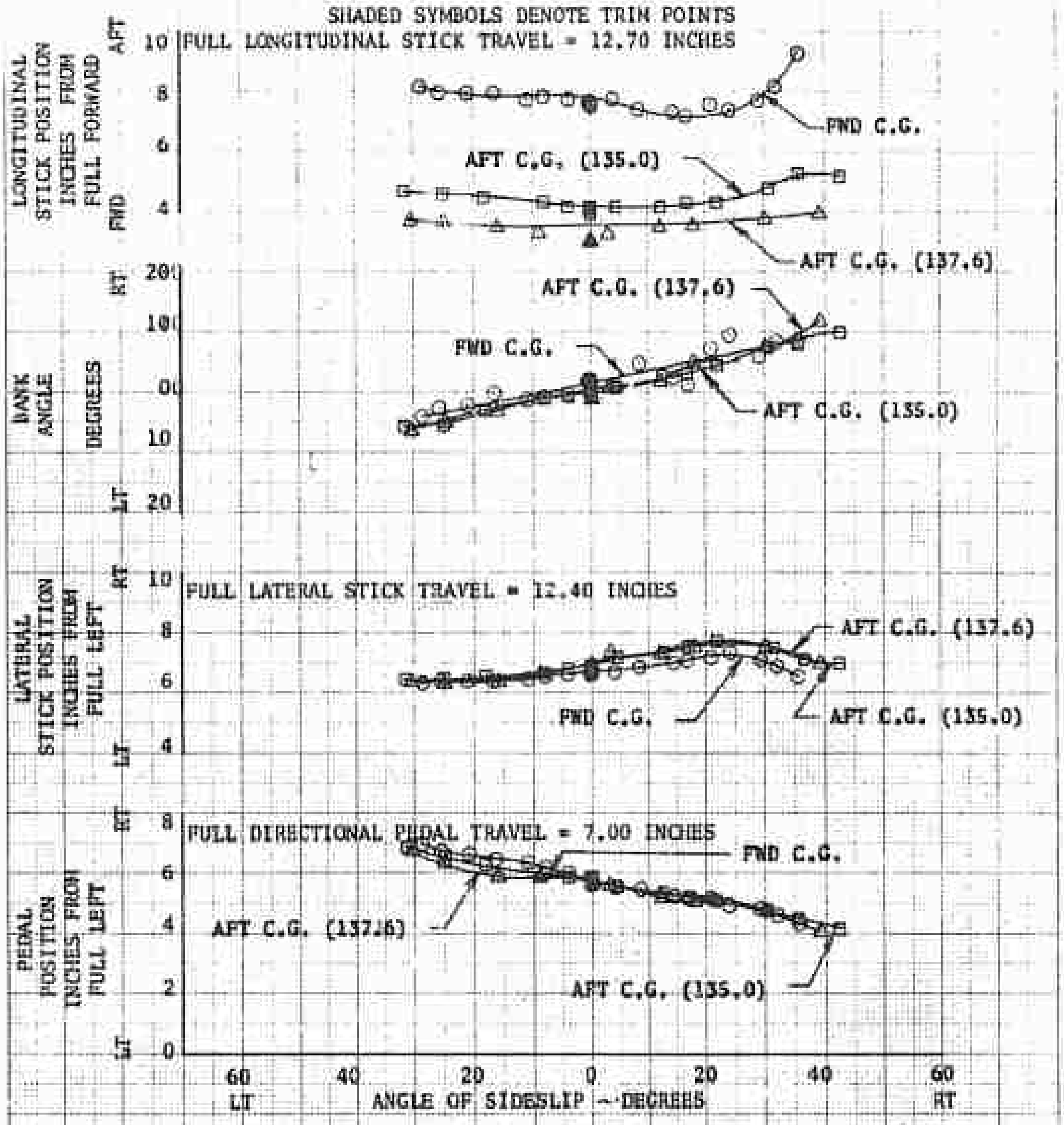


FIGURE NO. 102
STATIC LATERAL-DIRECTIONAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	60
□	8300	133.8(AFT)	5000	324	60

SHADED SYMBOLS DENOTE TRIM POINTS

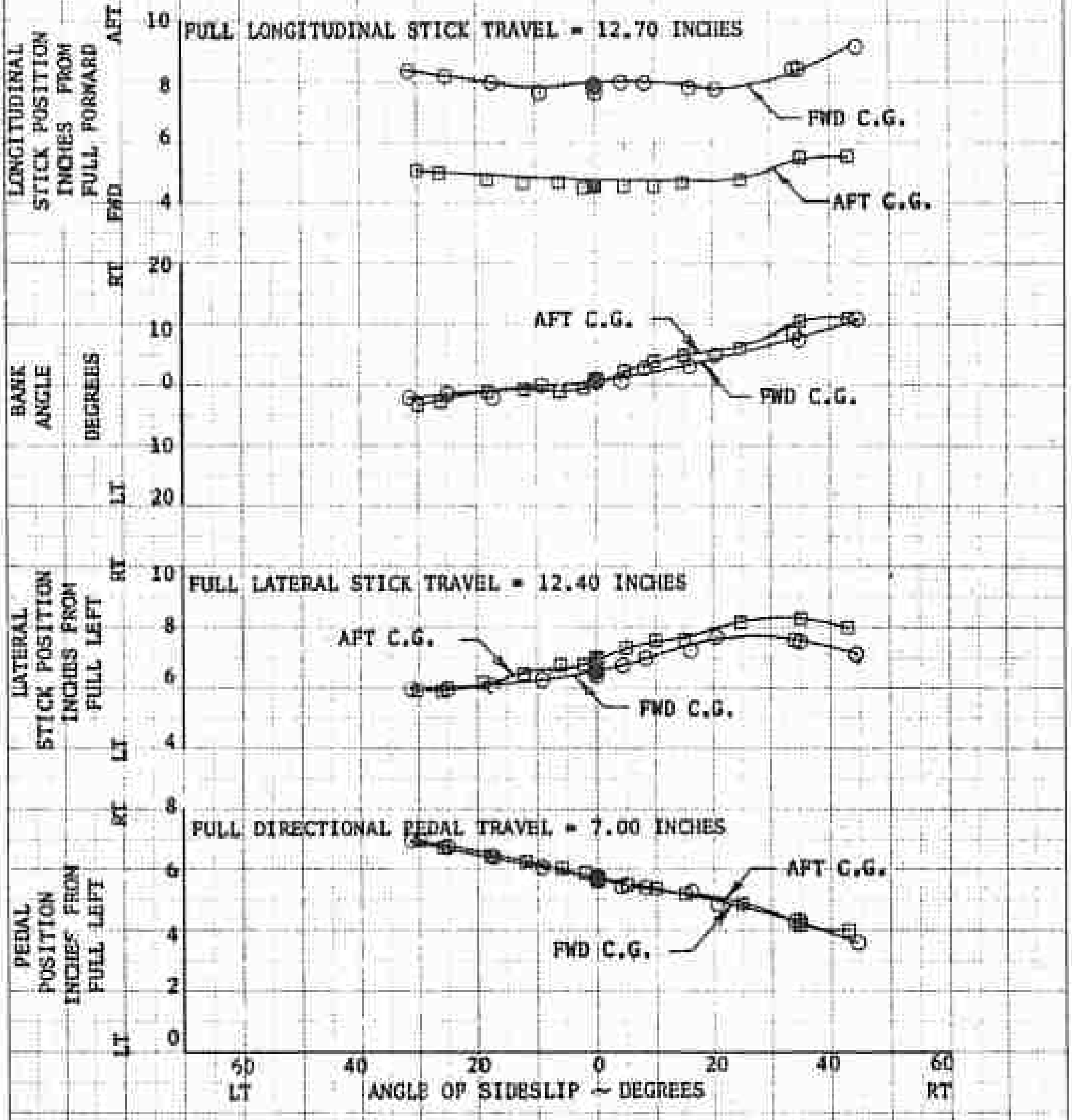


FIGURE NO. 103
STATIC LATERAL-DIRECTIONAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	8125	125.8(FWD)	5000	324	104
□	8300	133.8(AFT)	5000	324	104

SHADED SYMBOLS DENOTE TRIM POINTS

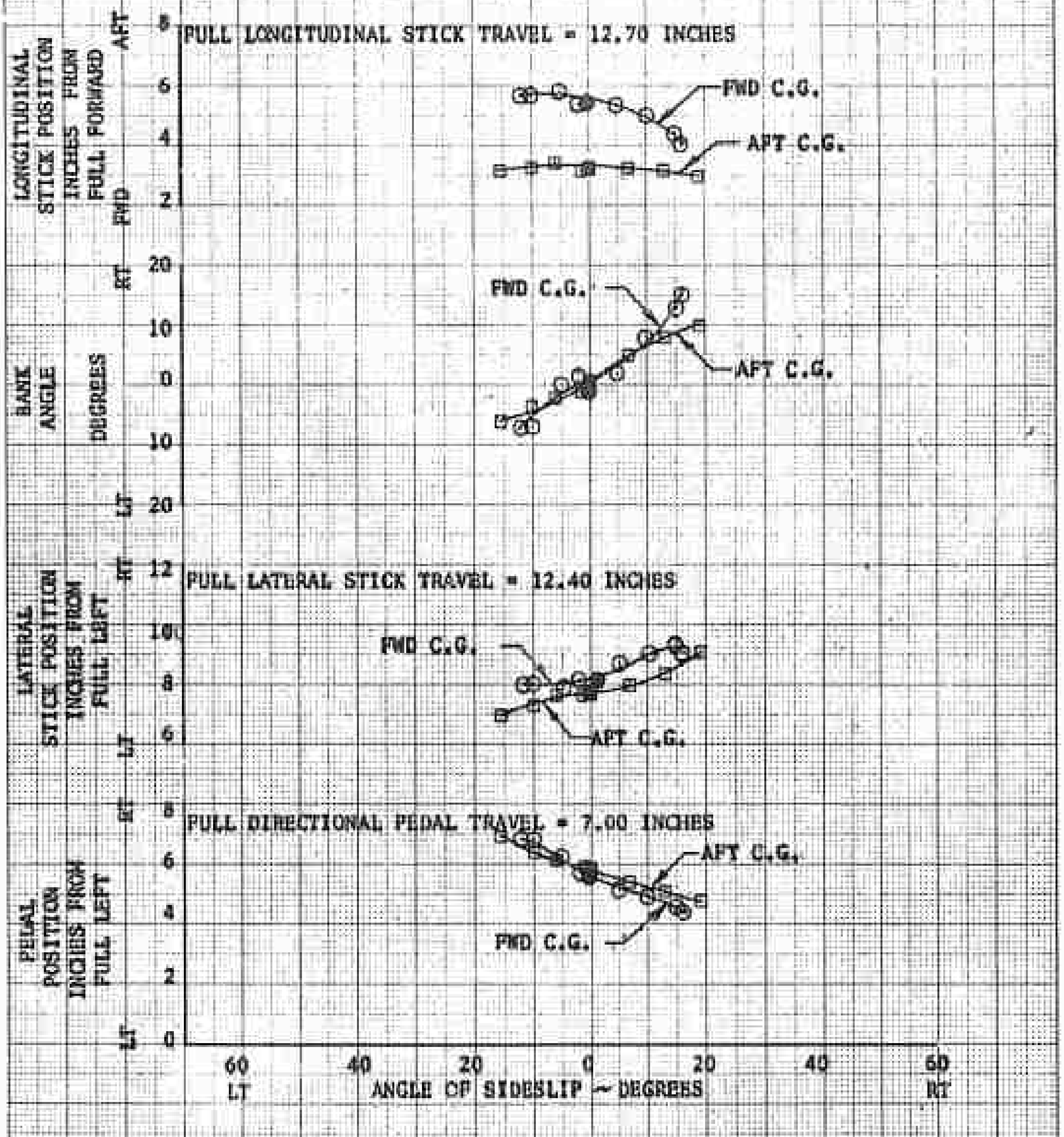


FIGURE NO. 104
STATIC LATERAL-DIRECTIONAL STABILITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
○	9245	126.3(FWD)	5000	324	60
□	9175	131.8(AFT)	5000	324	60

SHADED SYMBOLS DENOTE TRIM POINTS

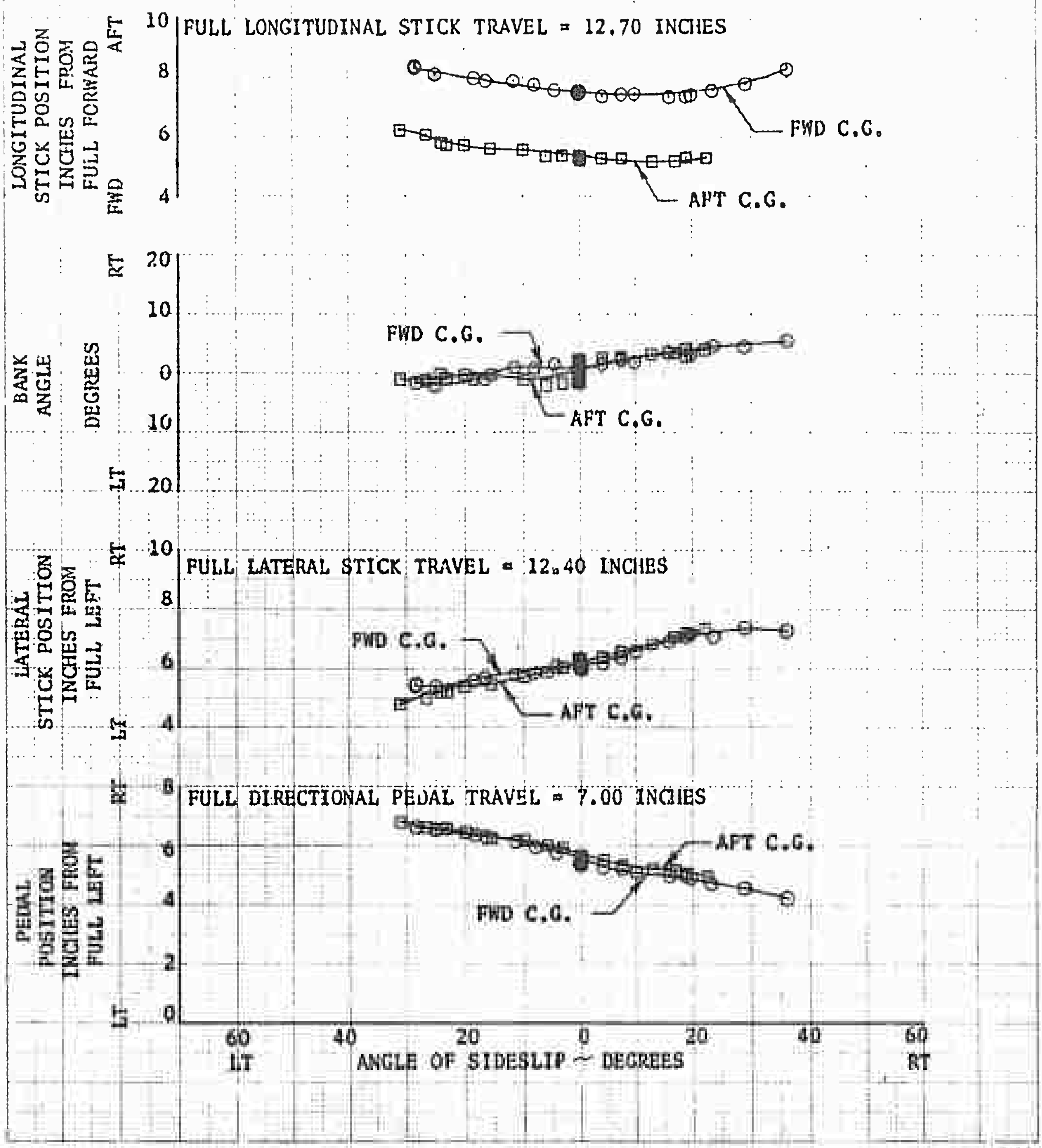


FIGURE NO. 105
CONTROL POSITIONS IN SIDEWARD FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
8140	125.8	2080	324

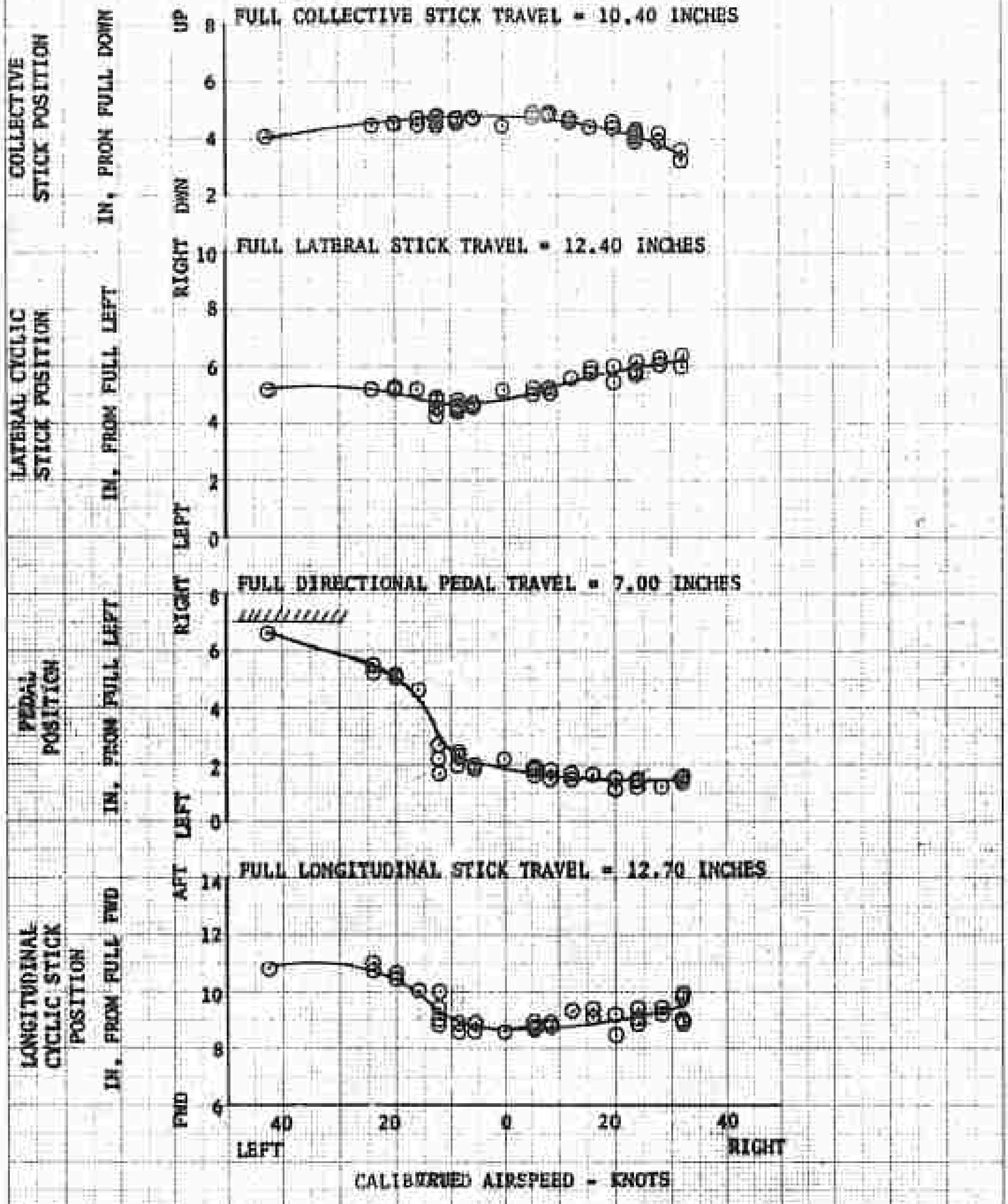


FIGURE NO. 106
CONTROL POSITIONS IN REARWARD FLIGHT
UH-1B/540 USA S/N 63-8684

GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
8140	125.8	2080	324

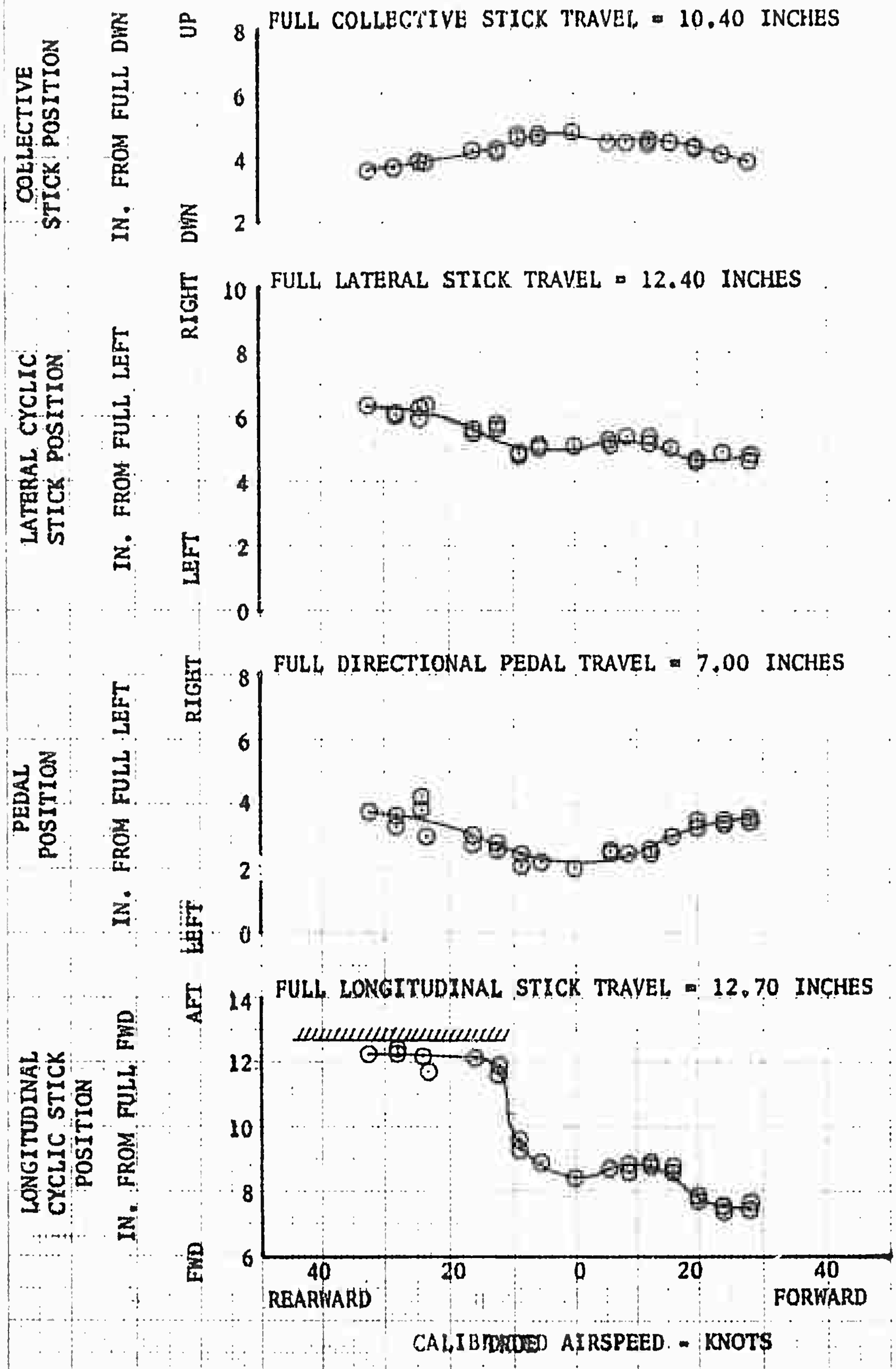


FIGURE NO. 107
REACTION TO AN AFT LONGITUDIN
LEVEL FLIGHT
UH-1B/540 USA S/N 63-86

C.G. STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET
126.1(FWD)	6500	5000

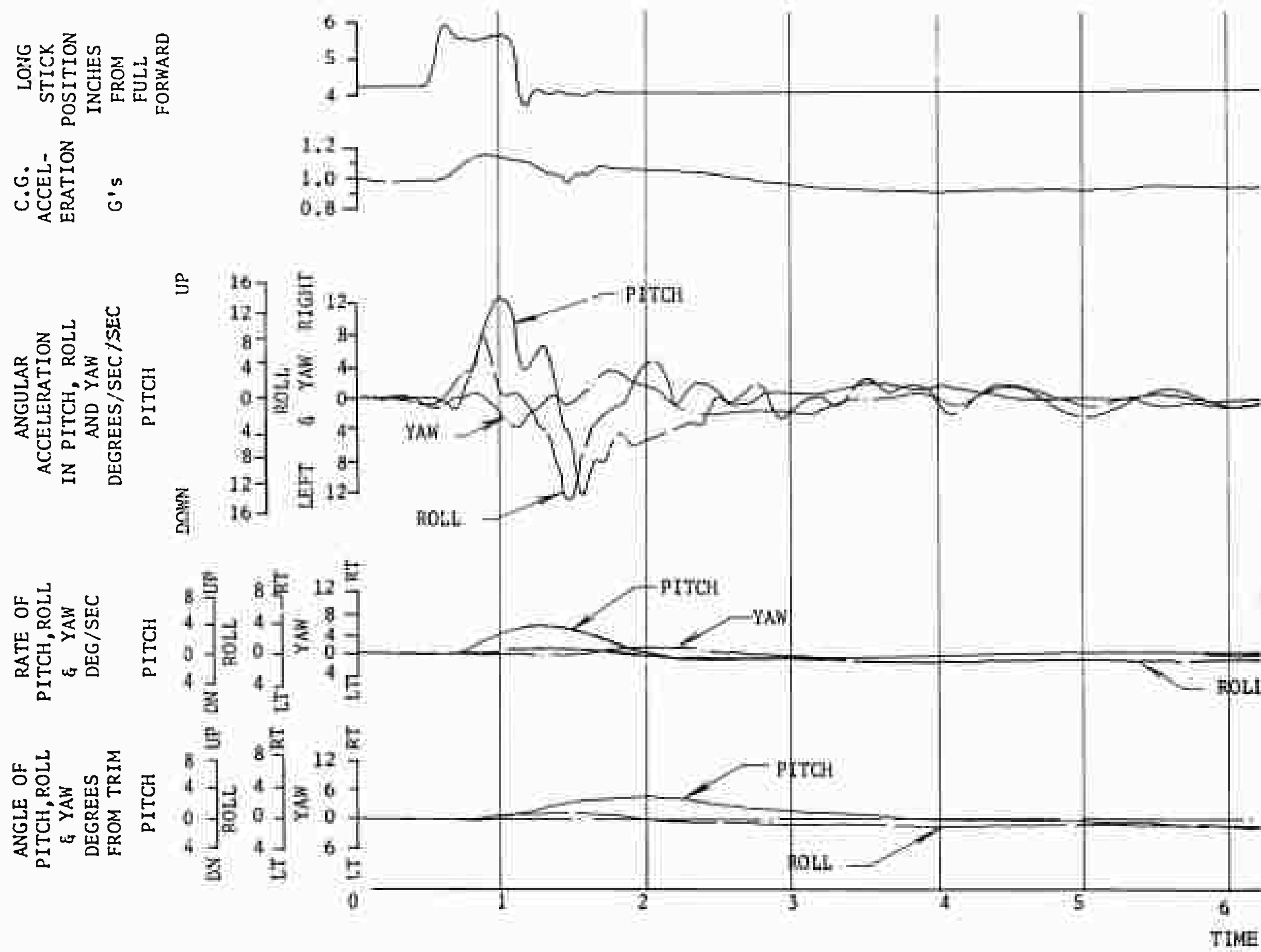


FIGURE NO. 107
ACTION TO AN AFT LONGITUDINAL PULSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
5000	324	93

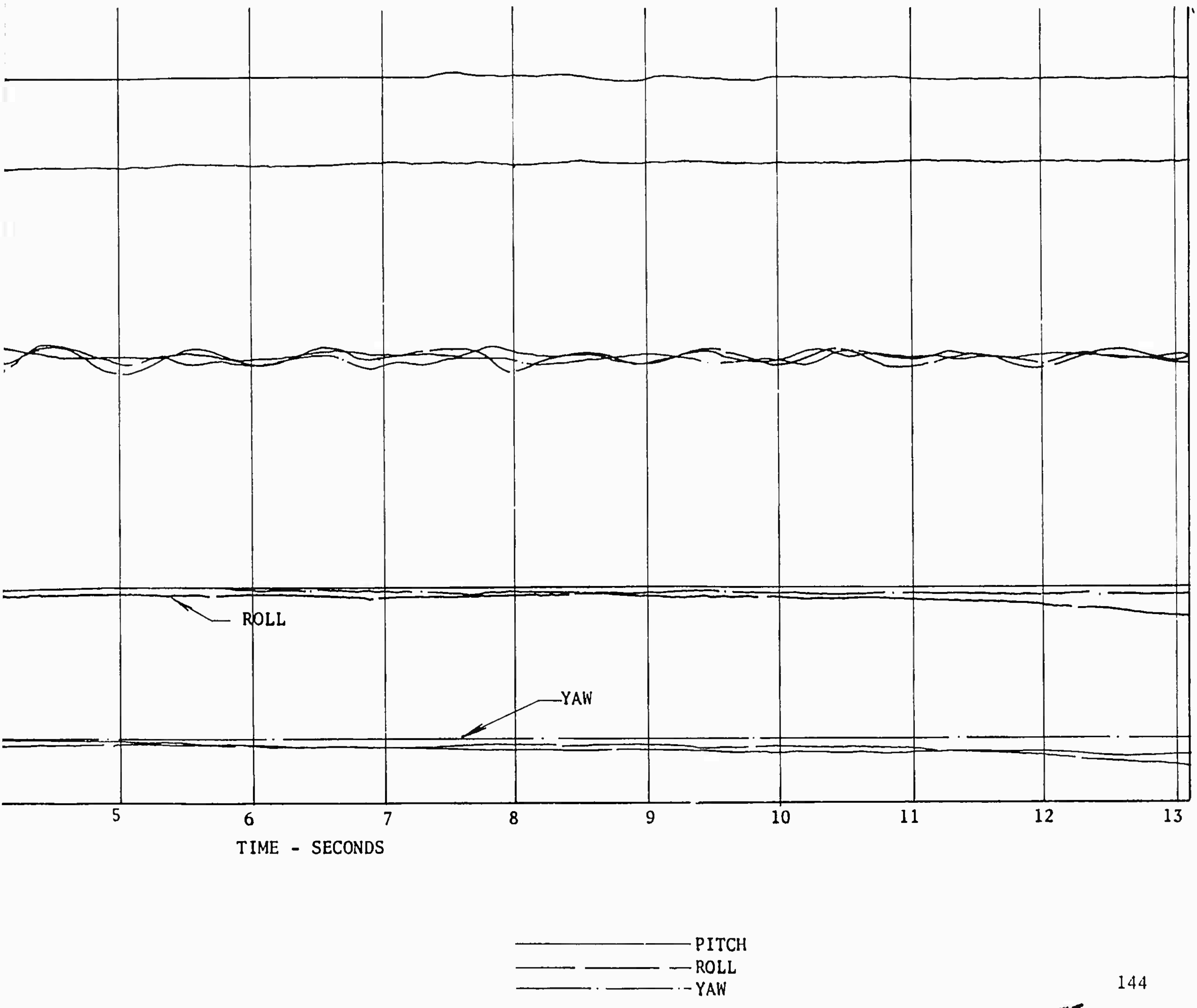


FIGURE NO
REACTION TO AN AFT L
LEVEL FL
UH-1B/540 USA

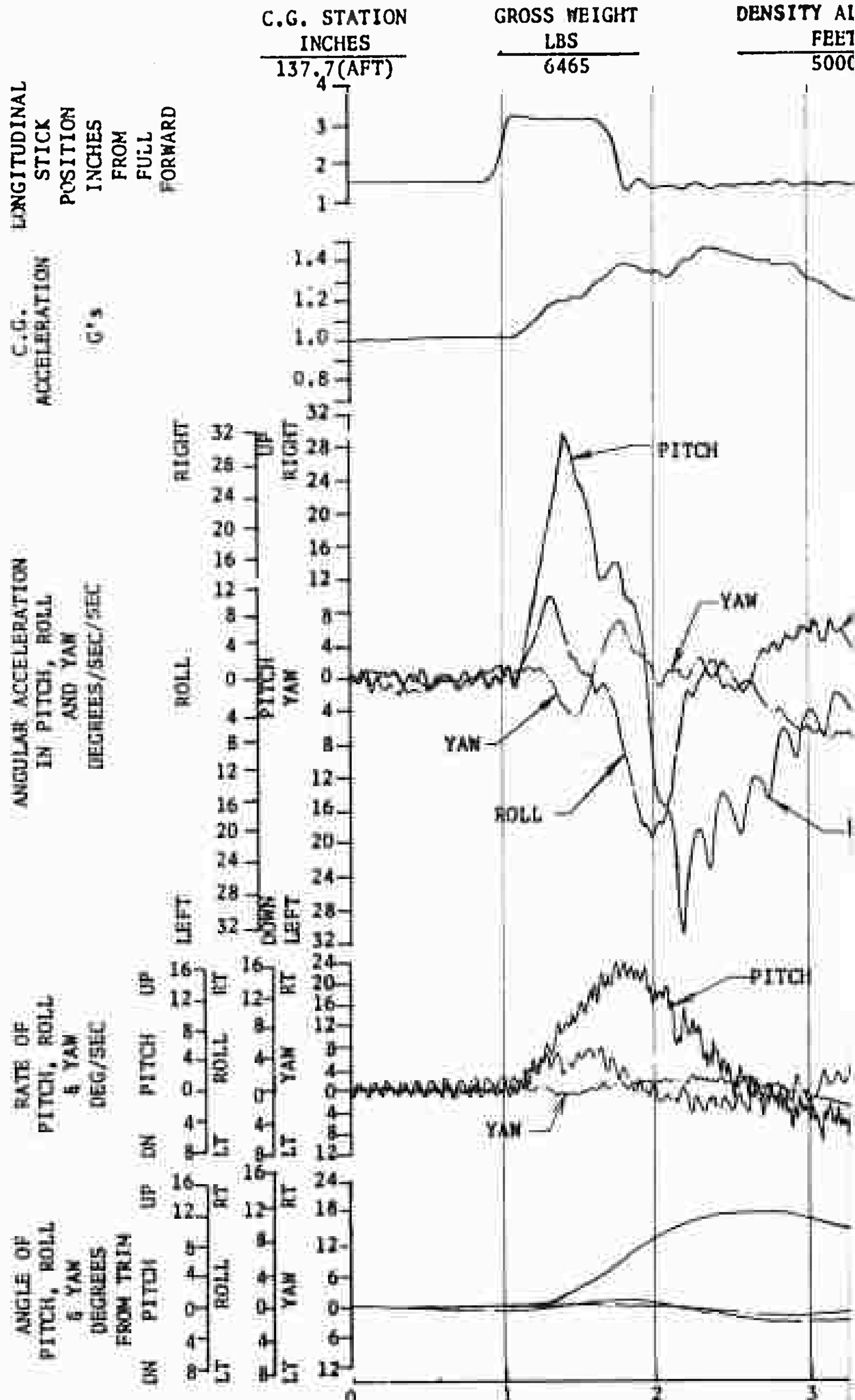


FIGURE NO. 108
REACTION TO AN AFT LONGITUDINAL PULSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

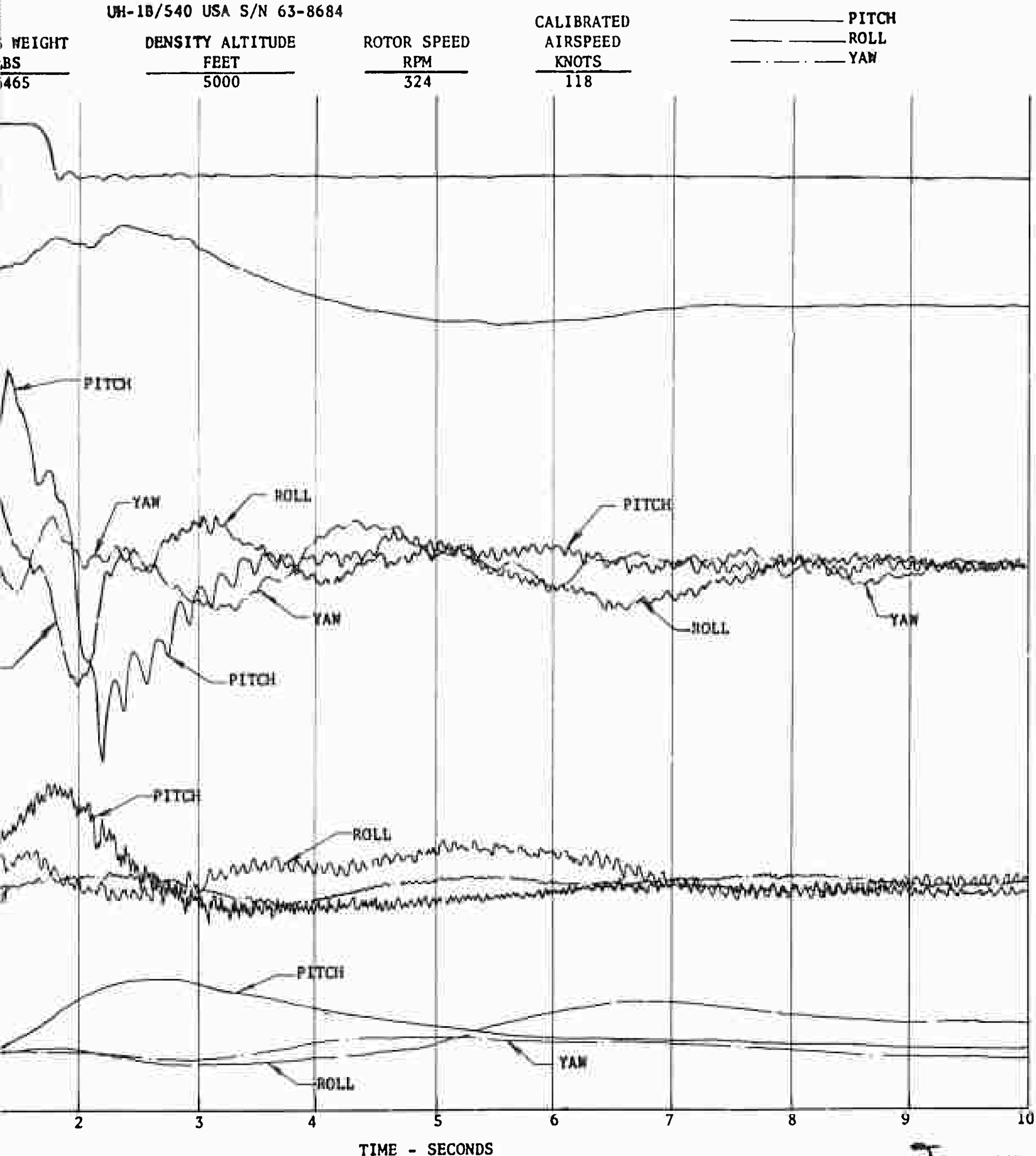


FIGURE NO.
REACTION TO AN AFT LO
MAXIMUM POWE
UH-1B/540 USA S

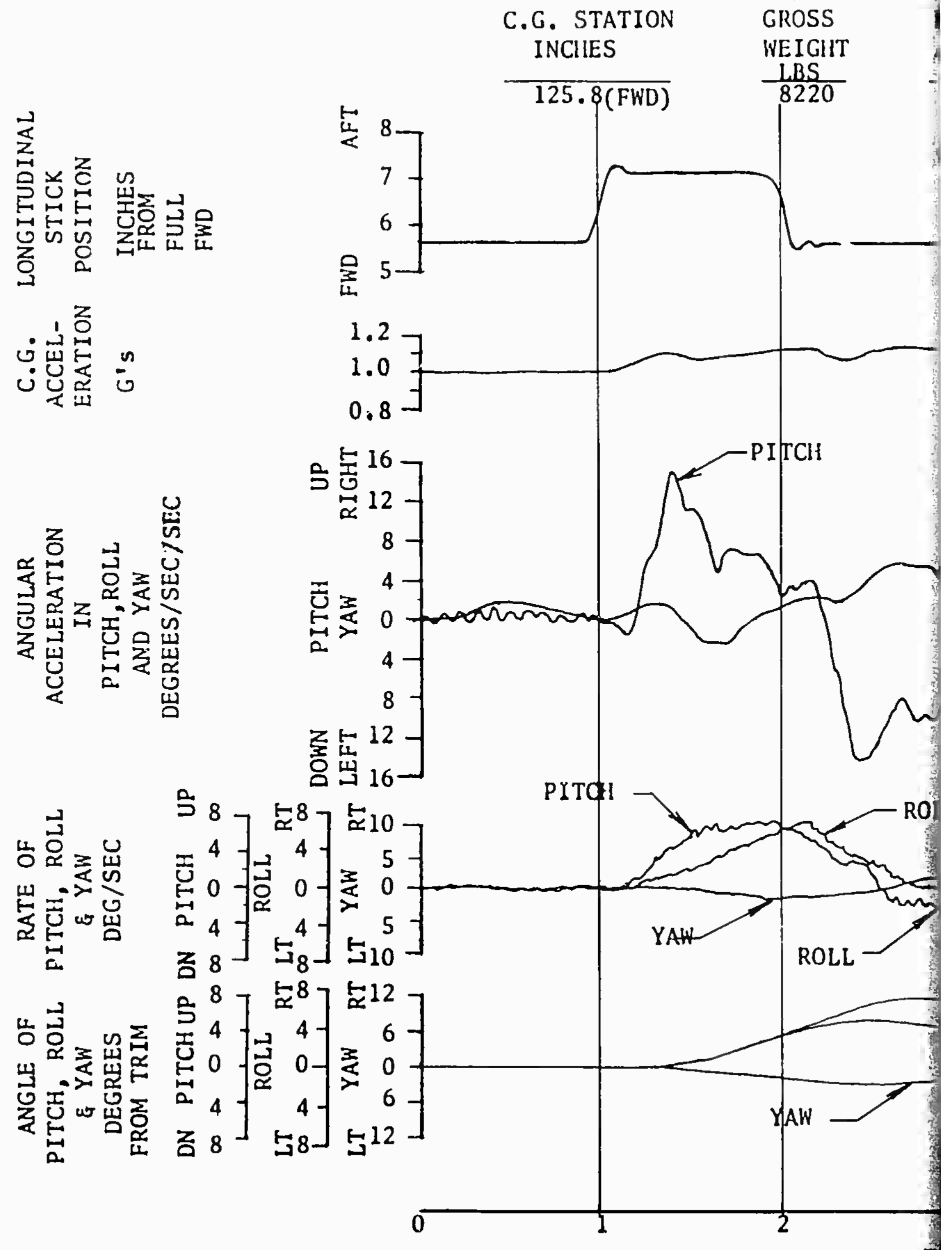


FIGURE NO. 109
REACTION TO AN AFT LONGITUDINAL PULSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

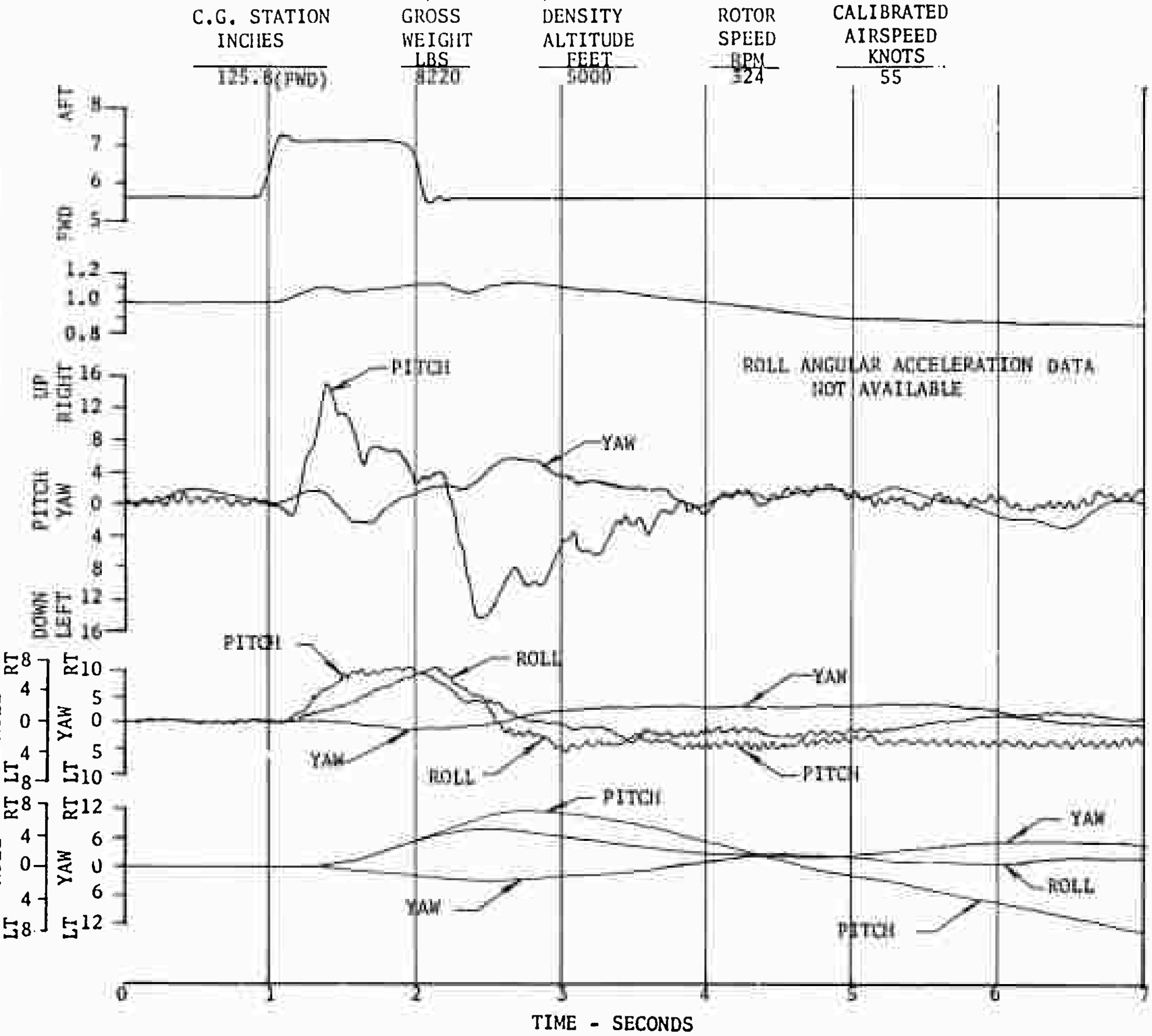


FIGURE NO. 110
REACTION TO A LEFT PEDAL PULSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

C.G. STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	RO
135.0(AFT)	8250	5000	

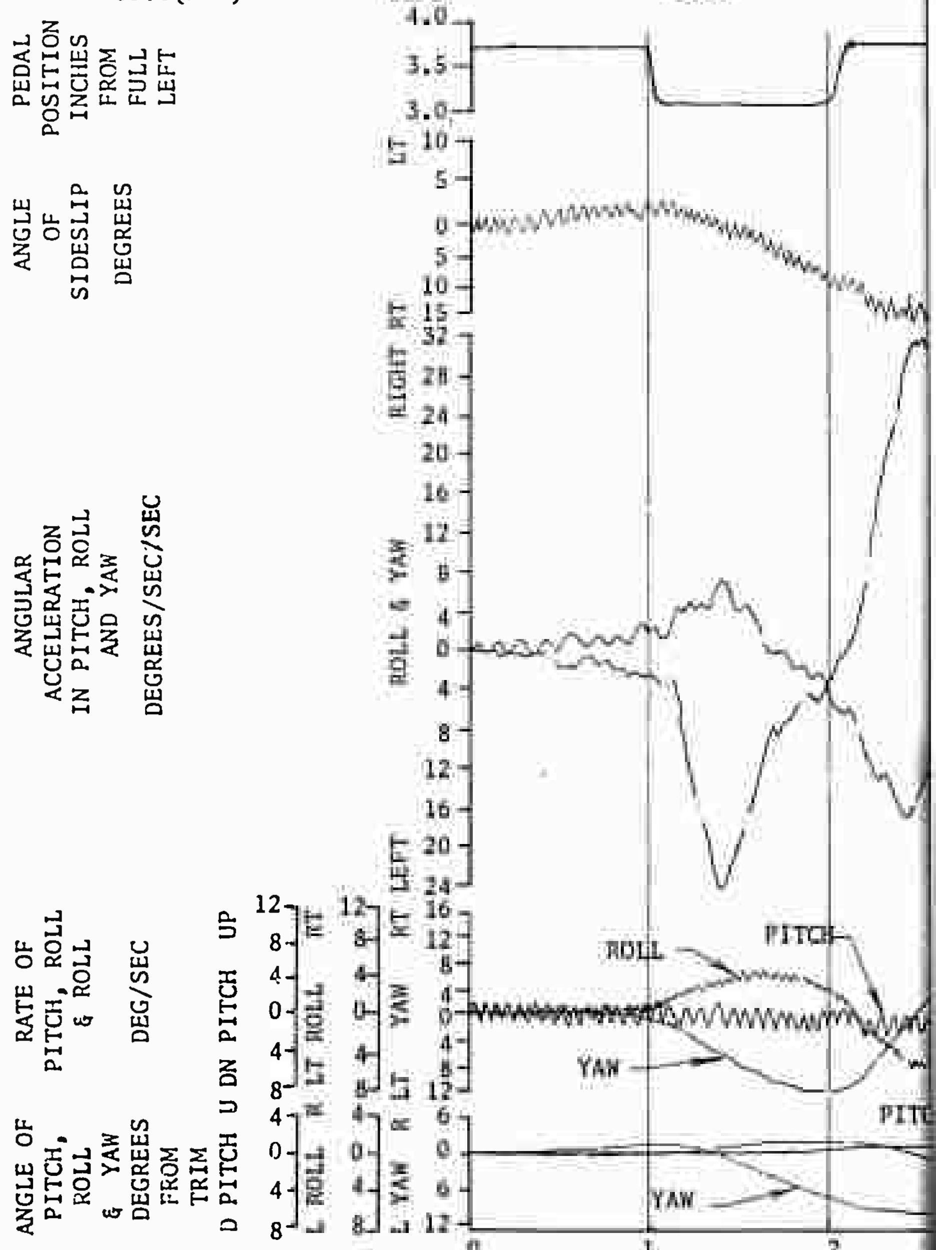
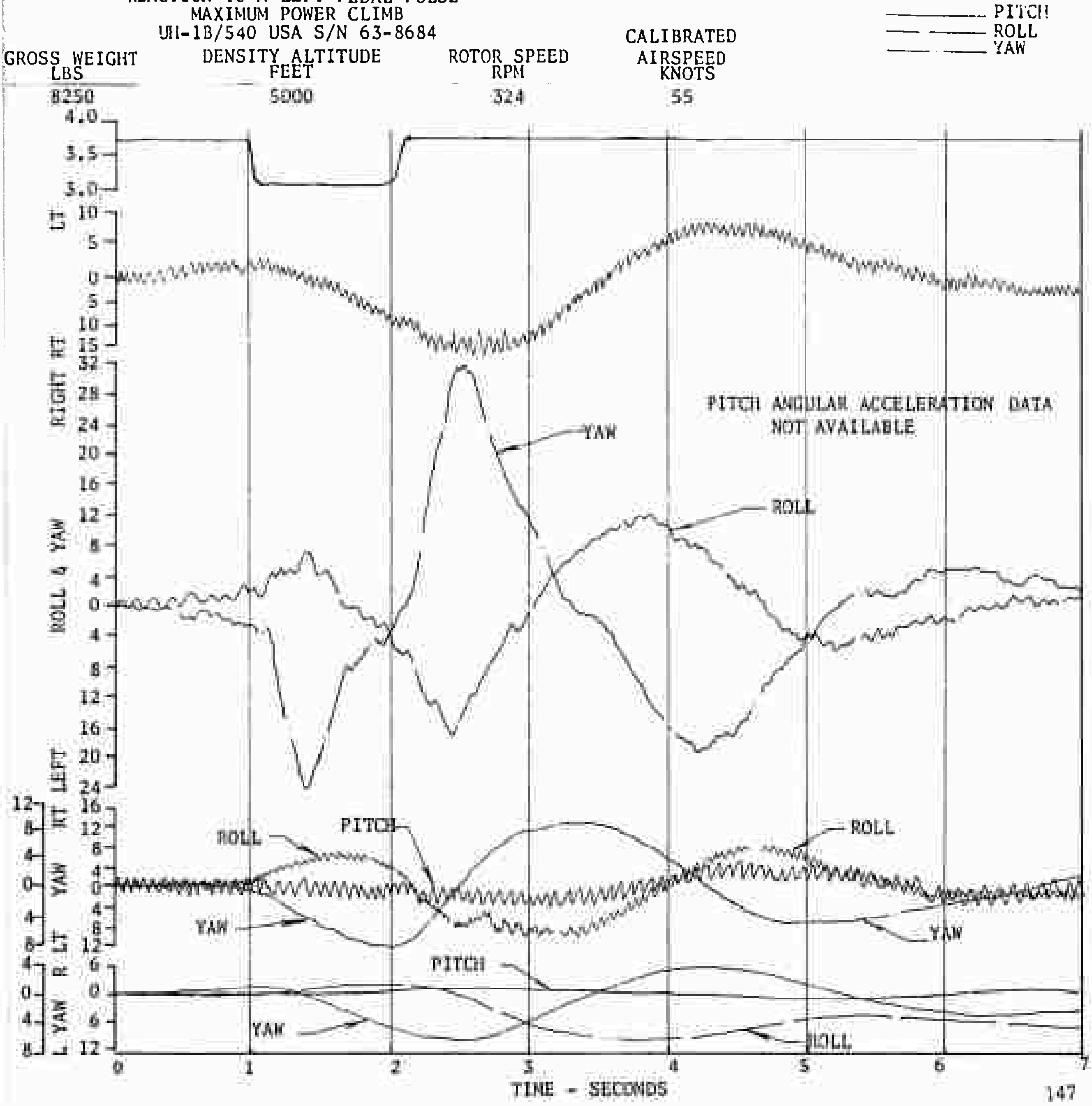


FIGURE NO. 110
REACTION TO A LEFT PEDAL PULSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

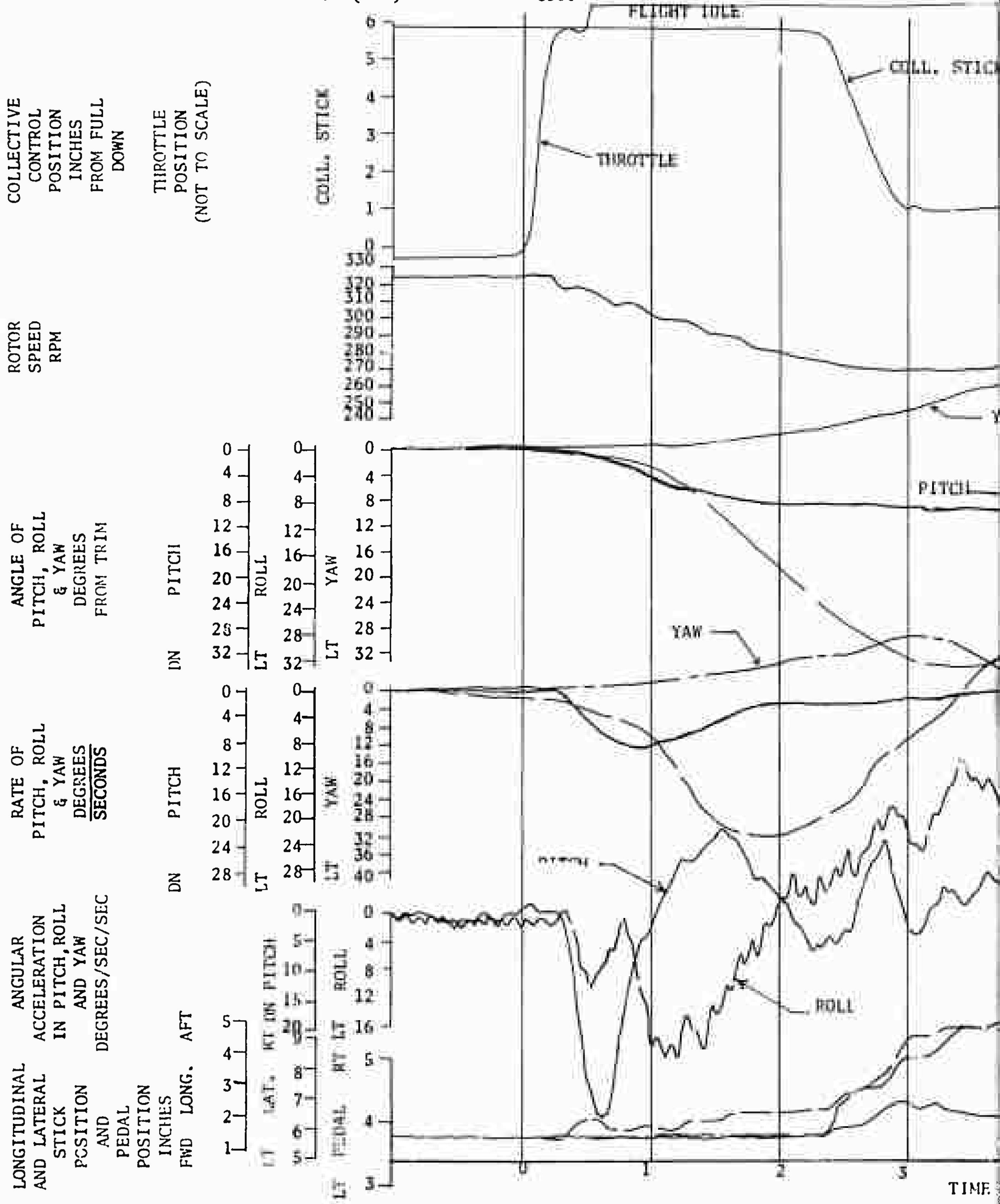
GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
8250	5000	324	55



2

FIGURE NO. 111
REACTION TO A THROTTLE CHOP
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

C.G. STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	CALIBRATED AIRSPEED KNOTS
135.0 (AFT)	8500	4630	133



IGURE NO. 111
N TO A THROTTLE CHOP
LEVEL FLIGHT
540 USA S/N 63-8684

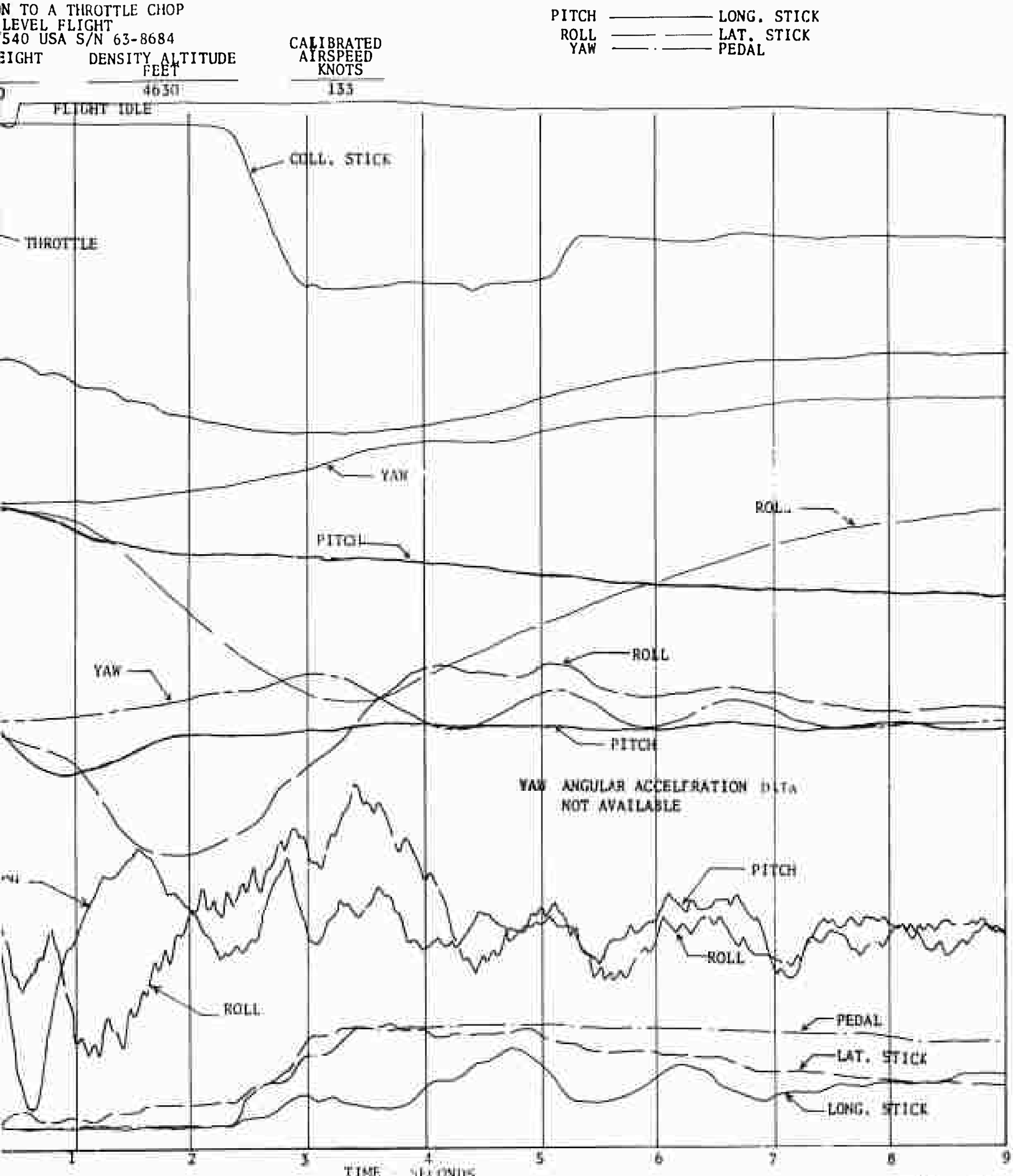


FIGURE NO. 112
LONGITUDINAL CONTROL SENSITIVITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
○	6825	126.1(FWD)	5000	324	112 A
□	6715	135.0(AFT)	5000	324	112 A
◇	6465	137.7(AFT)	5000	324	112 A
△	7800	125.5(FWD)	2120	324	112 B
◺	8220	125.8(FWD)	5000	324	112 B
☆	8275	133.8(AFT)	5000	324	112 B
△	9195	126.3(FWD)	5000	324	112 C
⬡	9230	131.8(AFT)	5000	324	112 C

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 113 THROUGH 128
2. SHADED SYMBOL DENOTES PITCH DOWN.
3. HALF SHADED SYMBOL DENOTES BOTH PITCH UP AND PITCH DOWN
4. FLAGGED SYMBOL DENOTES CLIMB
5. SLASHED SYMBOL DENOTES AUTOROTATION

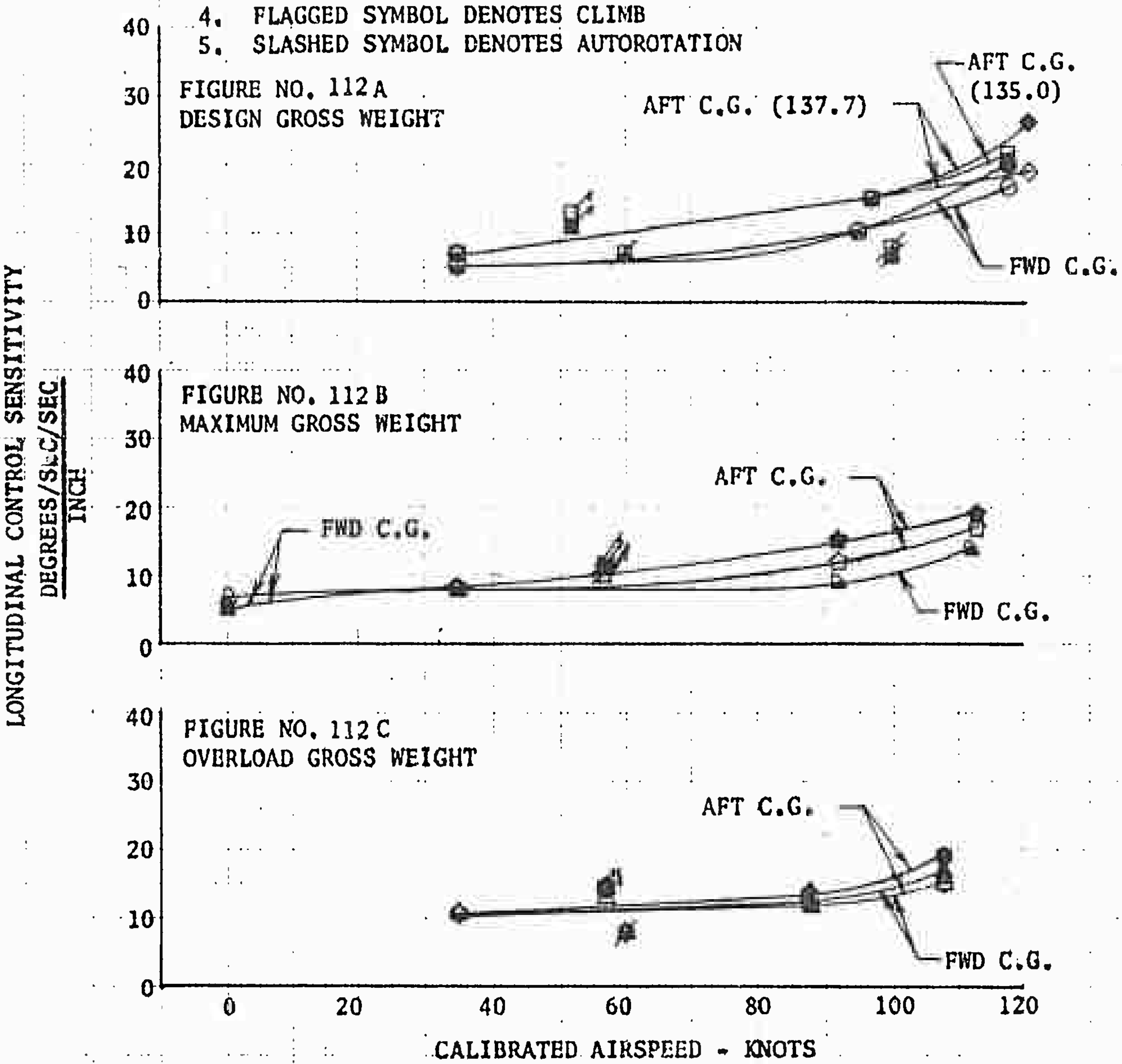


FIGURE NO. 113
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	6825	126.1(FWD)	5000	324
□	35	6715	135.0(AFT)	5000	324
△	35	6465	132.7(AFT)	5000	324

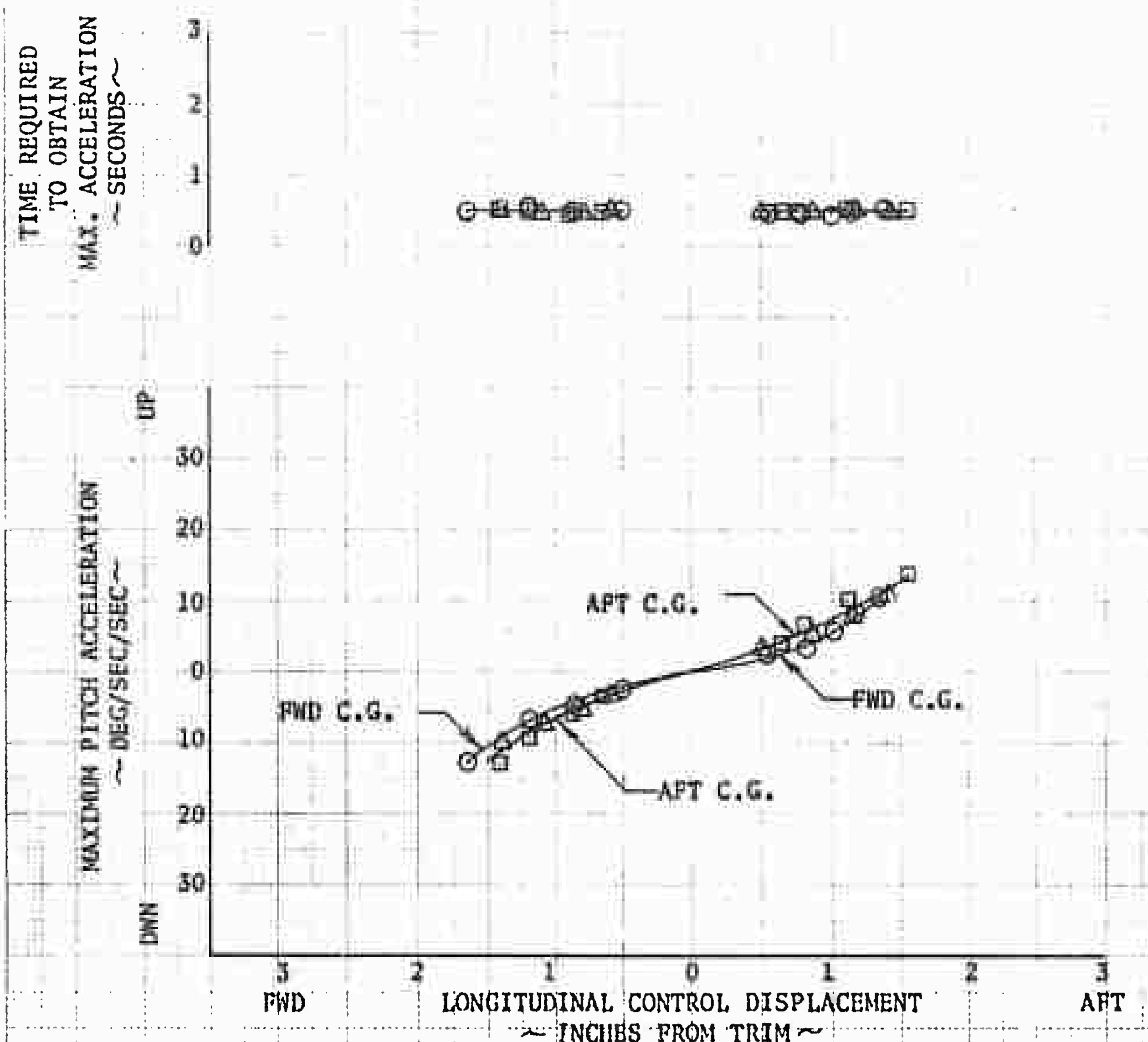


FIGURE NO. 114
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	95	6825	126.1(FWD)	5000	324
□	97	6715	135.0(AFT)	5000	324
△	99	6465	137.7(AFT)	5000	324

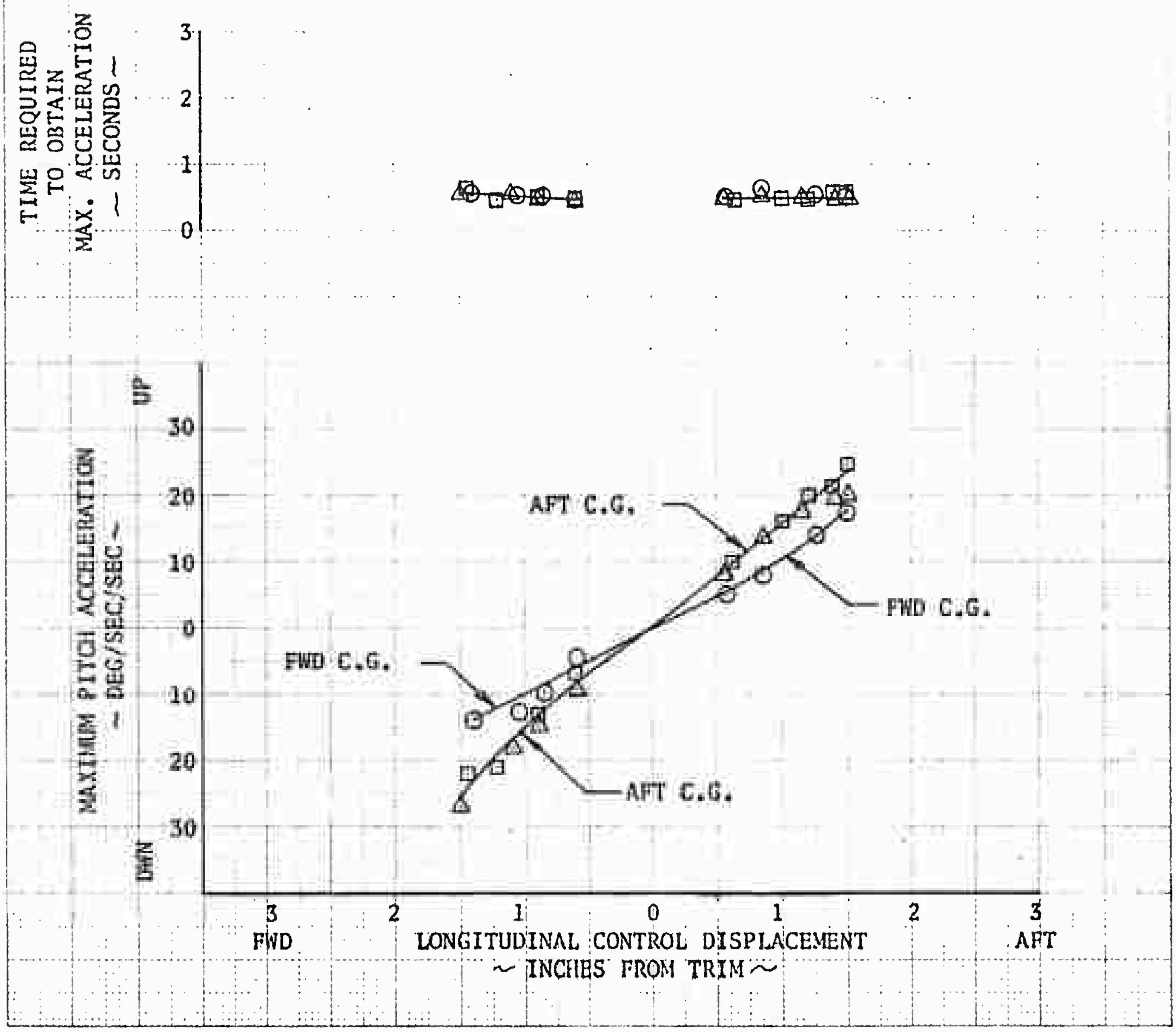


FIGURE NO. 115
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	118	6825	126.1(FWD)	5000	324
□	118	6715	135.0(AFT)	5000	324
△	121	6465	137.7(AFT)	5000	324

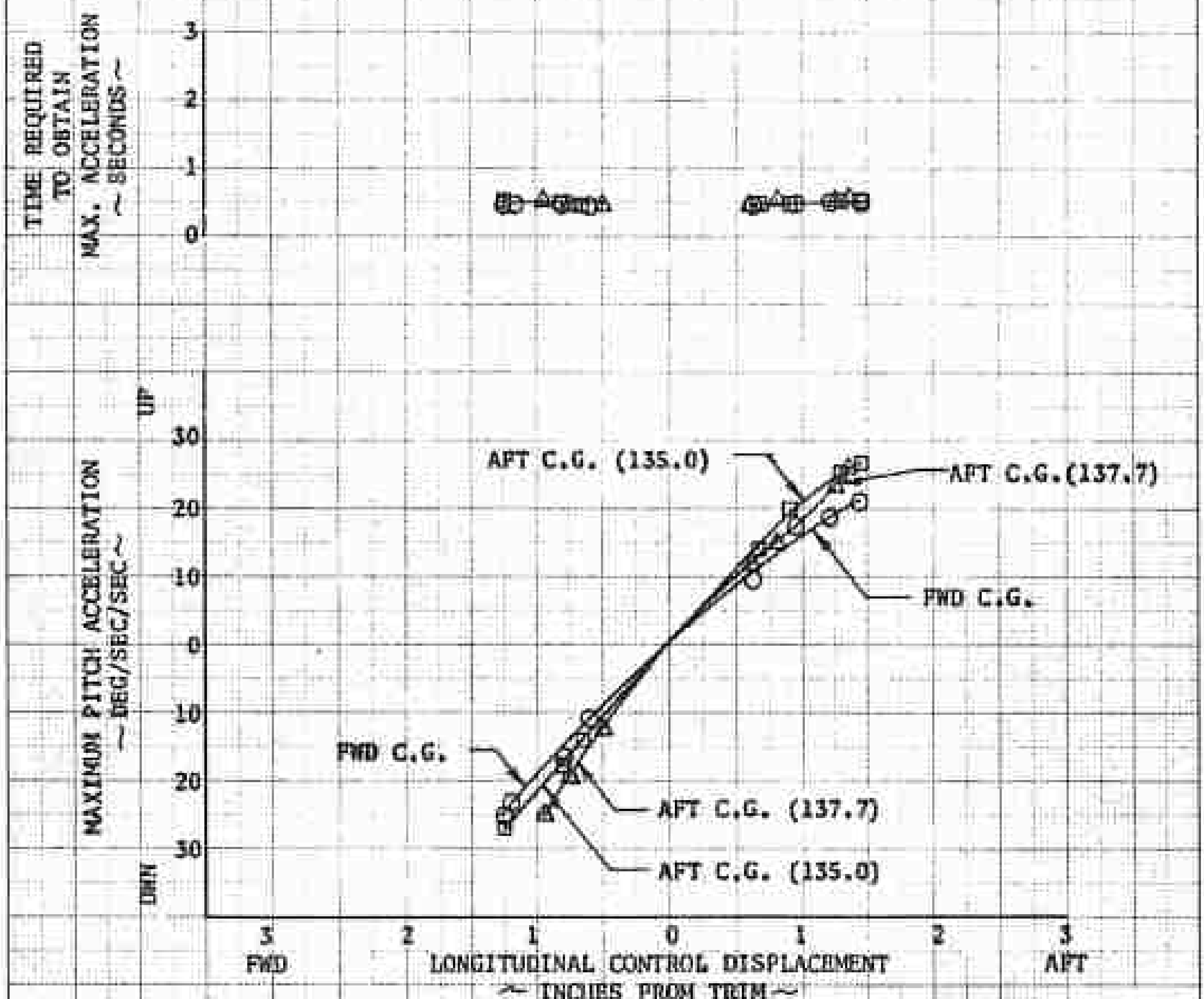


FIGURE NO. 116
LONGITUDINAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	HOVER	7800	125.5	2120	324

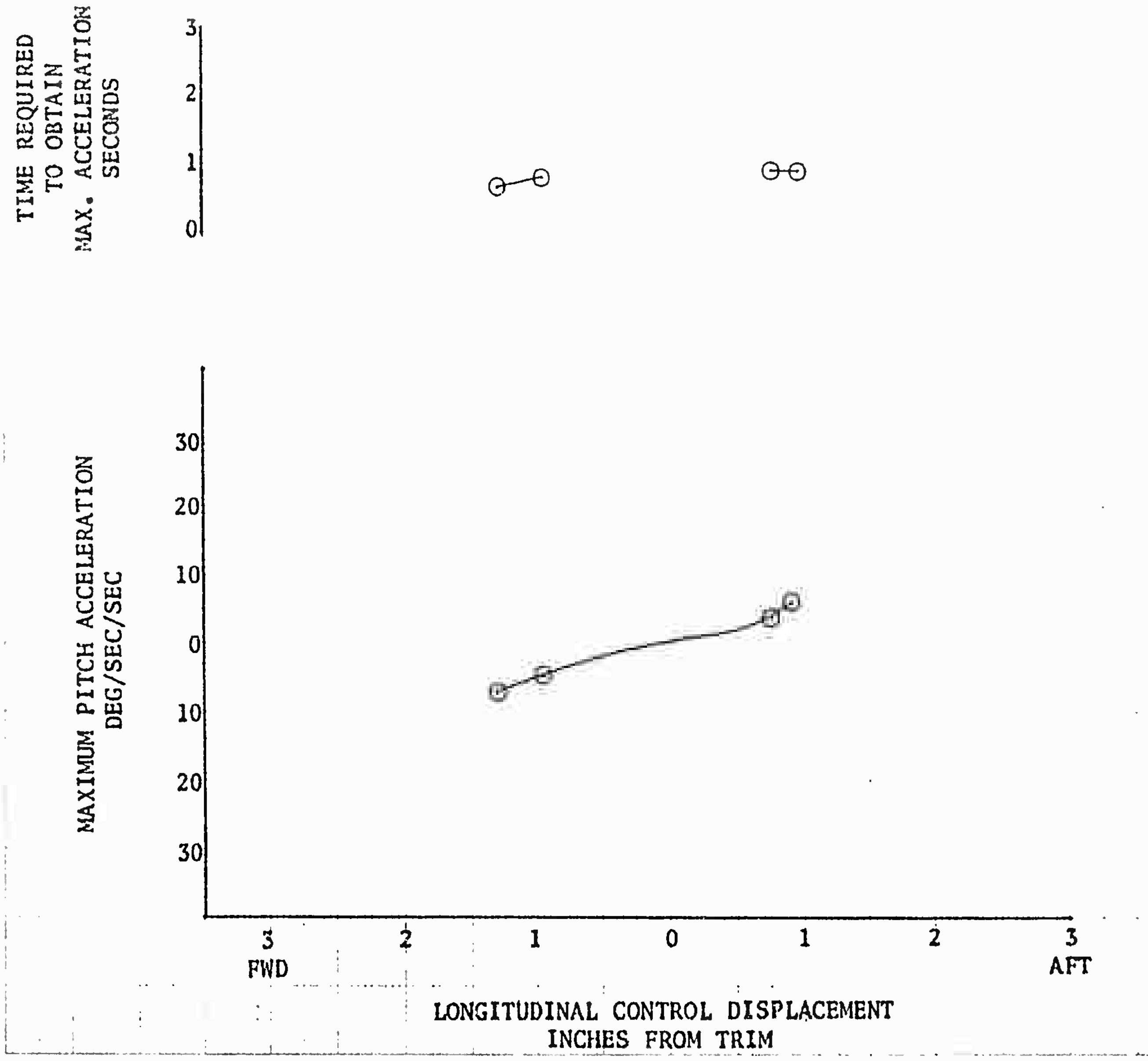


FIGURE NO. 117
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	8220	125.8(FWD)	5000	324
□	35	8275	133.8(AFT)	5000	324

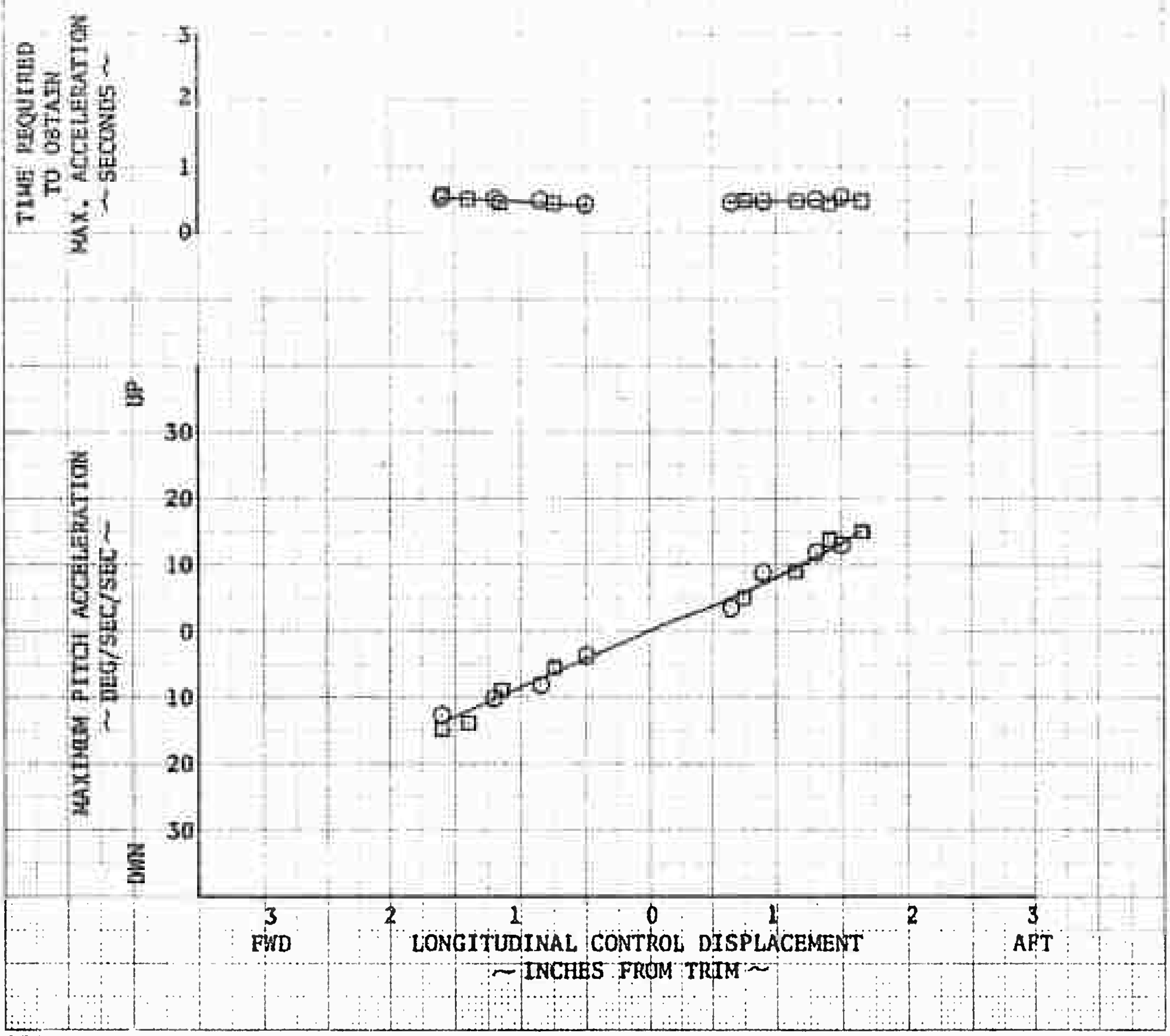


FIGURE NO. 118
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8220	125.8(FWD)	5000	324
□	92	8275	133.8(AFT)	5000	324

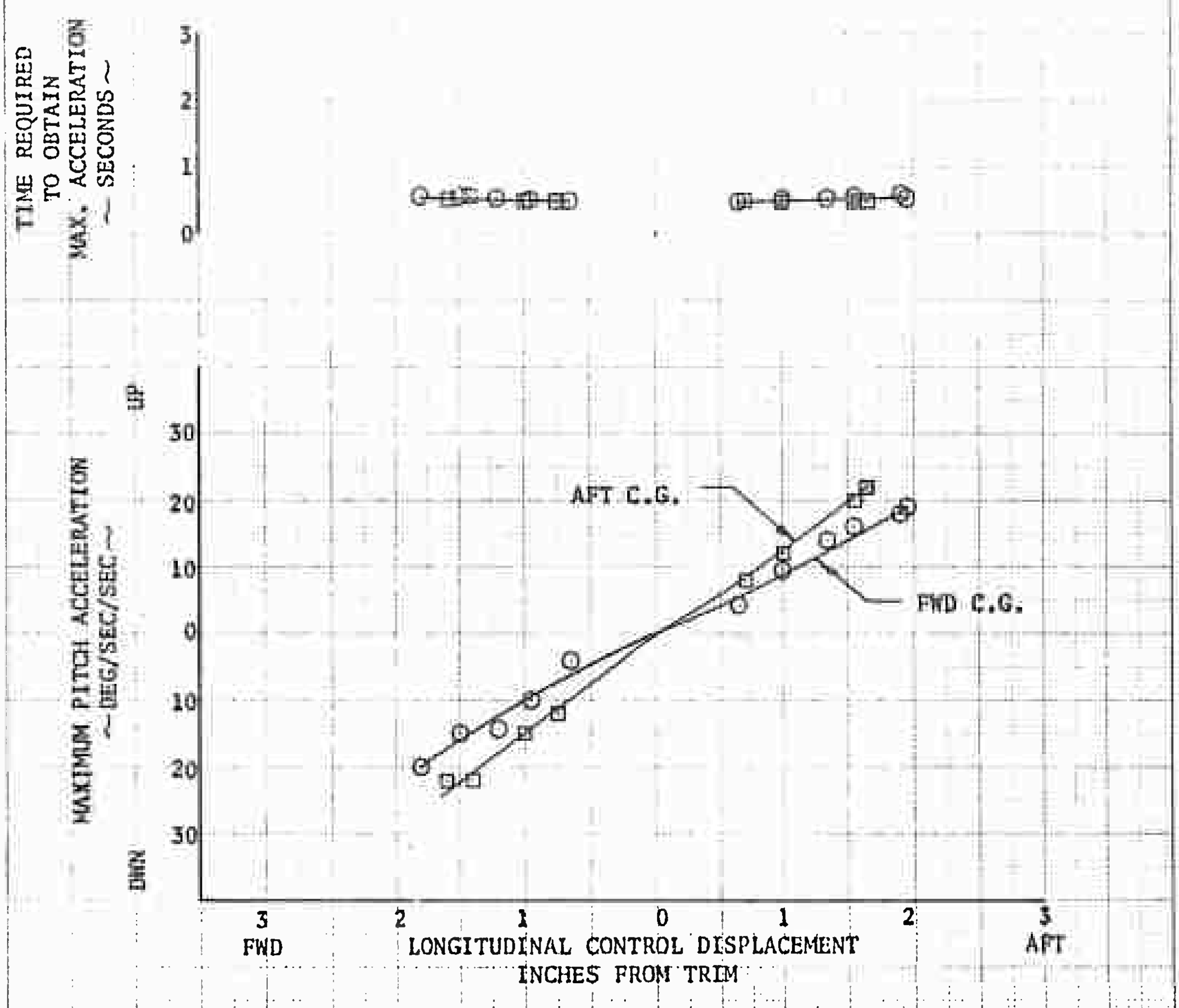


FIGURE NO. 119
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	112	8220	125.8(FWD)	5000	324
□	113	8275	133.8(AFT)	5000	324

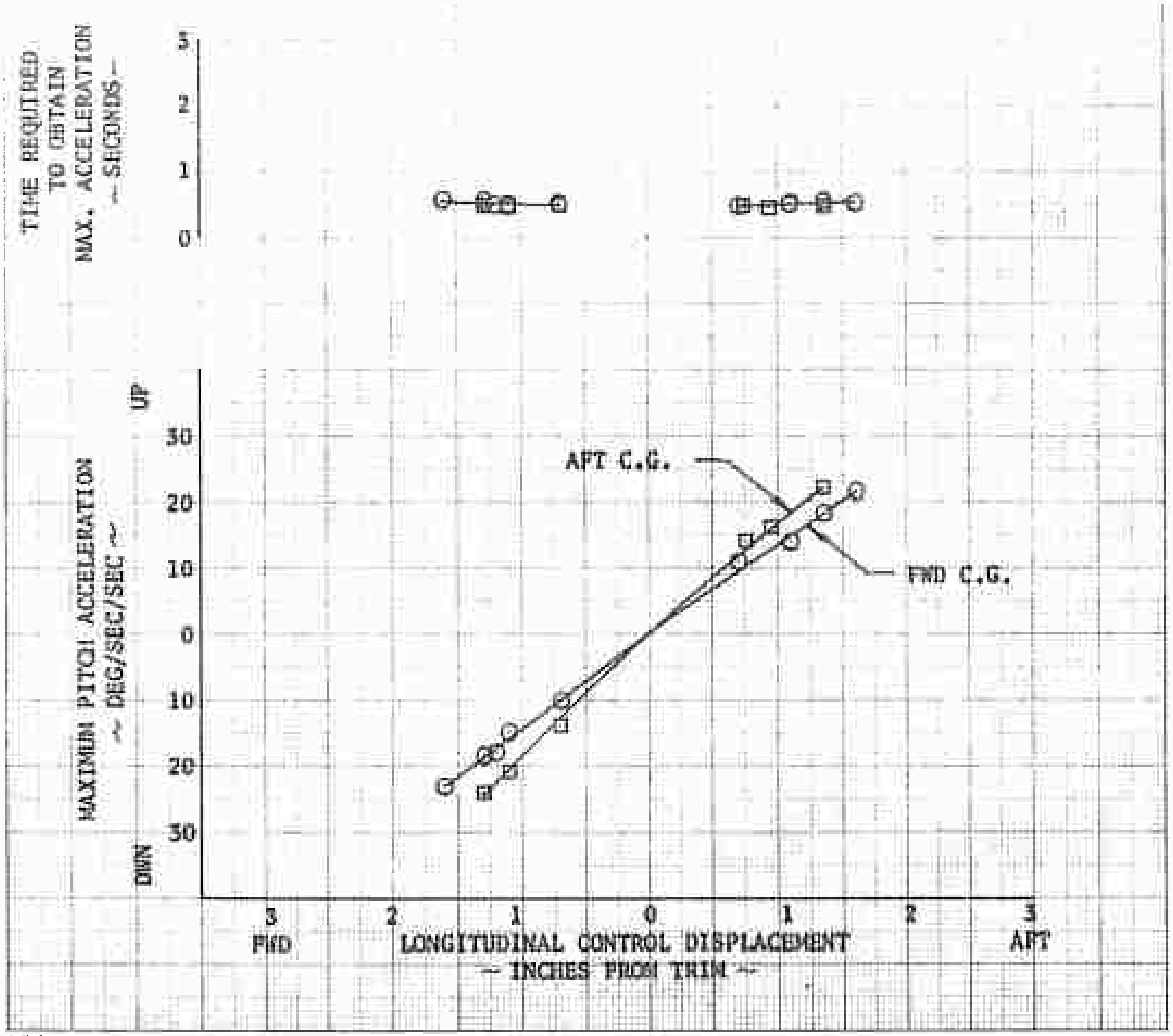


FIGURE NO. 120
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9195	126.3(FWD)	5000	324
□	35	9230	131.8(AFT)	5000	324

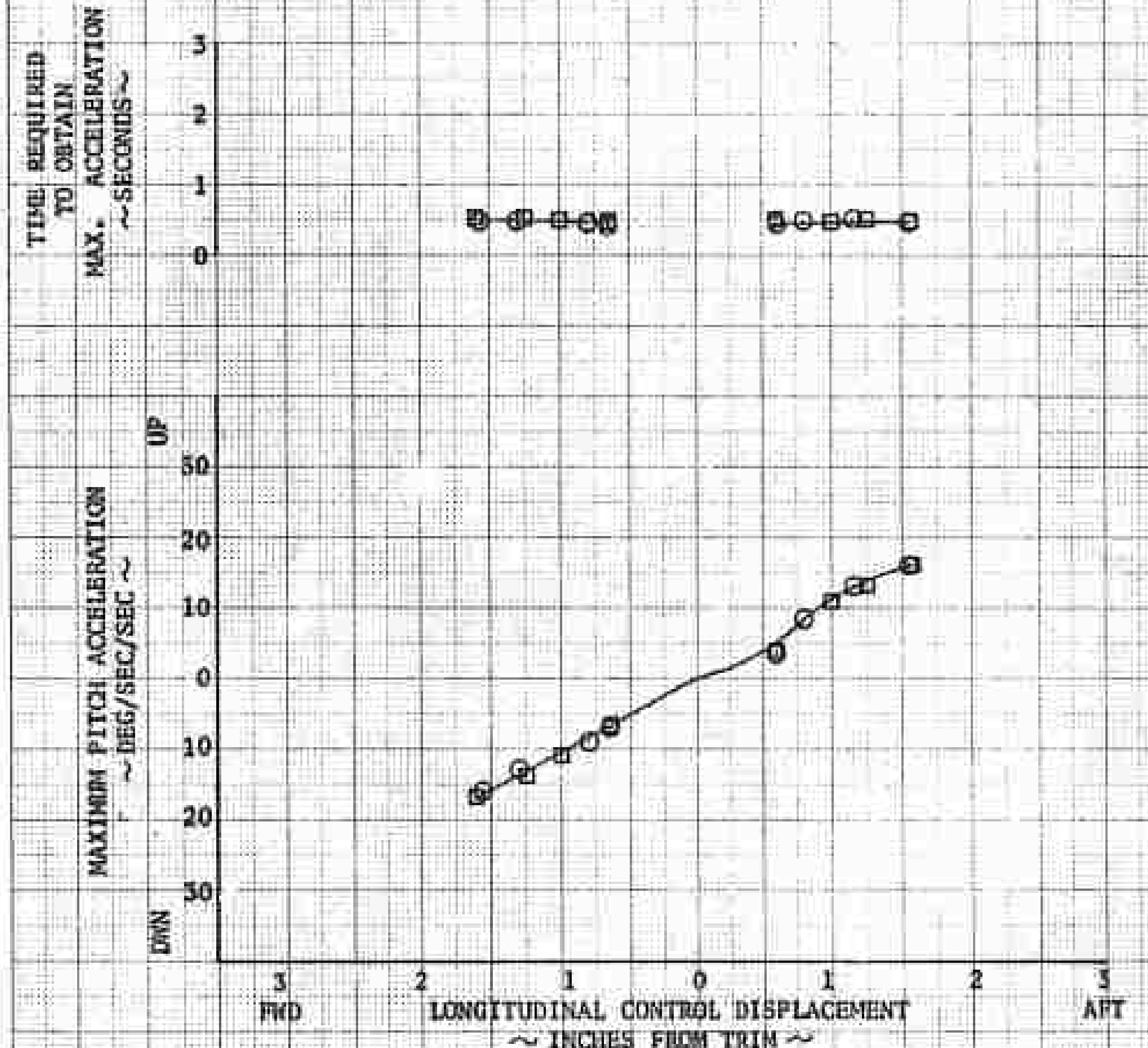


FIGURE NO. 121
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8664

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	88	9195	126.3(FWD)	5000	324
□	88	9230	131.8(AFT)	5000	324

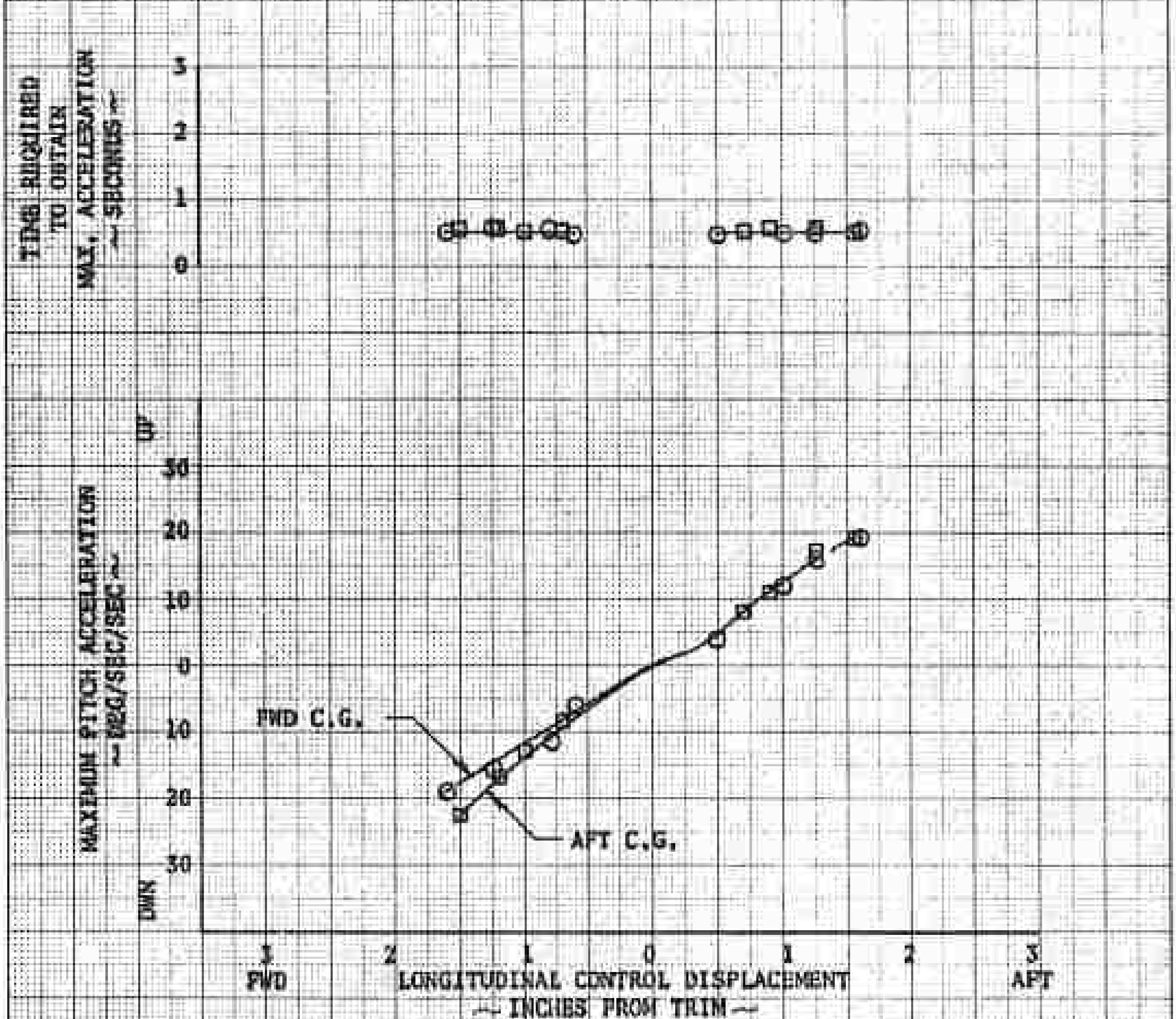


FIGURE NO. 122
LONGITUDINAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9495	126.3(FWD)	5000	324
□	108	9230	131.8(AFT)	5000	324

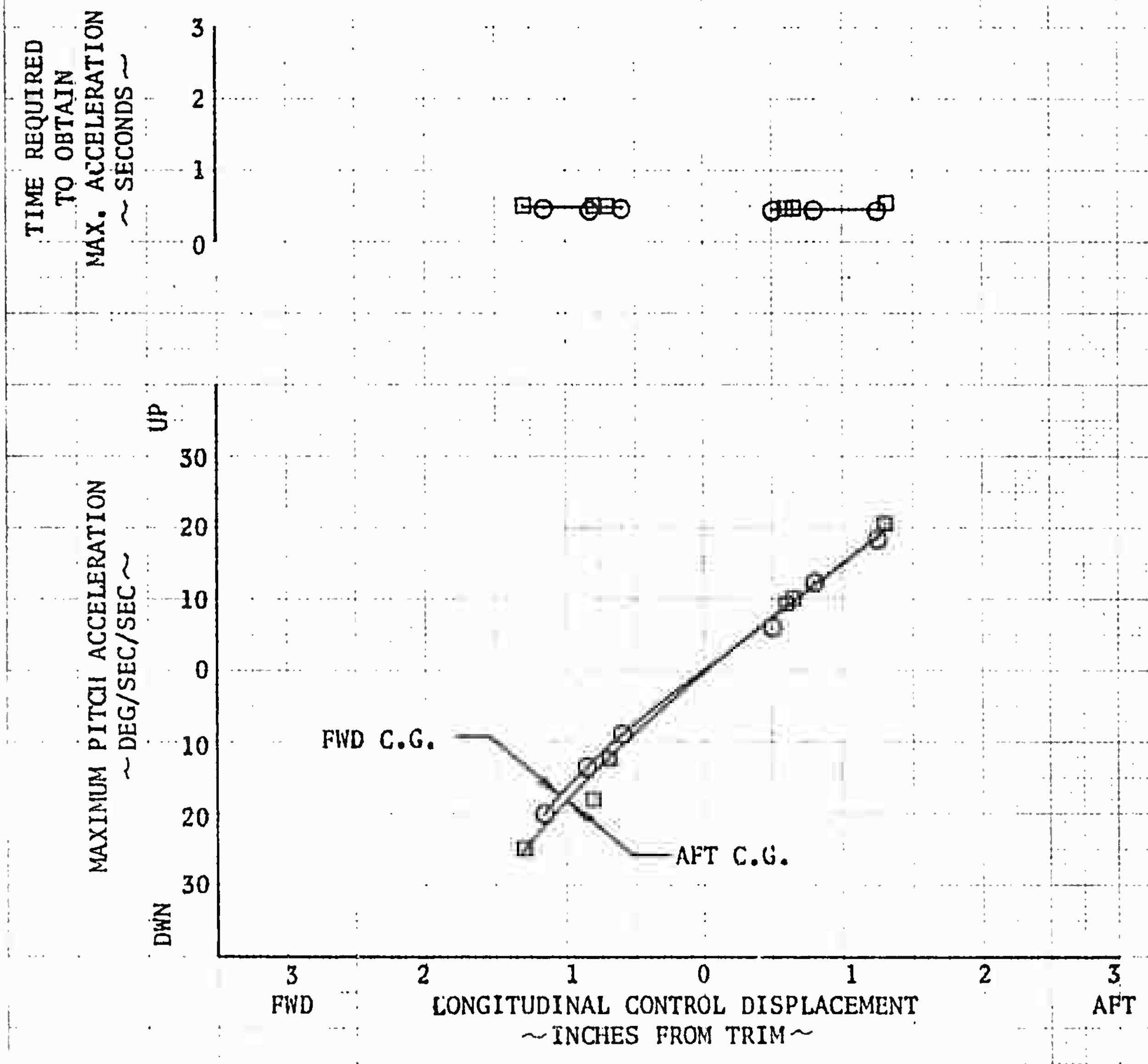


FIGURE NO. 173
LONGITUDINAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

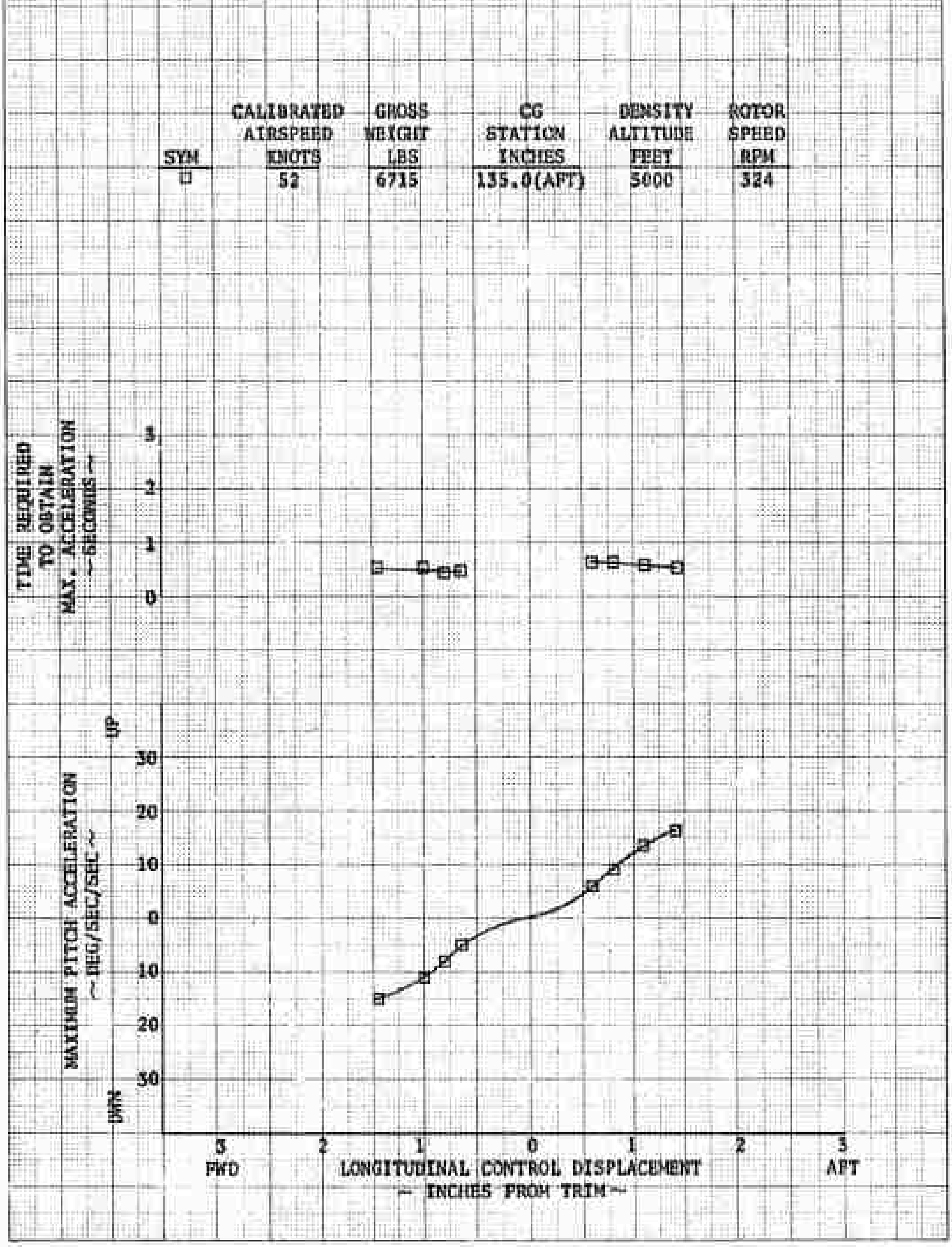


FIGURE NO. 124
LONGITUDINAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8220	125.8(FWD)	5000	324
□	57	8275	133.8(AFT)	5000	324

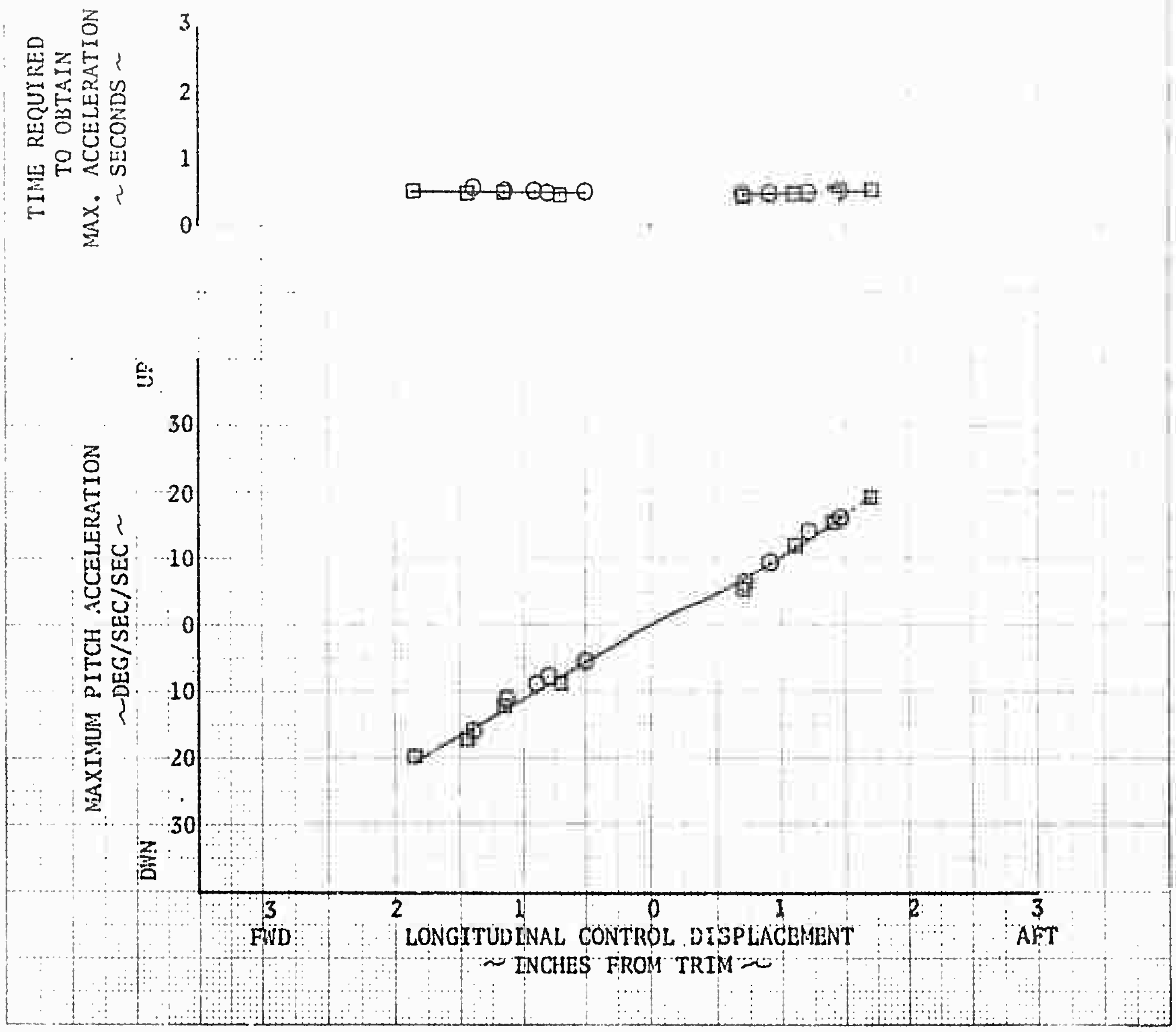


FIGURE NO. 125
LONGITUDINAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9195	126.3(FWD)	5000	324
□	57	9230	131.8(AFT)	5000	324

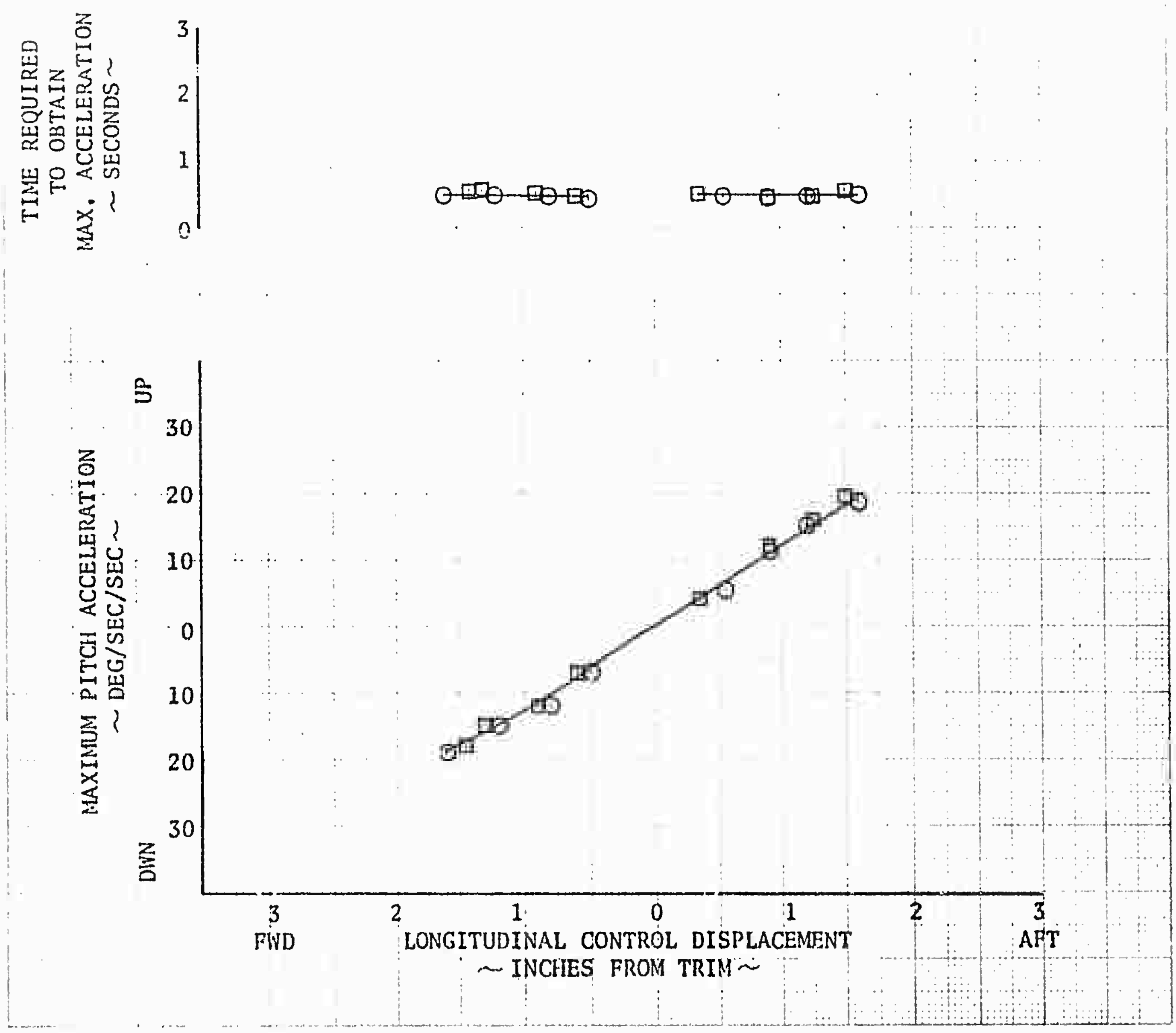


FIGURE NO. 126
LONGITUDINAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
□	60	6715	135.0(AFT)	5000	324
■	100	6715	135.0(AFT)	5000	324

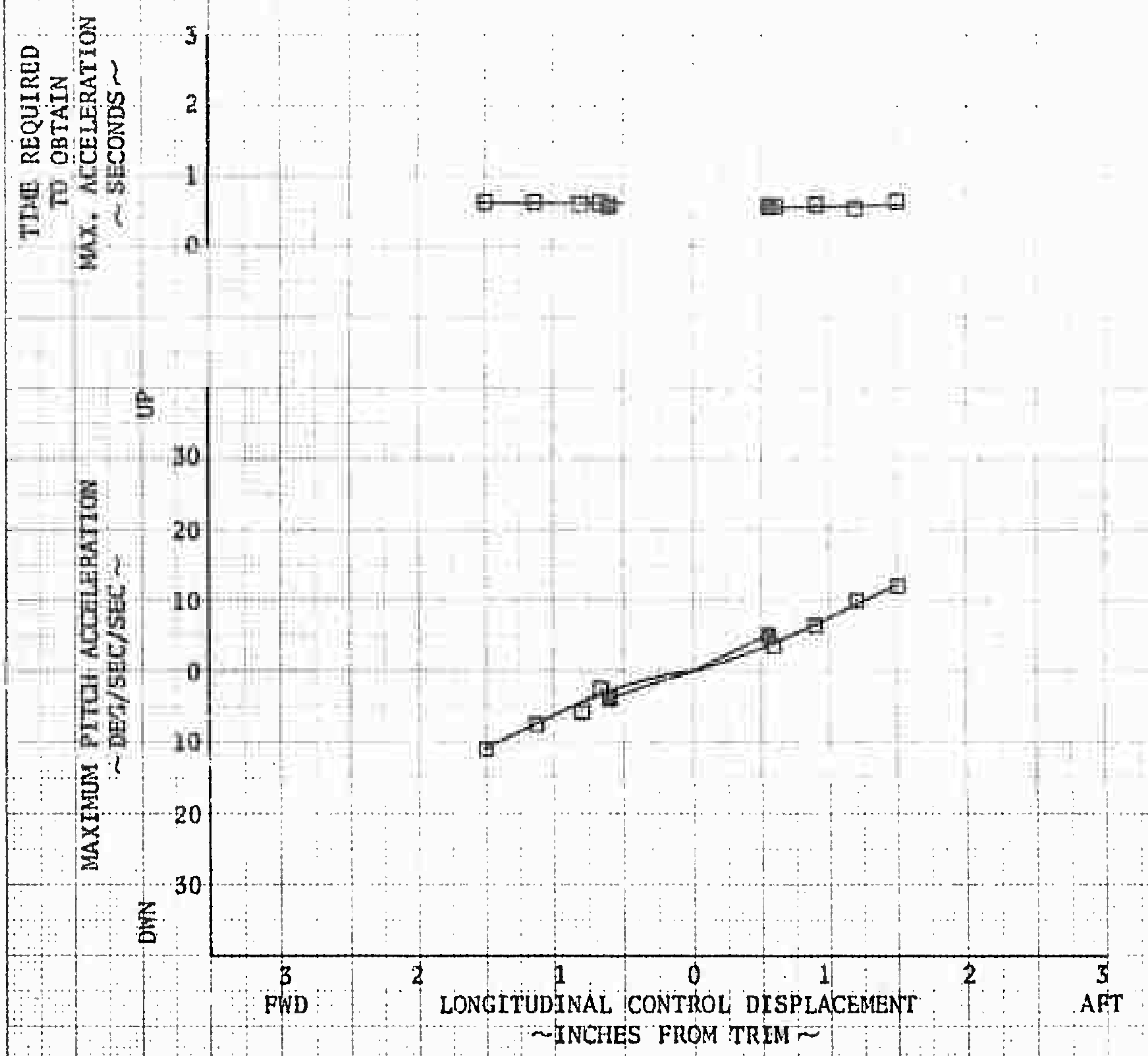


FIGURE NO. 127
LONGITUDINAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	8220	125.8(FWD)	5000	324
□	60	8275	133.8(AFT)	5000	324

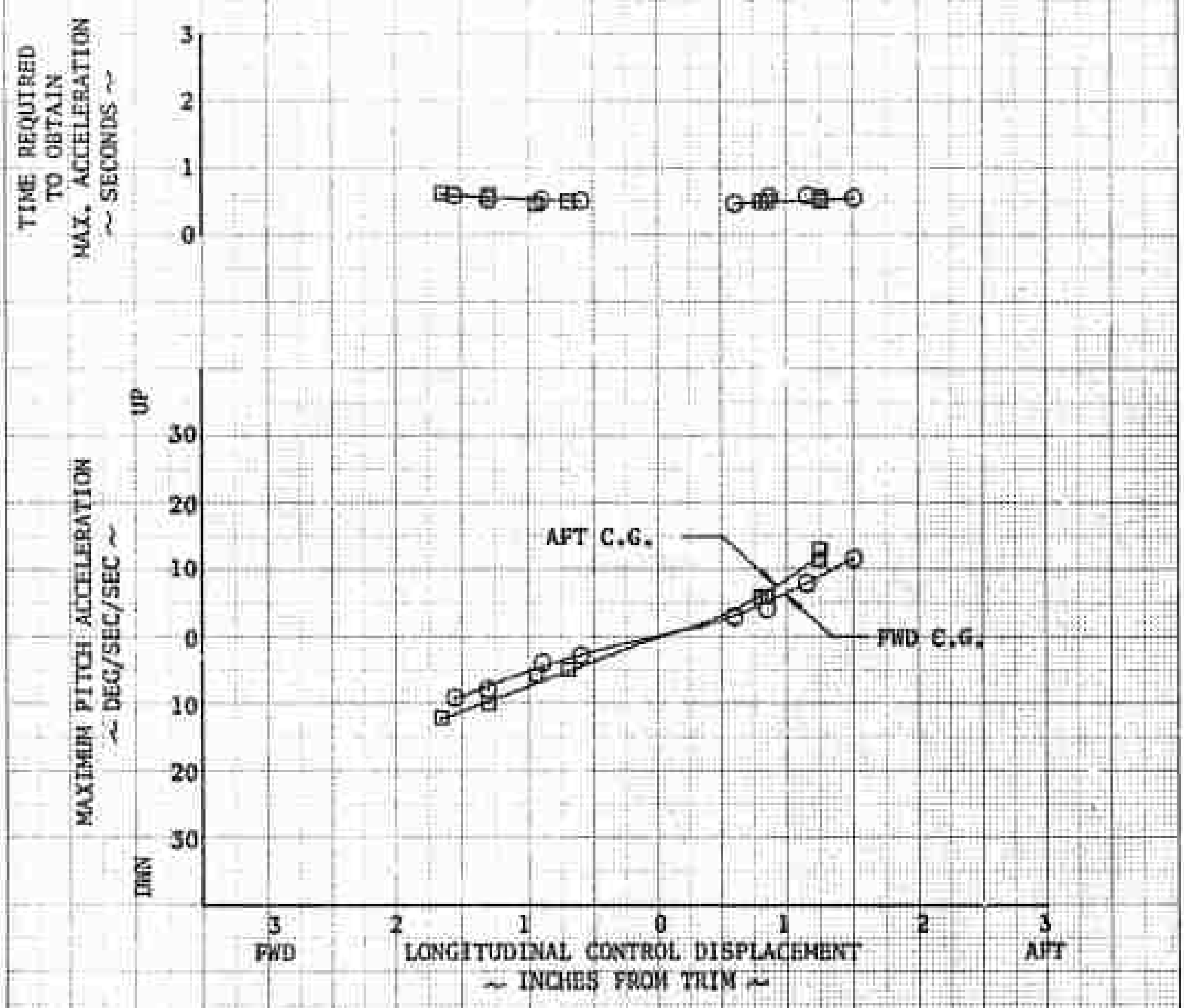


FIGURE NO. 128
LONGITUDINAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9195	126.3(FWD)	5000	324
□	60	9230	131.8(AFT)	5000	324

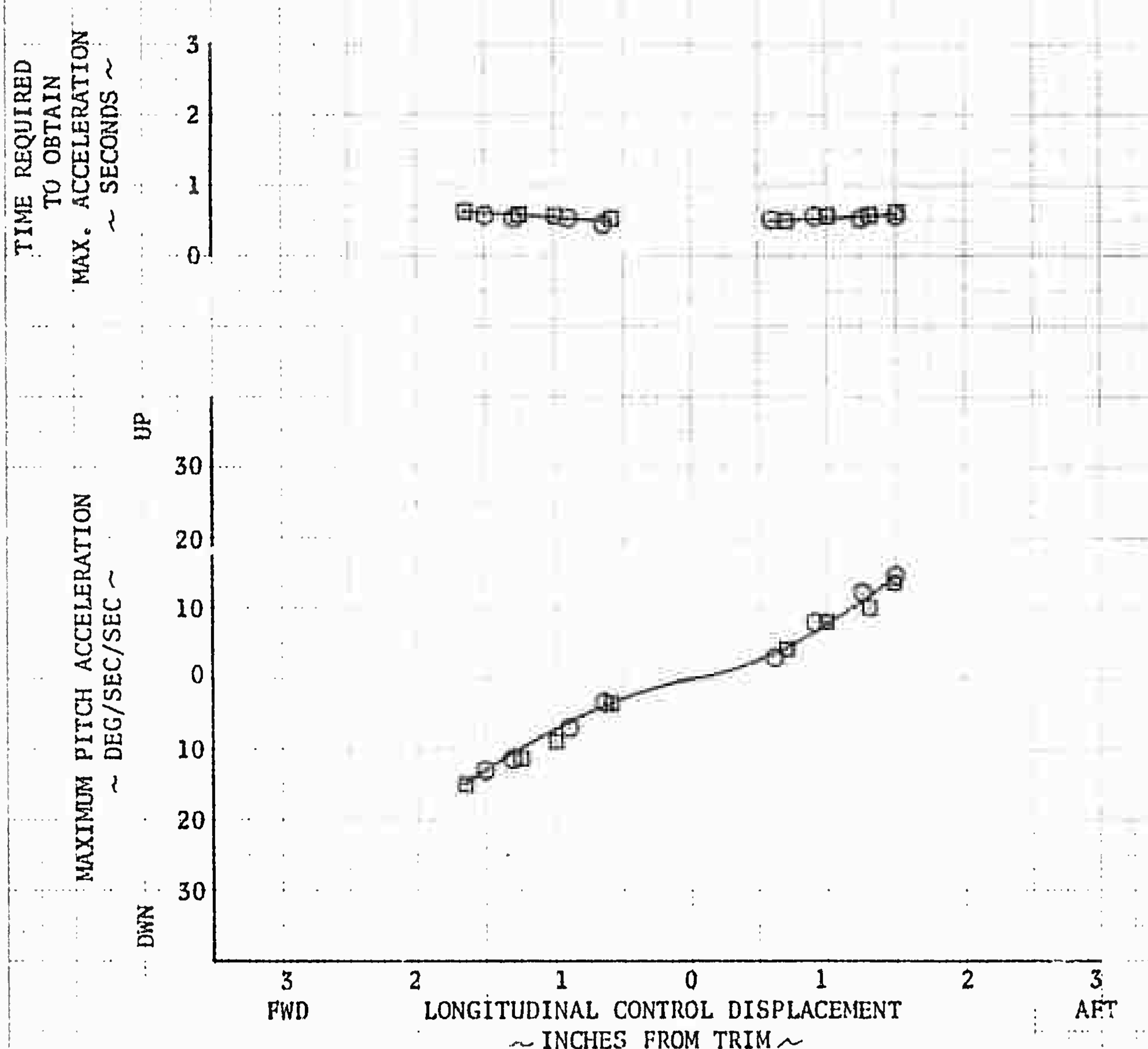


FIGURE NO. 129
LONGITUDINAL CONTROL RESPONSE SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
○	6825	126.1 (FWD)	5000	324	129 A
□	6715	135.0 (AFT)	5000	324	129 A
◇	6465	137.7 (AFT)	5000	324	129 A
○	7800	125.5 (FWD)	2120	324	129 B
◁	8220	125.8 (FWD)	5000	324	129 B
☆	8275	133.8 (AFT)	5000	324	129 B
△	9195	126.3 (FWD)	5000	324	129 C
△	9230	131.8 (AFT)	5000	324	129 C

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 130 THROUGH 145
2. SHADED SYMBOL DENOTES PITCH DOWN.
3. HALF SHADED SYMBOL DENOTES BOTH PITCH UP AND PITCH DOWN.
4. FLAGGED SYMBOL DENOTES CLIMB.
5. SLASHED SYMBOL DENOTES AUTOROTATION.

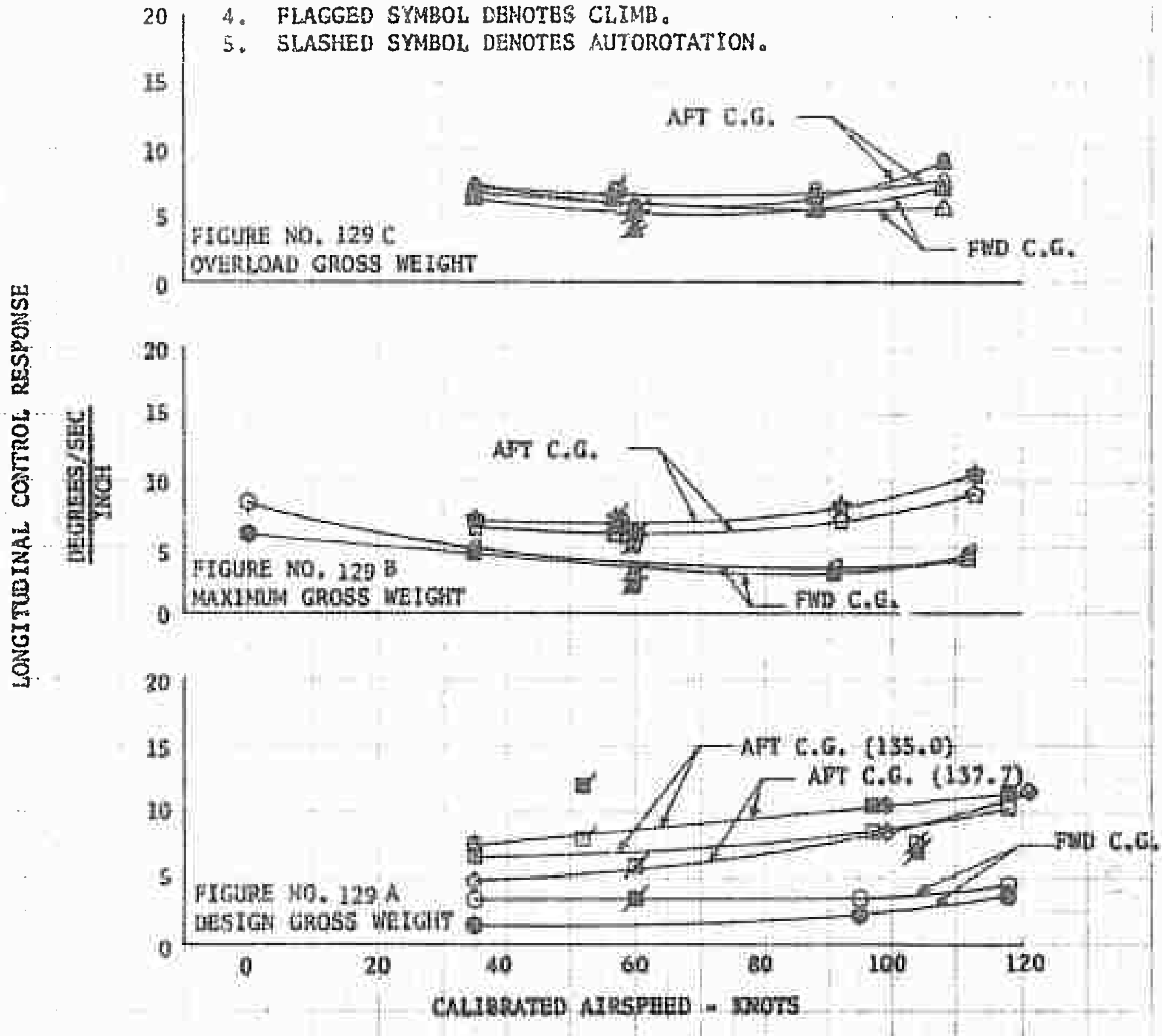


FIGURE NO. 130
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	6825	126.1(FWD)	5000	324
□	35	6715	135.0(AFT)	5000	324
△	35	6465	137.7(AFT)	5000	324

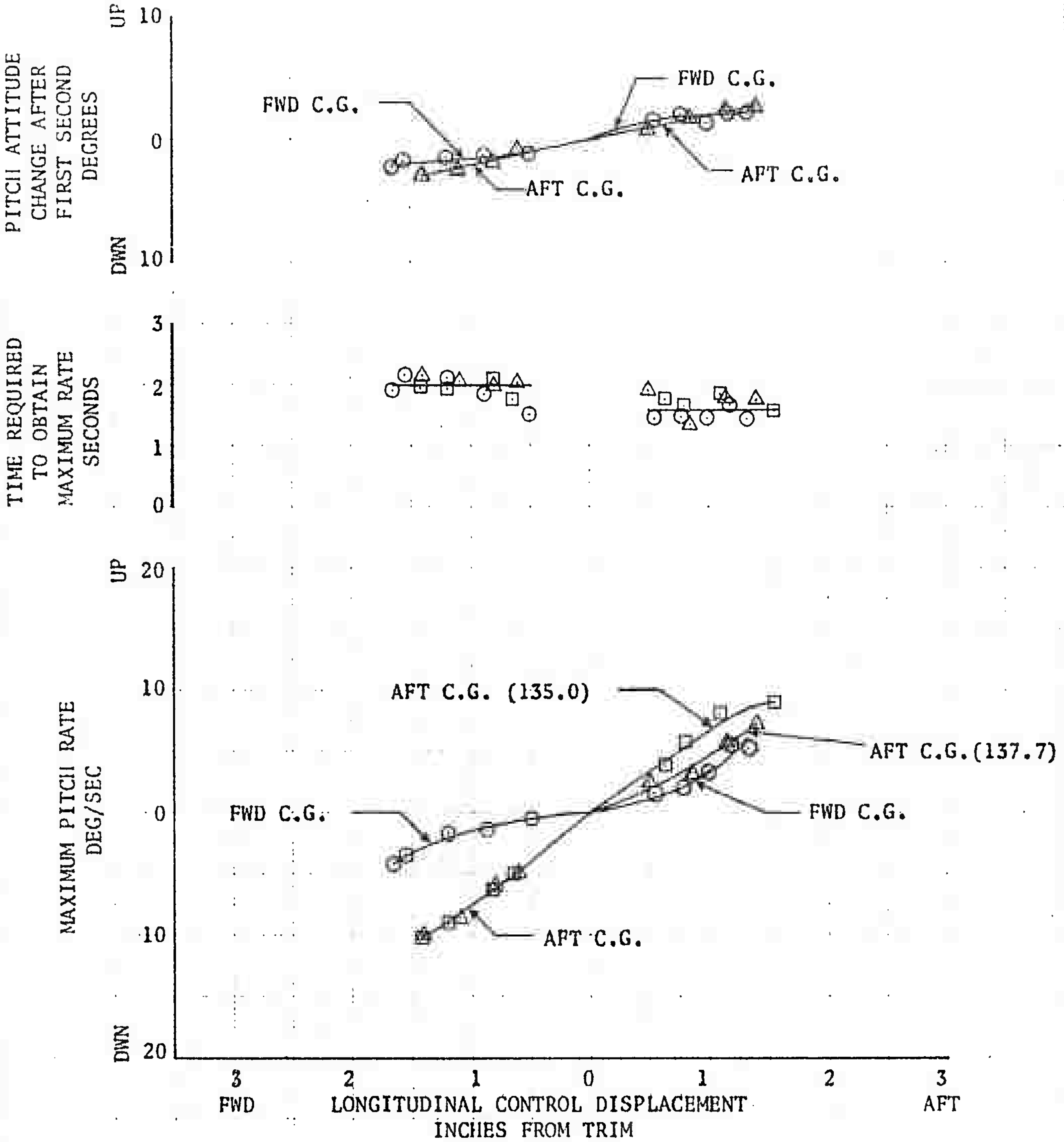


FIGURE NO. 131
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	95	6825	126.1(FWD)	5000	324
□	97	6715	135.0(AFT)	5000	324
△	99	6465	137.7(AFT)	5000	324

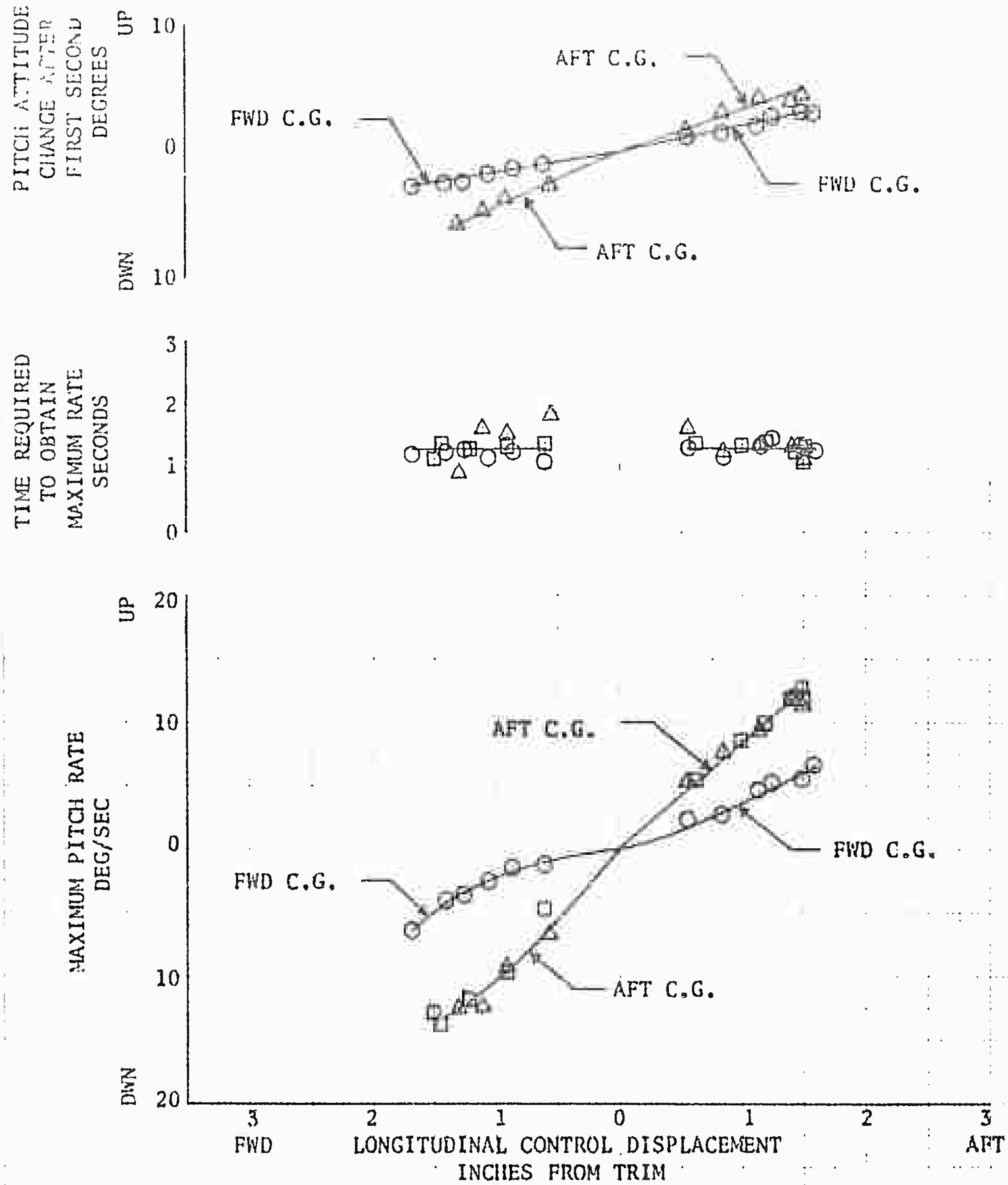


FIGURE NO. 132
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	118	6825	126.1(FWD)	5000	324
□	118	6715	135.0(AFT)	5000	324
△	121	6465	137.7(AFT)	5000	324

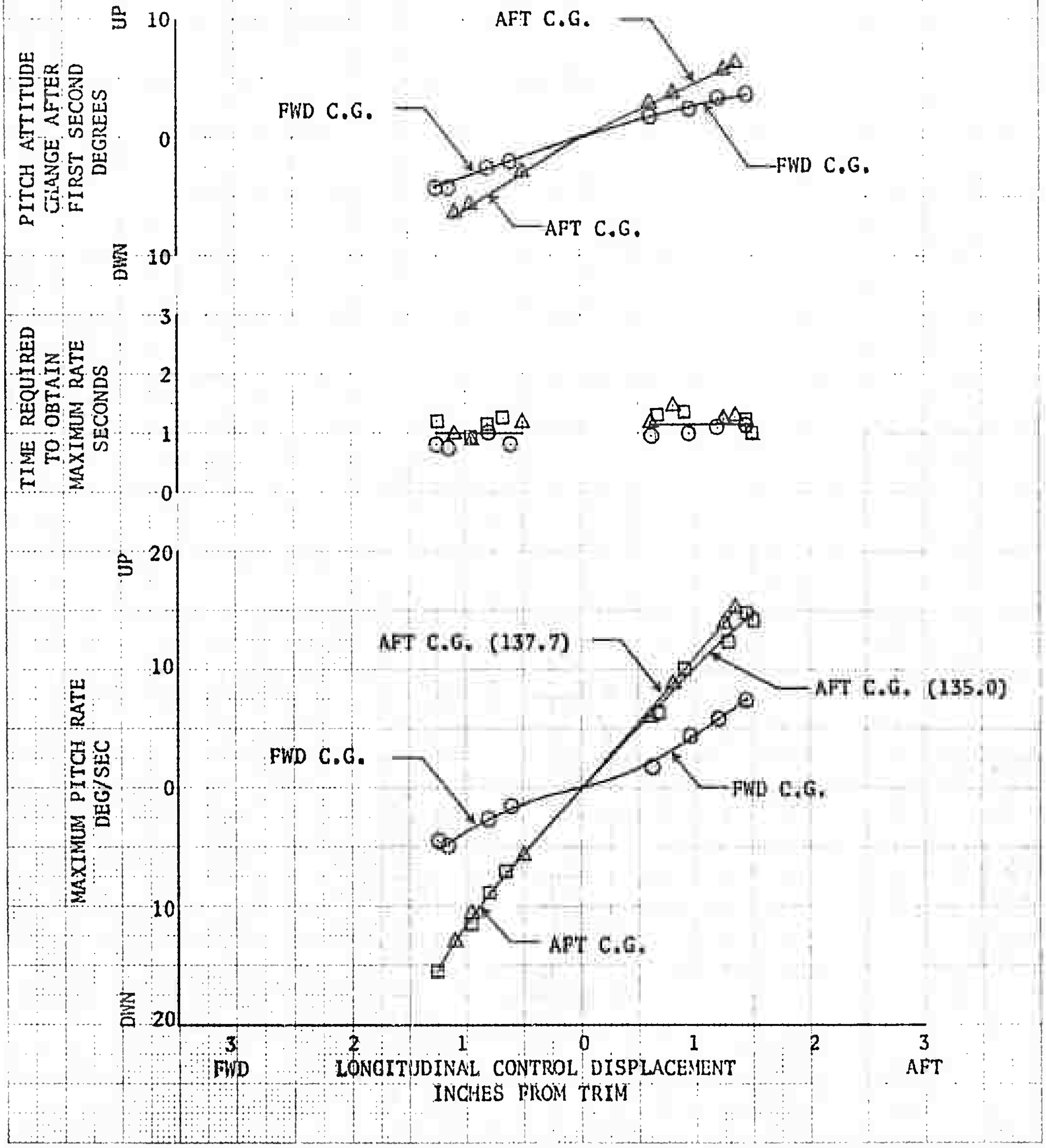


FIGURE NO. 133
LONGITUDINAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
	HOVER	7800	125.5(FWD)	2120	324

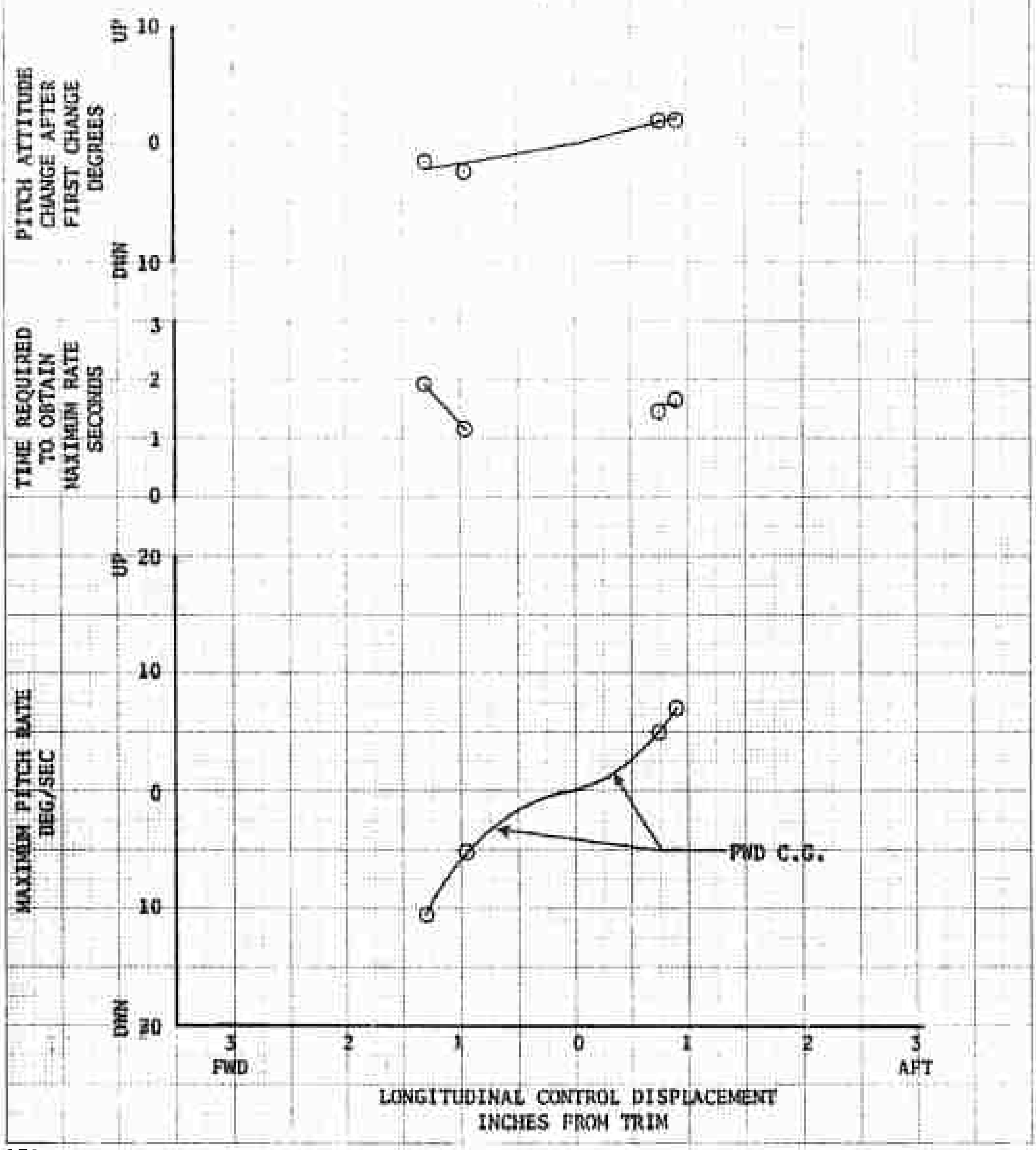


FIGURE NO. 134
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	8220	125.8(FWD)	5000	324
□	35	8275	133.8(AFT)	5000	324

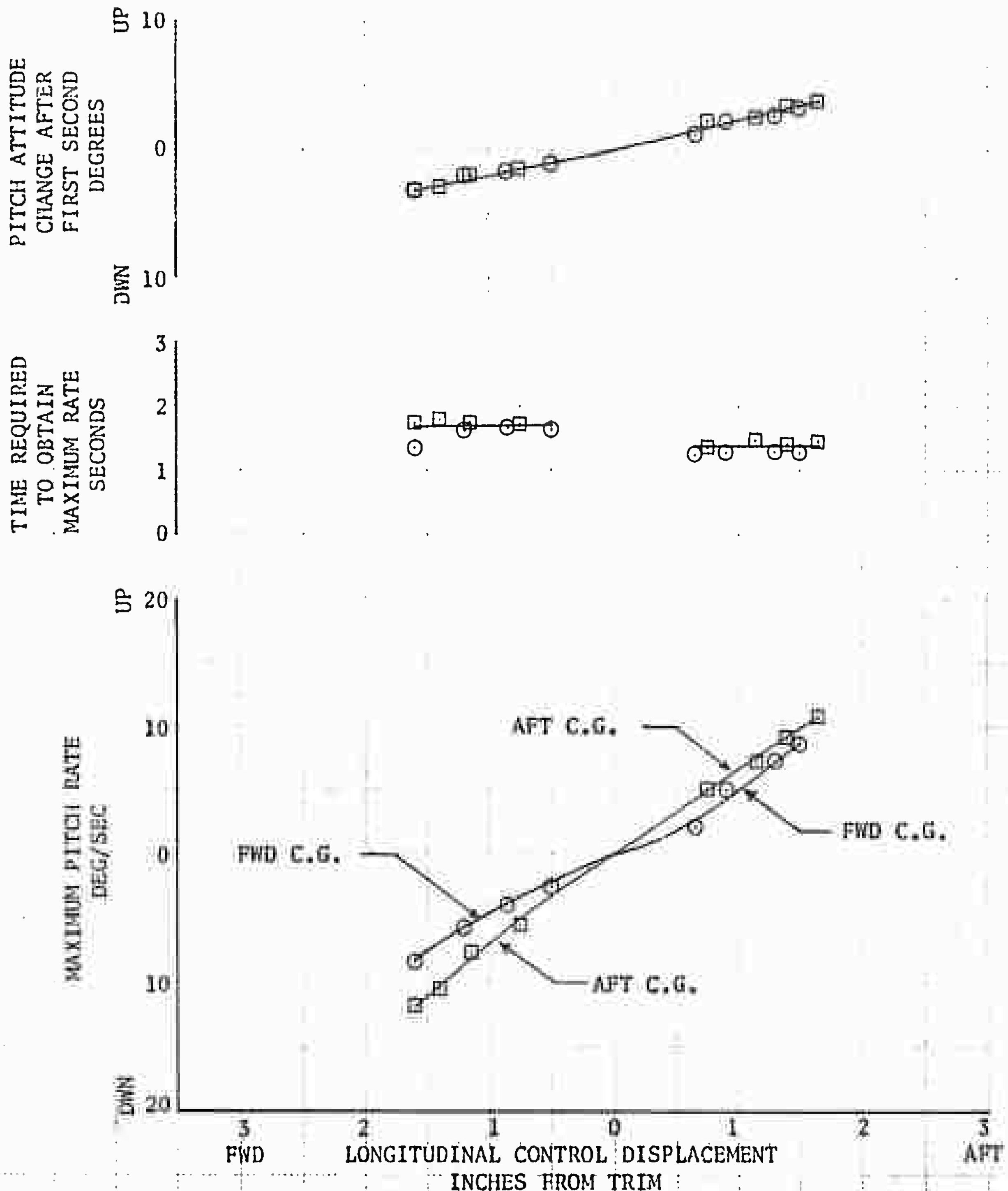


FIGURE NO. 135
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8220	125.8(FWD)	5000	324
□	92	8275	133.8(AFT)	5000	324

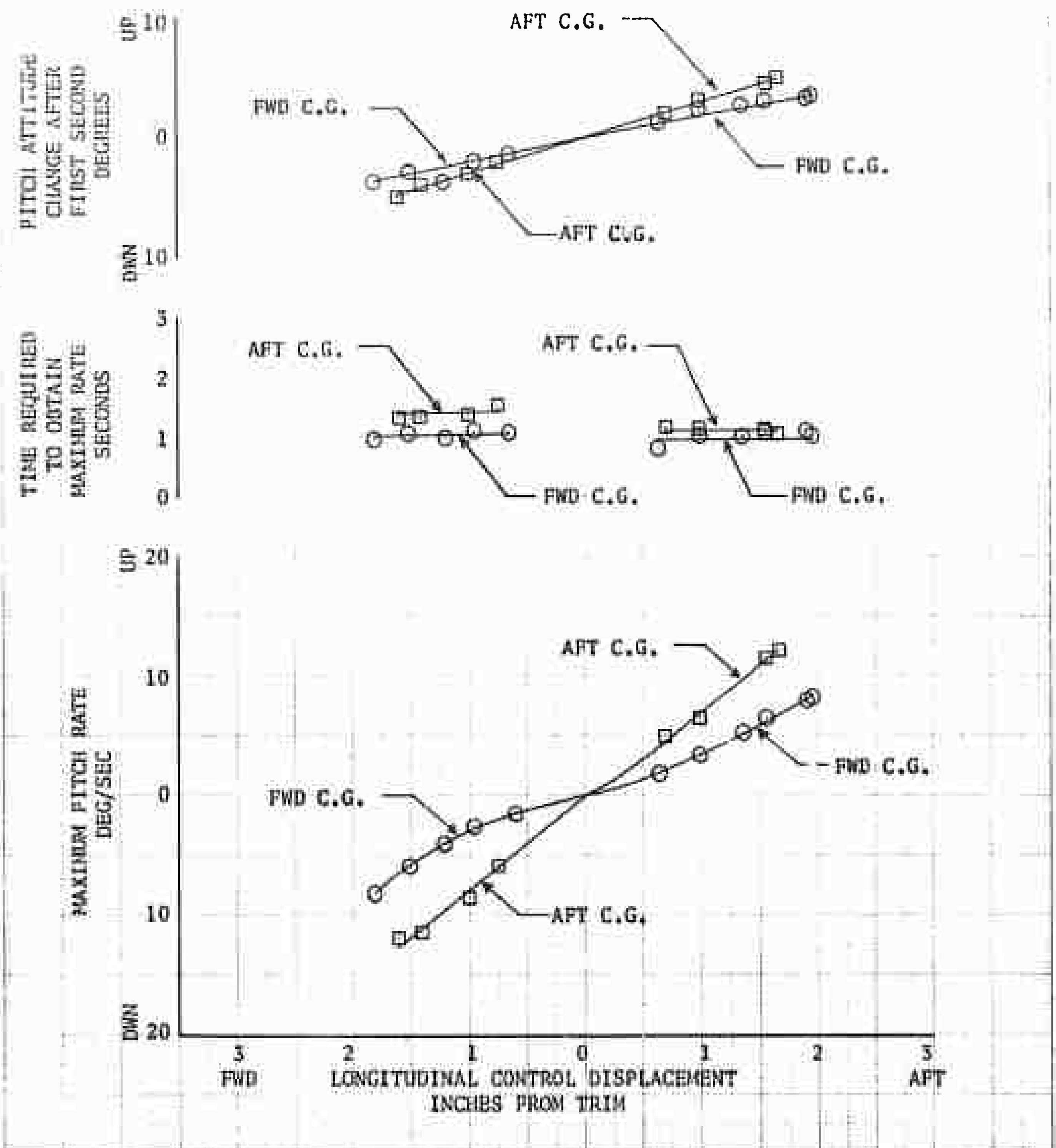


FIGURE NO. 136
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
O	112	8220	125.8(FWD)	5000	324
□	113	8275	133.8(AFT)	5000	324

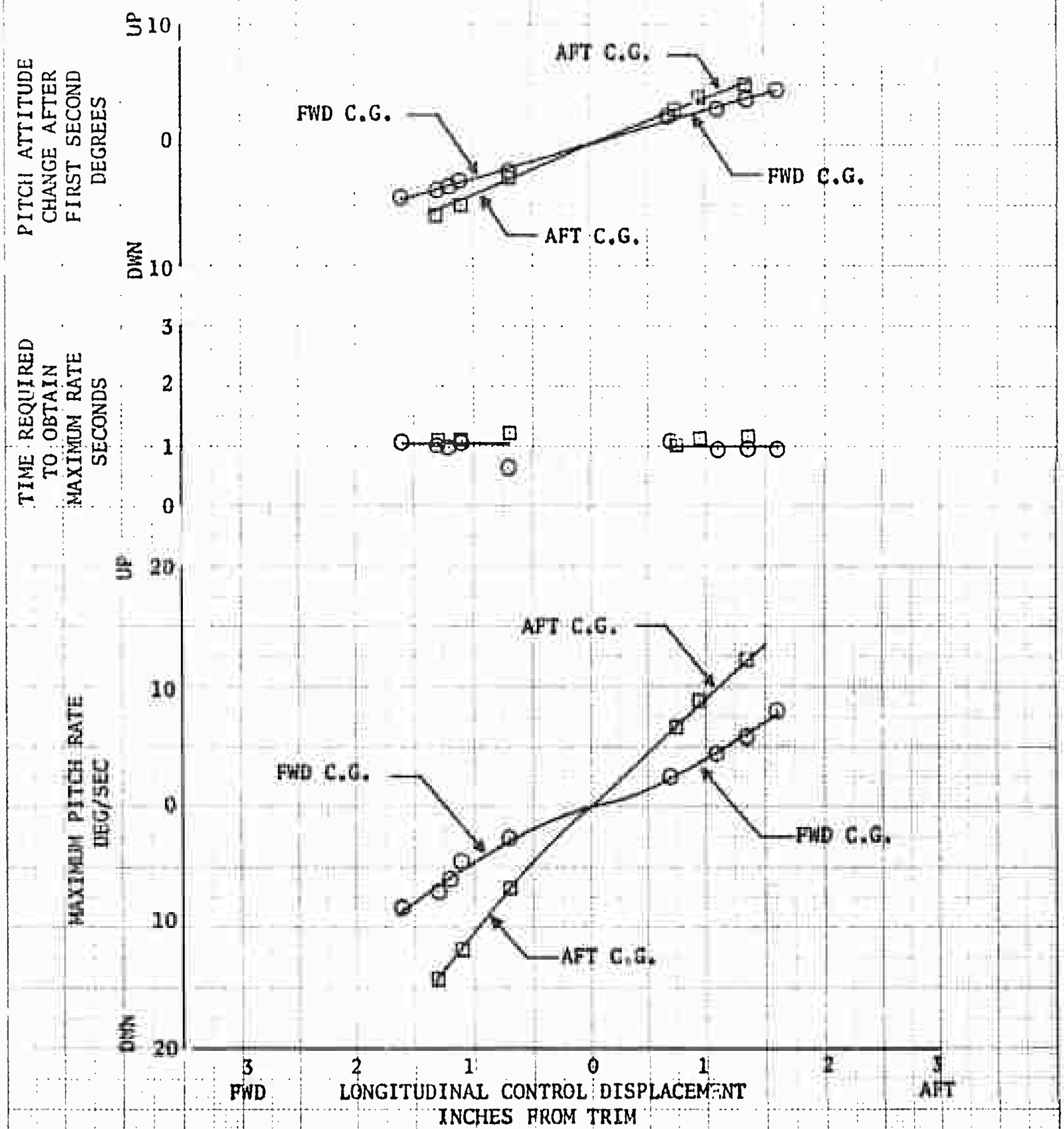


FIGURE NO. 137
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9195	126.3(FWD)	5000	324
□	35	9230	131.8(AFT)	5000	324

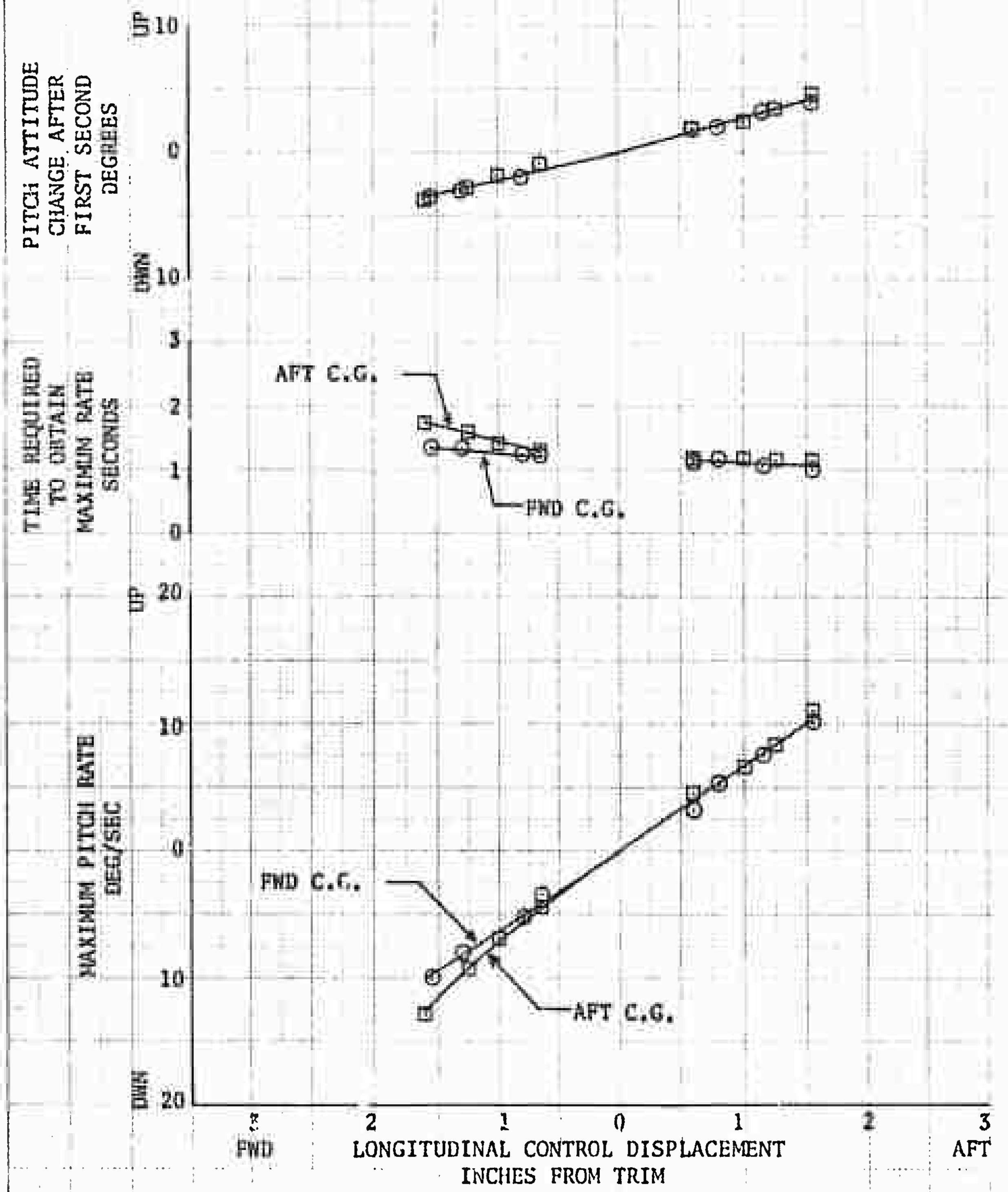


FIGURE NO. 138
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	88	9195	126.3(FWD)	5000	324
□	88	9230	131.8(AFT)	5000	324

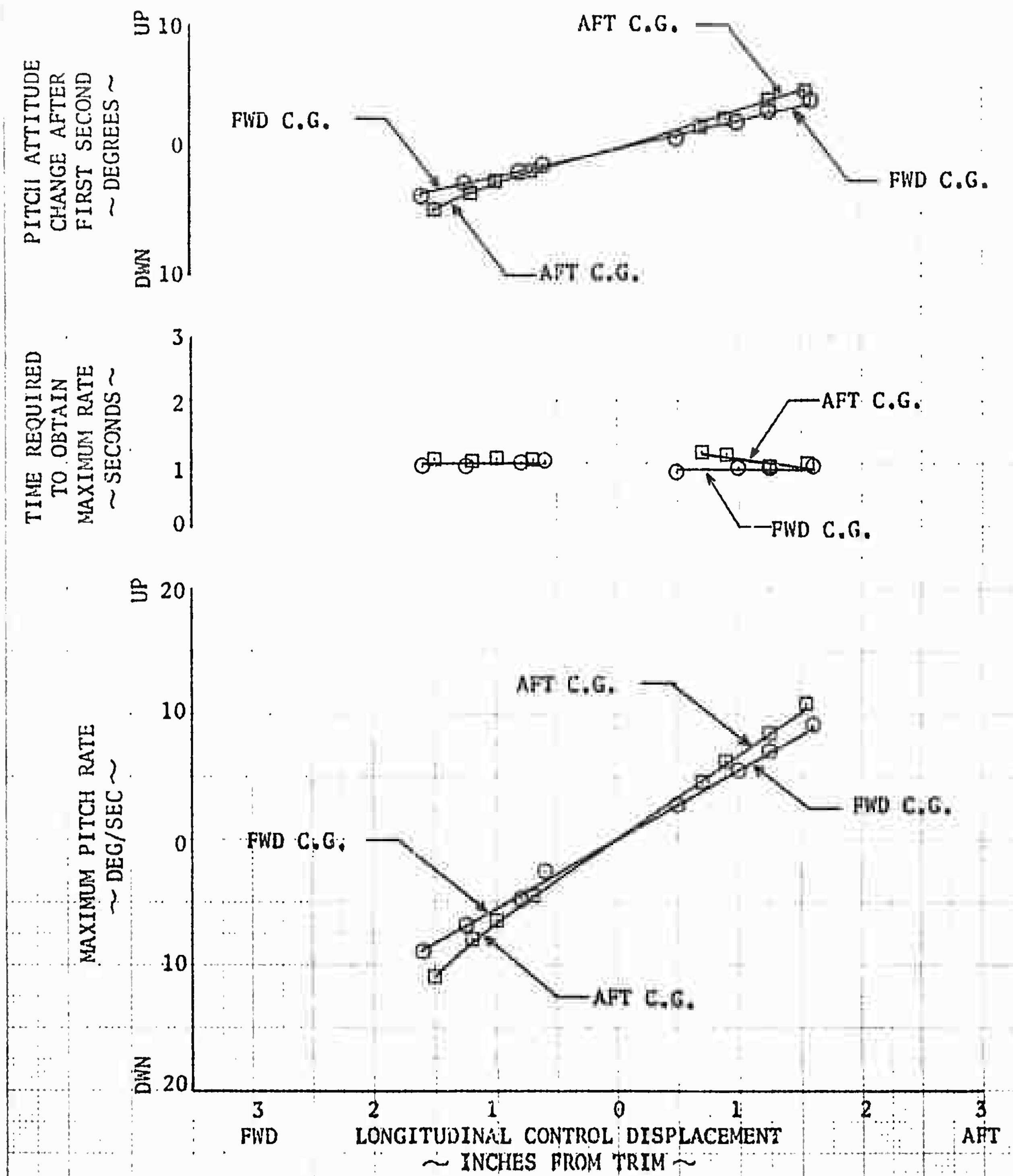


FIGURE NO. 139
LONGITUDINAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9195	126.3(FWD)	5000	324
□	108	9230	131.8(AFT)	5000	324

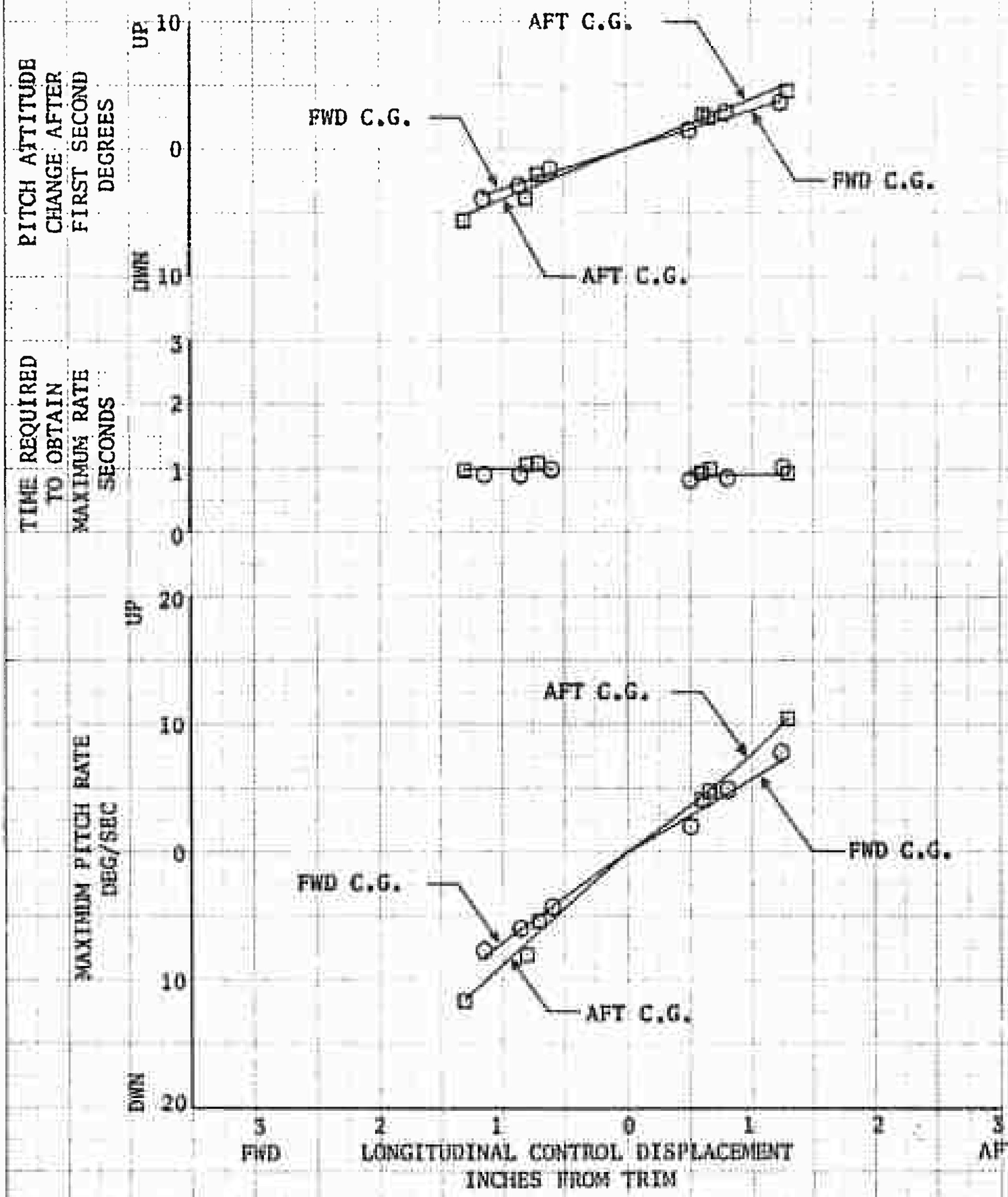


FIGURE NO. 140
LONGITUDINAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
□	52	6715	135.0(AFT)	5000	324

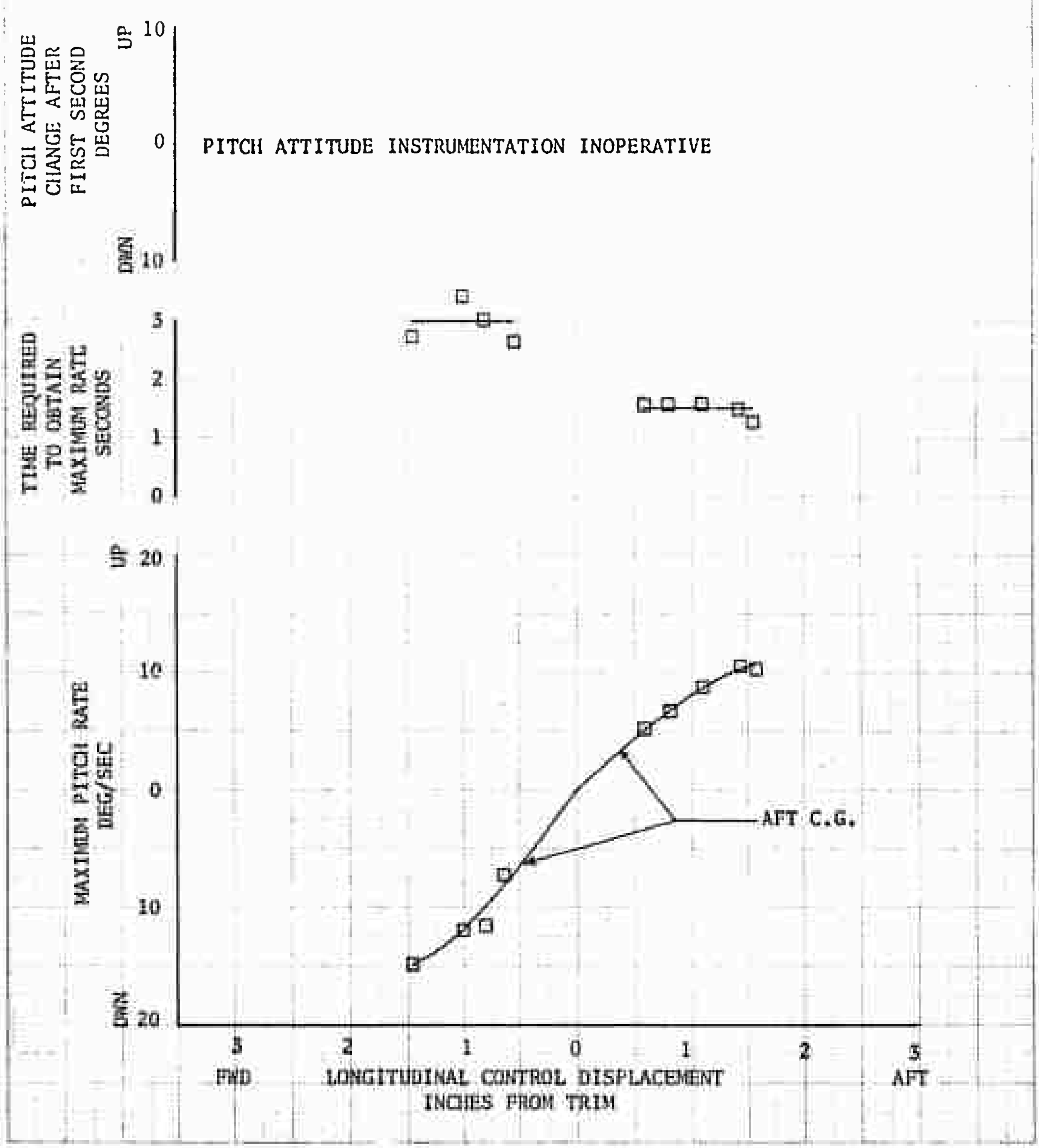


FIGURE NO. 141
LONGITUDINAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8220	125.8(FWD)	5000	324
□	57	8275	133.8(AFT)	5000	324

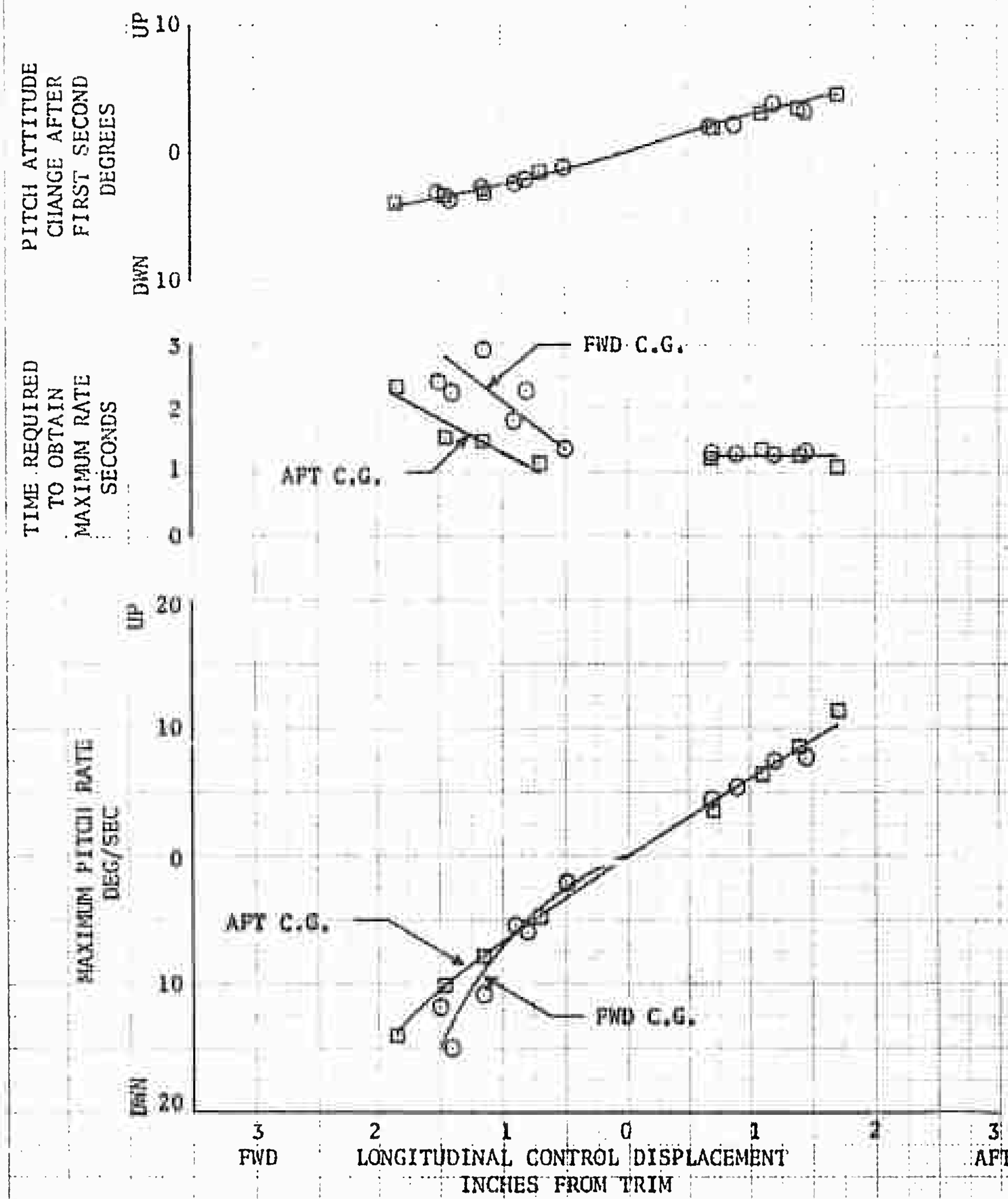


FIGURE NO. 142
LONGITUDINAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9195	126.3(FWD)	5000	324
□	57	9230	131.8(AFT)	5000	324

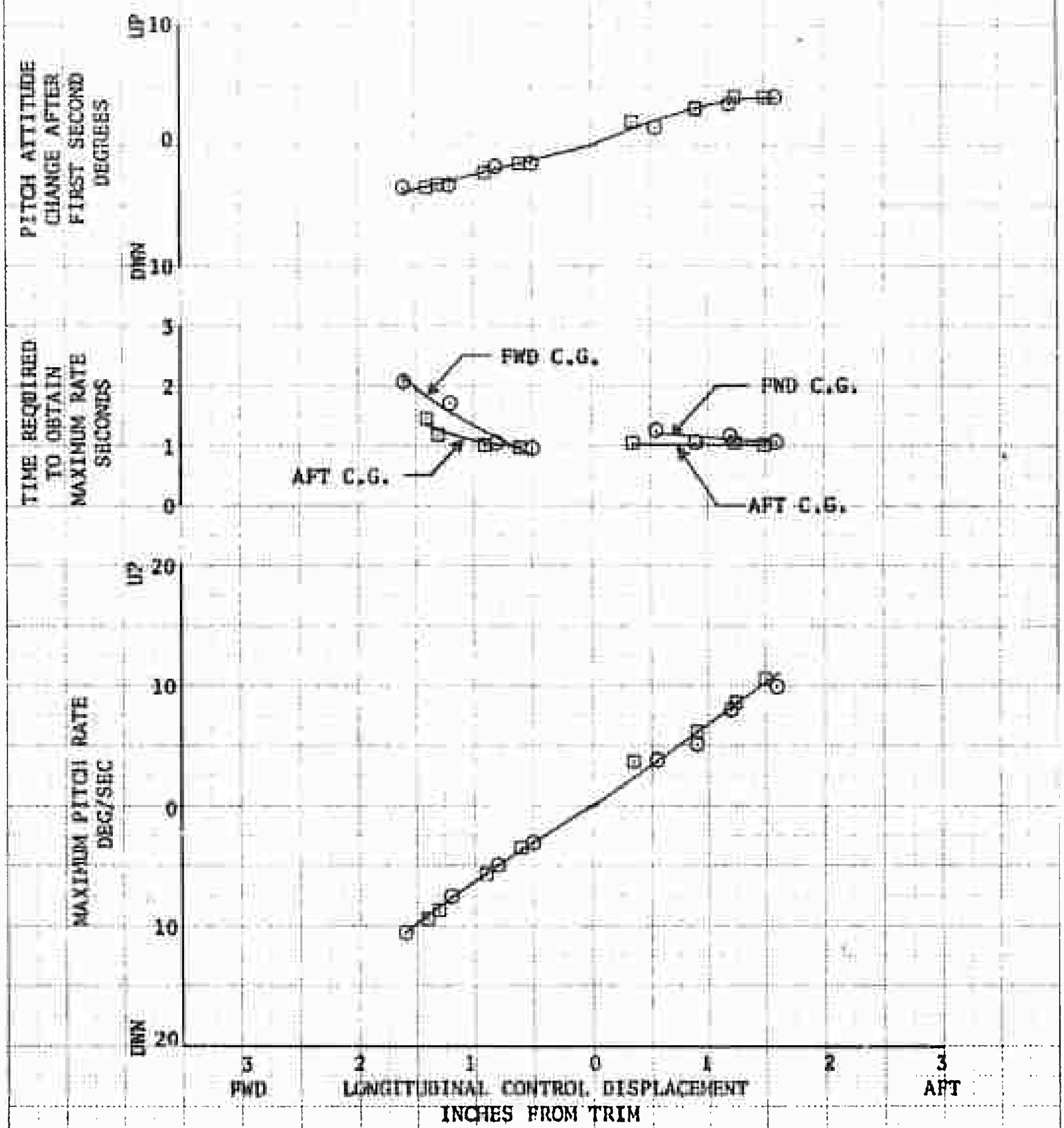


FIGURE NO. 143
LONGITUDINAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
□	60	6715	135.0(AFT)	5000	324
■	104	6715	135.0(AFT)	5000	324

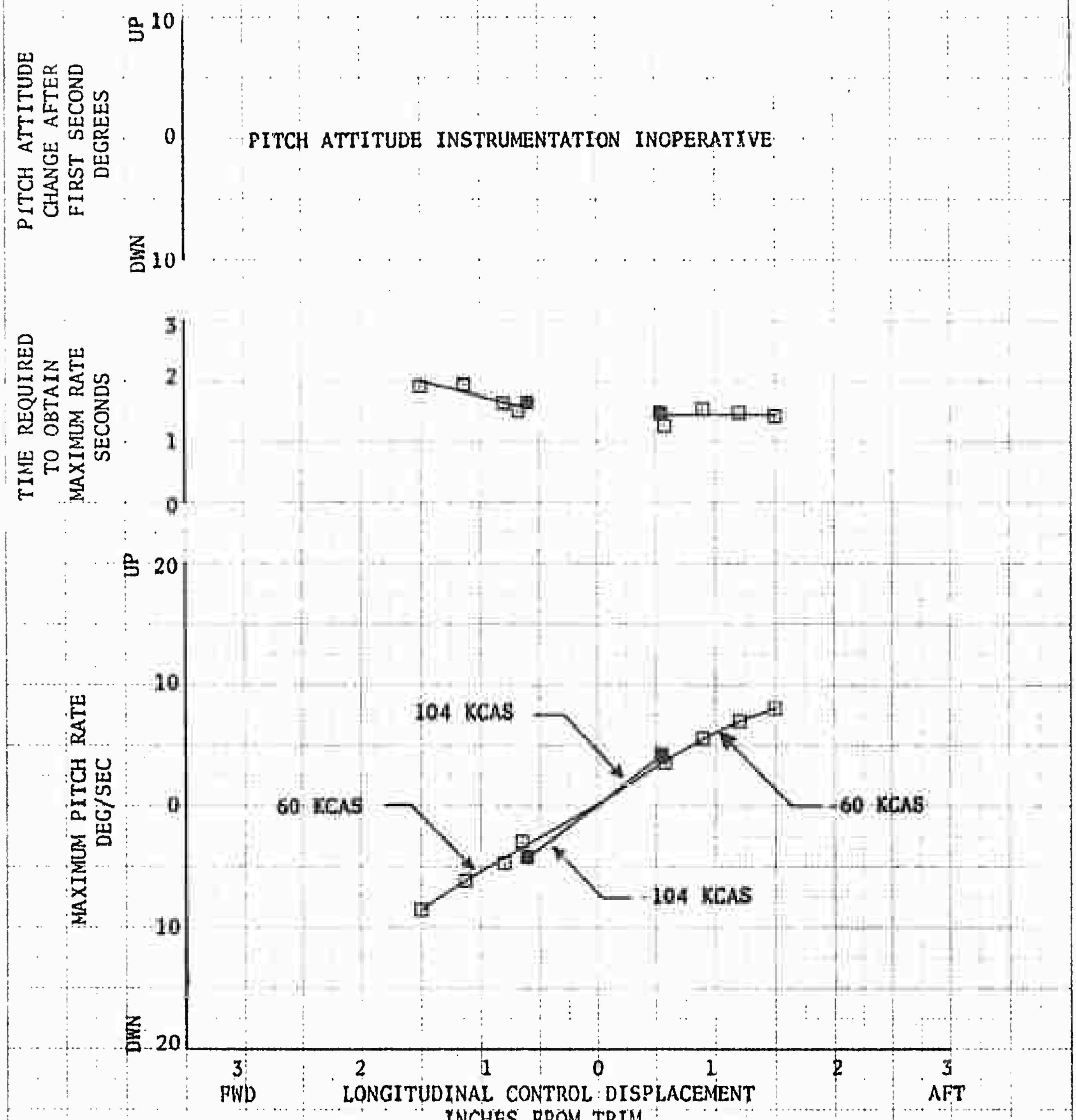


FIGURE NO. 144
LONGITUDINAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
O	60	8220	125.8(FWD)	5000	324
□	60	8275	133.8(AFT)	5000	324

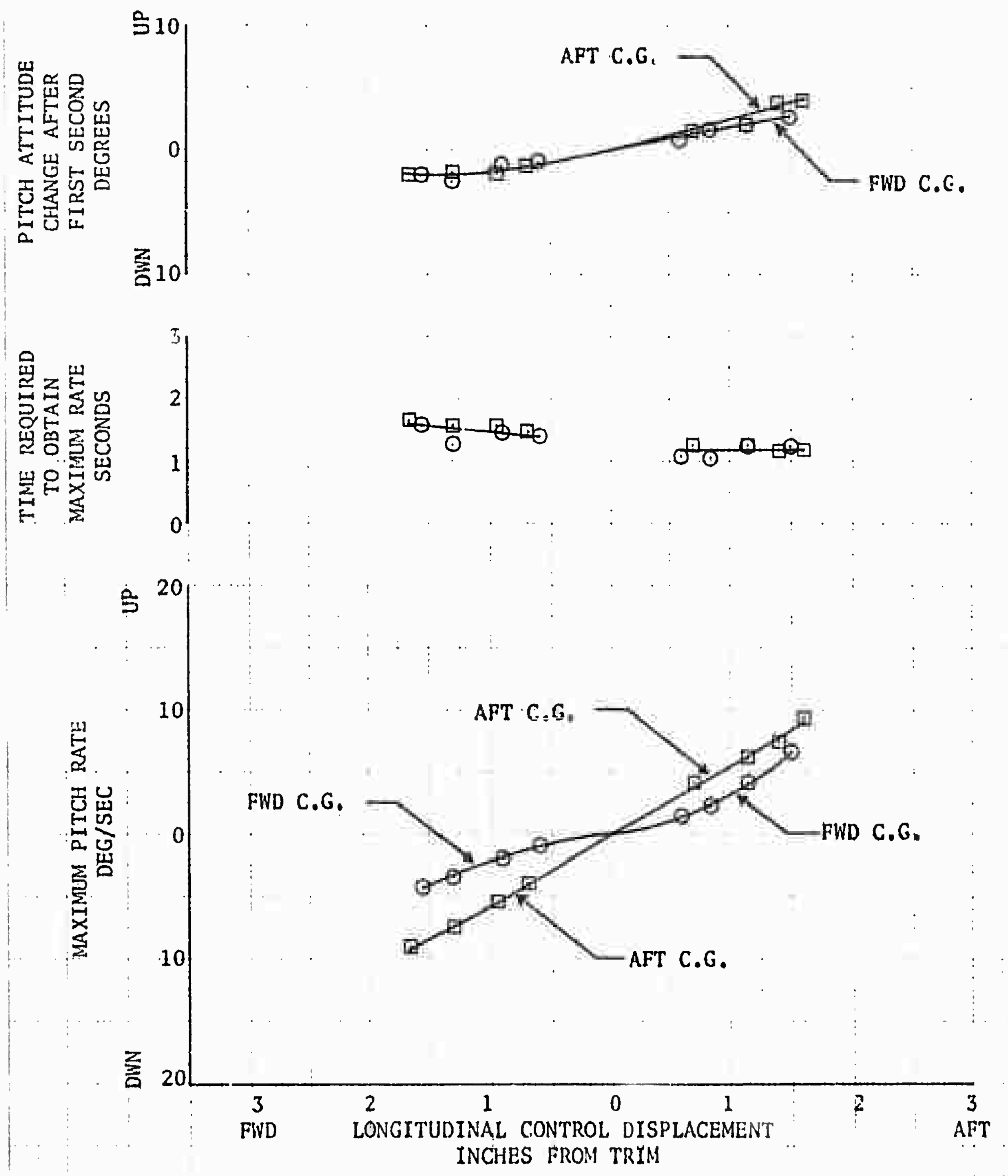


FIGURE NO. 145
LONGITUDINAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9195	126.3(FWD)	5000	324
□	60	9230	131.8(AFT)	5000	324

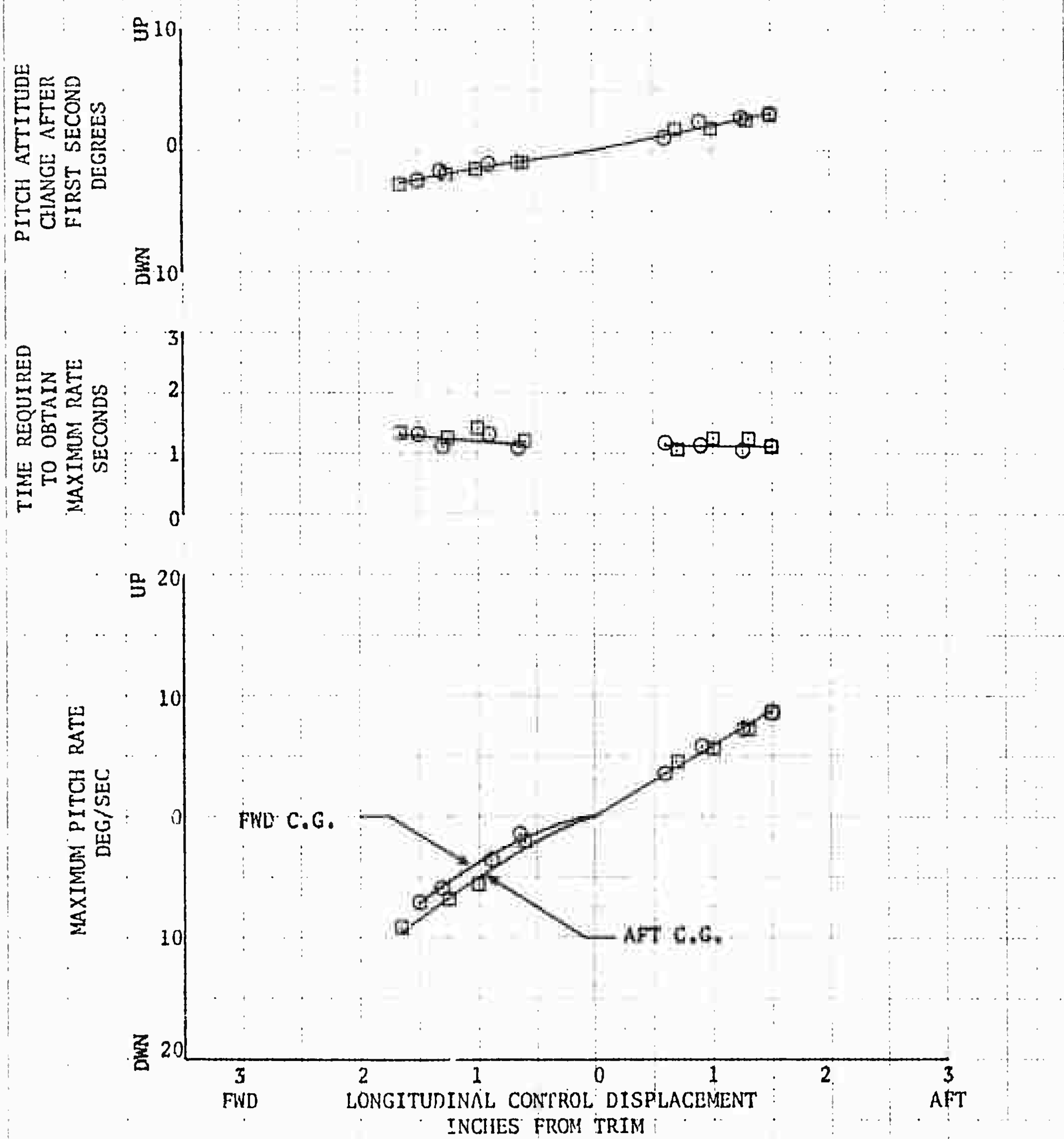


FIGURE NO. 146
REACTION TO A FORWARD LONGITUDINAL STEP
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

C.G. STATION INCHES	GROSS WEIGHT LBS	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
137.7 (AFT)	8220	5000	324	118

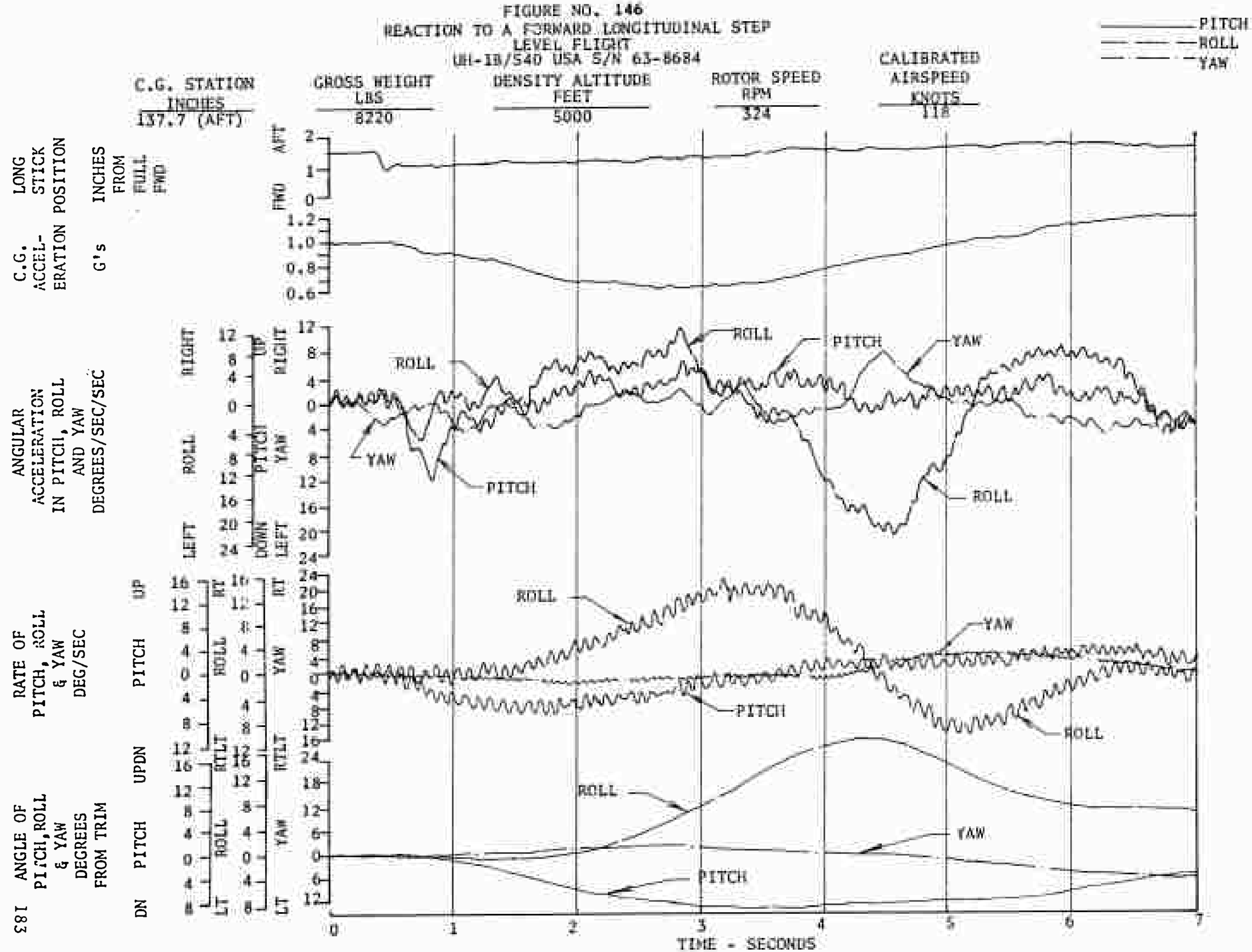


FIGURE NO. 147
LATERAL CONTROL SENSITIVITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
◇	6360	128.0(FWD)	2040	324	147 A
○	6825	126.1(FWD)	5000	324	147 A
□	6800	134.9(AFT)	5000	324	147 A
△	7800	125.5(FWD)	2120	324	147 B
◺	8250	125.8(FWD)	5000	324	147 B
⬭	8250	128.5(FWD)	2040	324	147 B
☆	8200	134.0(AFT)	5000	324	147 B
△	9255	126.4(FWD)	5000	324	147 C
⬡	9245	131.8(AFT)	5000	324	147 C

NOTES:

1. CURVES DERIVED FROM FIGURES NO. 148 THROUGH 165
2. SHADED SYMBOL DENOTES ROLL LEFT.
3. HALF SHADED SYMBOL DENOTES BOTH ROLL LEFT AND ROLL RIGHT.
4. FLAGGED SYMBOL DENOTES CLIMB.
5. SLASHED SYMBOL DENOTES AUTOROTATION.

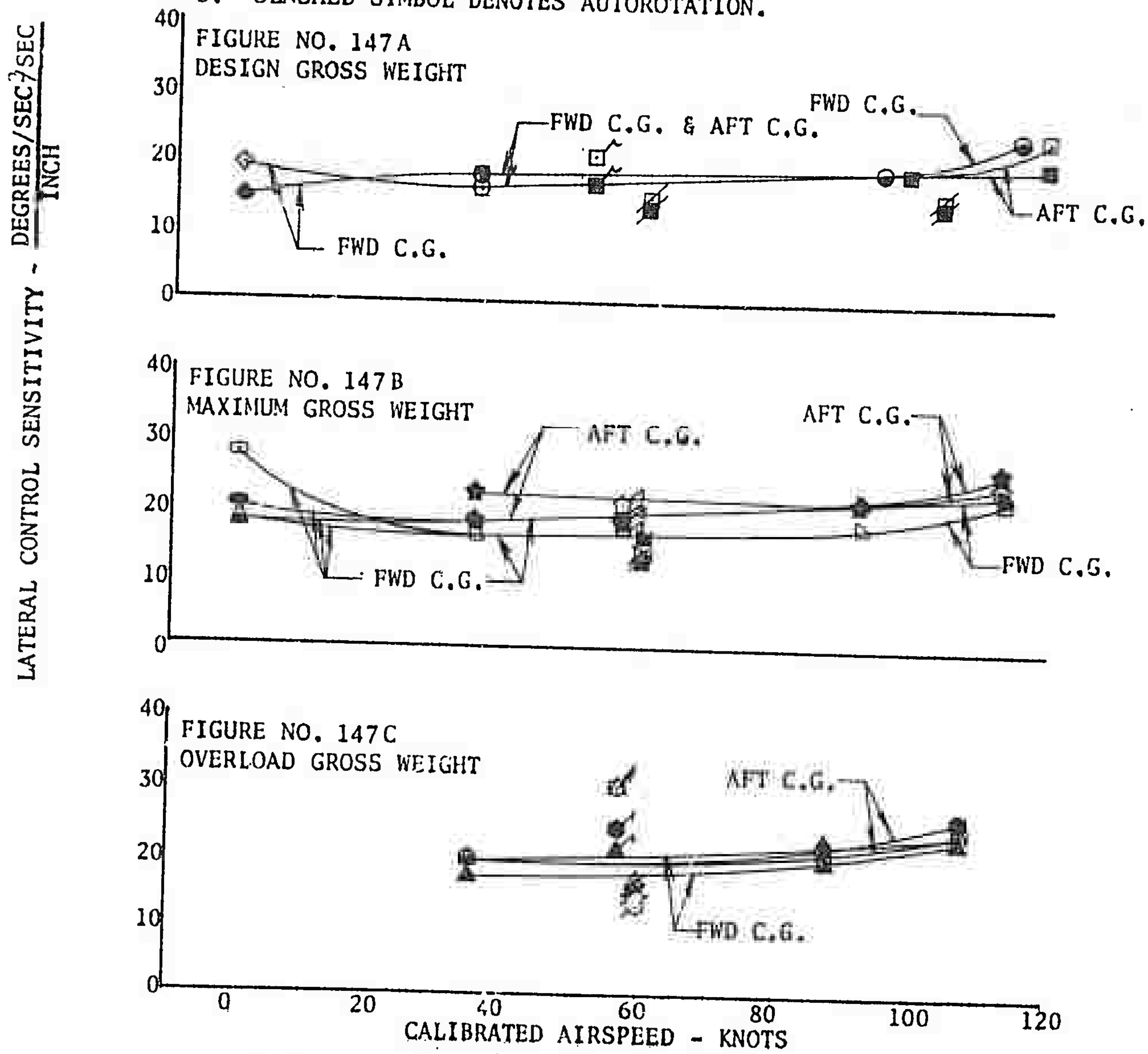


FIGURE NO. 148
LATERAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SKID HEIGHT FEET	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
5	6360	128.0(FWD)	2040	324

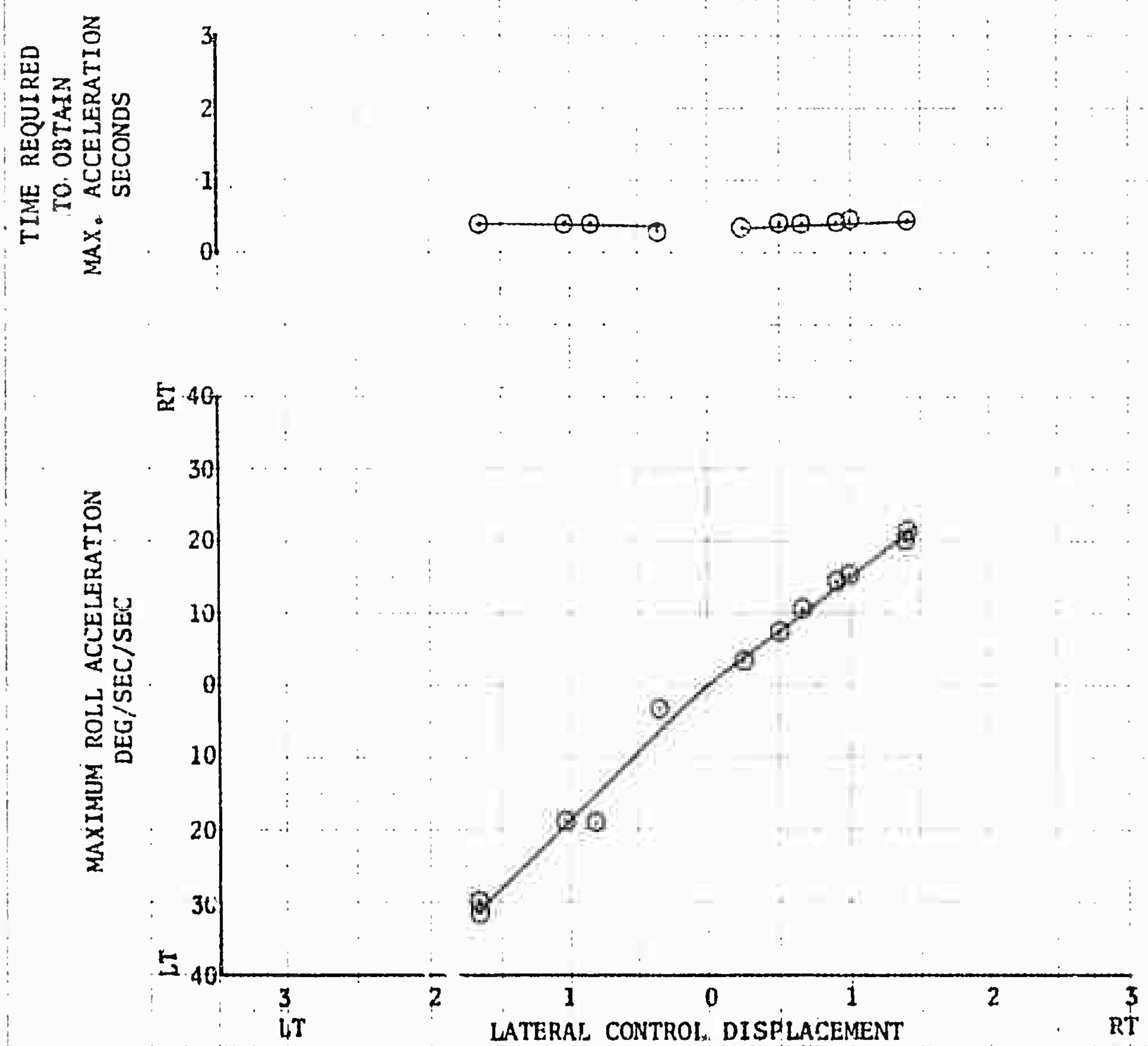


FIGURE NO. 149
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
⊙	35	6750	126.1(FWD)	5000	324
☐	35	6800	134.9(AFT)	5000	324

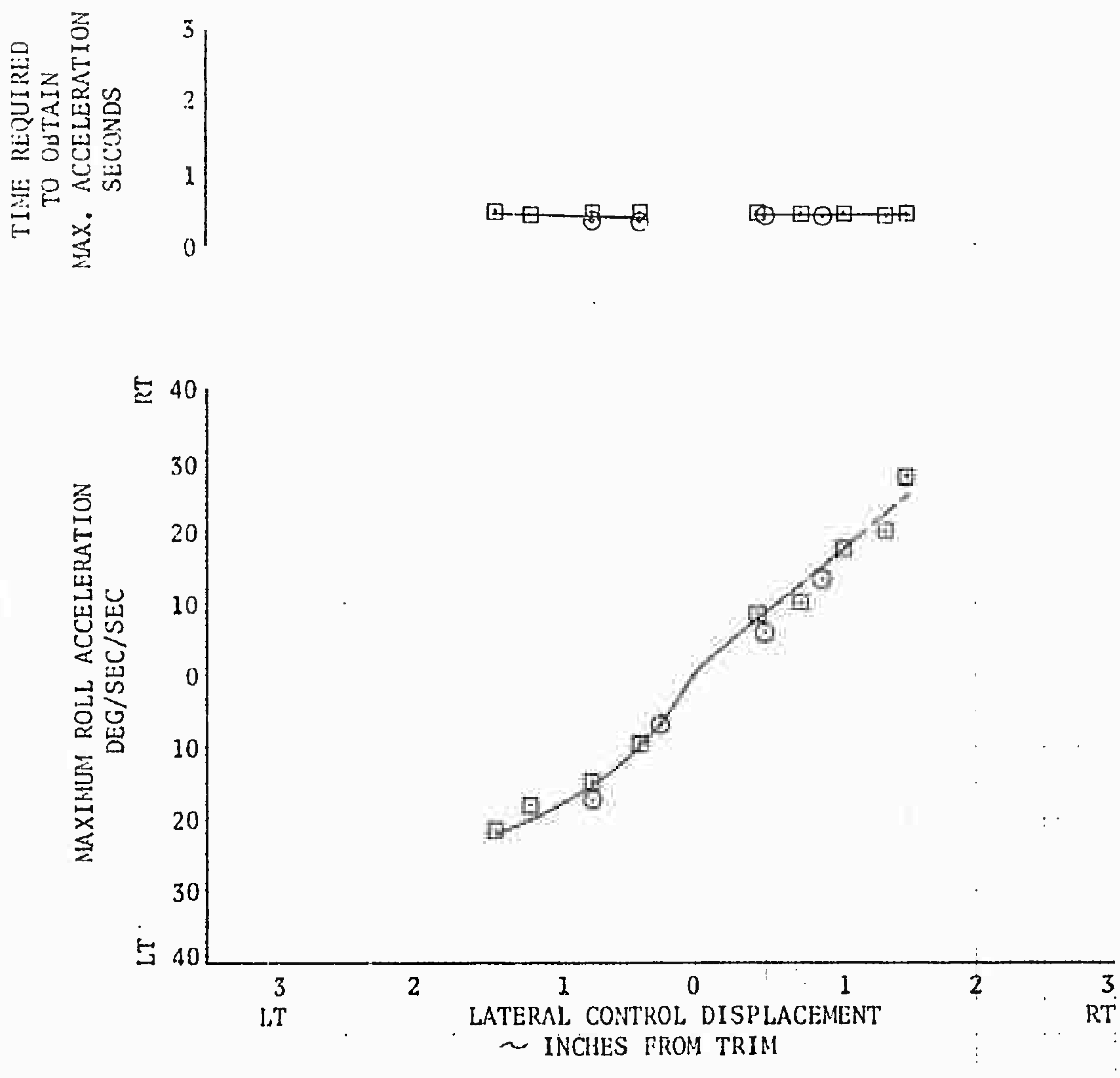


FIGURE NO. 150
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
⊙	95	6850	125.7(FWD)	5000	324
⊡	99	6800	134.9(AFT)	5000	324

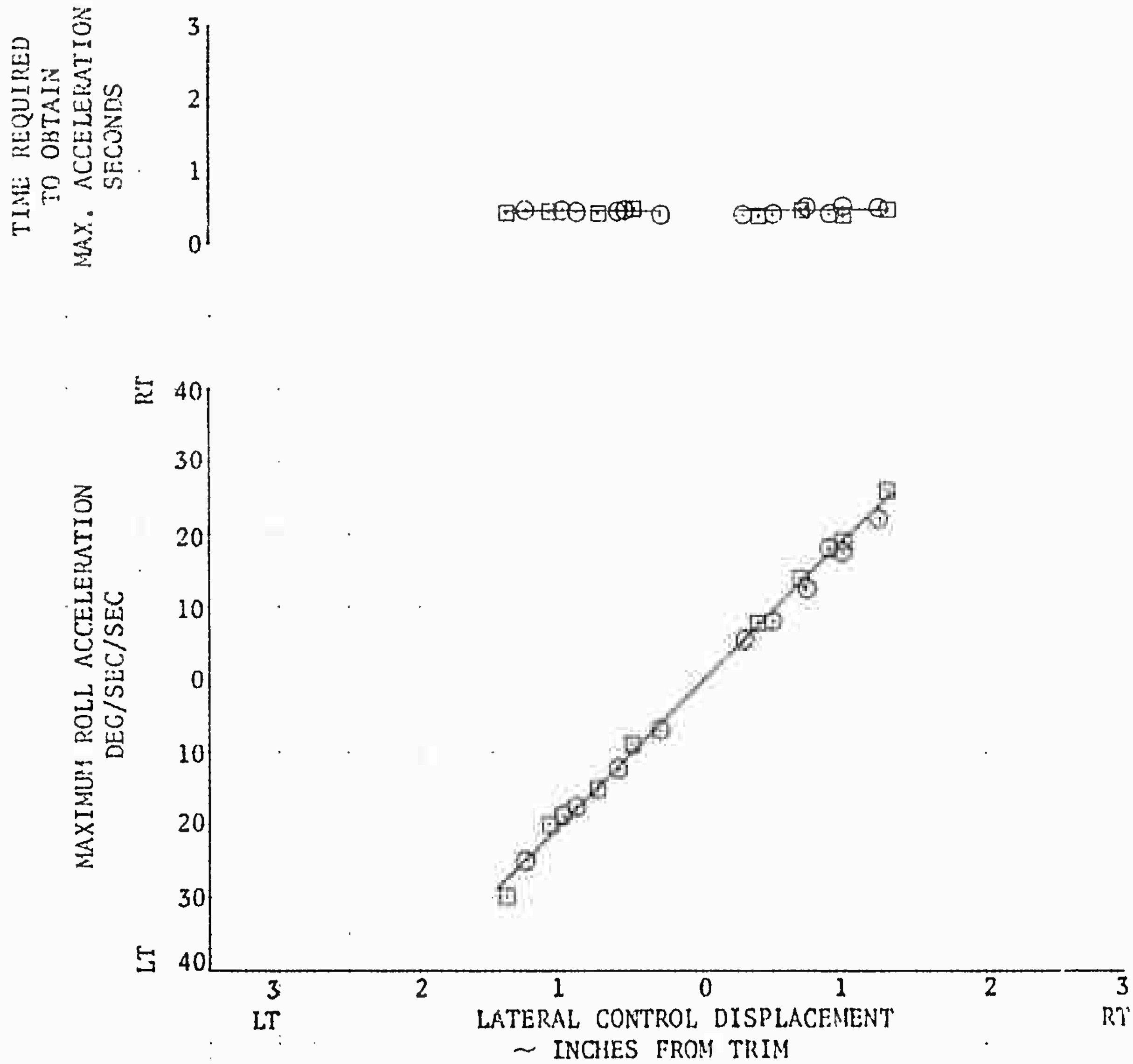


FIGURE NO. 151
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
⊙	115	6865	126.2(FWD)	5000	324
⊡	119	6800	134.9(AFT)	5000	324

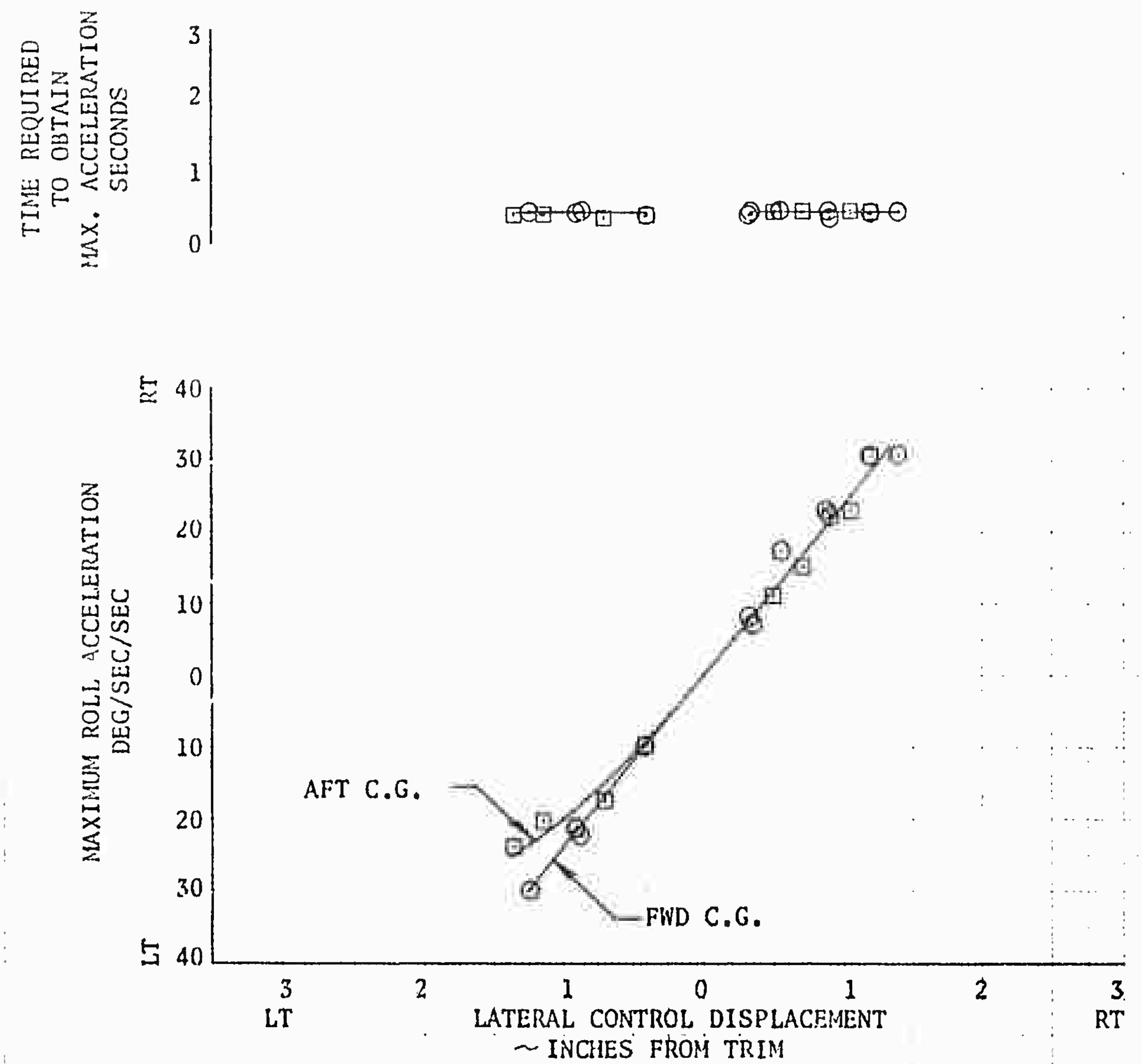


FIGURE NO. 152
LATERAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SKID HEIGHT FEET	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
5	7800	125.5(FWD)	2120	324

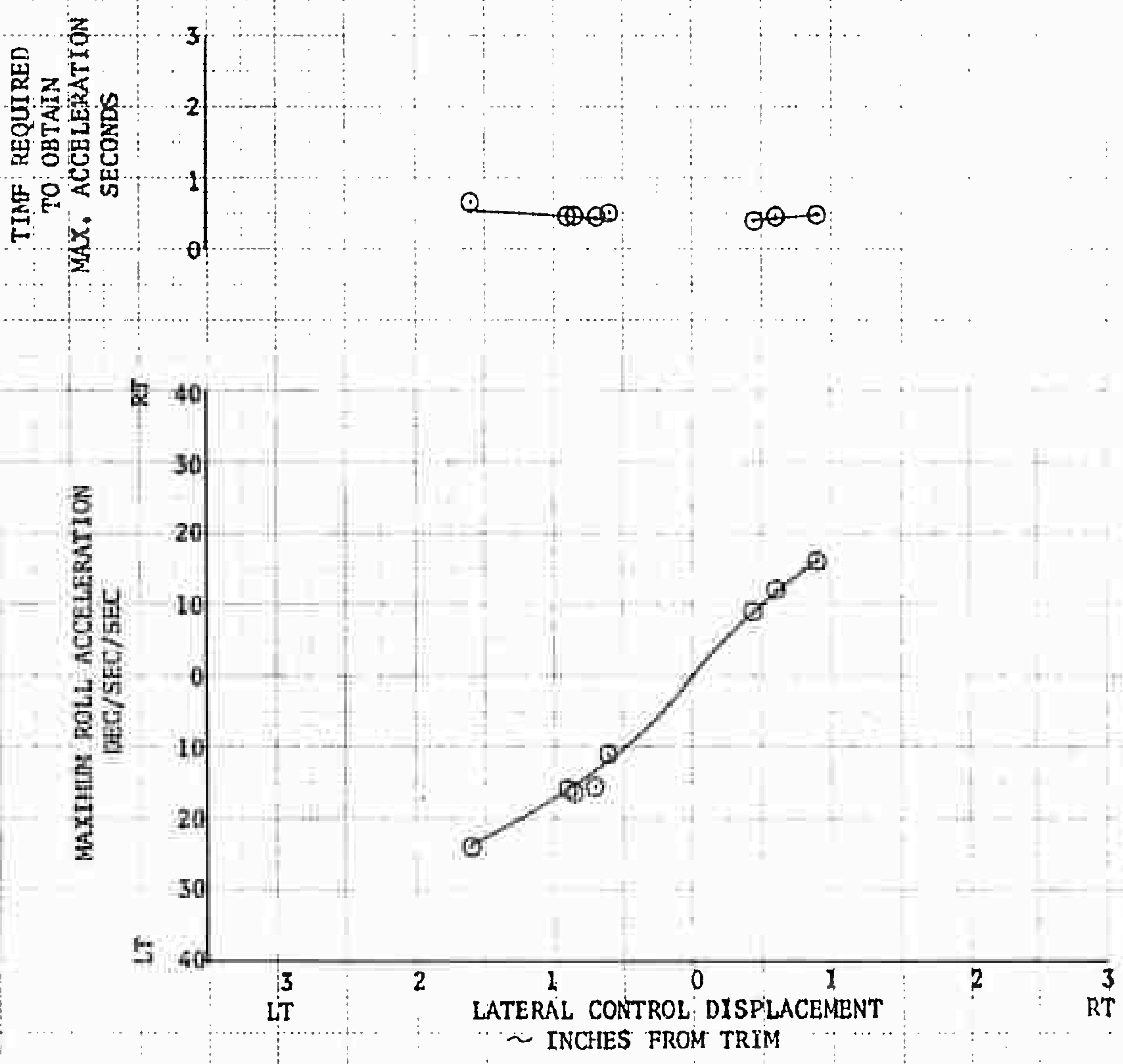


FIGURE NO. 153
LATERAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SKID HEIGHT FEET	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
5	8250	128.5(FWD)	2040	324

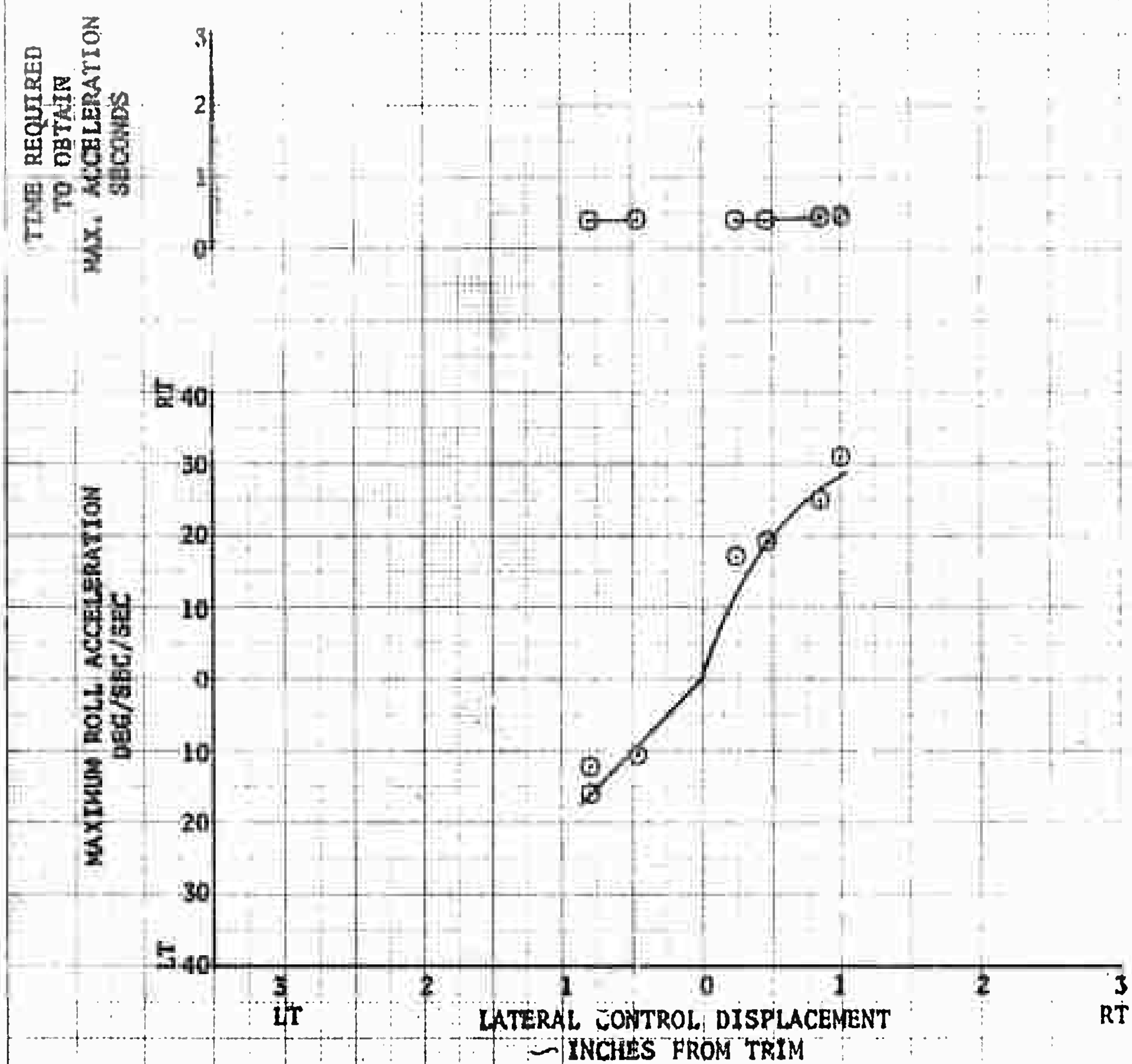


FIGURE NO. 154
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
⊙	35	8250	125.8(FWD)	5000	324
□	35	8155	134.0(AFT)	5000	324

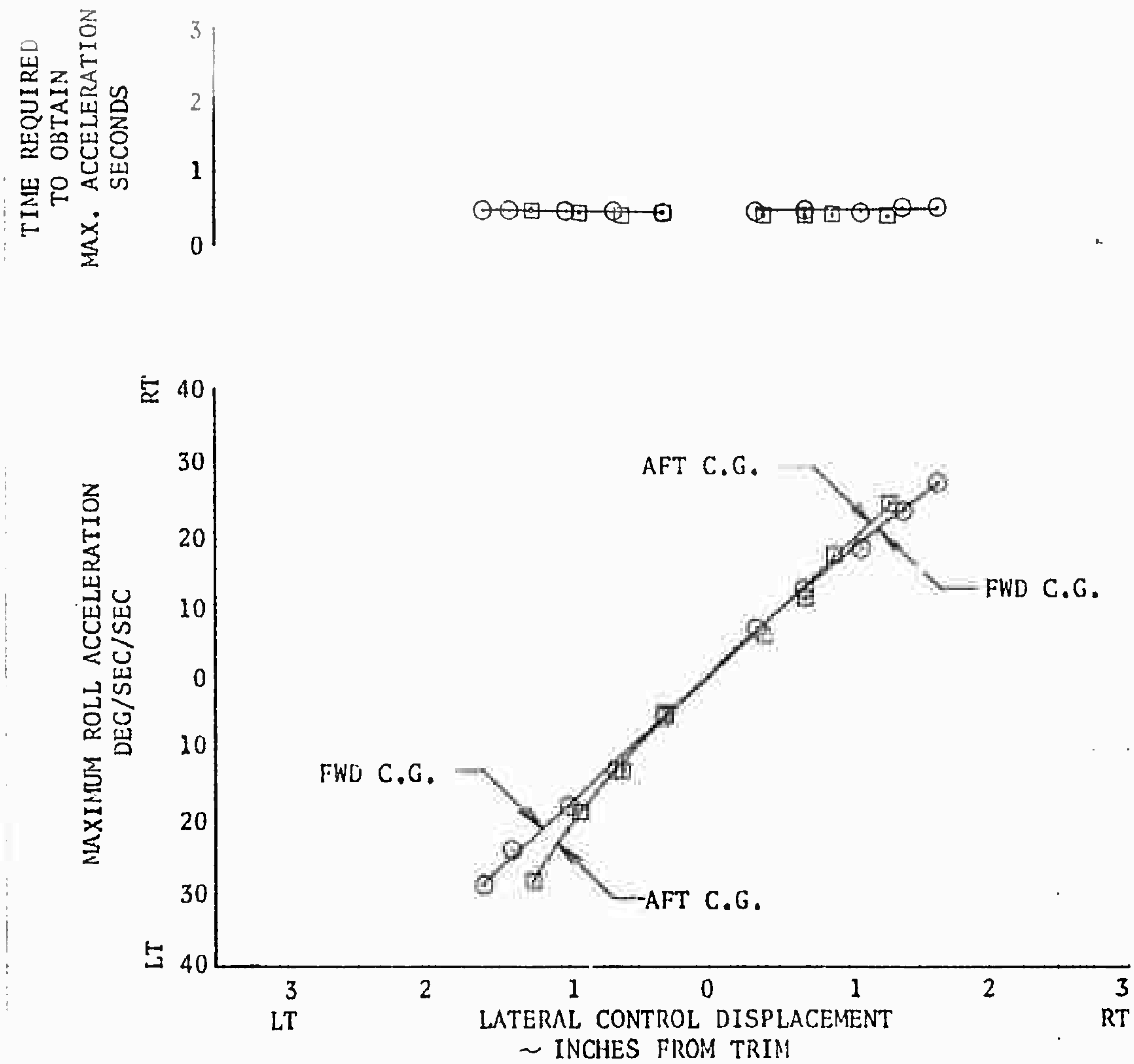


FIGURE NO. 155
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8250	125.8(FWD)	5000	324
□	92	8155	134.0(AFT)	5000	324

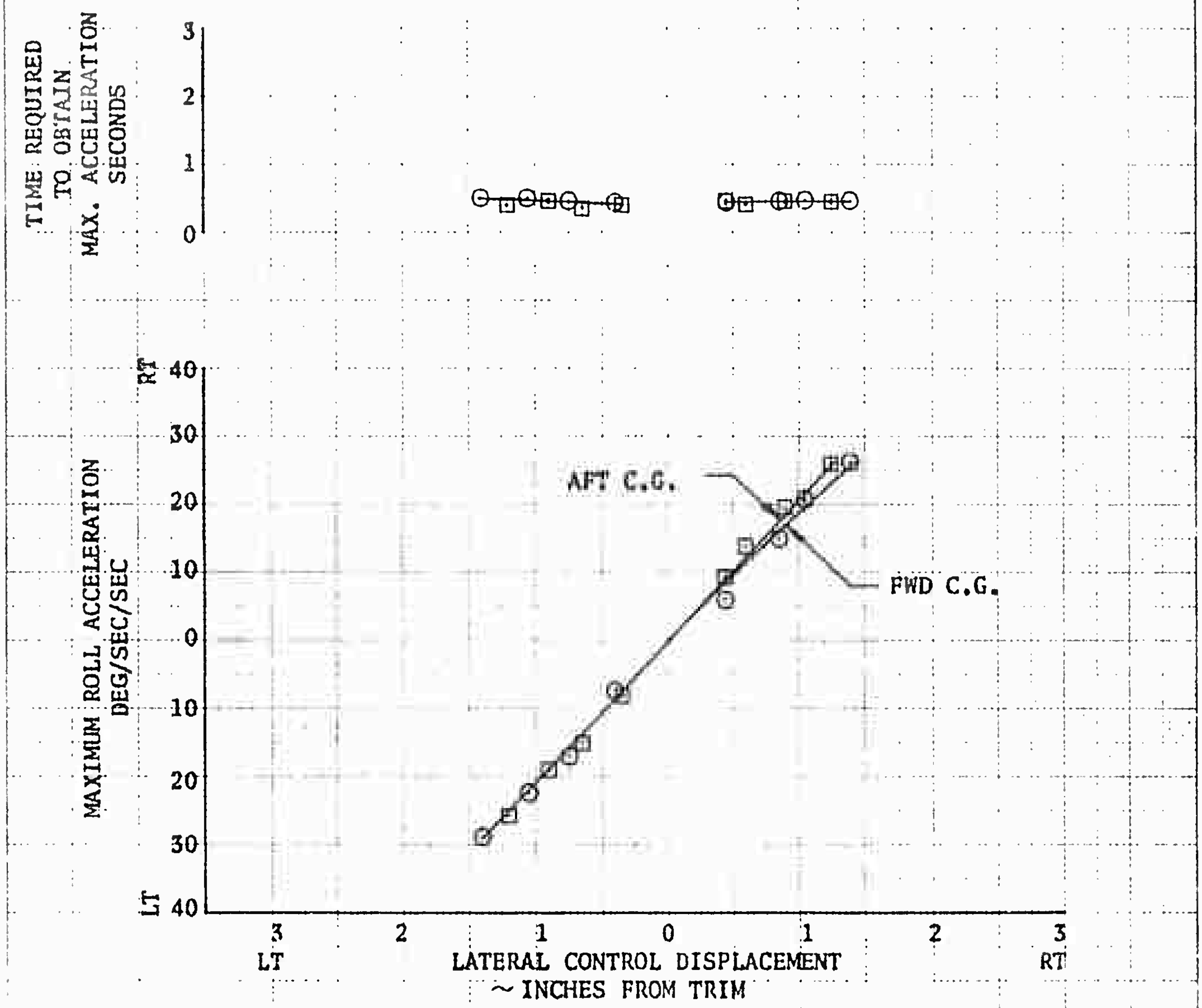


FIGURE NO. 156
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	113	8250	125.8(FWD)	5000	324
□	113	8155	134.0(AFT)	5000	324

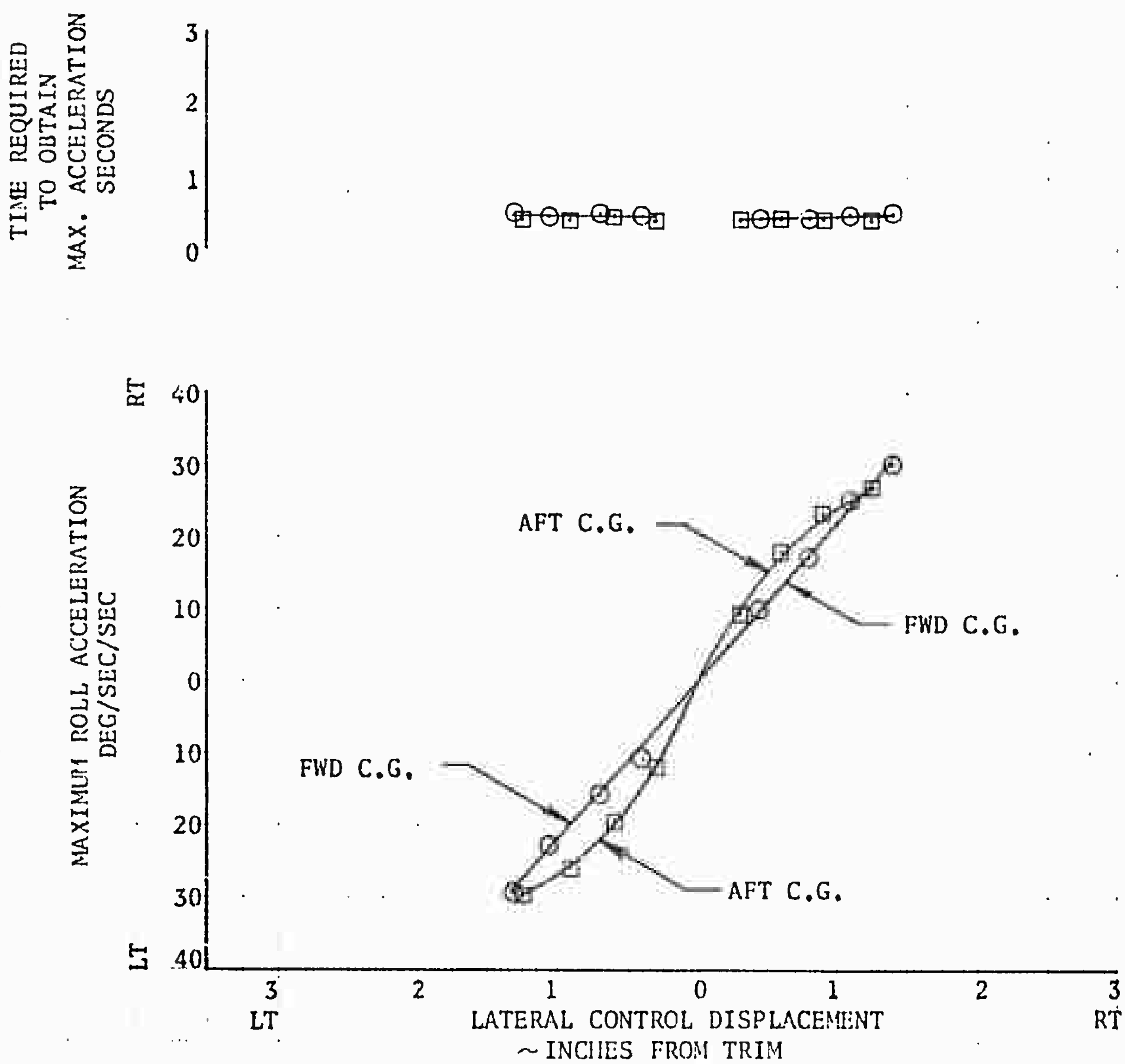


FIGURE NO. 157
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9255	126.9(FWD)	5000	324
□	35	9245	131.8(AFT)	5000	324

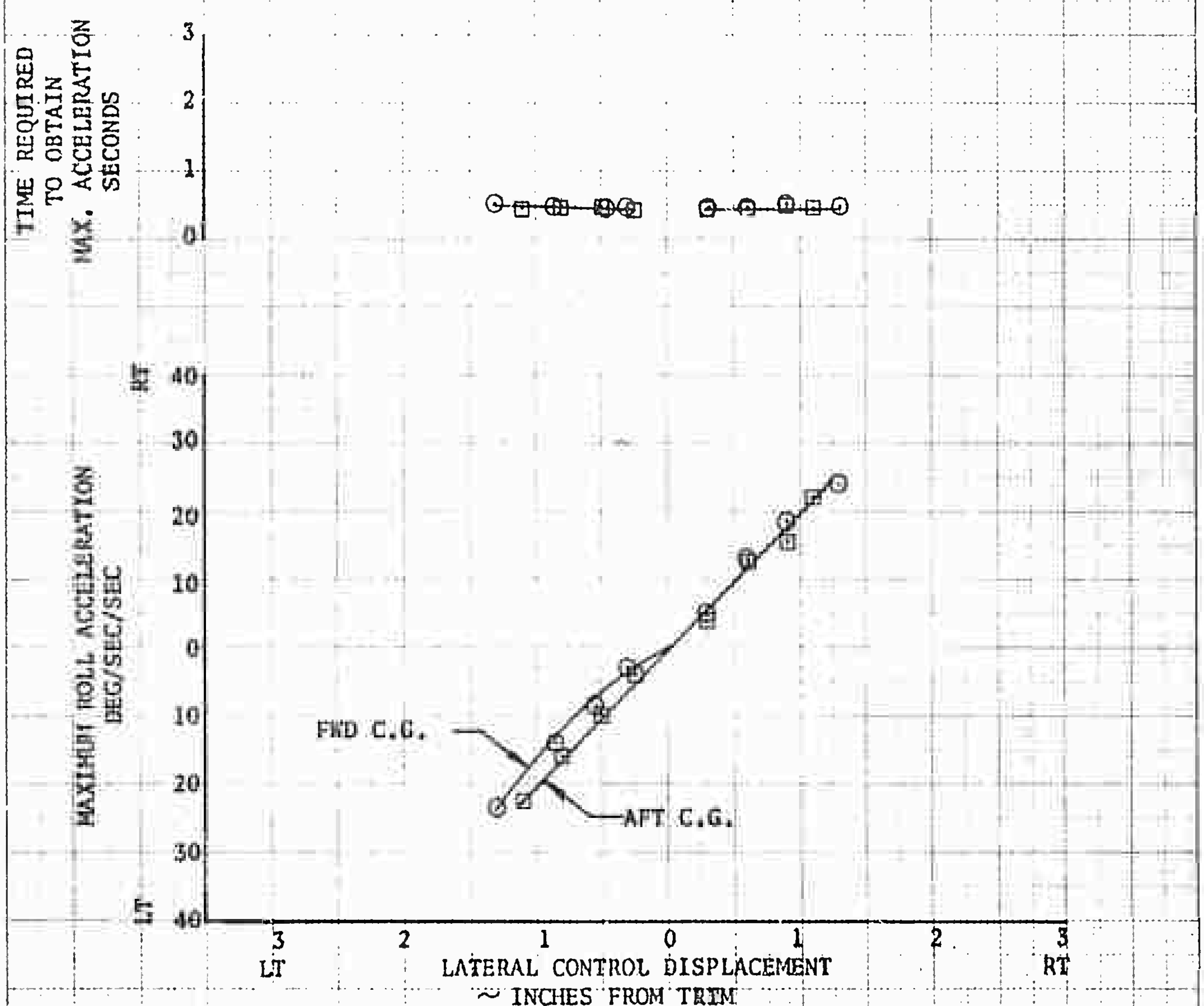


FIGURE NO. 158
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	88	9255	126.4(FWD)	5000	324
□	88	9245	131.8(AFT)	5000	324

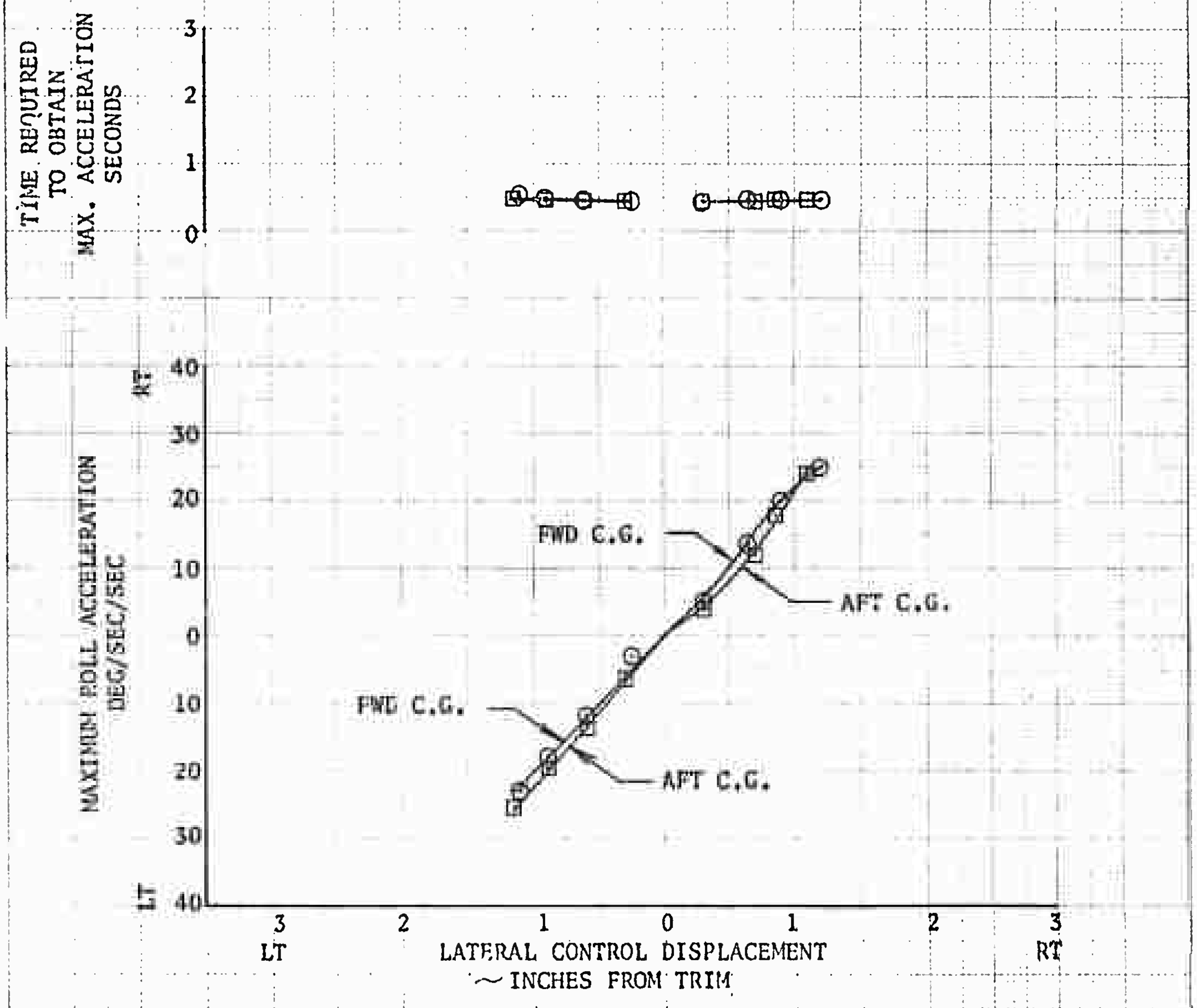


FIGURE NO. 159
LATERAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9255	126.4(FWD)	5000	324
□	108	9245	131.8(AFT)	5000	324

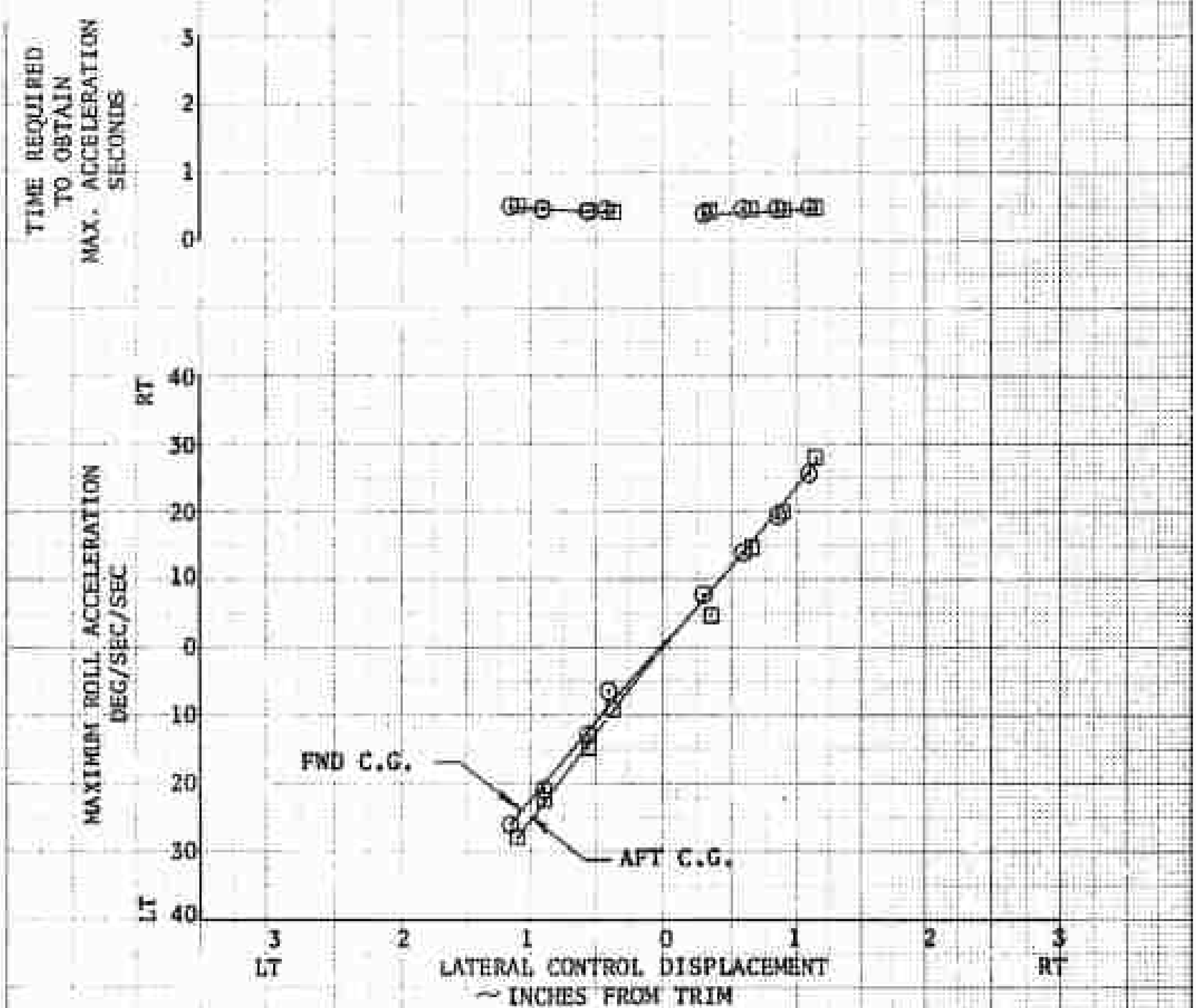


FIGURE NO. 160
LATERAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
52	6800	134.9(AFT)	5000	324

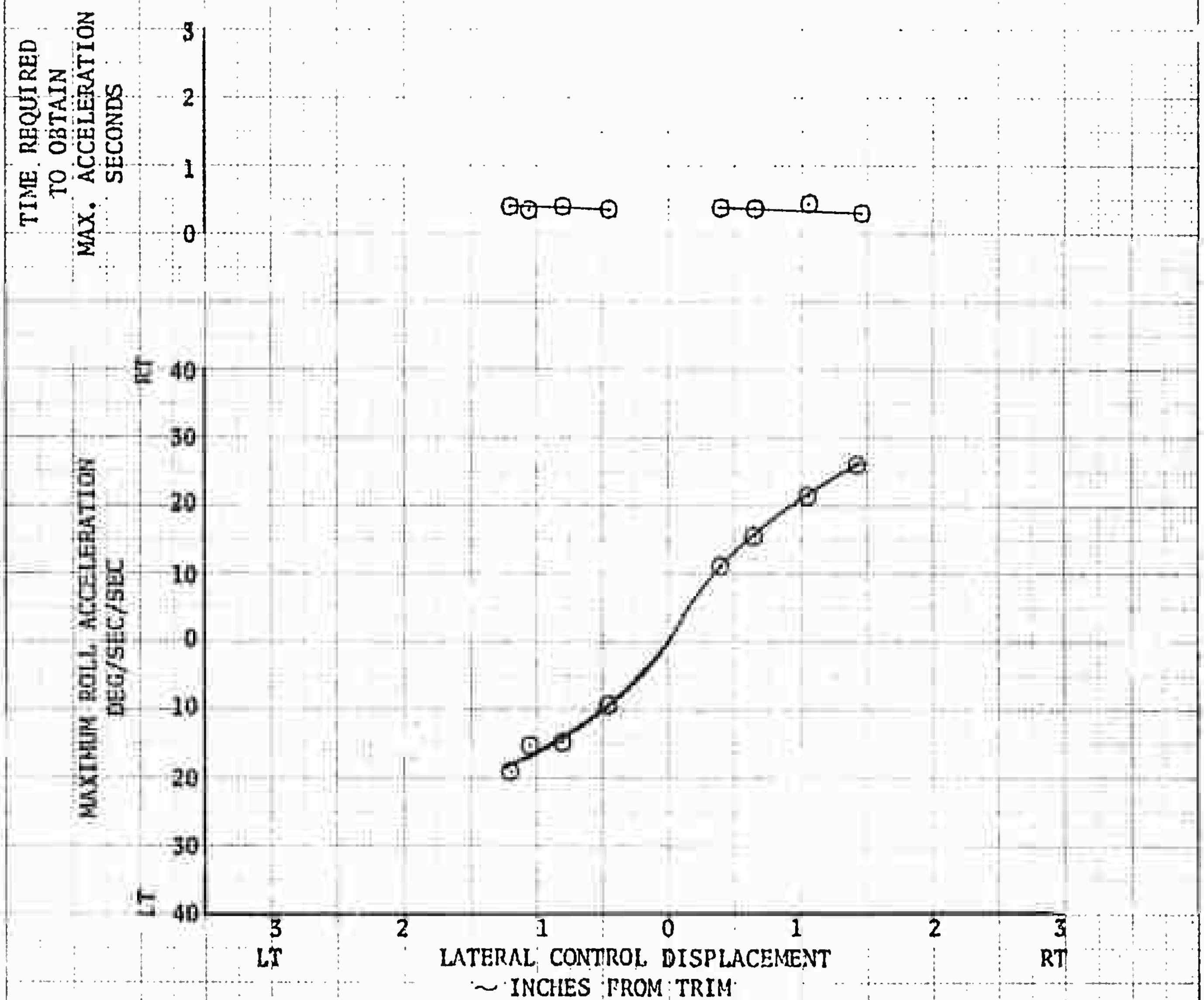


FIGURE NO. 161
LATERAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8250	125.8(FWD)	5000	324
□	57	8245	133.0(AFT)	5000	324

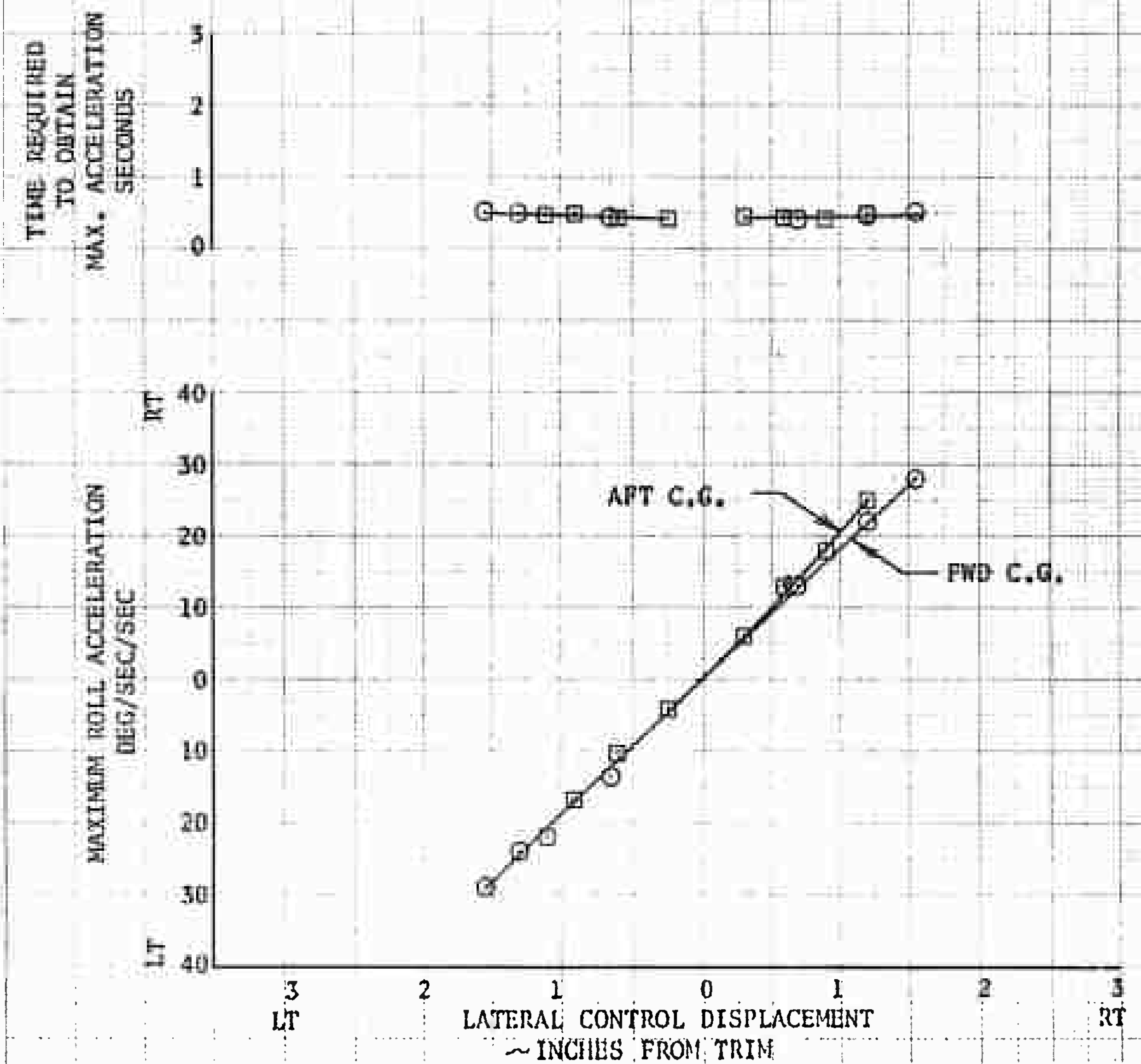


FIGURE NO. 162
LATERAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9255	126.9(FWD)	5000	324
□	57	9245	131.8(AFT)	5000	324

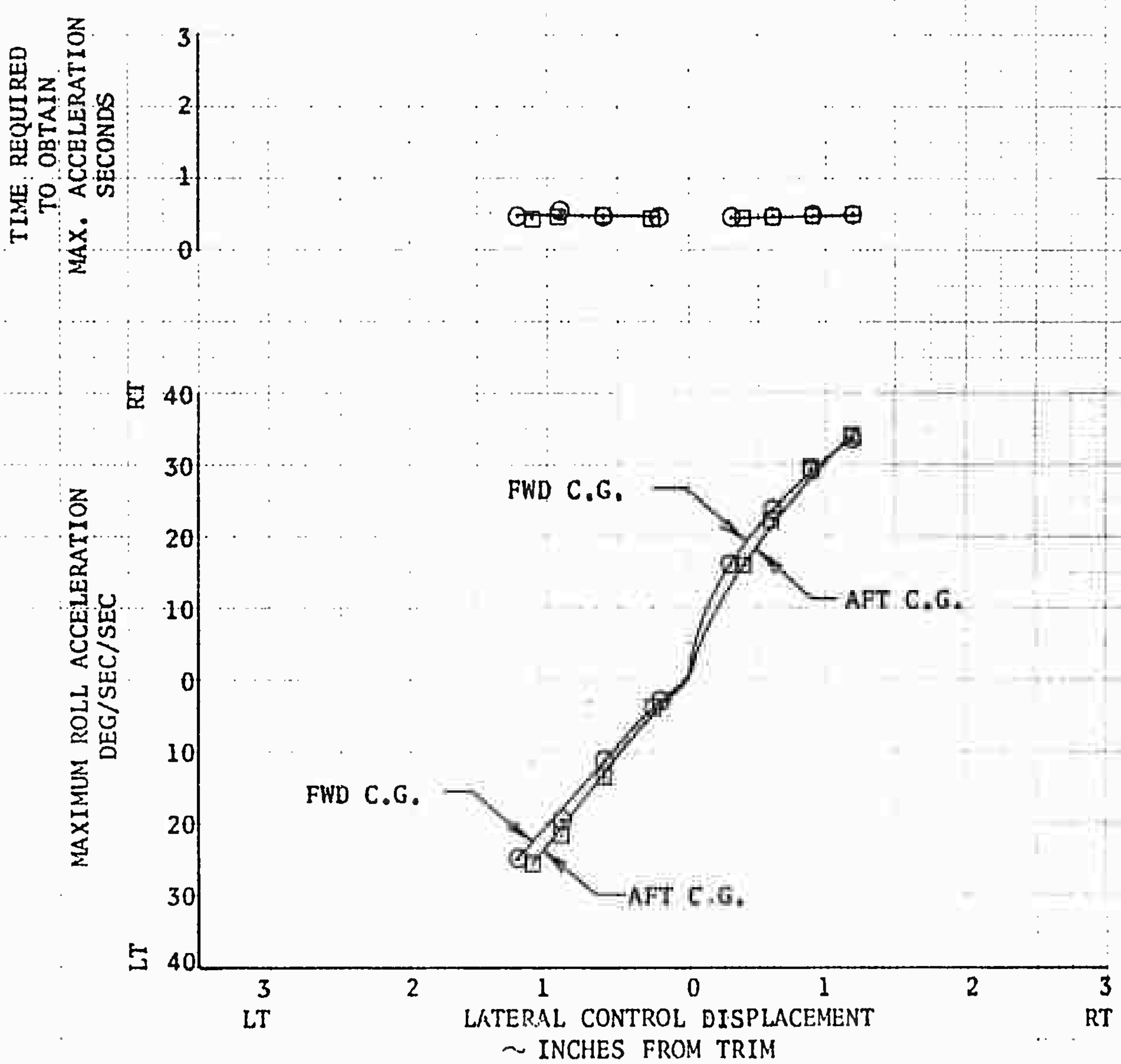


FIGURE NO. 163
LATERAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	6800	134.9(AFT)	5000	324
□	104	6800	134.9(AFT)	5000	324

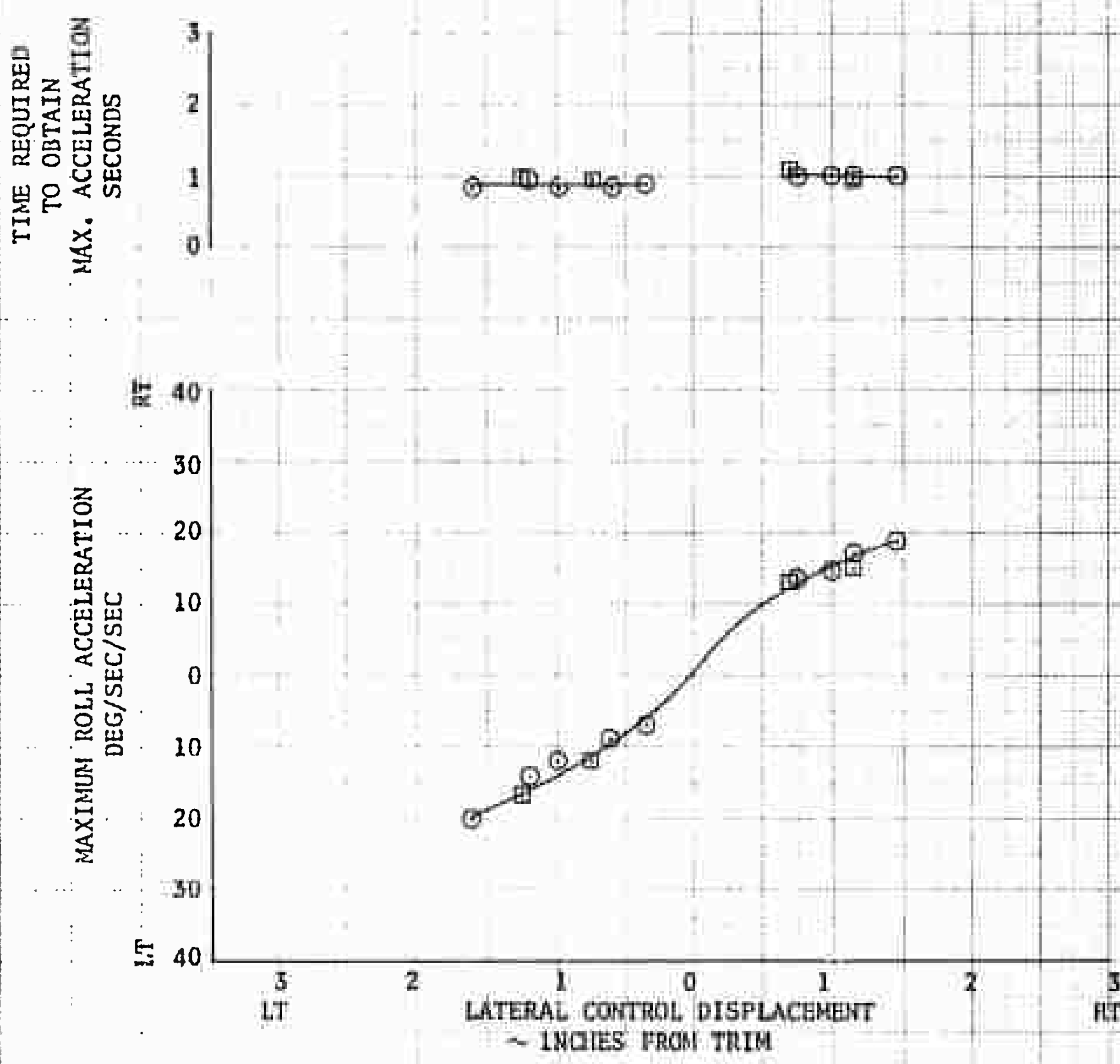


FIGURE NO. 164
LATERAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LB	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	8250	125.8(FWD)	5000	324
□	60	8245	133.9(AFT)	5000	324

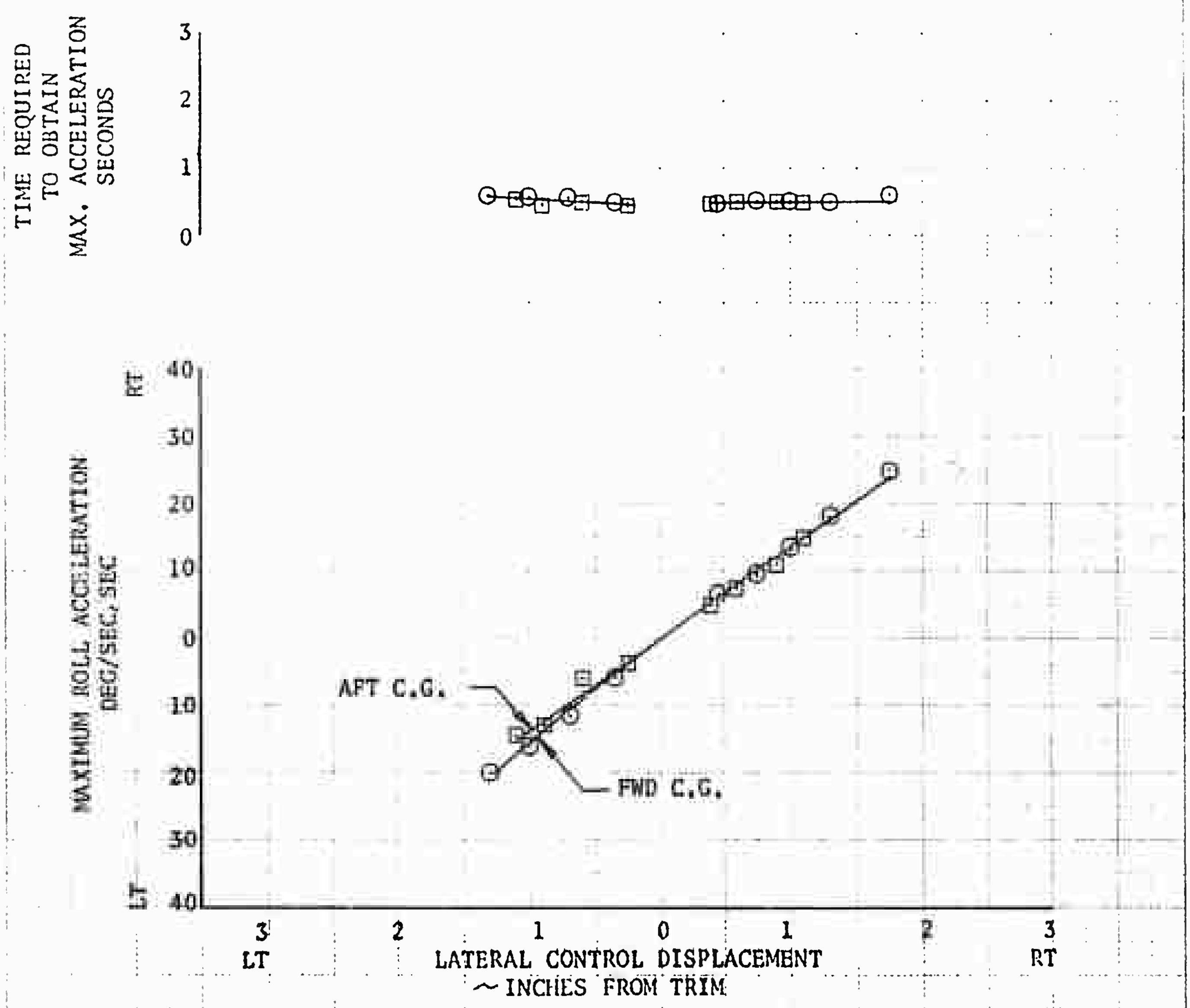


FIGURE NO. 165
LATERAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9255	126.4 (FWD)	5000	324
□	60	9245	131.8 (AFT)	5000	324

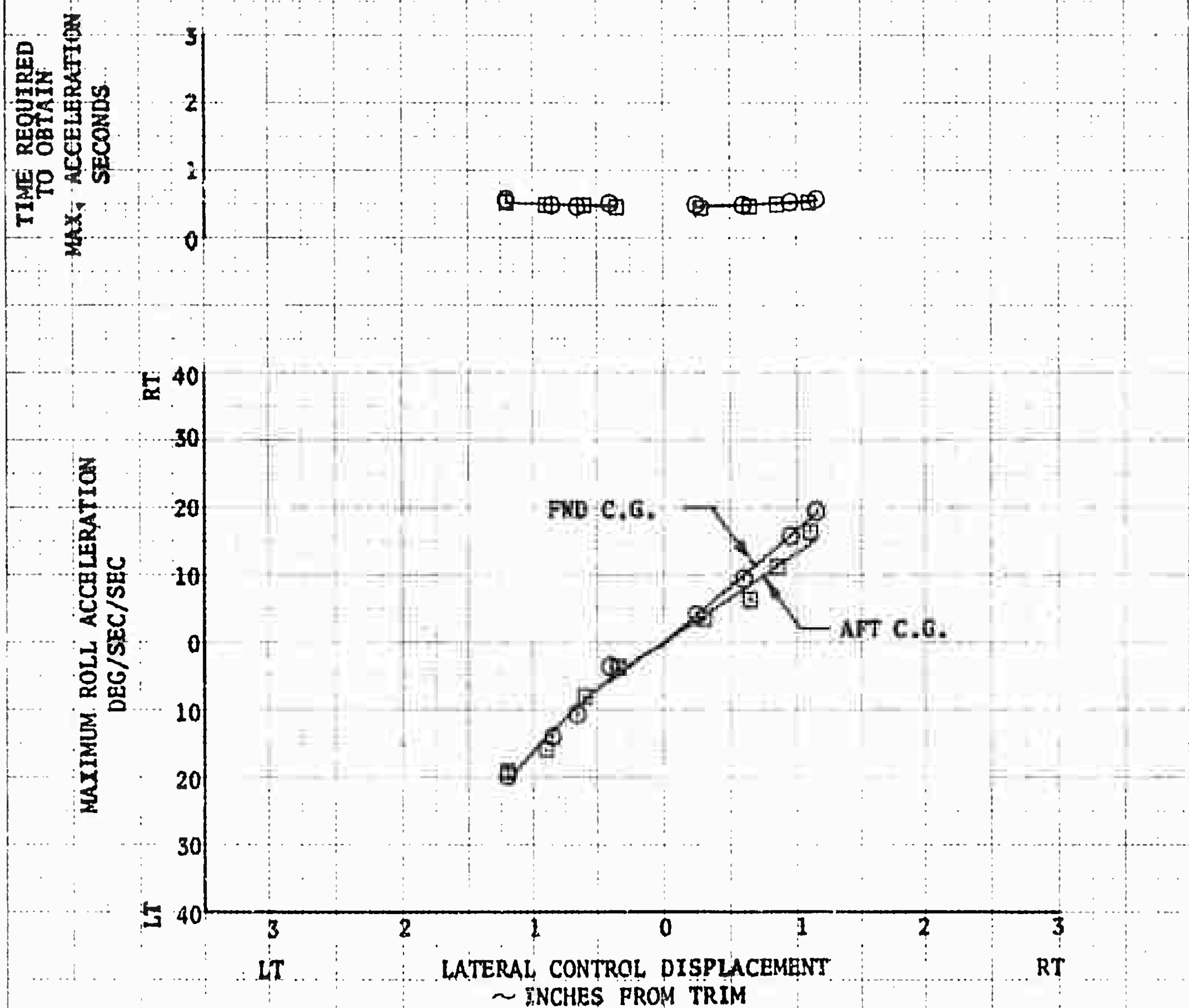


FIGURE NO. 166
LATERAL CONTROL RESPONSE SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
◇	6360	128.0(FWD)	2040	324	166A
○	6825	126.1(FWD)	5000	324	166A
□	6800	134.9(AFT)	5000	324	166A
△	7800	125.5(FWD)	2120	324	166B
◺	8250	125.8(FWD)	5000	324	166B
⬭	8250	128.5(FWD)	2040	324	166B
☆	8200	134.0(AFT)	5000	324	166B
△	9255	126.4(FWD)	5000	324	166C
⬡	9245	131.8(AFT)	5000	324	166C

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 167 THROUGH 184
2. SHADED SYMBOL DENOTES ROLL LEFT.
3. HALF SHADED SYMBOL DENOTES BOTH RIGHT AND LEFT ROLL.
4. FLAGGED SYMBOL DENOTES CLIMB.
5. SLASHED SYMBOL DENOTES AUTOROTATION.

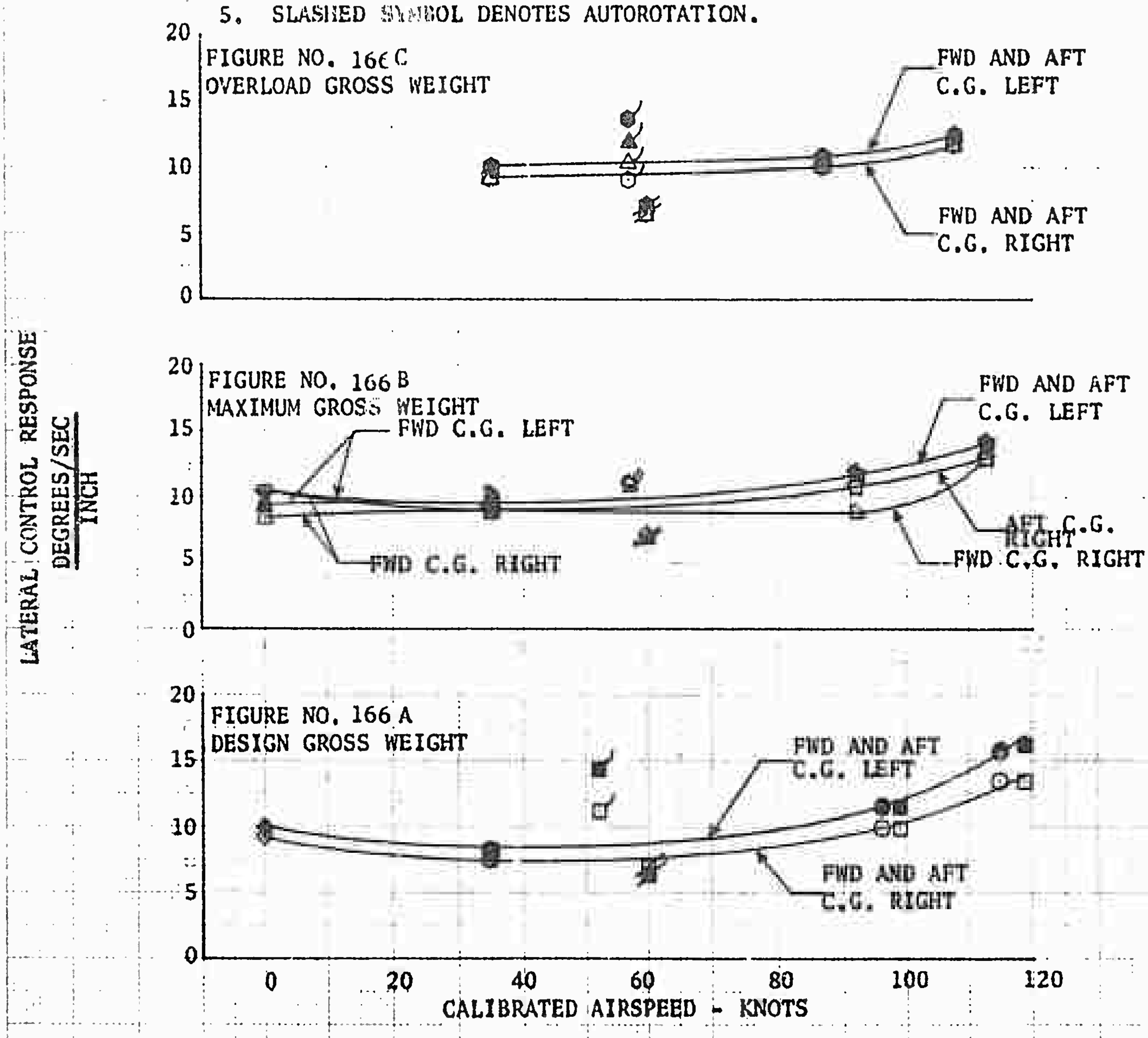


FIGURE NO. 167
LATERAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	6360	128.0(FWD)	2040	324

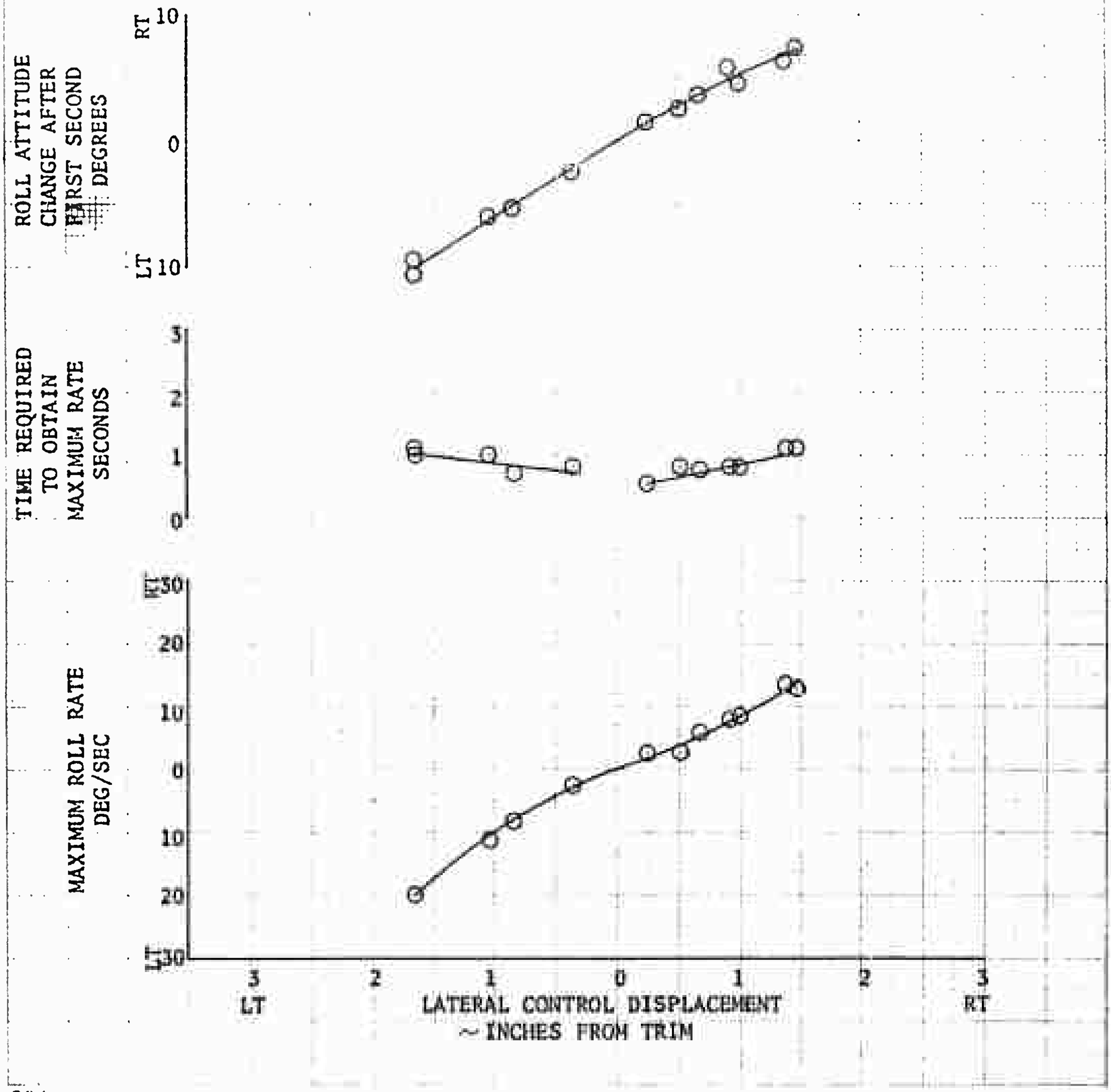


FIGURE NO. 168
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	6750	126.1(FWD)	5000	324
⊡	35	6800	134.9(AFT)	5000	324

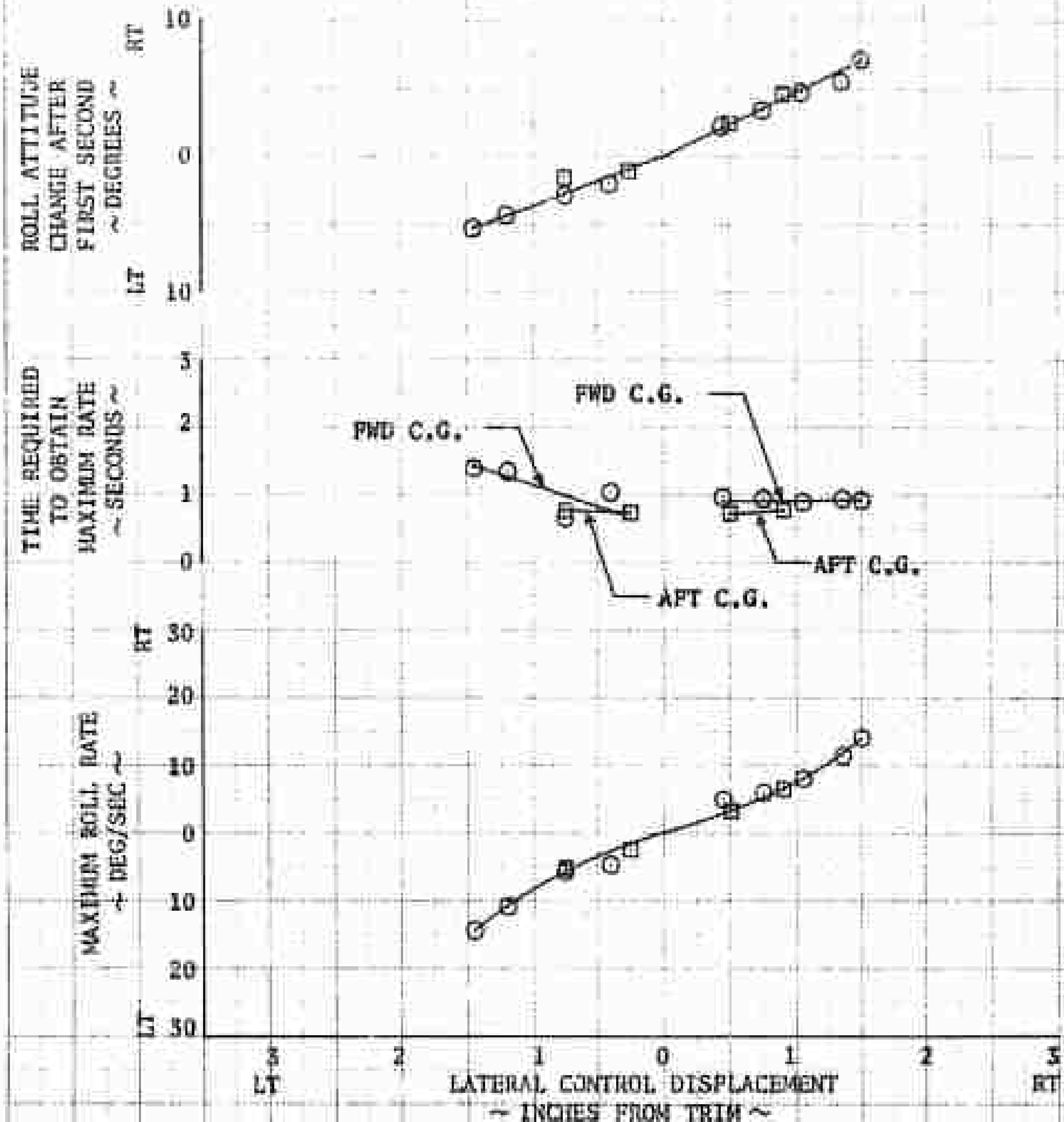


FIGURE NO. 169
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	96	6850	125.9(FWD)	5000	324
□	99	6800	134.9(AFT)	5000	324

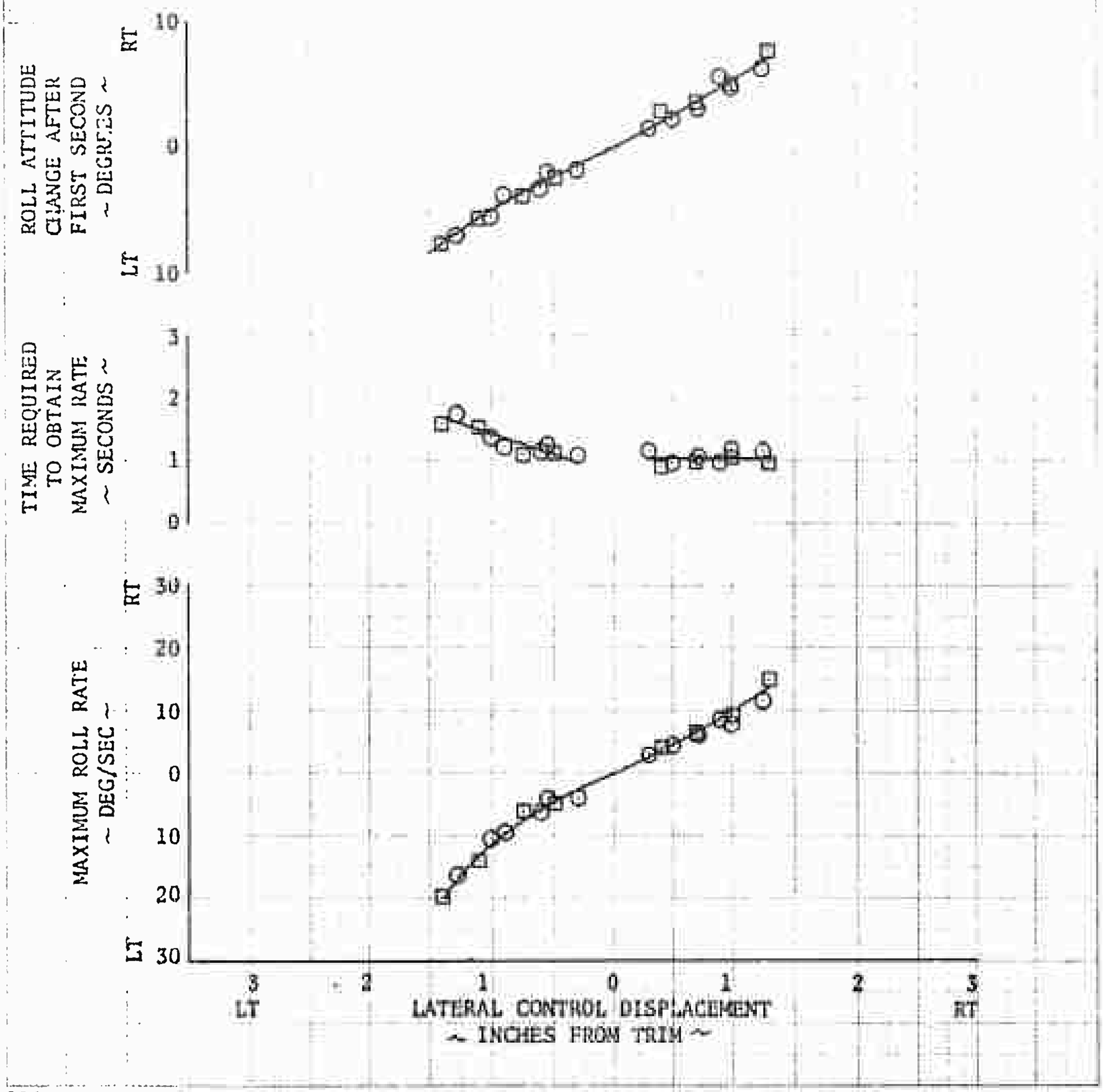


FIGURE NO. 170
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	115	6865	126.2(FWD)	5000	324
□	119	6800	134.9(AFT)	5000	324

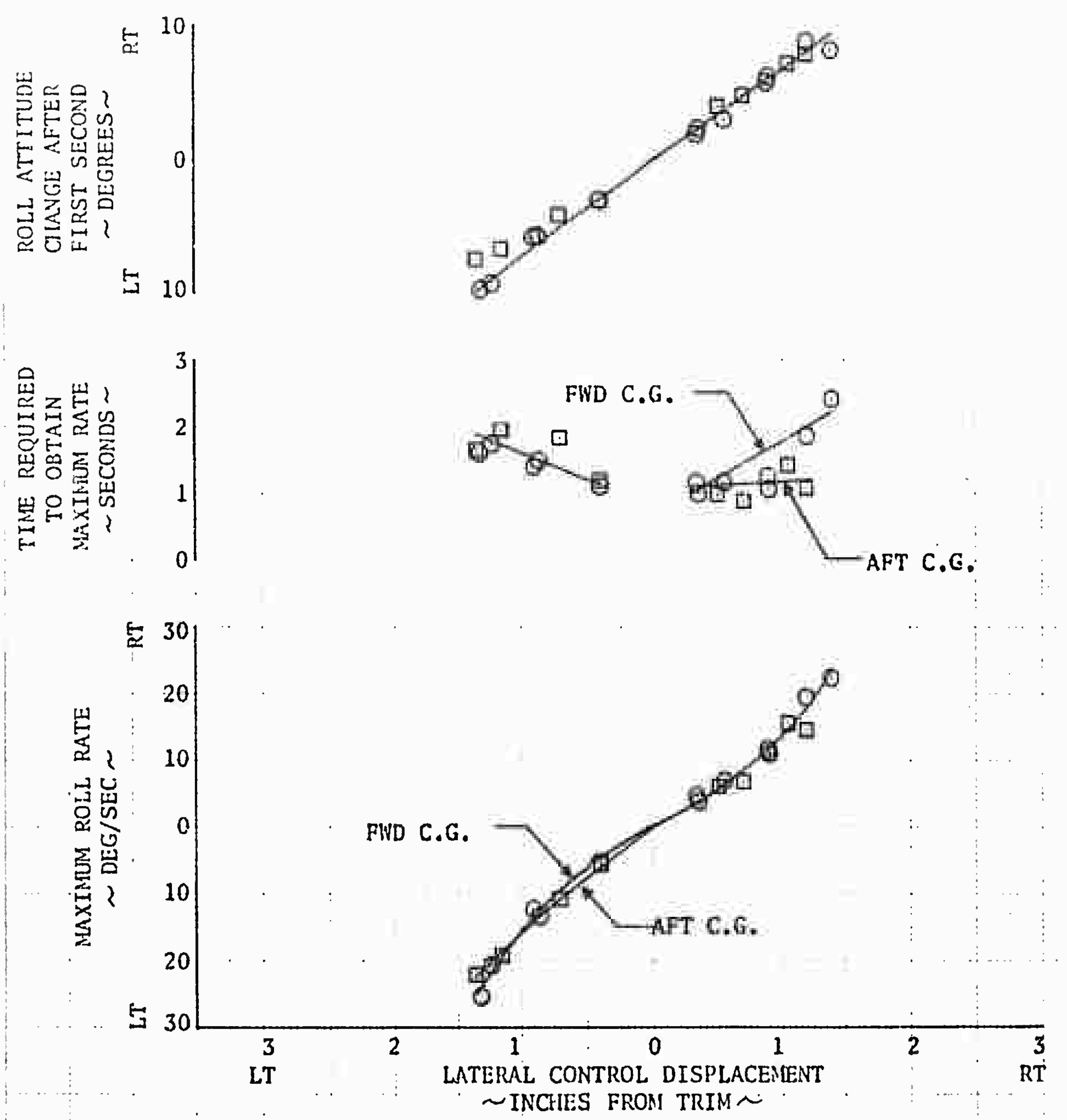


FIGURE NO. 171
LATERAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	7800	125.5(FWD)	2120	324

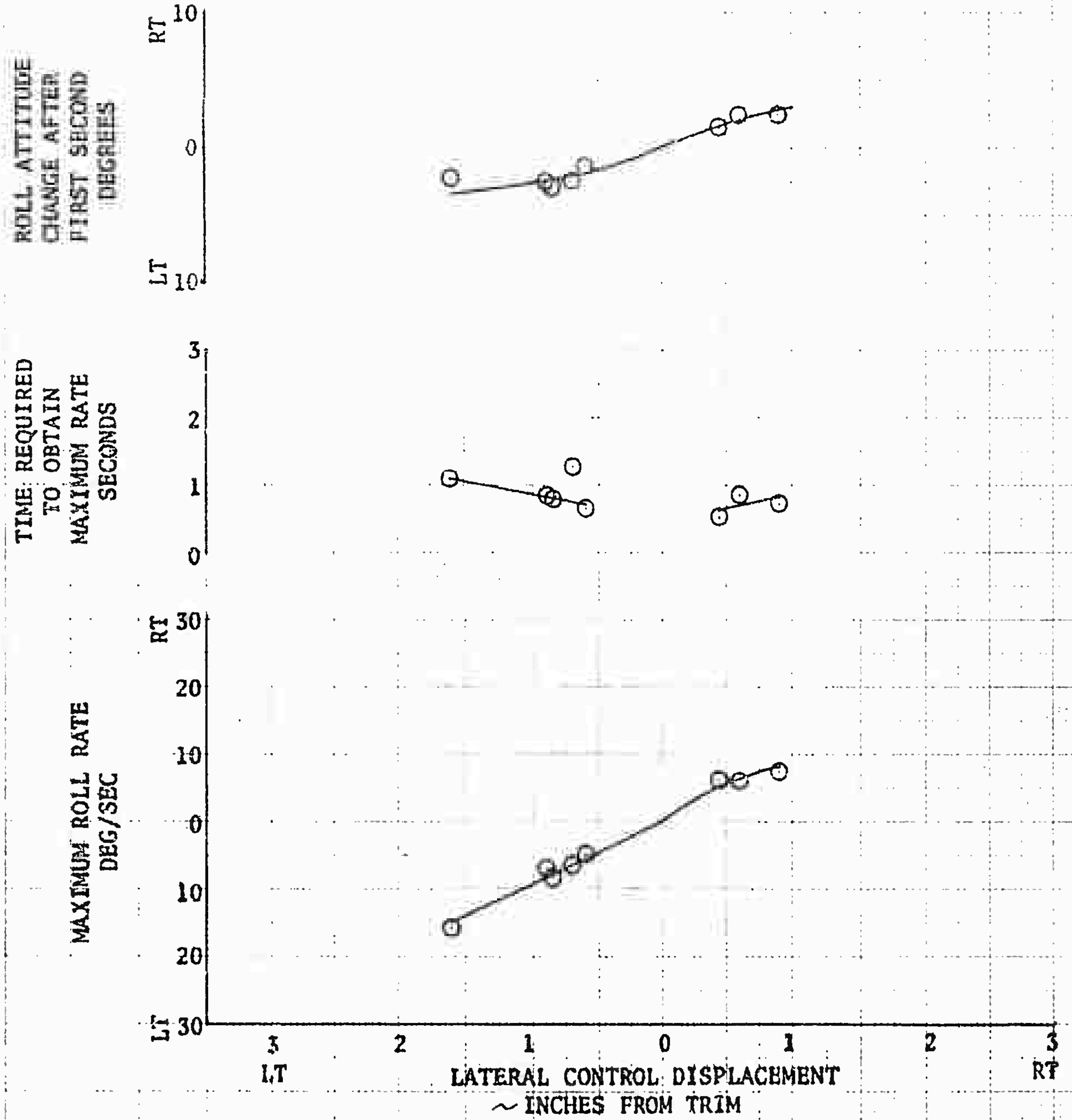


FIGURE NO. 172
LATERAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	8250	128.5(FWD)	2040	324

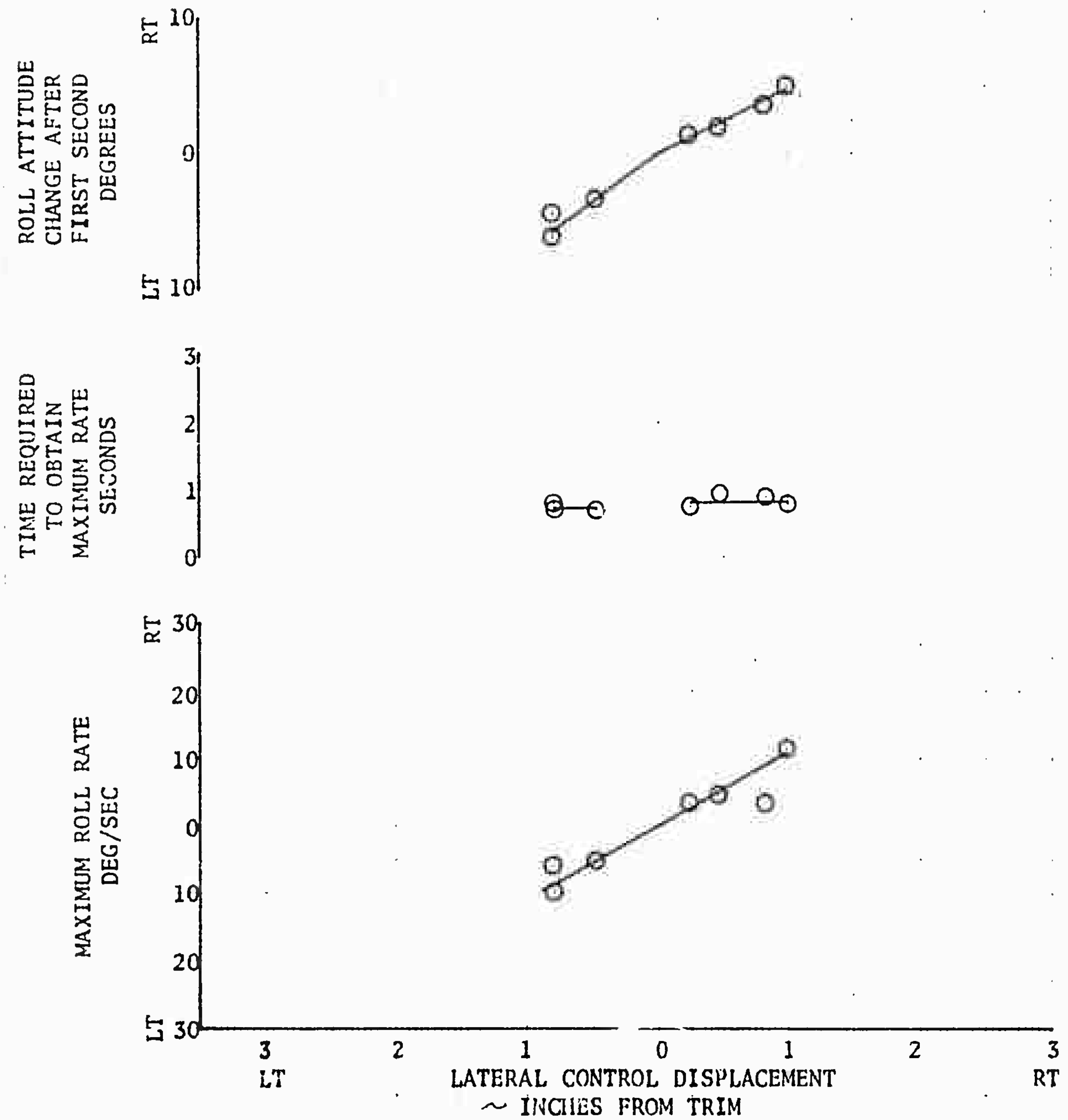


FIGURE NO. 173
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	8250	125.8(FWD)	5000	324
□	35	8155	134.0(AFT)	5000	324

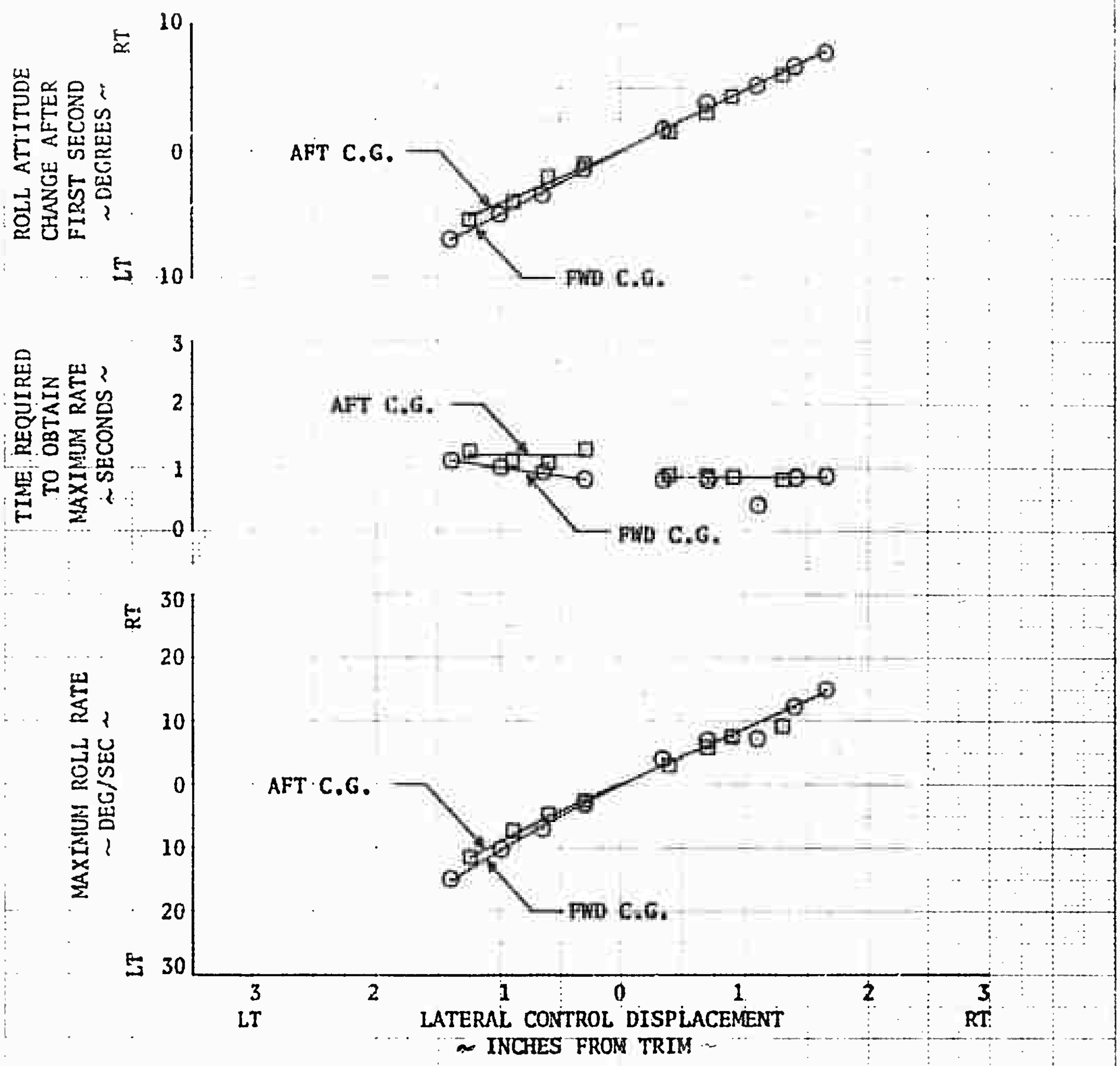


FIGURE NO. 174
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8250	125.8(FWD)	5000	324
□	92	8155	134.0(AFT)	5000	324

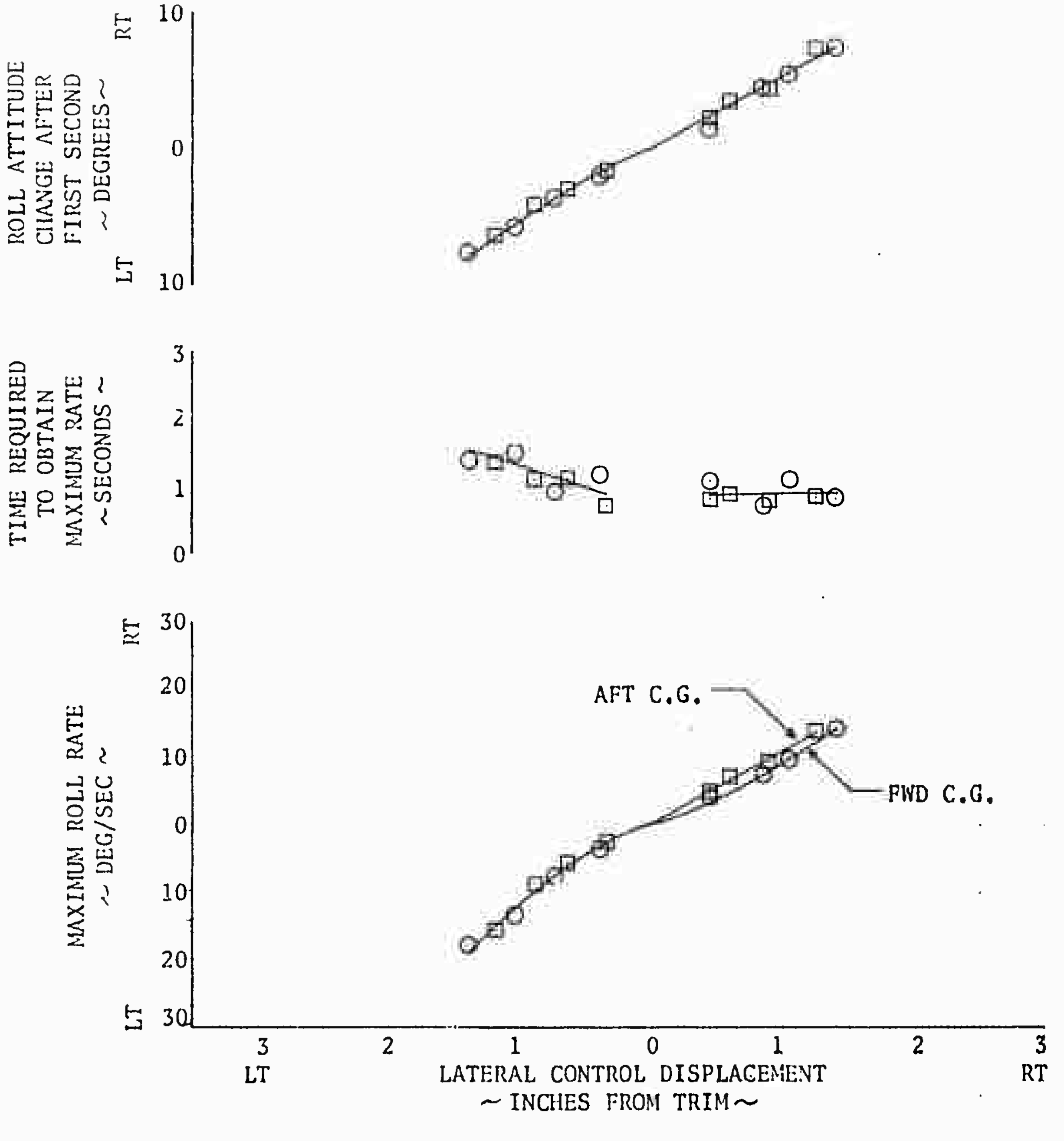


FIGURE NO. 175
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	113	8250	125.8(FWD)	5000	324
□	113	8155	134.0(AFT)	5000	324

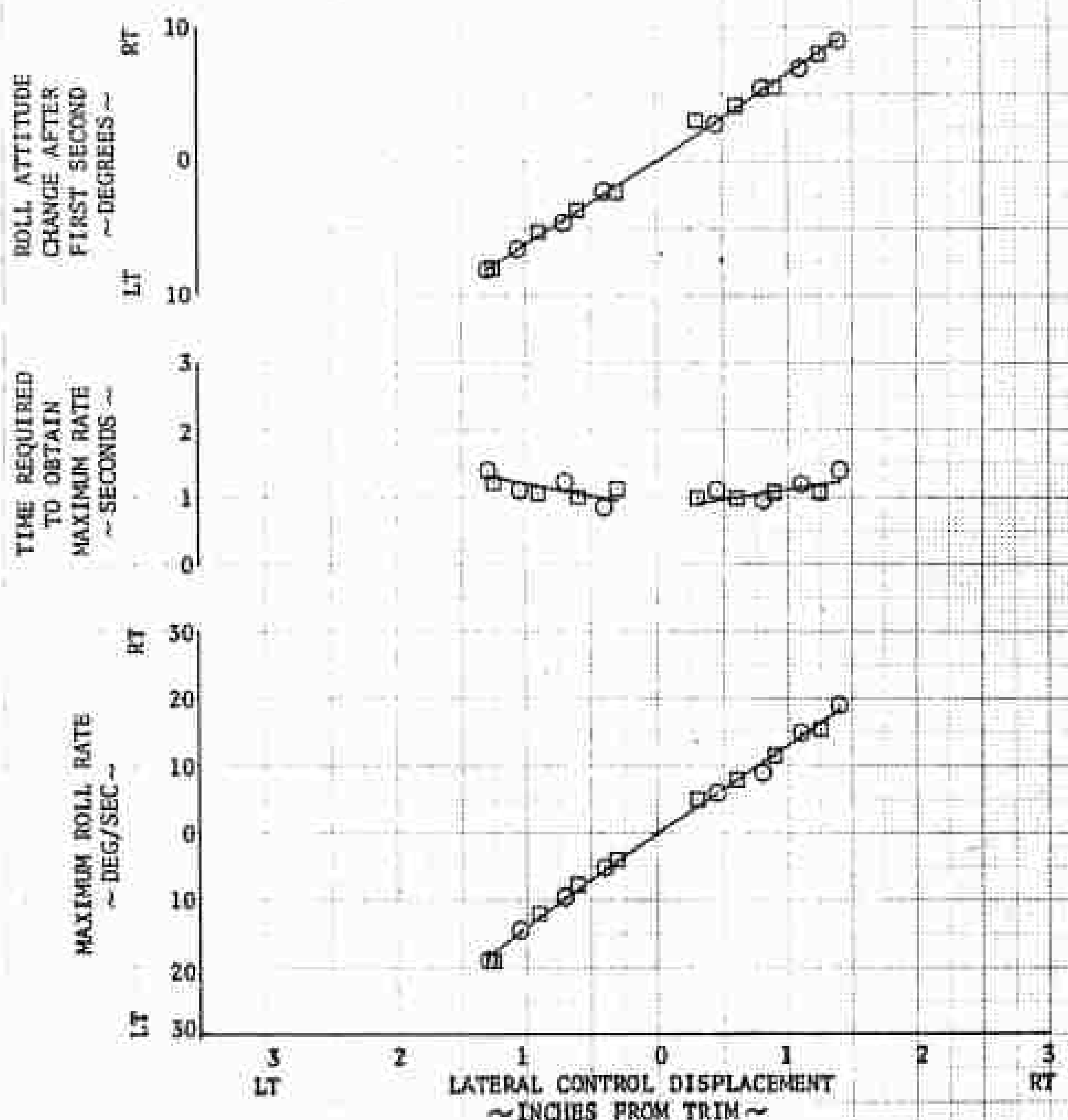


FIGURE NO. 176
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9255	126.9(FWD)	5000	324
□	35	9245	131.8(AFT)	5000	324

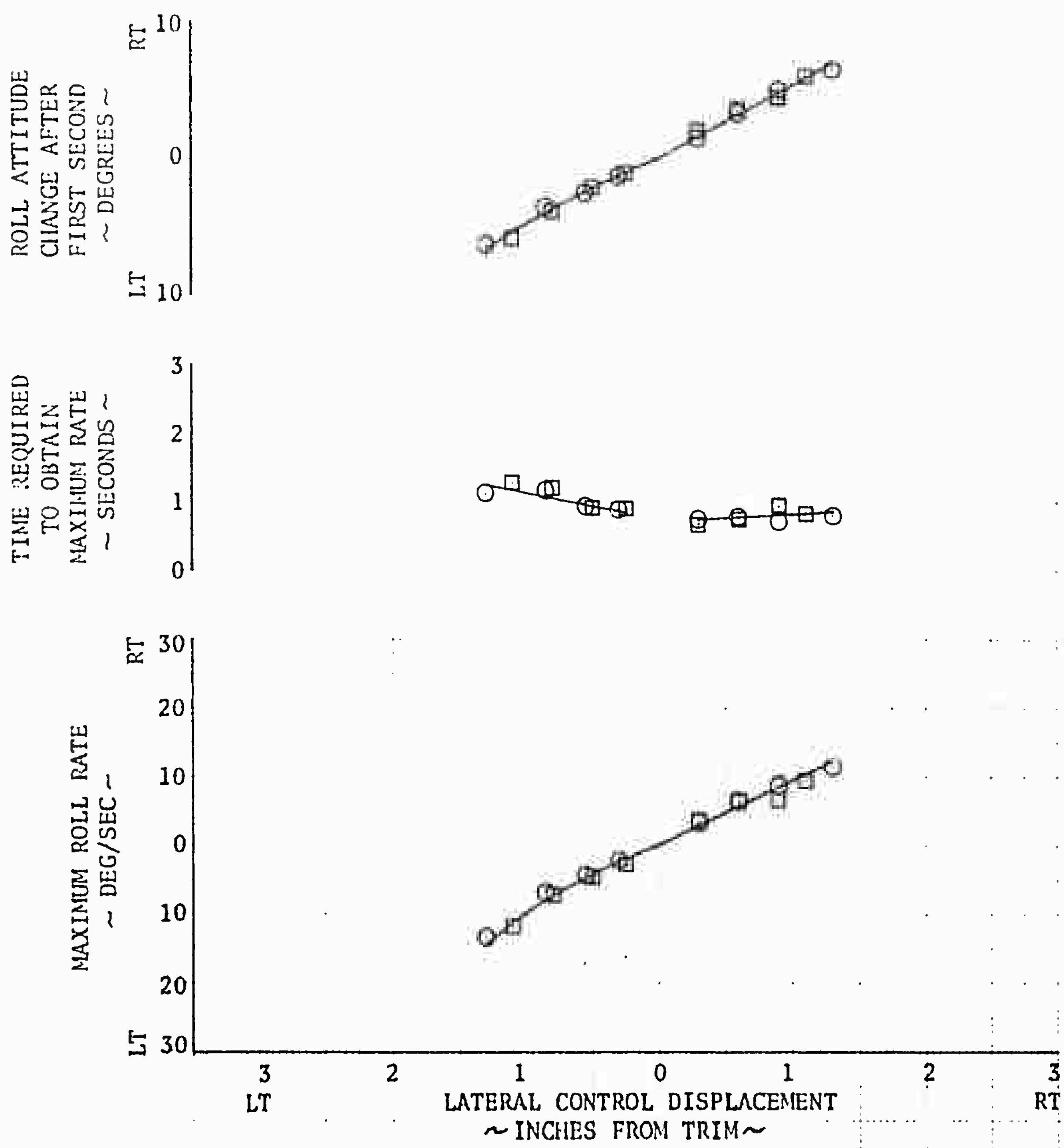


FIGURE NO. 177
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	87	9255	126.4(FWD)	5000	324
□	87	9245	131.8(AFT)	5000	324

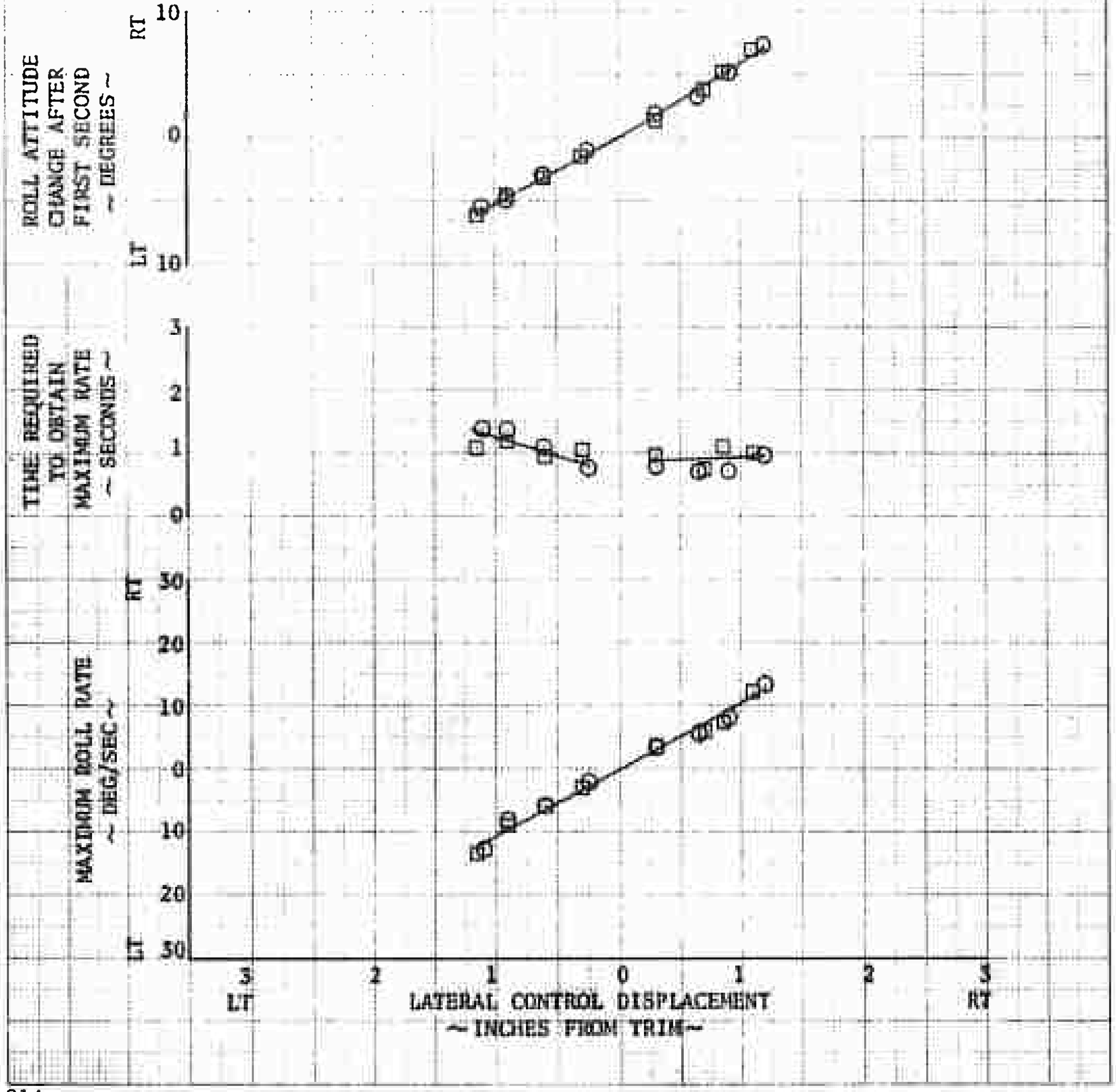


FIGURE NO. 178
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9255	126.4(FWD)	5000	324
□	108	9245	131.8(AFT)	5000	324

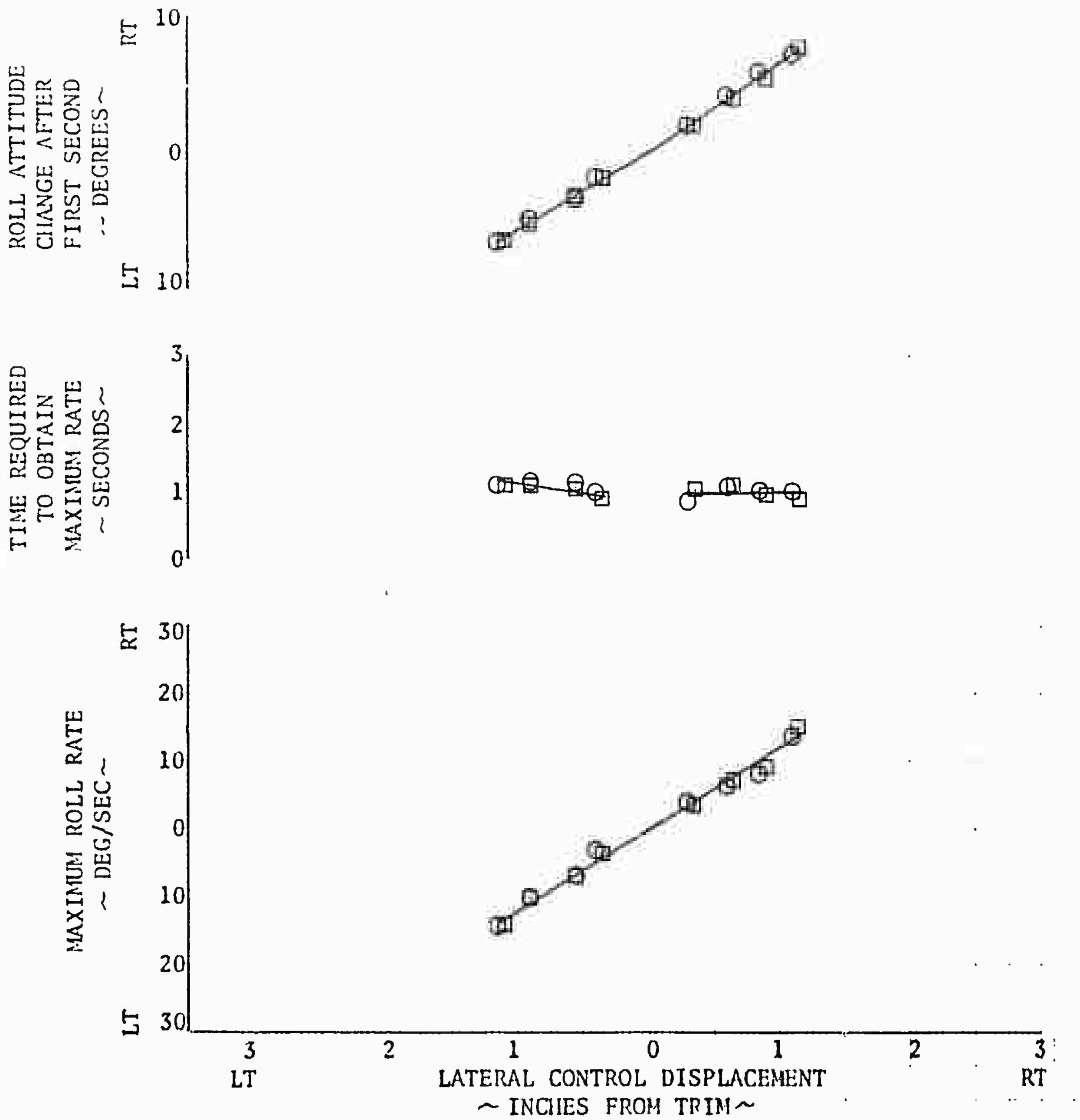


FIGURE NO. 179
LATERAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
52	6800	134.9(AFT)	5000	324

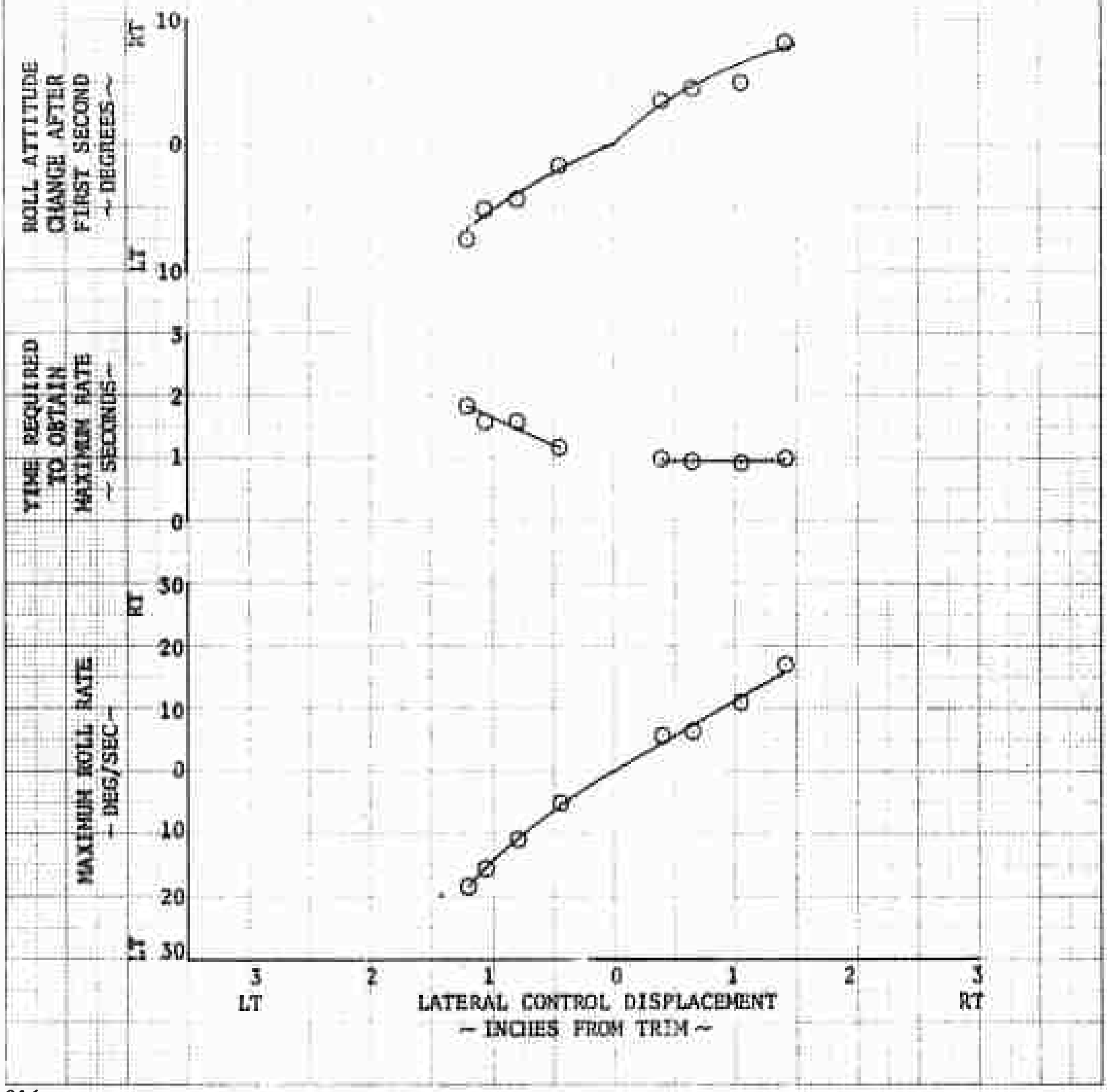


FIGURE NO. 180
LATERAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8250	125.8(FWD)	5000	324
□	57	8245	133.9(AFT)	5000	324

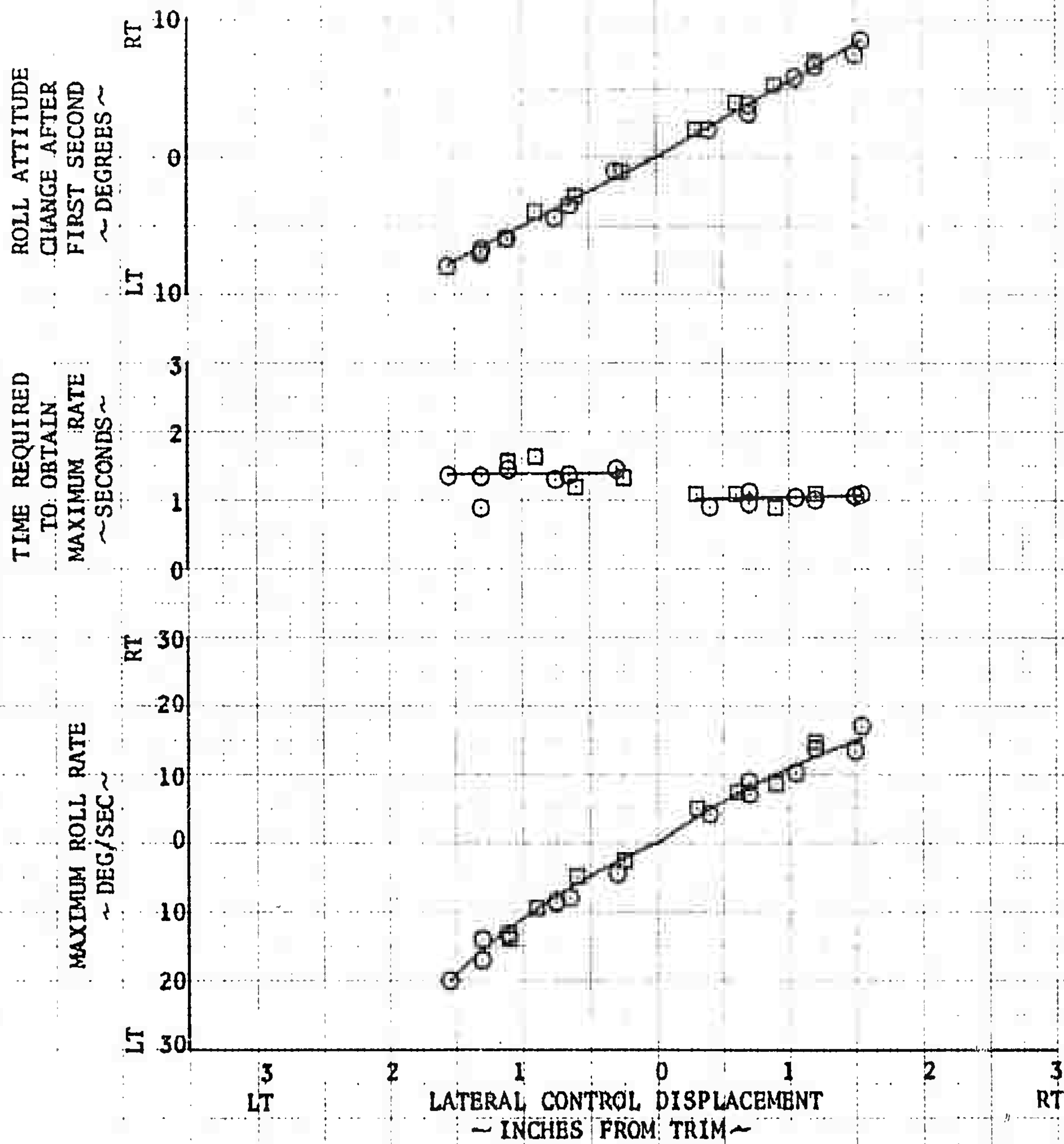


FIGURE NO. 181
LATERAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9255	126.4(FWD)	5000	324
□	57	9245	131.8(AFT)	5000	324

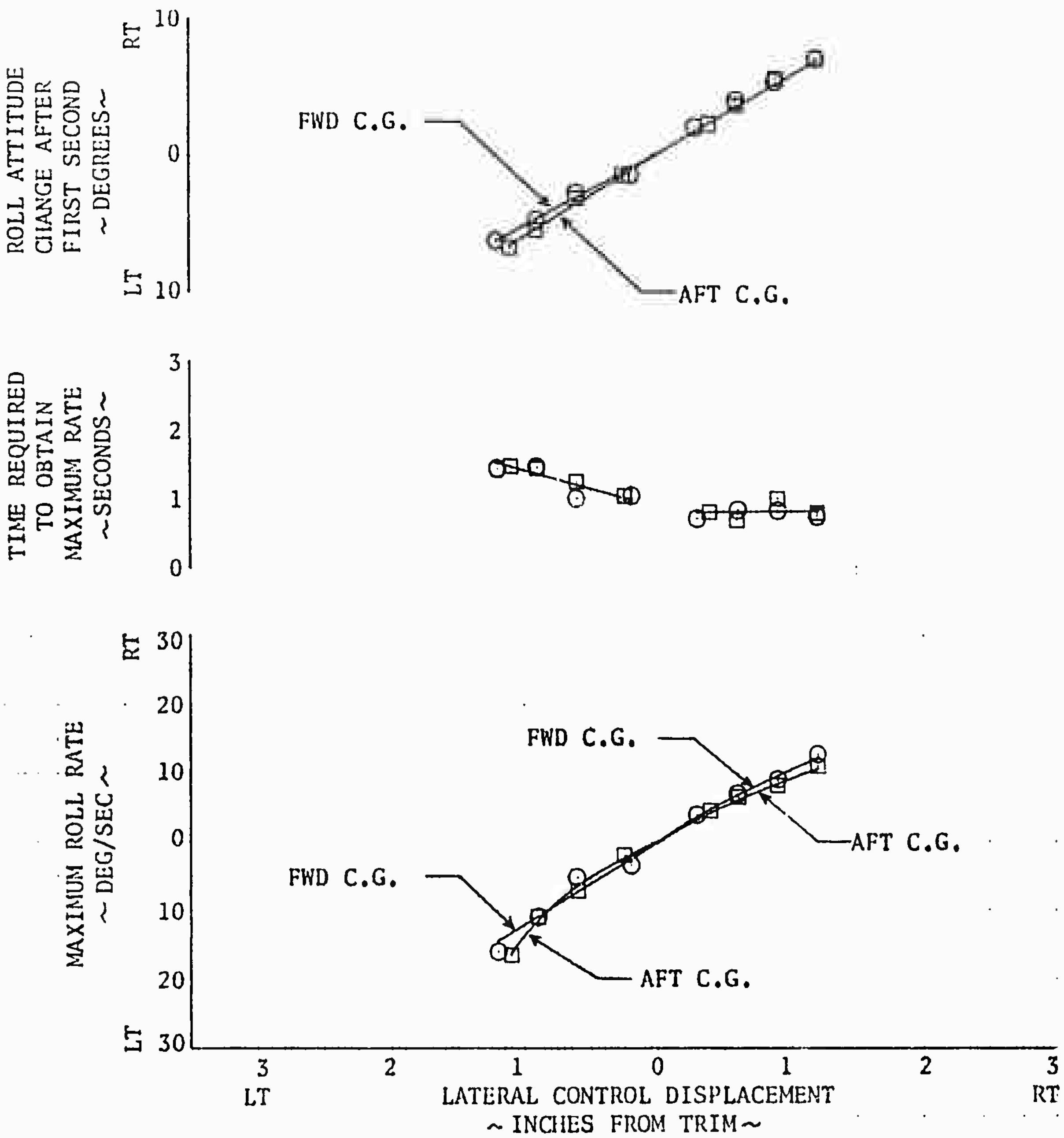


FIGURE NO. 182
LATERAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
60	6800	134.9(AFT)	5000	324

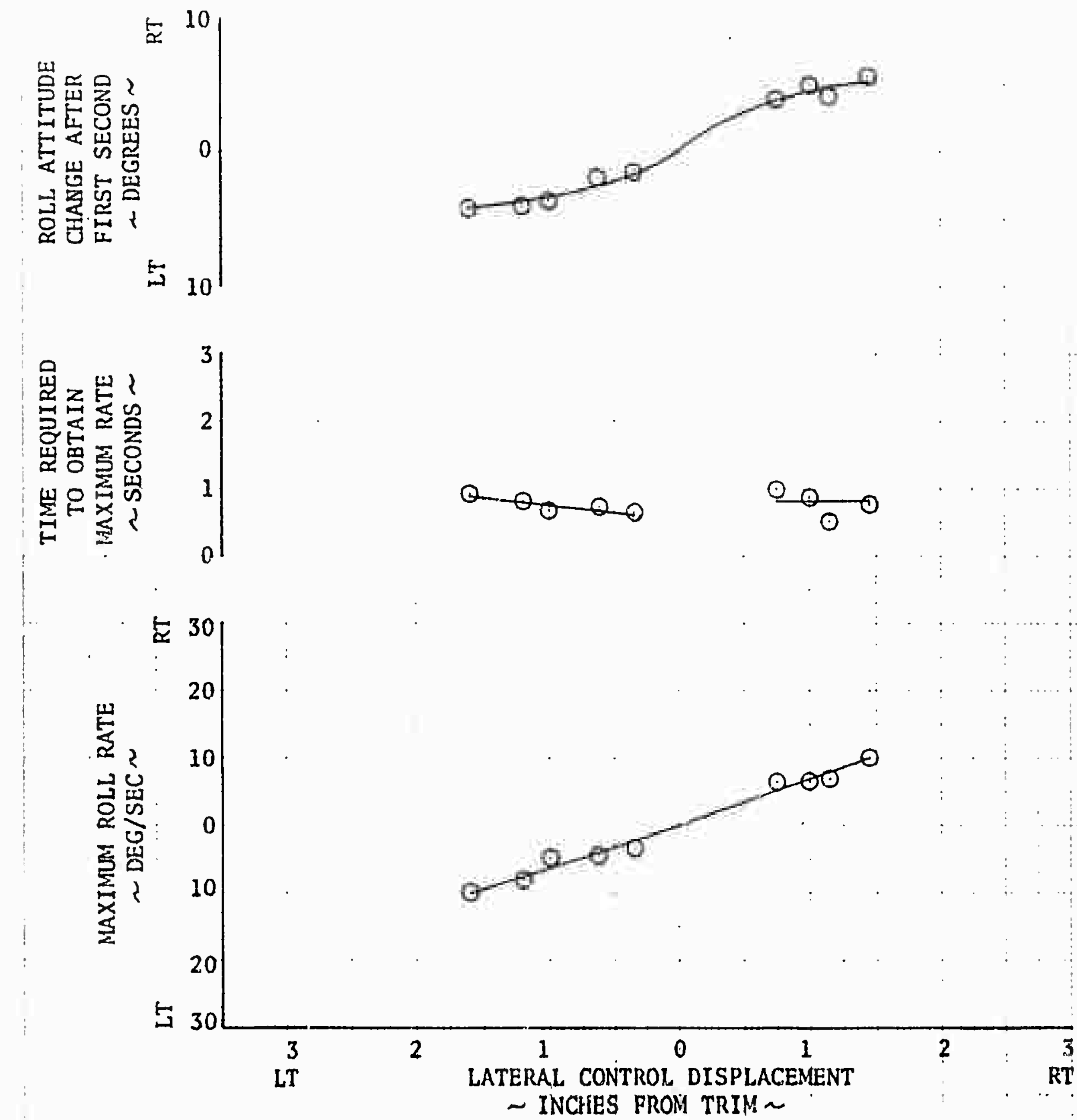


FIGURE NO. 183
LATERAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	8250	125.8(FWD)	5000	324
□	60	8245	133.9(AFT)	5000	324

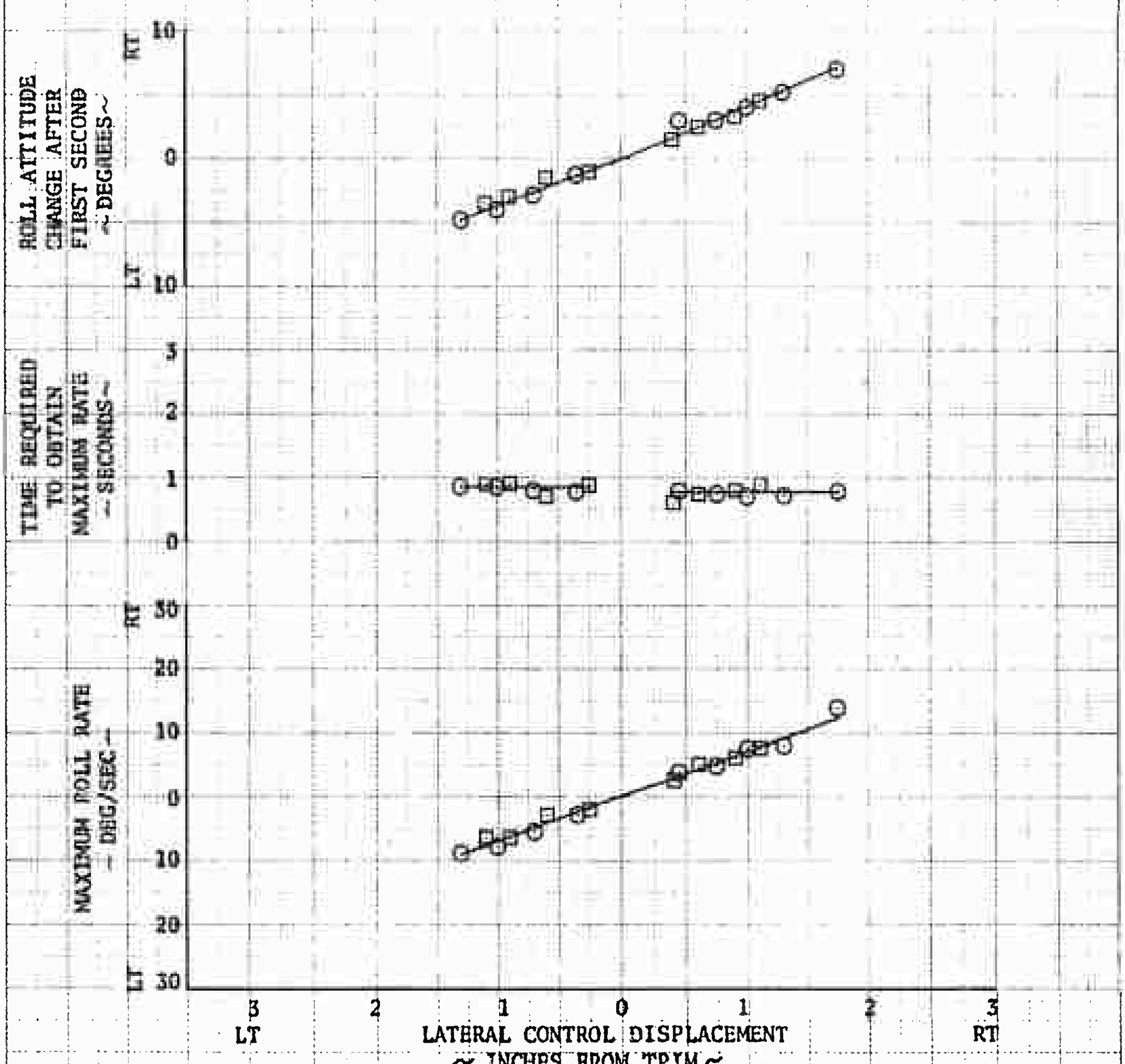


FIGURE NO. 184
LATERAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9255	126.4(FWD)	5000	324
□	60	9245	131.8(AFT)	5000	324

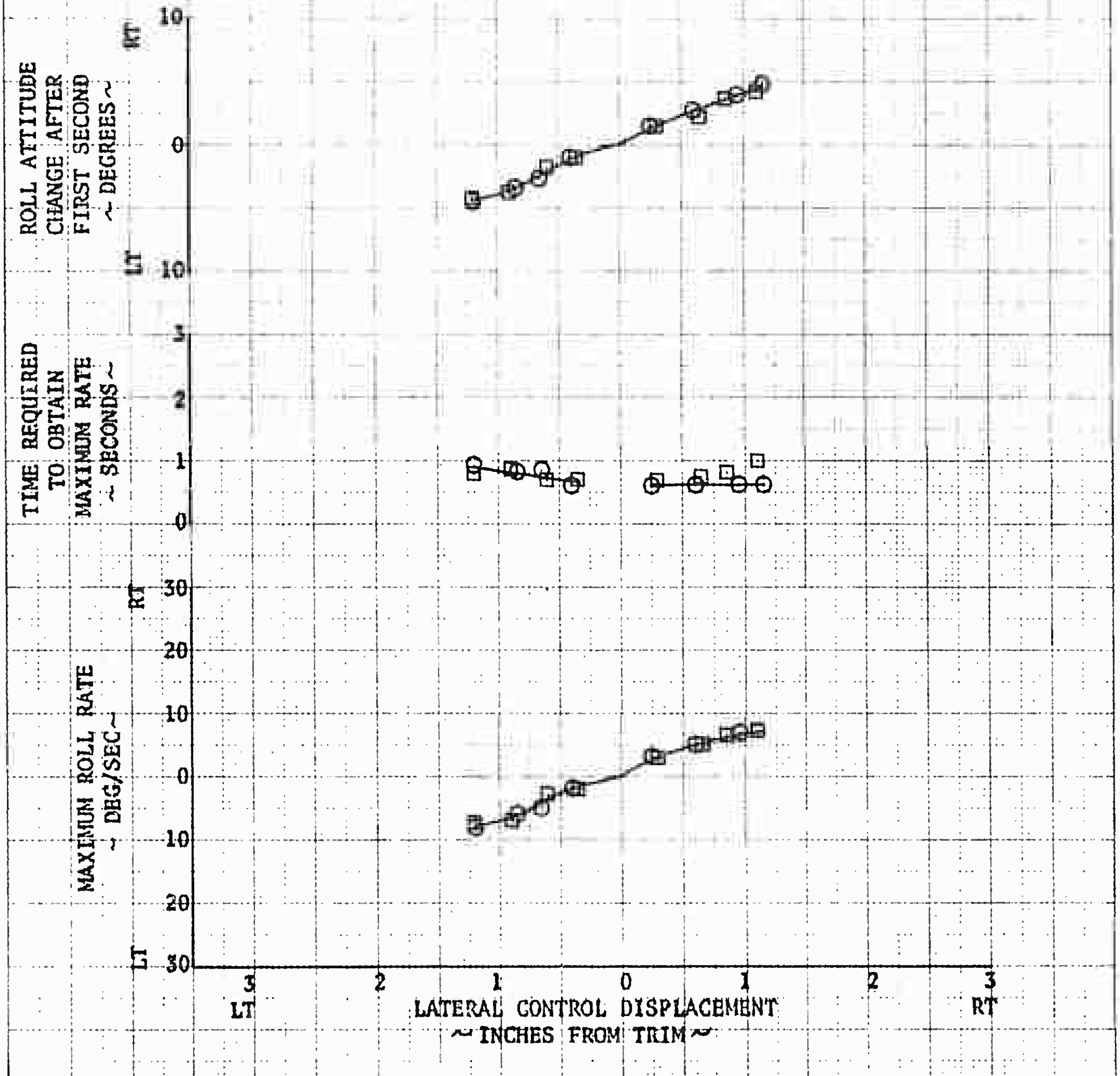


FIGURE NO. 185
DIRECTIONAL CONTROL SENSITIVITY SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
◇	6360	128.0(FWD)	2040	324	185 A
○	6790	126.1(FWD)	5000	324	185 A
□	6850	135.0(AFT)	5000	324	185 A
△	7800	125.5(FWD)	2120	324	185 B
◁	8205	126.0(FWD)	5000	324	185 B
⬭	8260	128.5(FWD)	2040	324	185 B
☆	8200	134.0(AFT)	5000	324	185 B
△	9280	126.5(FWD)	5000	324	185 C
⬡	9115	131.8(AFT)	5000	324	185 C

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 186 THROUGH 203
2. SHADED SYMBOL DENOTES LEFT YAW.
3. HALF SHADED SYMBOL DENOTES YAW LEFT AND YAW RIGHT.
4. FLAGGED SYMBOL DENOTES CLIMB.
5. SLASHED SYMBOL DENOTES AUTOROTATION.

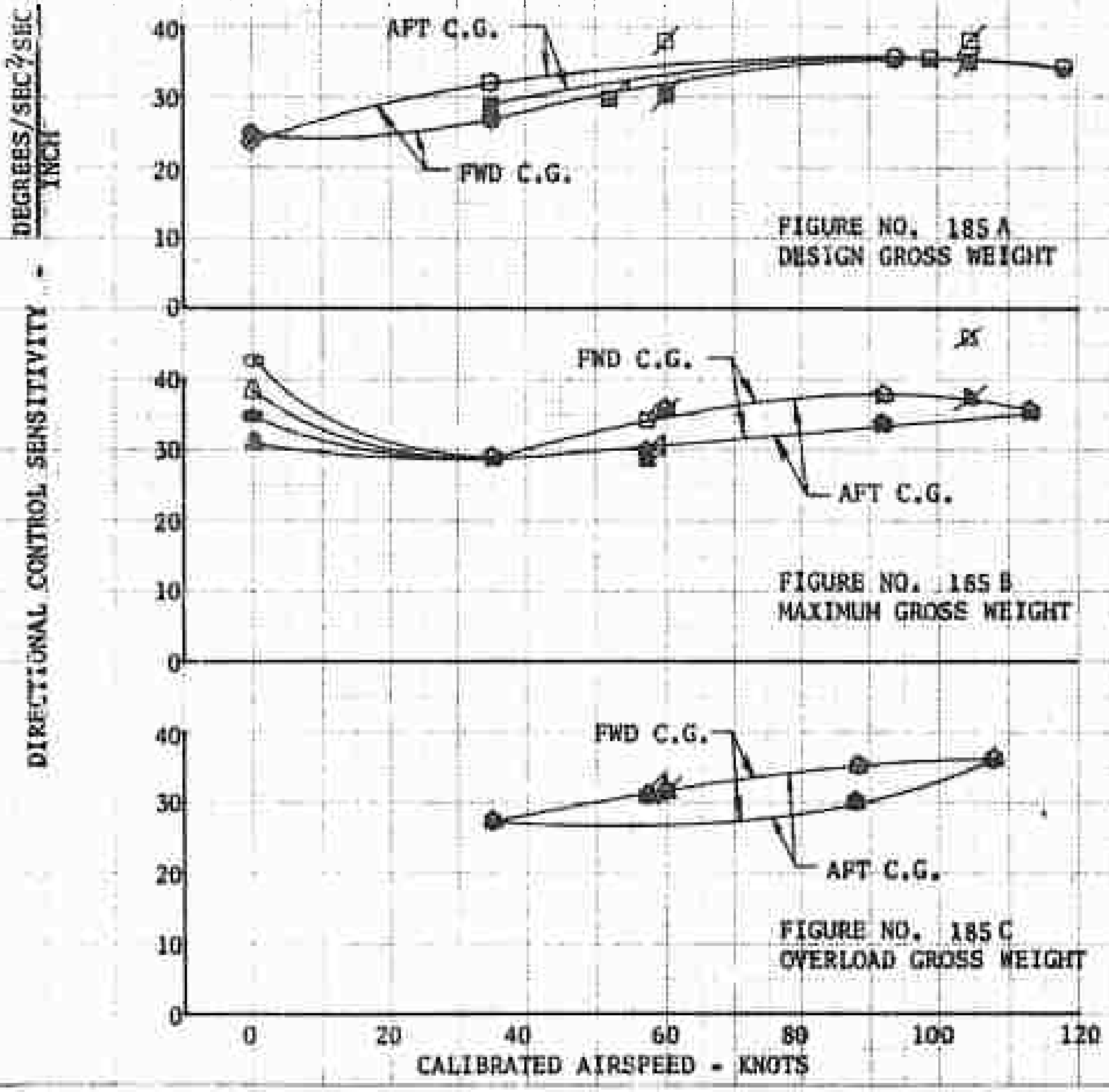


FIGURE NO. 186
DIRECTIONAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SYM	SKID HEIGHT FEET	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	5	6360	128.0(FWD)	2040	324

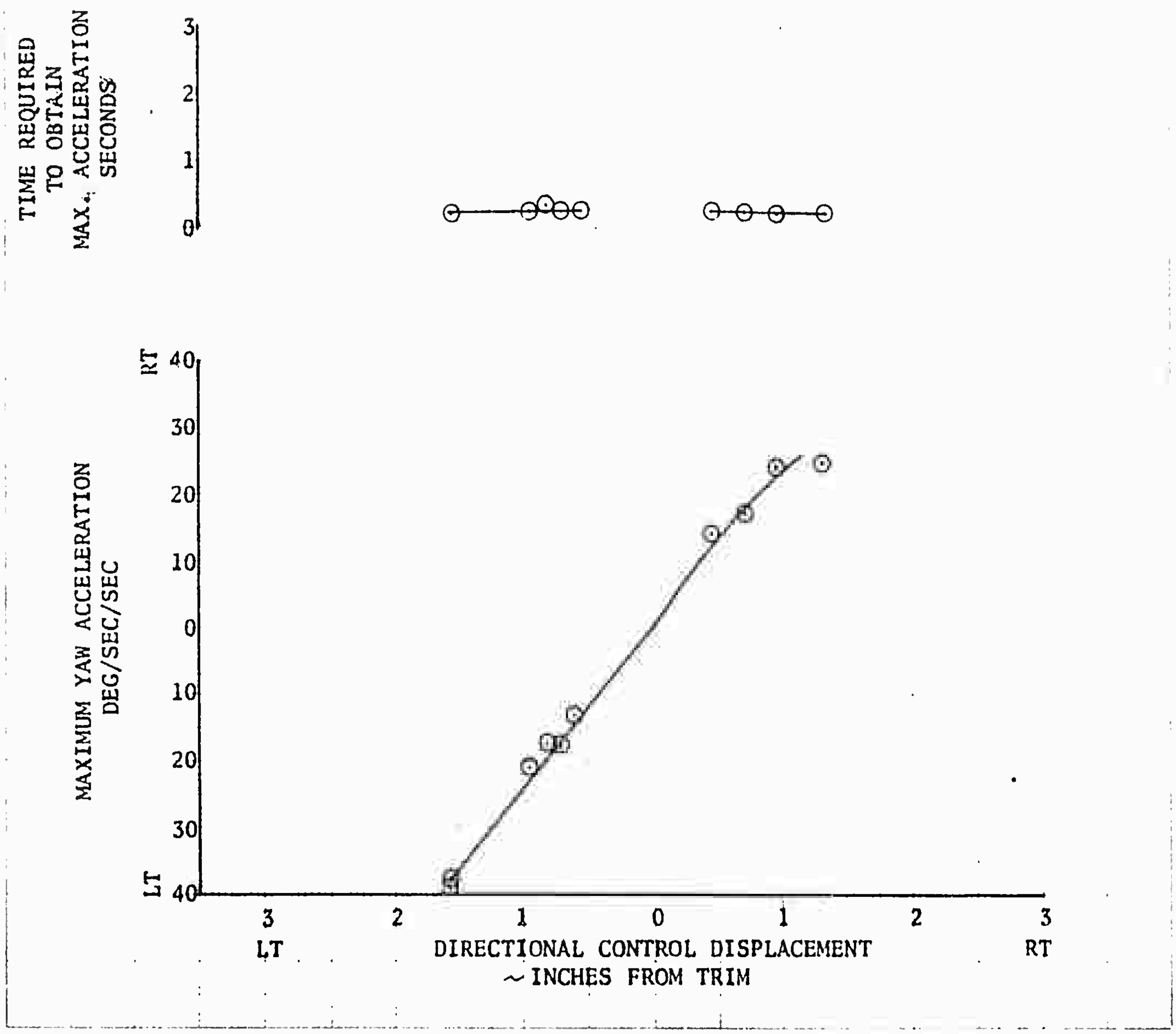


FIGURE NO. 187
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	6770	126.1(FWD)	5000	324
⊡	35	6770	134.8(AFT)	5000	324

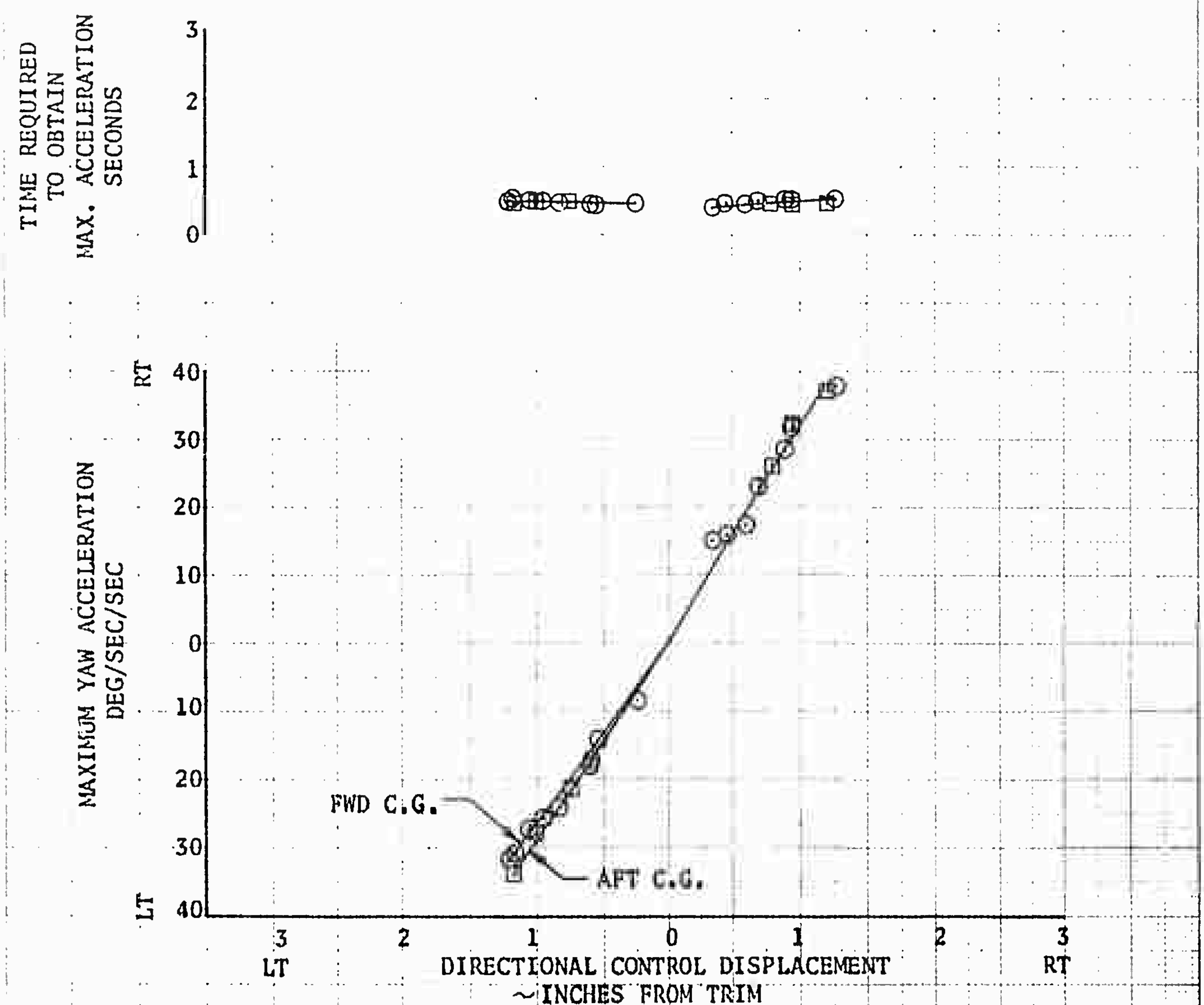


FIGURE NO. 188
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	94	6790	126.1(FWD)	5000	324
□	99	6770	134.8(AFT)	5000	324

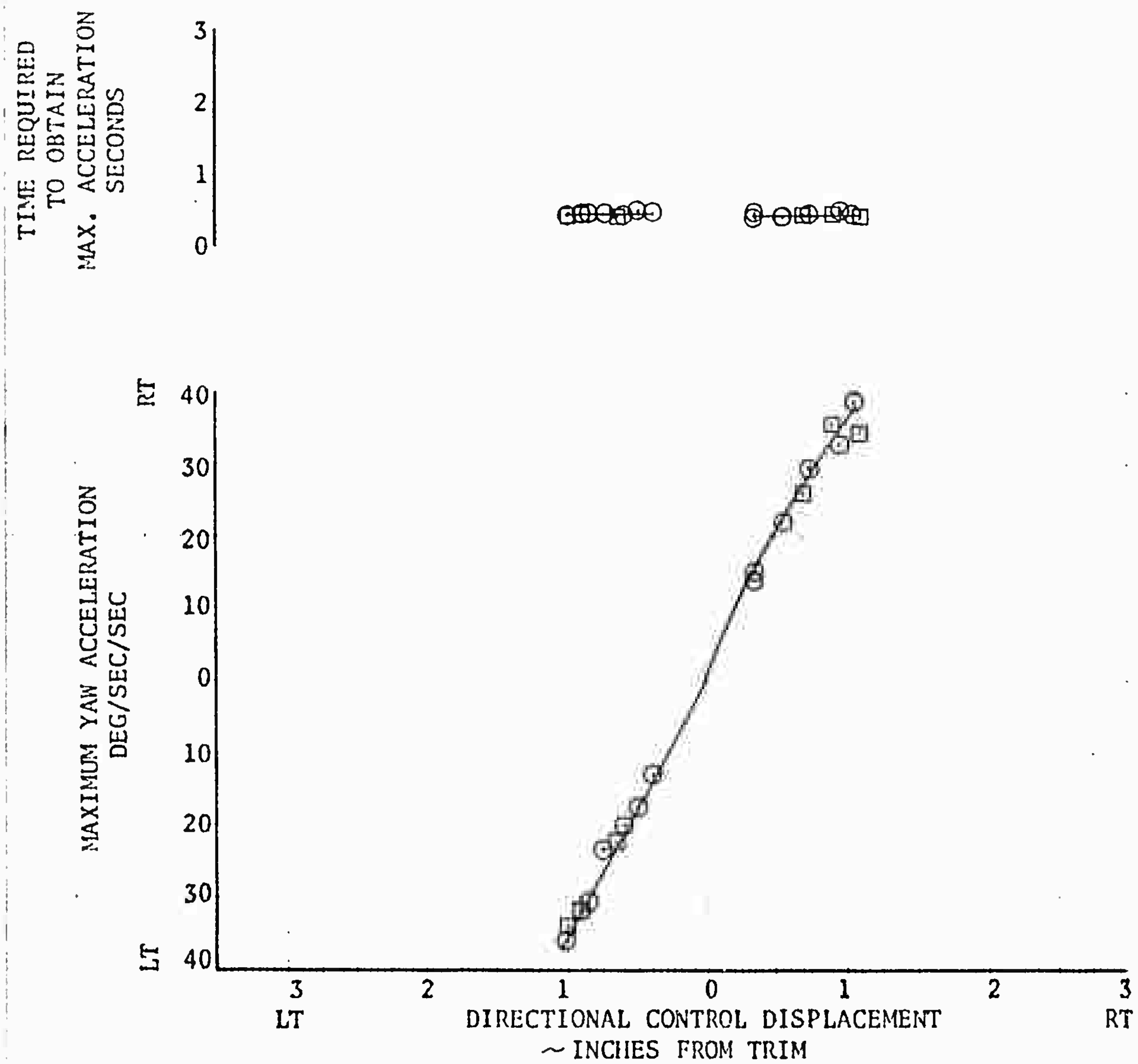


FIGURE NO. 189
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	118	6790	126.1(FWD)	5000	324
□	118	6770	134.8(AFT)	5000	324

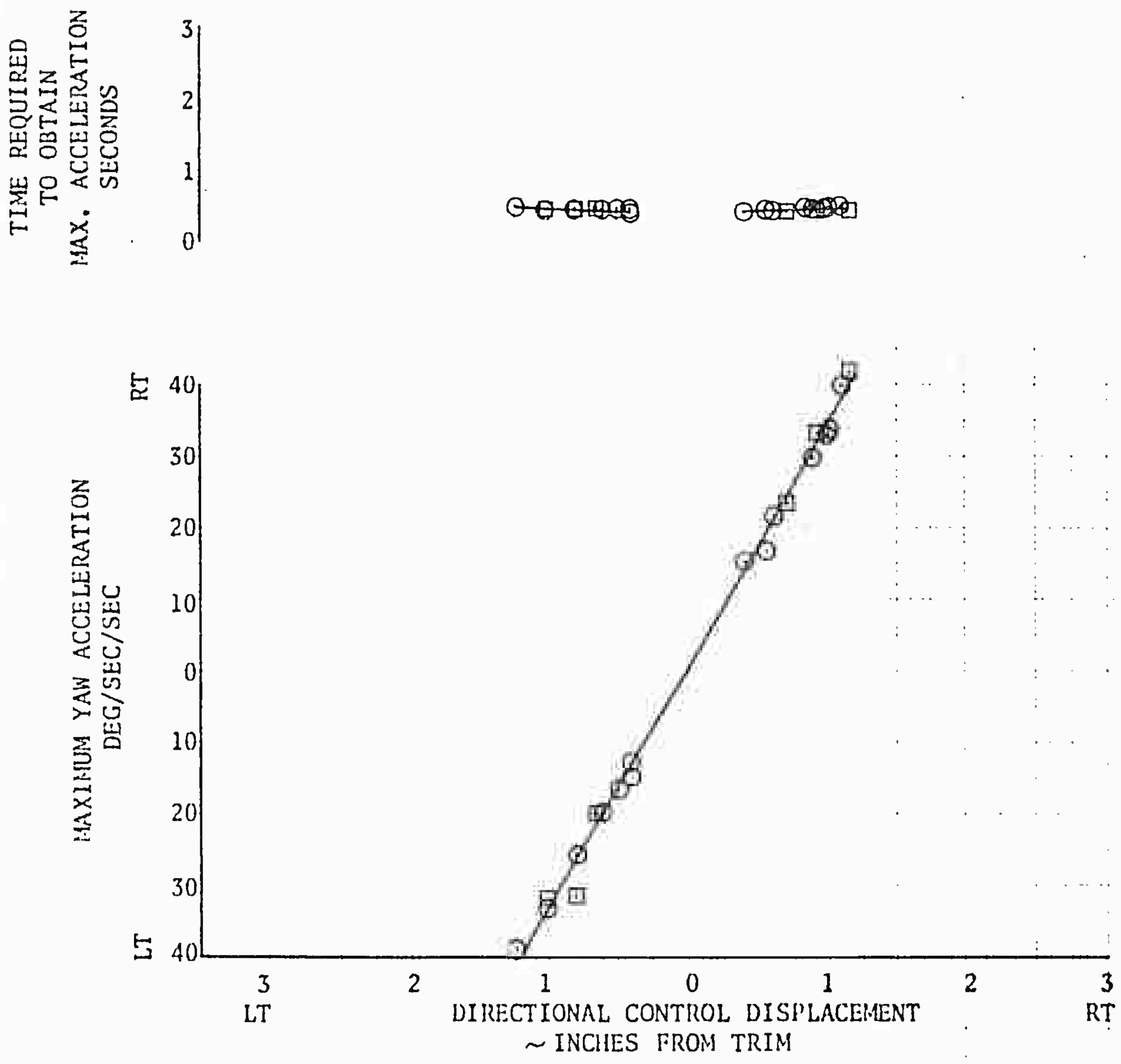


FIGURE NO. 190
DIRECTIONAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SKID HEIGHT FEET	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
5	7800	125.5(FWD)	2120	324

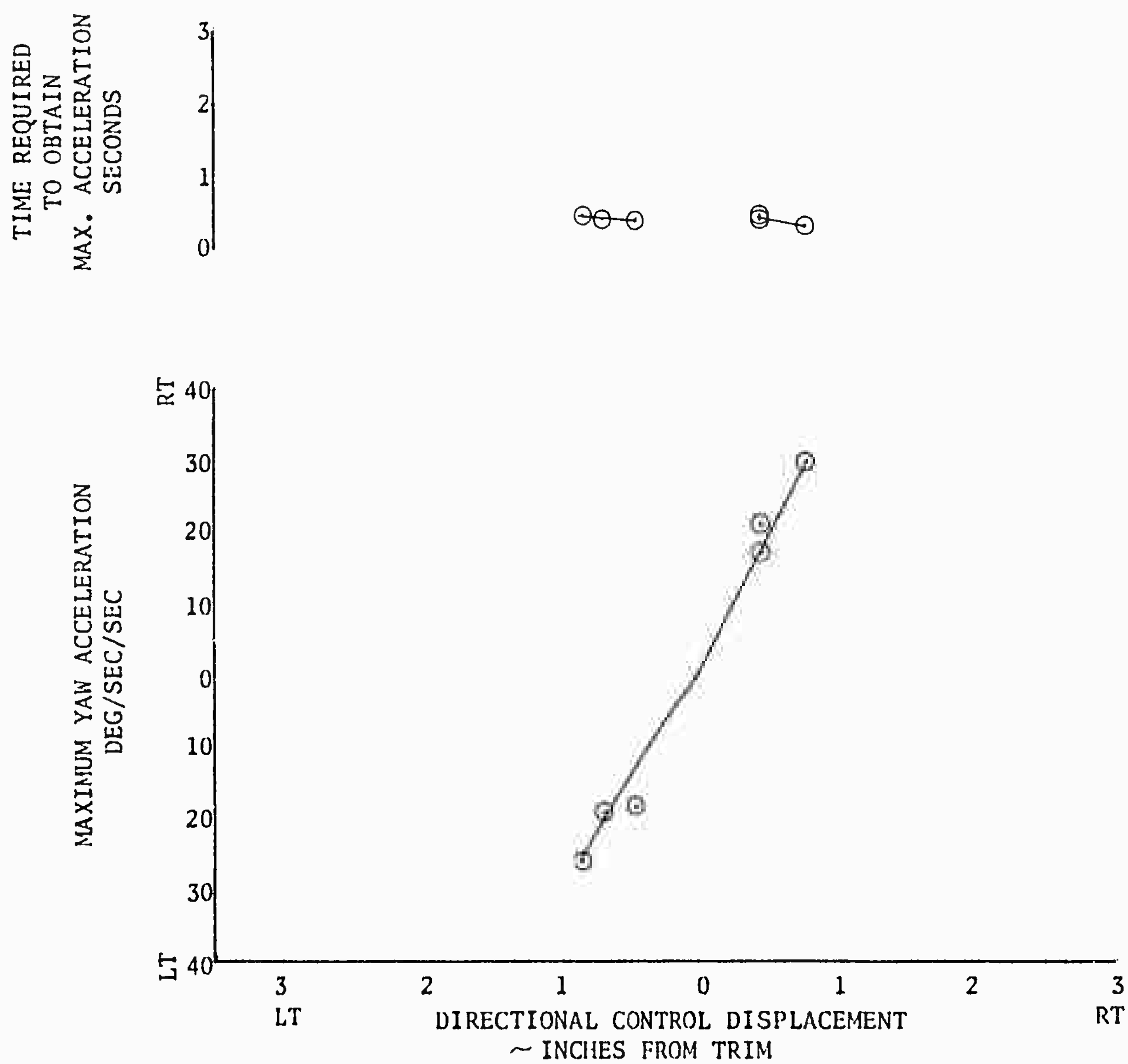


FIGURE NO. 191
DIRECTIONAL CONTROL SENSITIVITY
HOVER
UH-1B/540 USA S/N 63-8684

SYM	SKID HEIGHT FEET	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	5	8250	128.5(FWD)	2040	324

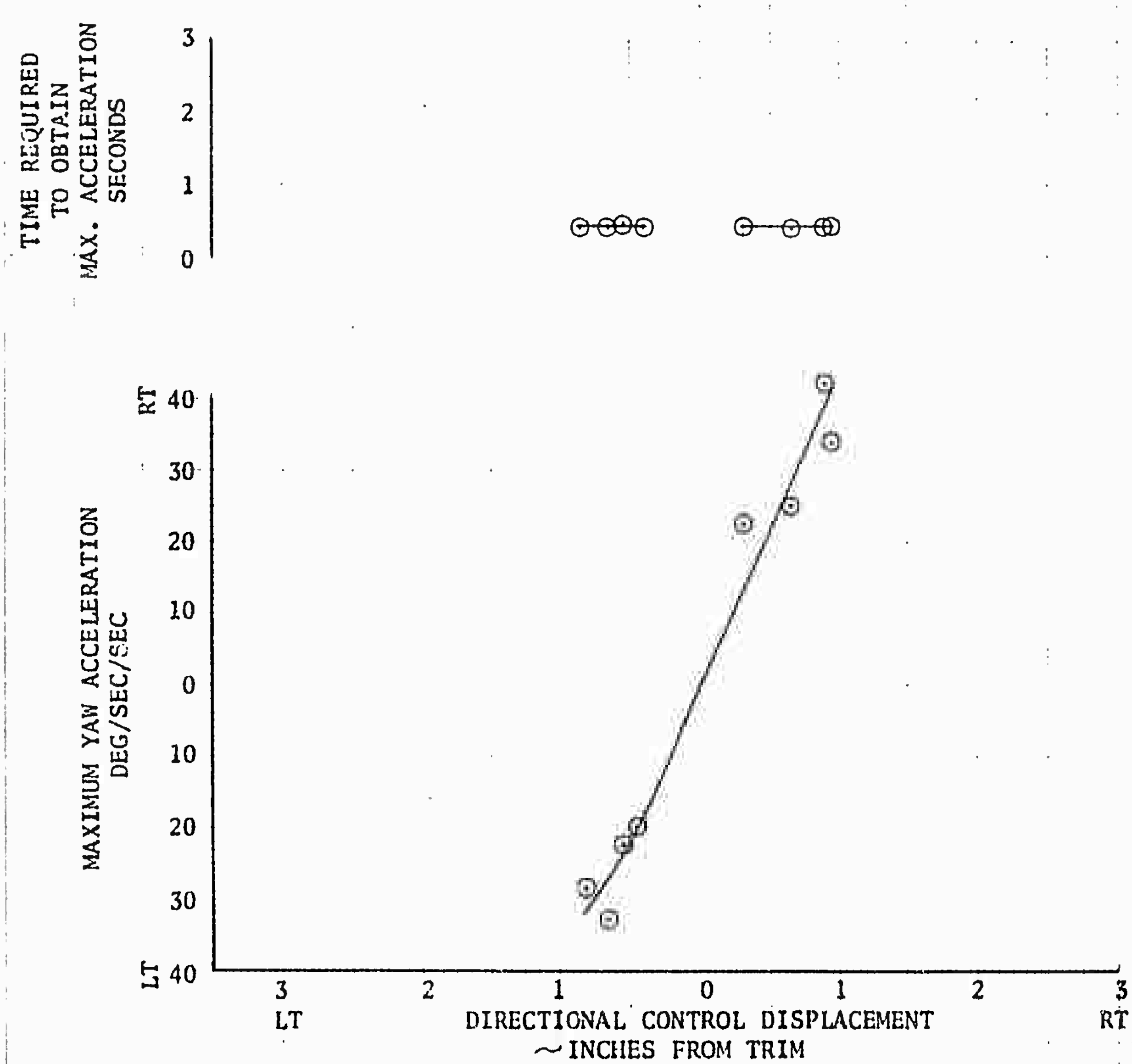


FIGURE NO. 192
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	8205	126.0(FWD)	5000	324
□	35	8155	134.0(AFT)	5000	324

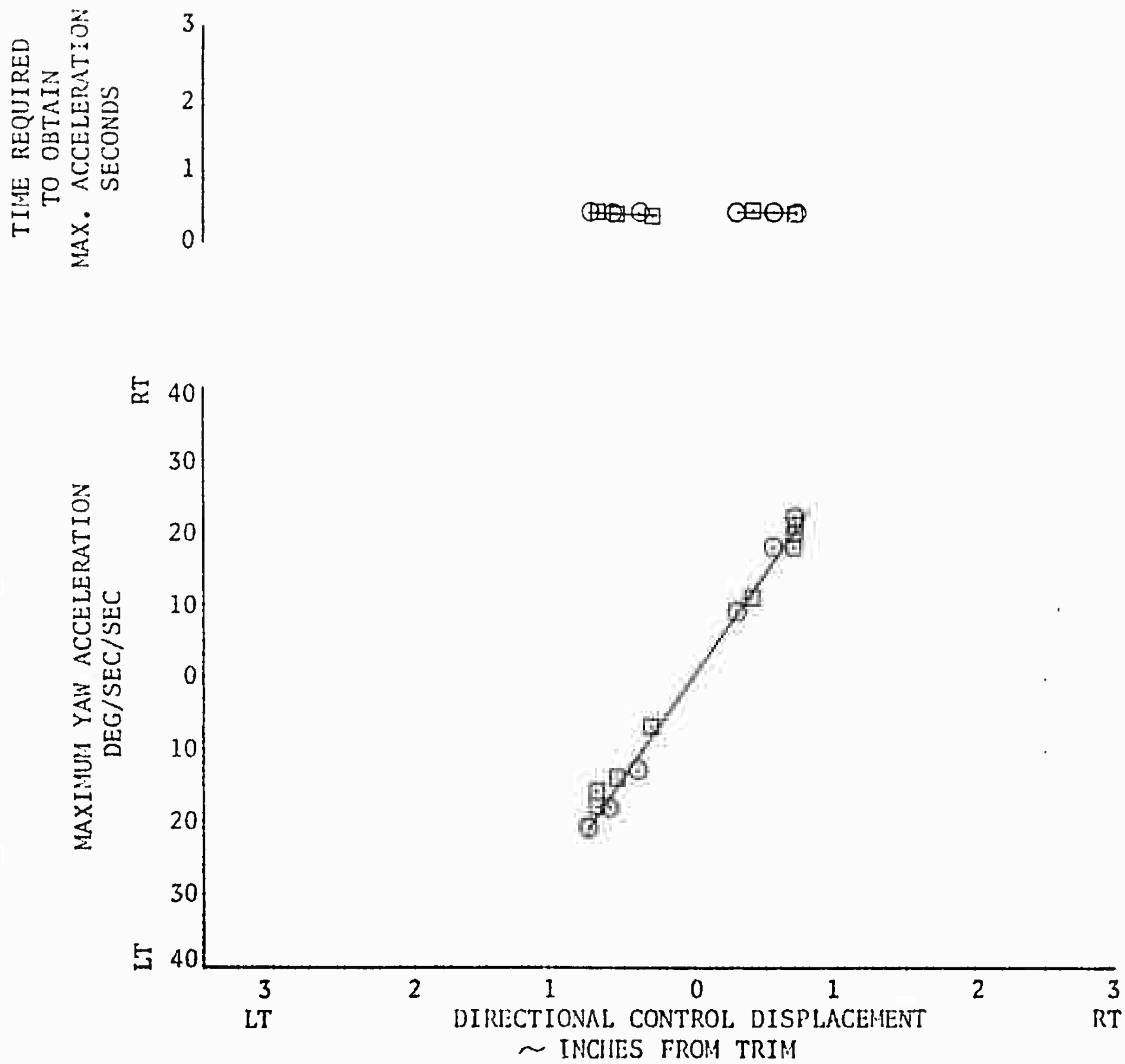


FIGURE NO. 193
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8205	126.0(FWD)	5000	324
□	92	8155	134.0(AFT)	5000	324

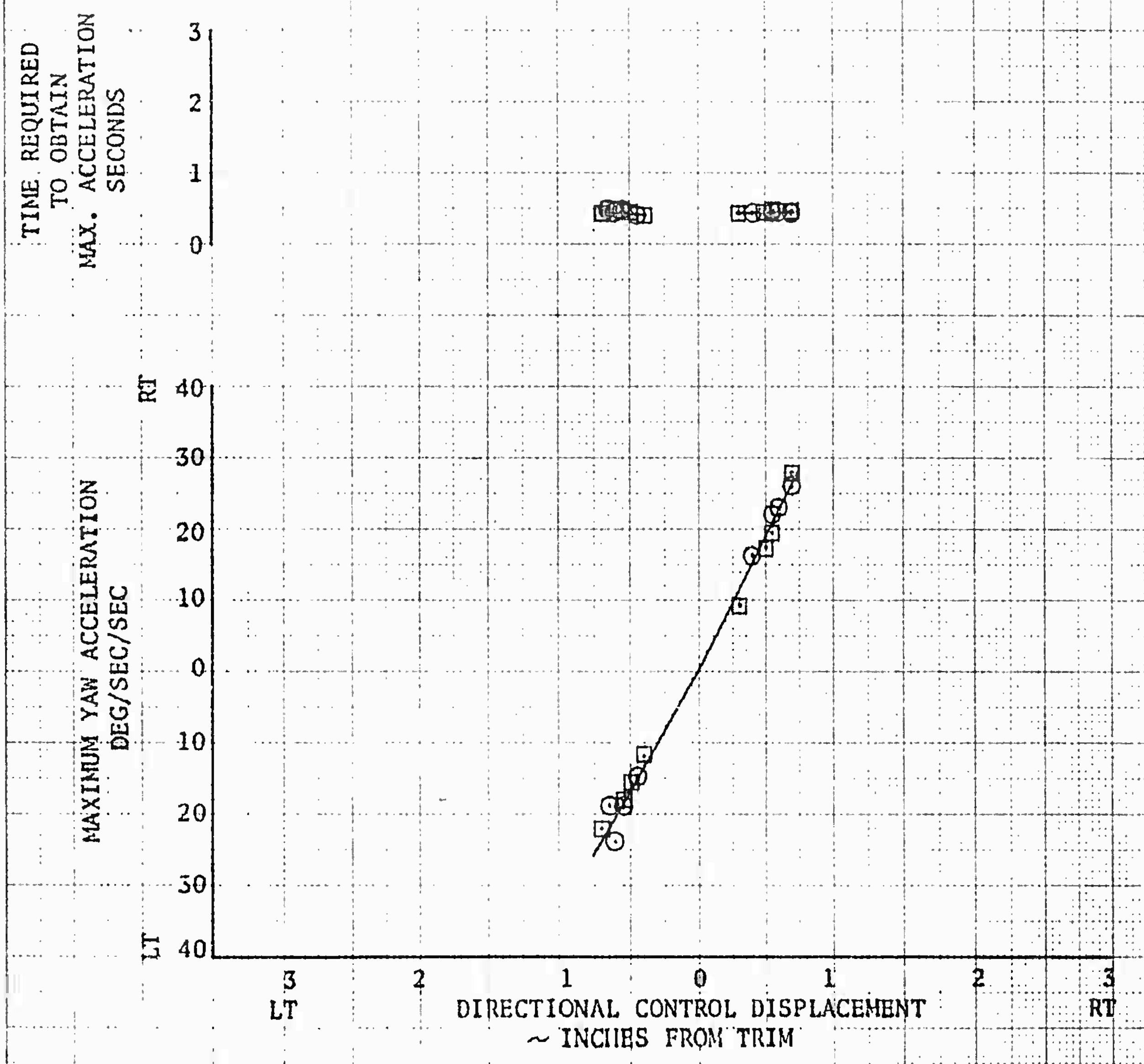


FIGURE NO. 194
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	113	8205	126.0(FWD)	5000	324
□	113	8155	134.0(AFT)	5000	324

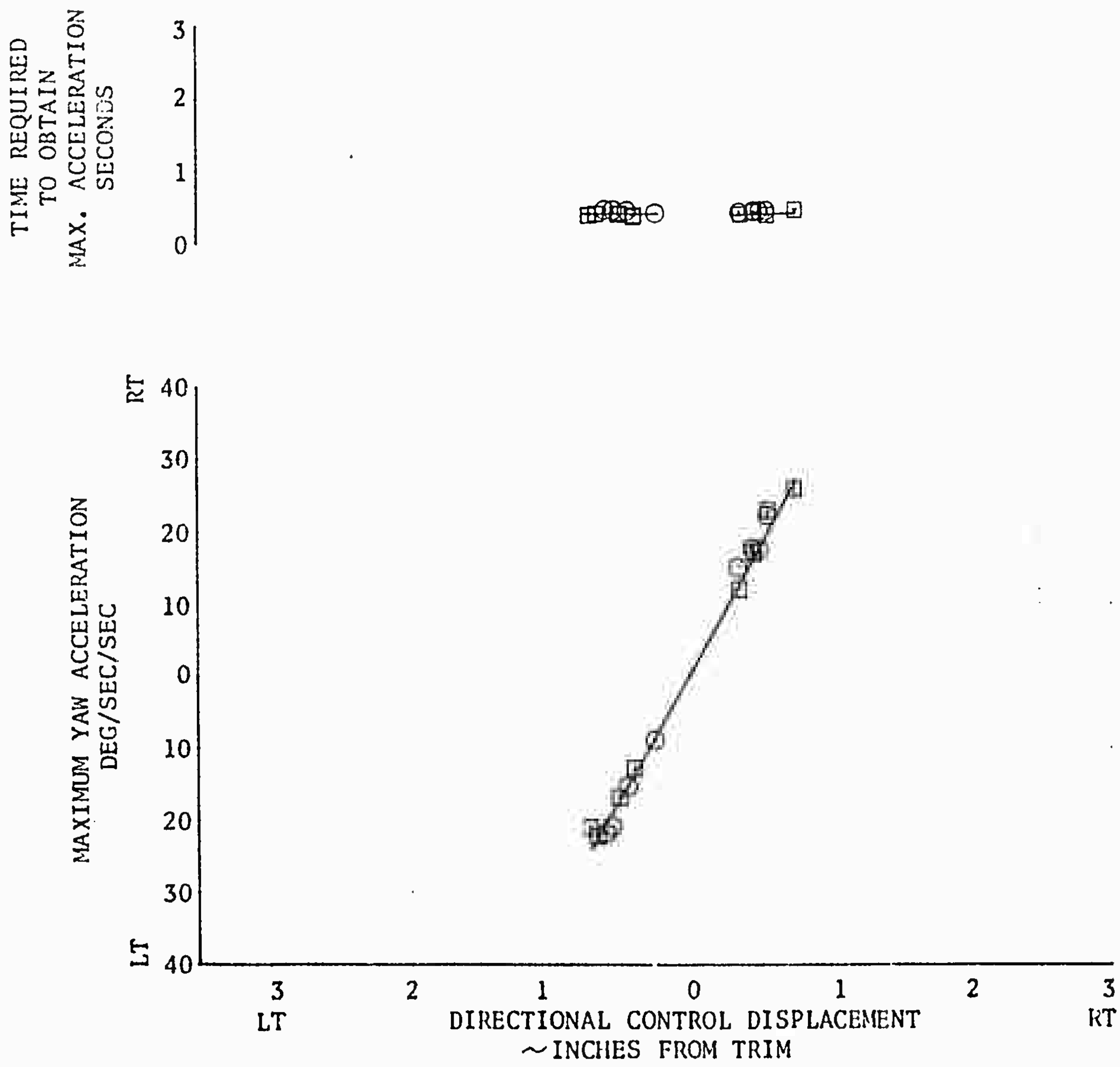


FIGURE NO. 195
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9280	126.5(FWD)	5000	324
□	35	9115	131.8(AFT)	5000	324

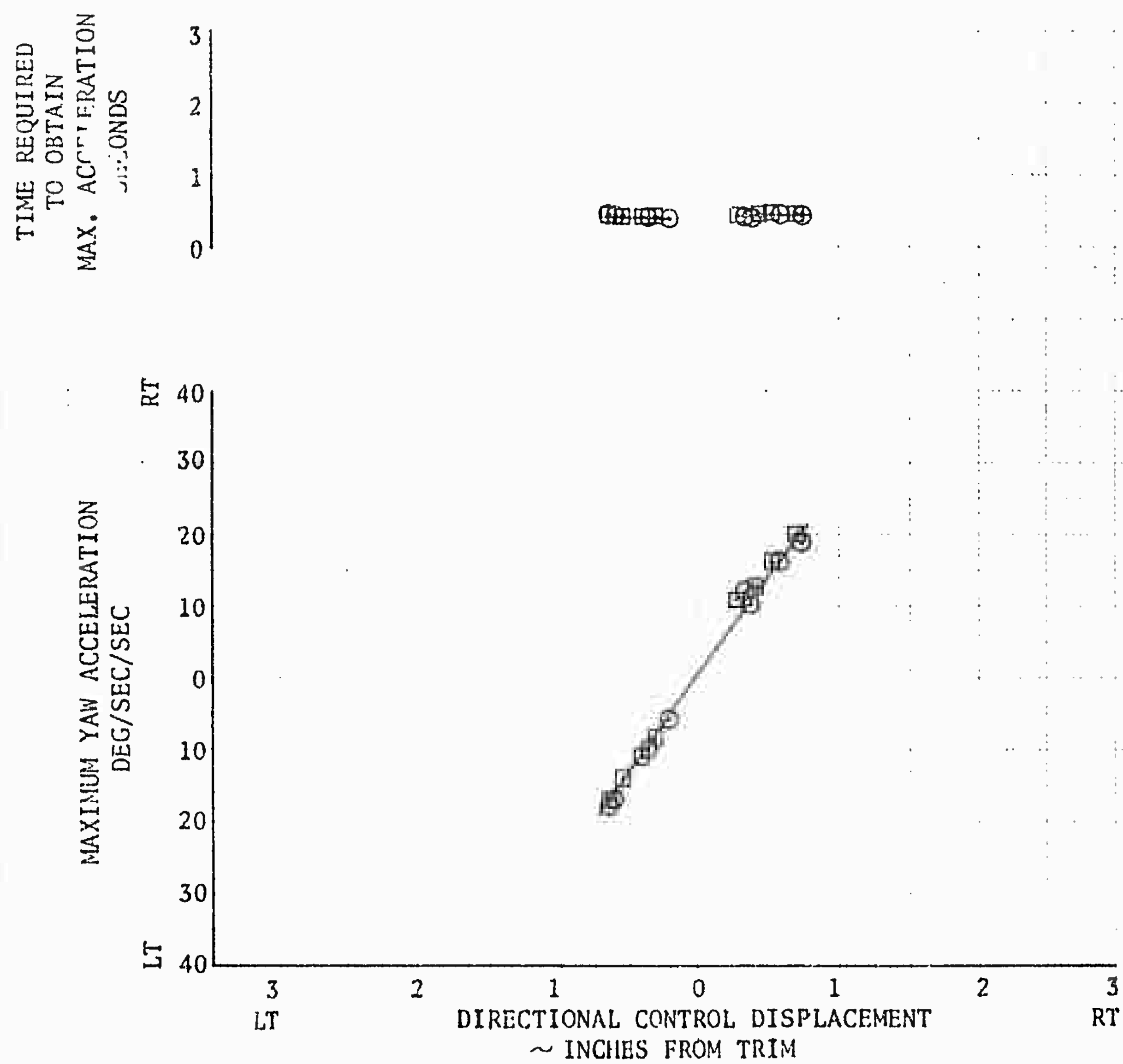


FIGURE NO. 196
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	88	9280	126.5(FWD)	5000	324
□	88	9115	131.8(AFT)	5000	324

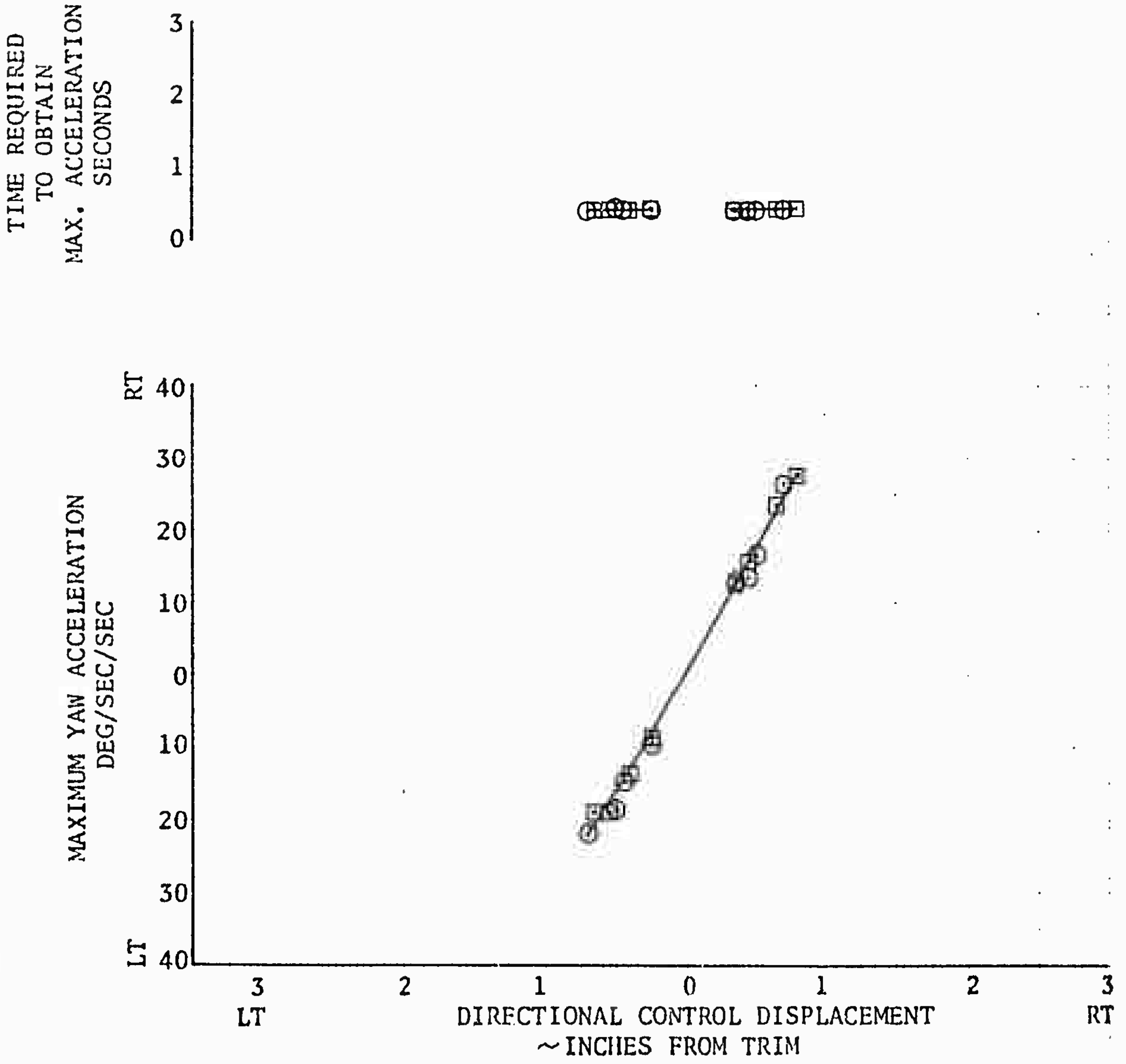


FIGURE NO. 197
DIRECTIONAL CONTROL SENSITIVITY
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9280	126.5(FWD)	5000	324
□	108	9115	131.8(AFT)	5000	324

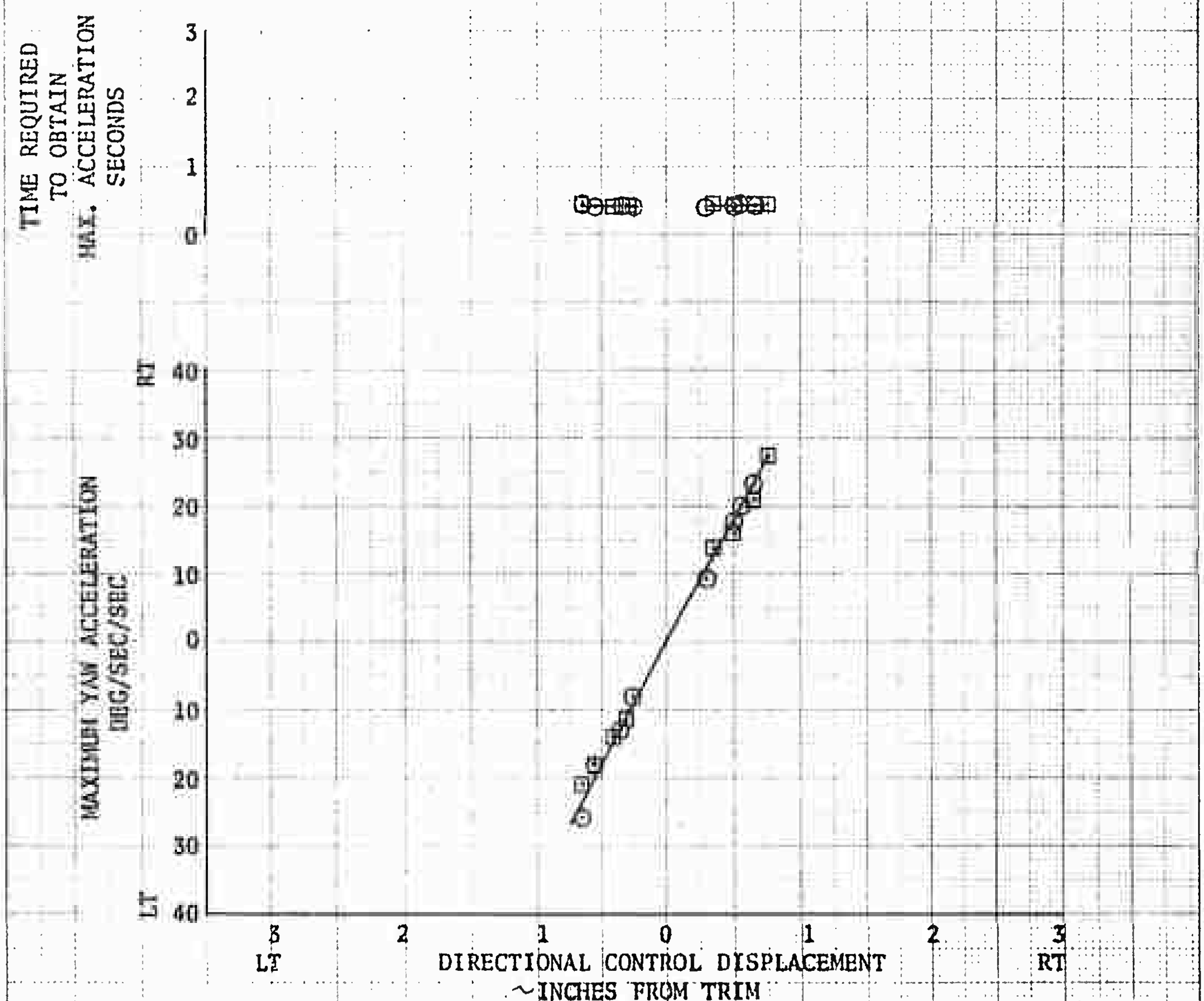


FIGURE NO. 198
DIRECTIONAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
52	6930	135.0(AFT)	5000	324

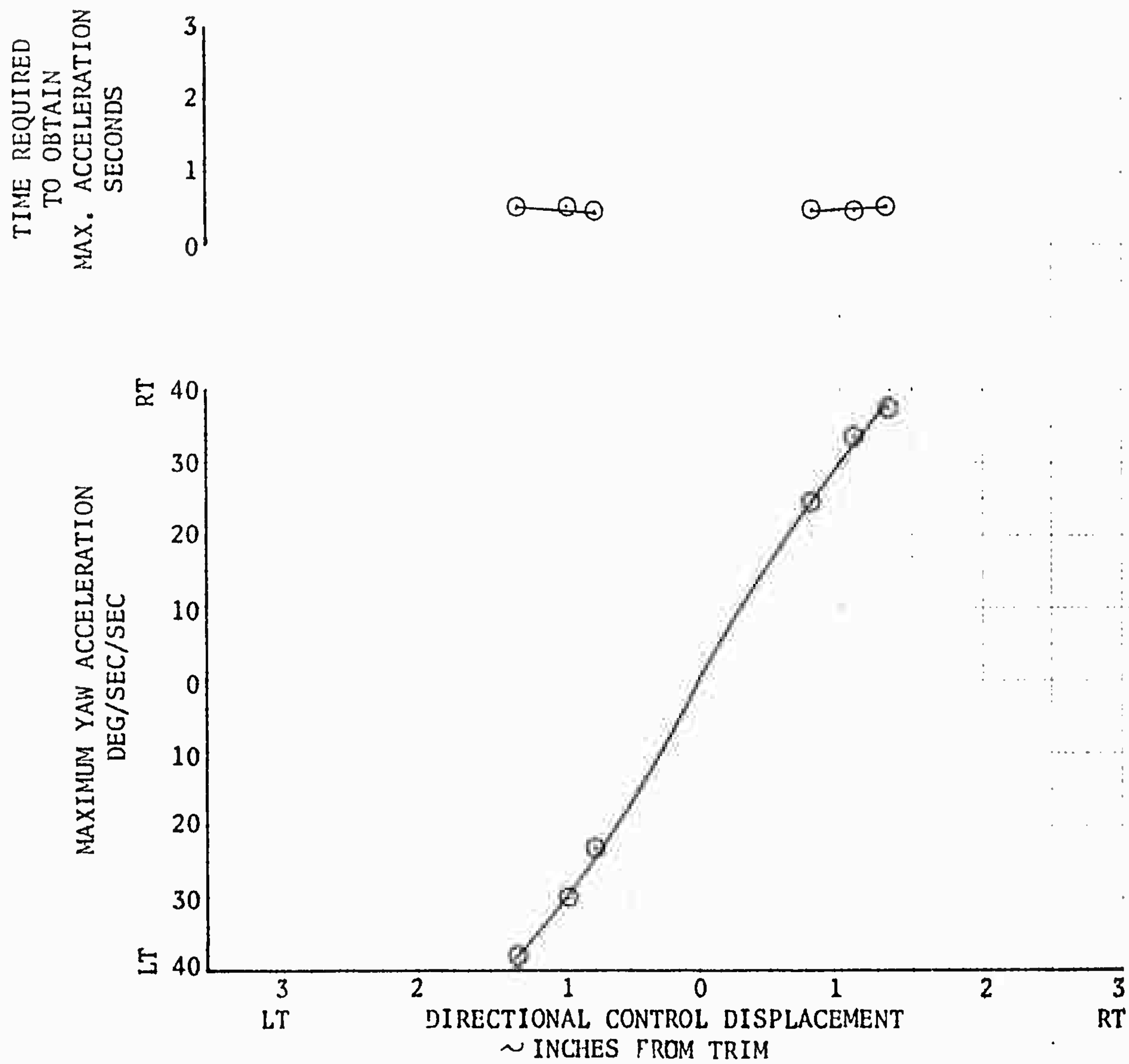


FIGURE NO. 199
DIRECTIONAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8205	126.0(FWD)	5000	324
□	57	8245	133.9(AFT)	5000	324

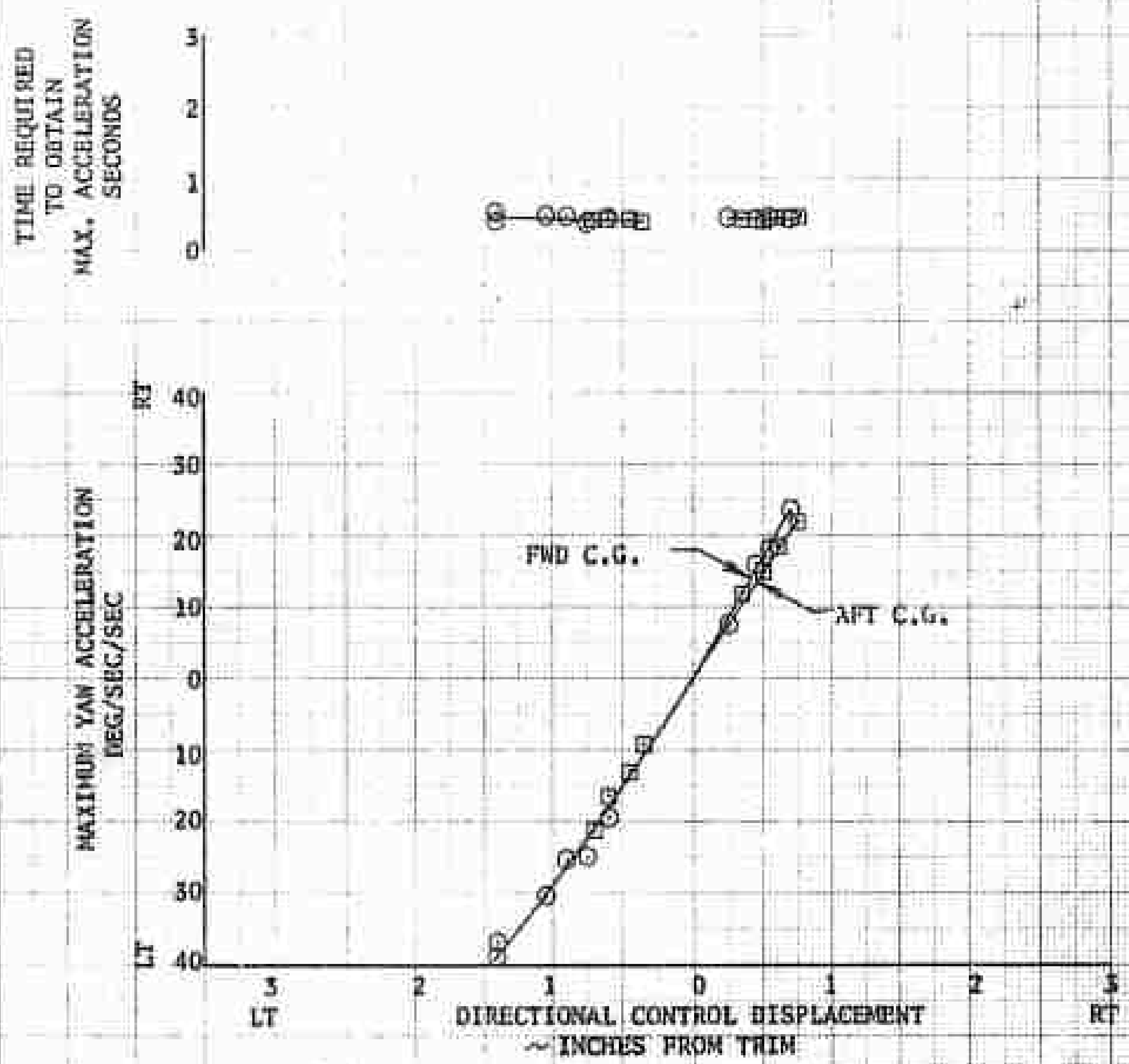


FIGURE NO. 200
DIRECTIONAL CONTROL SENSITIVITY
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9280	126.5(FWD)	5000	324
□	57	9115	131.8(AFT)	5000	324

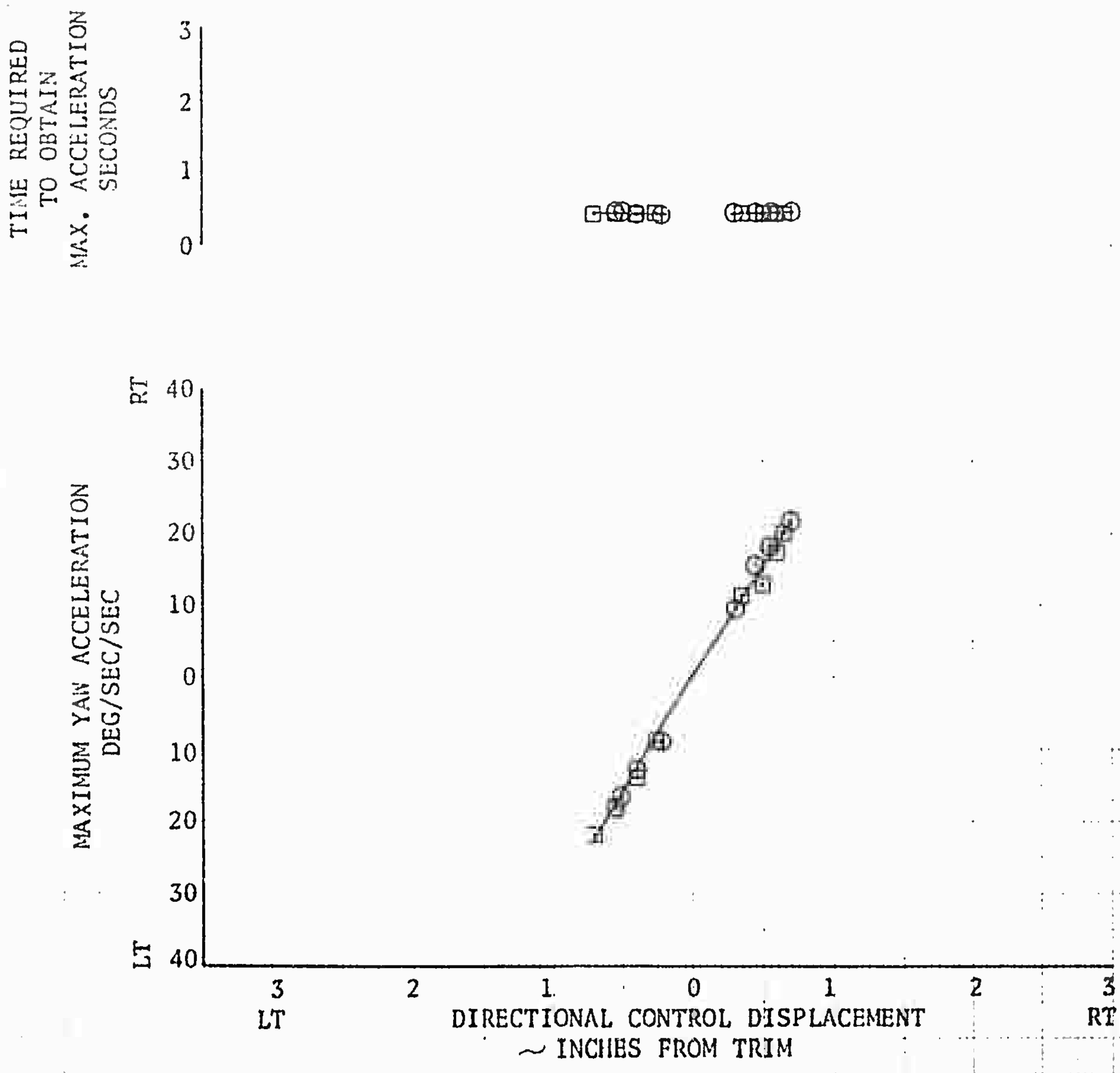


FIGURE NO. 201
DIRECTIONAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	6930	135.0(AFT)	5000	324
□	104	6930	135.0(AFT)	5000	324

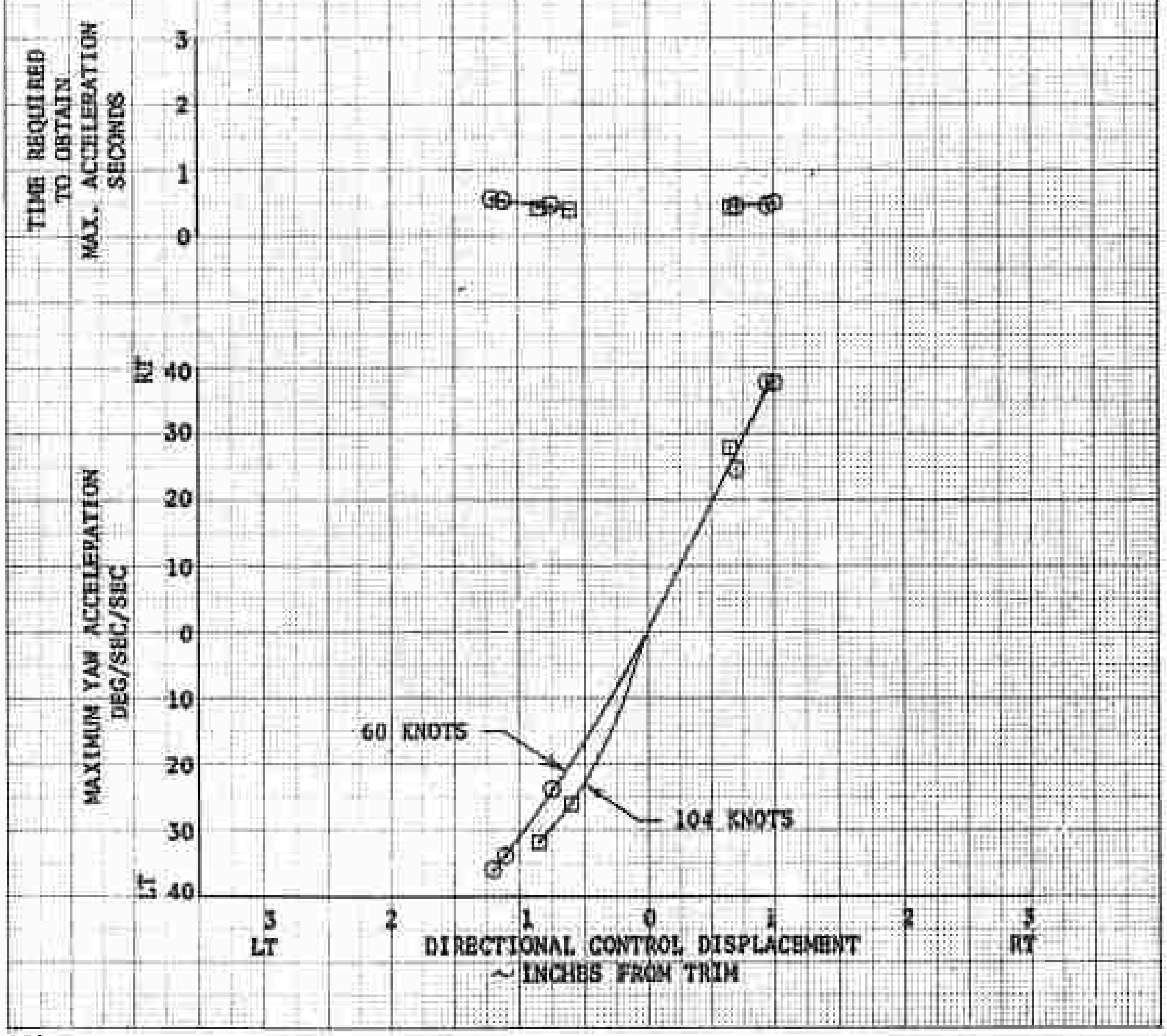


FIGURE NO. 202
DIRECTIONAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	8205	126.0(FWD)	5000	324
□	60	8245	133.9(AFT)	5000	324
●	104	8245	126.0(FWD)	5000	324

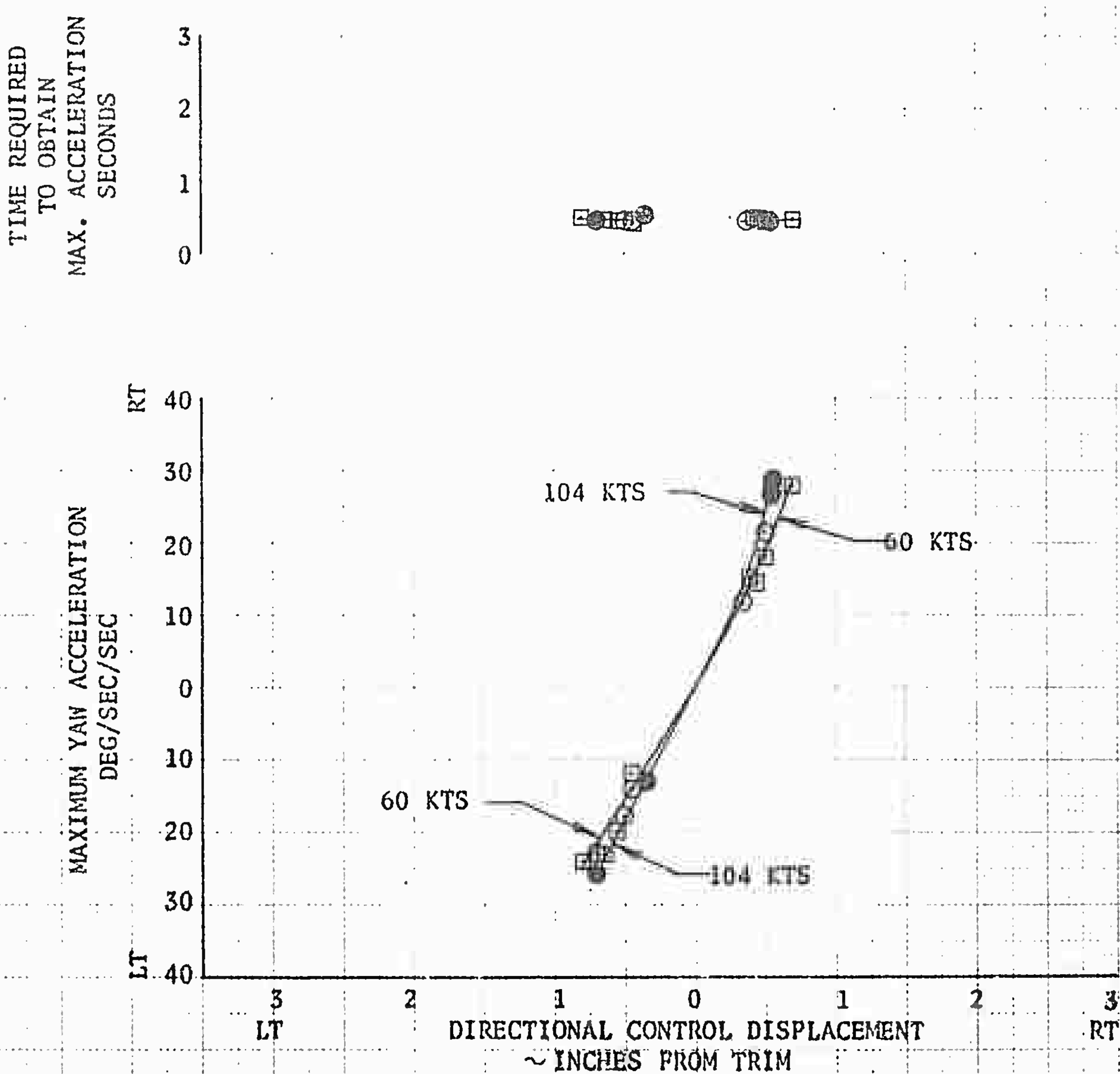


FIGURE NO. 203
DIRECTIONAL CONTROL SENSITIVITY
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9280	126.5(FWD)	5000	324
□	60	9115	131.8(AFT)	5000	324

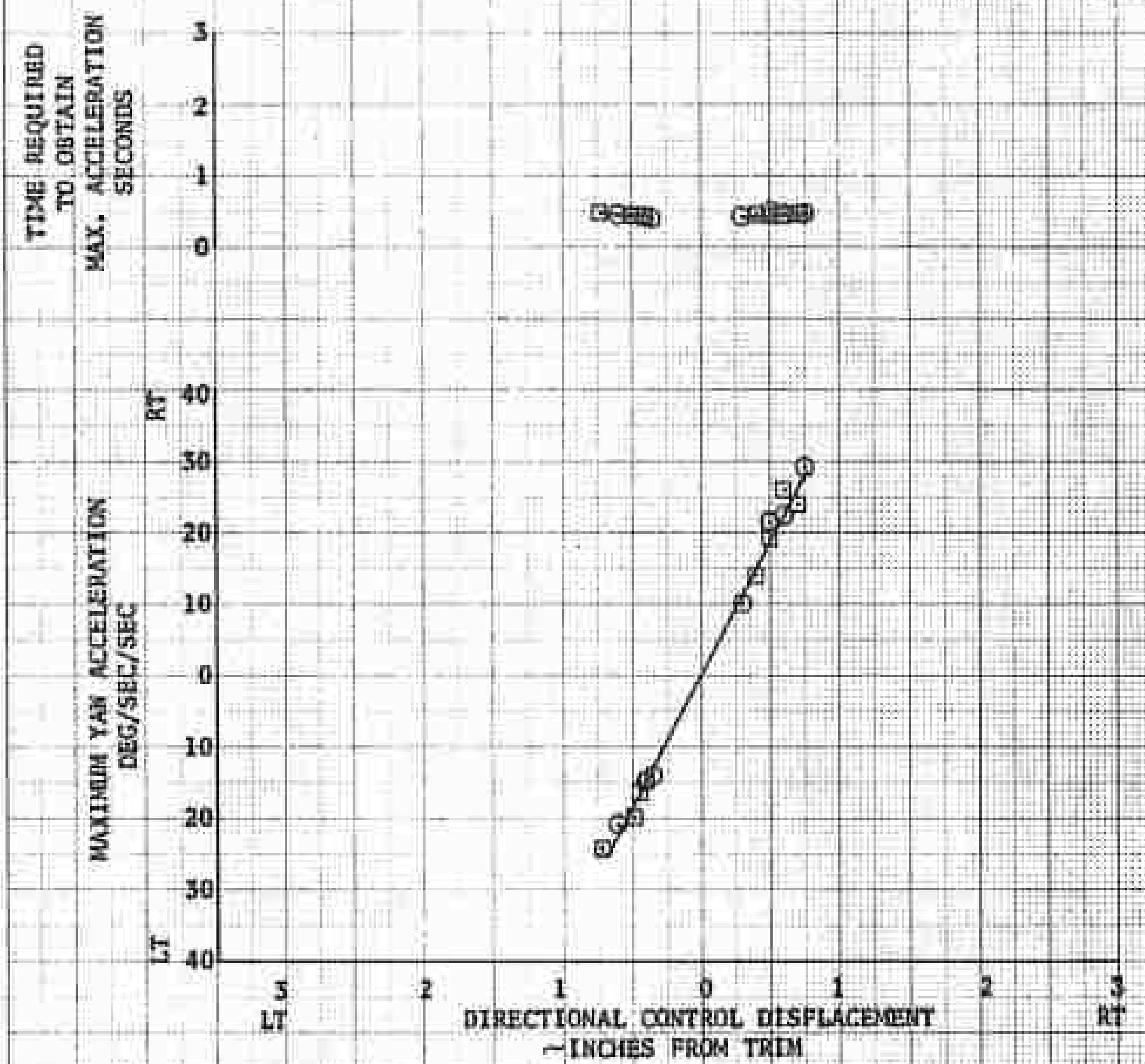


FIGURE NO. 204
DIRECTIONAL CONTROL RESPONSE SUMMARY
UH-1B/540 USA S/N 63-8684

SYM	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	PLOTTED ON FIGURE NO.
◇	6360	128.0(FWD)	2040	324	204 A
○	6790	126.1(FWD)	5000	324	204 A
□	6850	135.0(AFT)	5000	324	204 A
△	7800	125.5(FWD)	2120	324	204 B
◺	8205	126.0(FWD)	5000	324	204 B
⬭	8250	128.5(FWD)	2040	324	204 B
☆	8200	134.0(AFT)	5000	324	204 B
△	9280	126.5(FWD)	5000	324	204 C
⬡	9115	131.8(AFT)	5000	324	204 C

NOTES:
1. CURVES DERIVED FROM FIGURES NO. 205 THROUGH 222
2. SHADED SYMBOL DENOTES LEFT YAW.
3. HALF SHADED SYMBOL DENOTES BOTH RIGHT AND LEFT YAW.
4. FLAGGED SYMBOL DENOTES CLIMB.
5. SLASHED SYMBOL DENOTES AUTOROTATION.

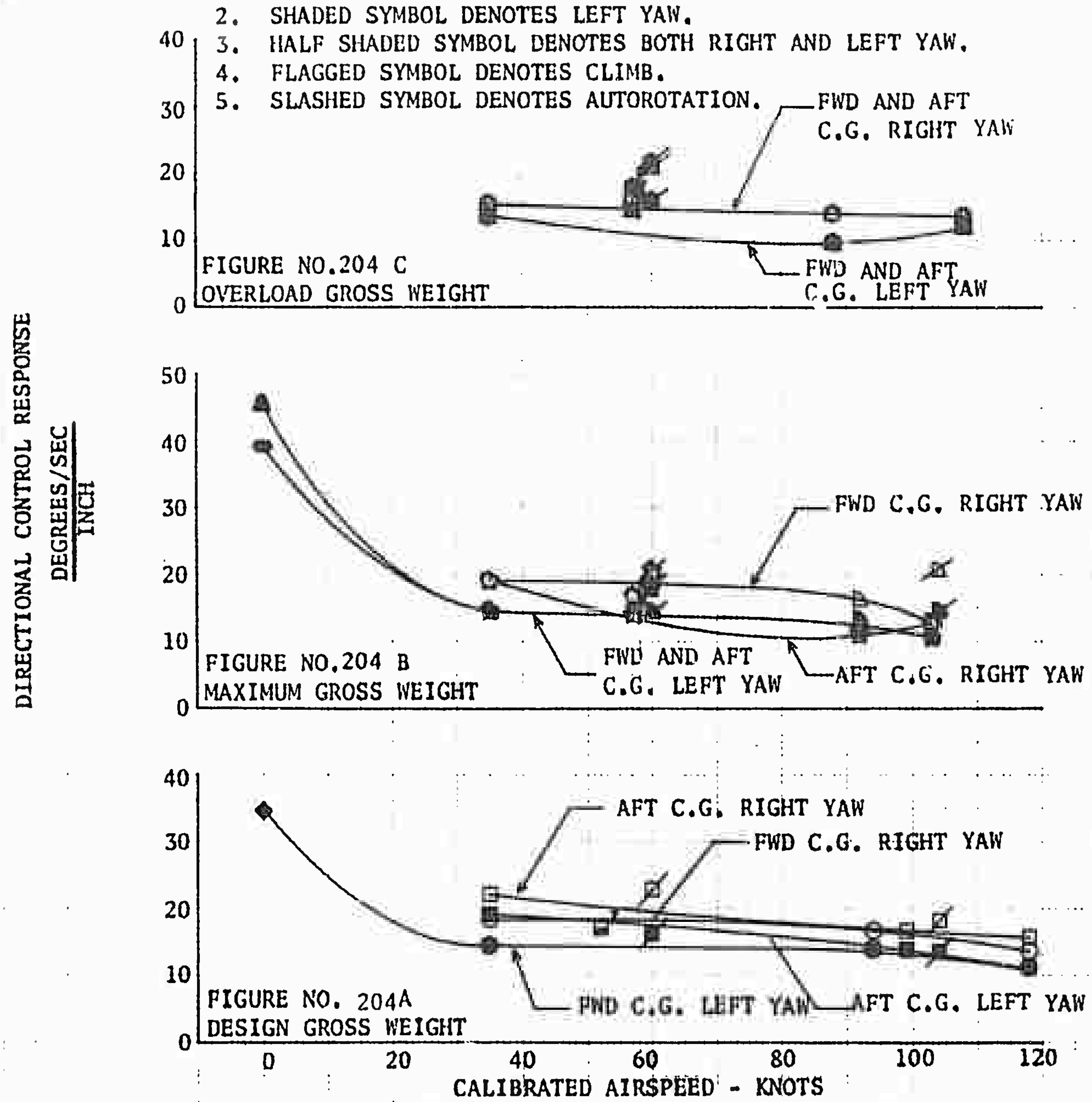


FIGURE NO. 205
DIRECTIONAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	6360	128.0(FWD)	2040	324

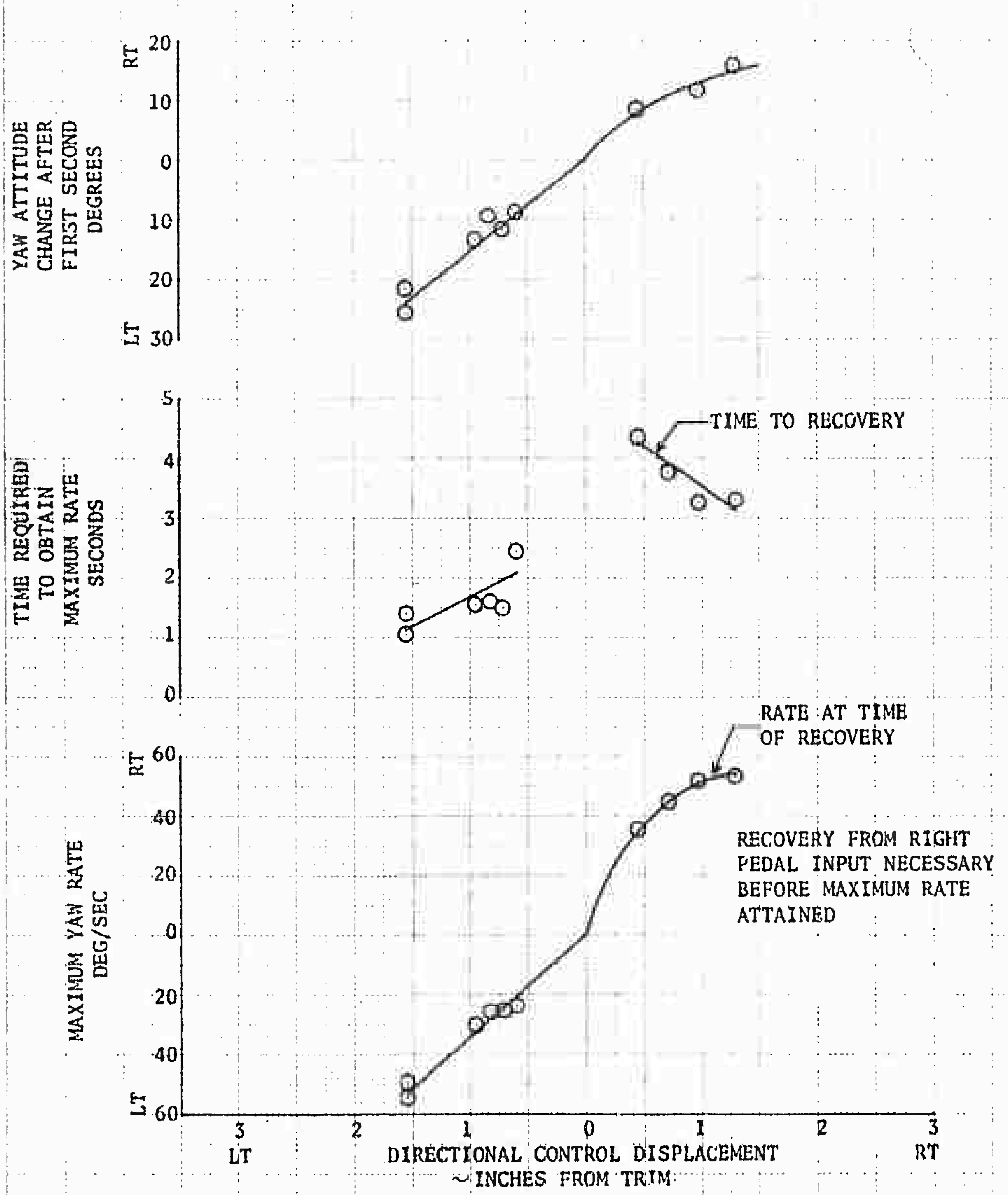


FIGURE NO. 206
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	6770	126.1(FWD)	5000	324
□	35	6770	134.8(AFT)	5000	324

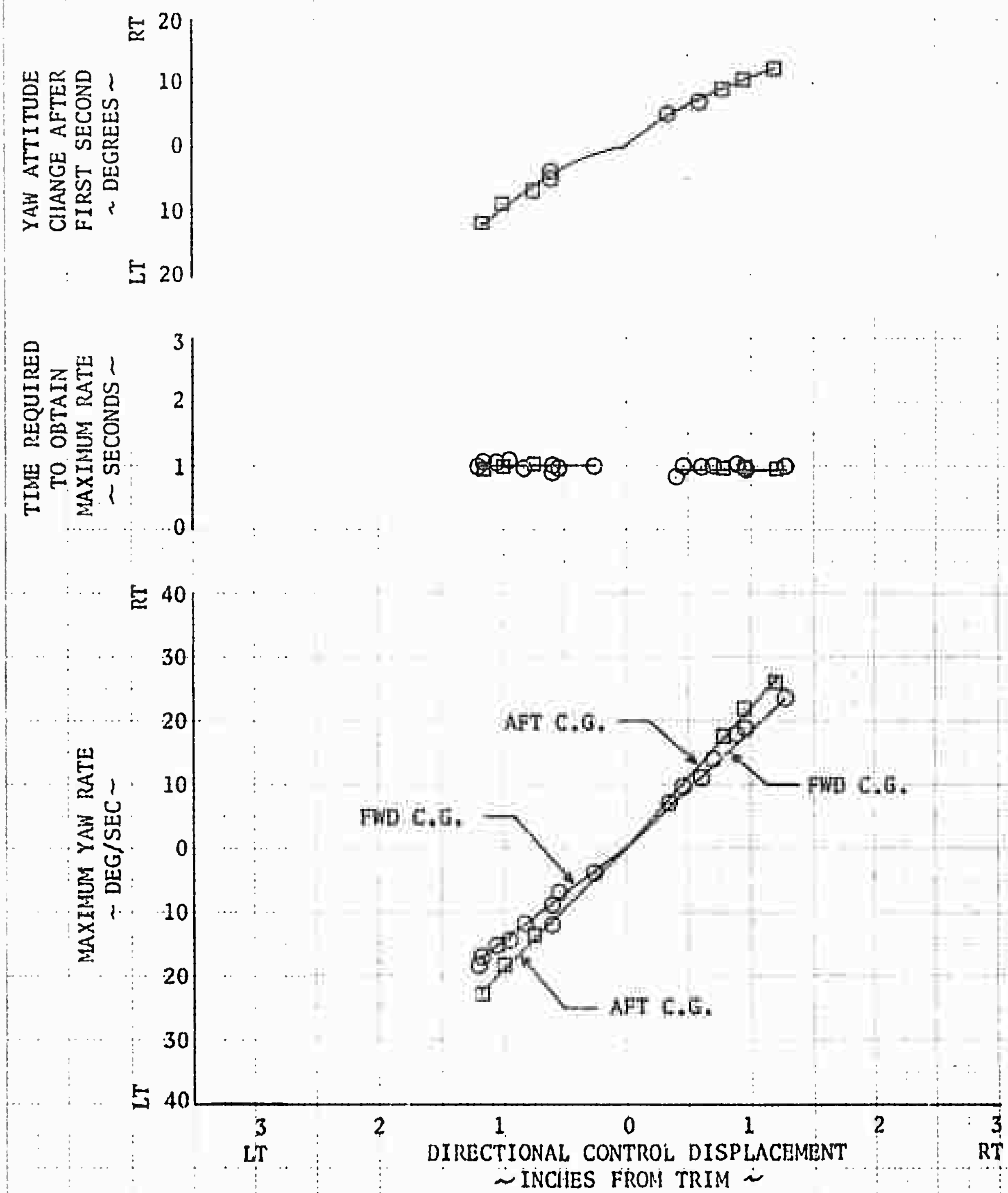


FIGURE NO. 207
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	94	6790	126.1(FWD)	5000	324
□	99	6770	134.8(AFT)	5000	324

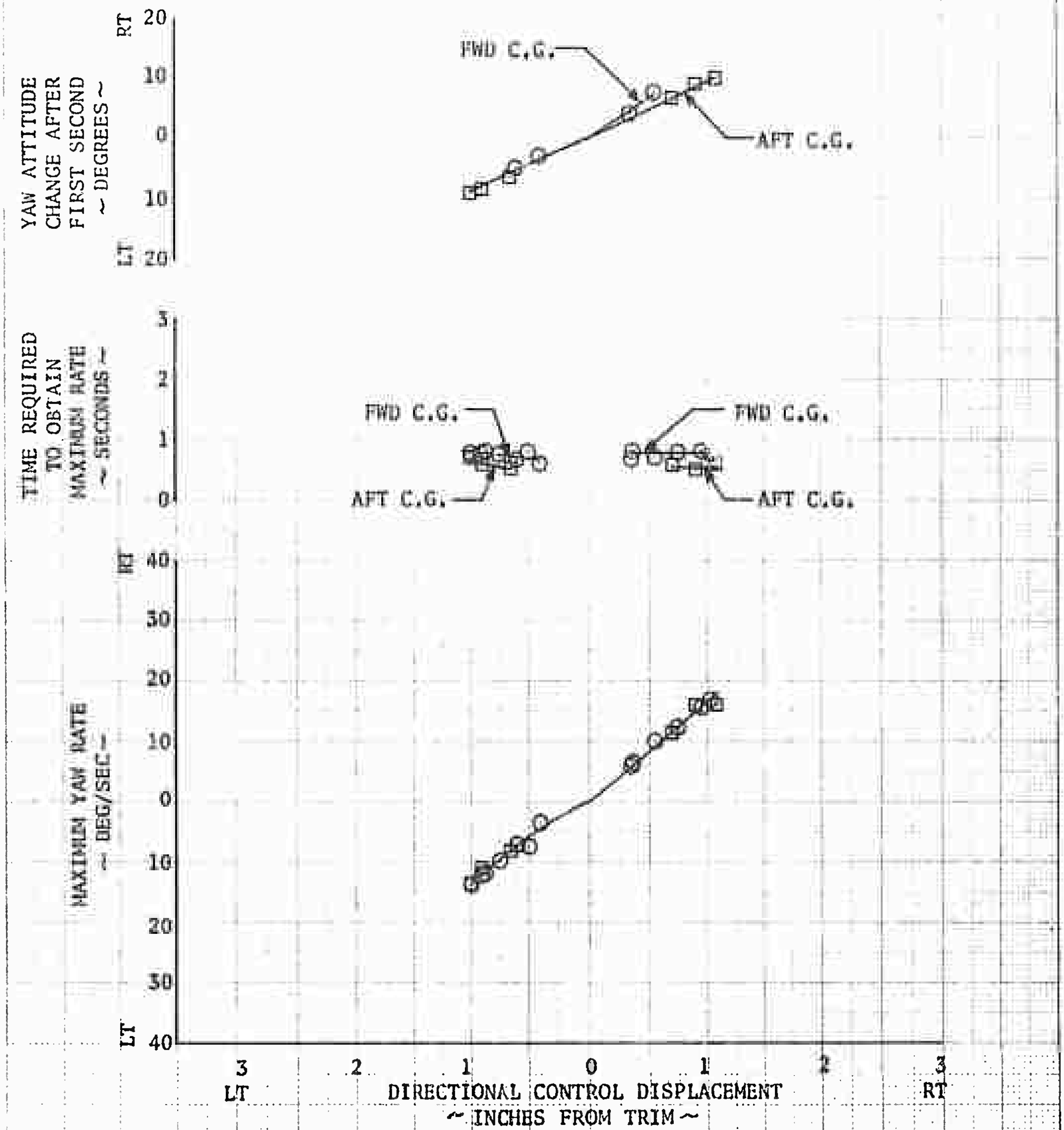


FIGURE NO. 208
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	118	6790	126.1(FWD)	5000	324
□	118	6770	134.8(AFT)	5000	324

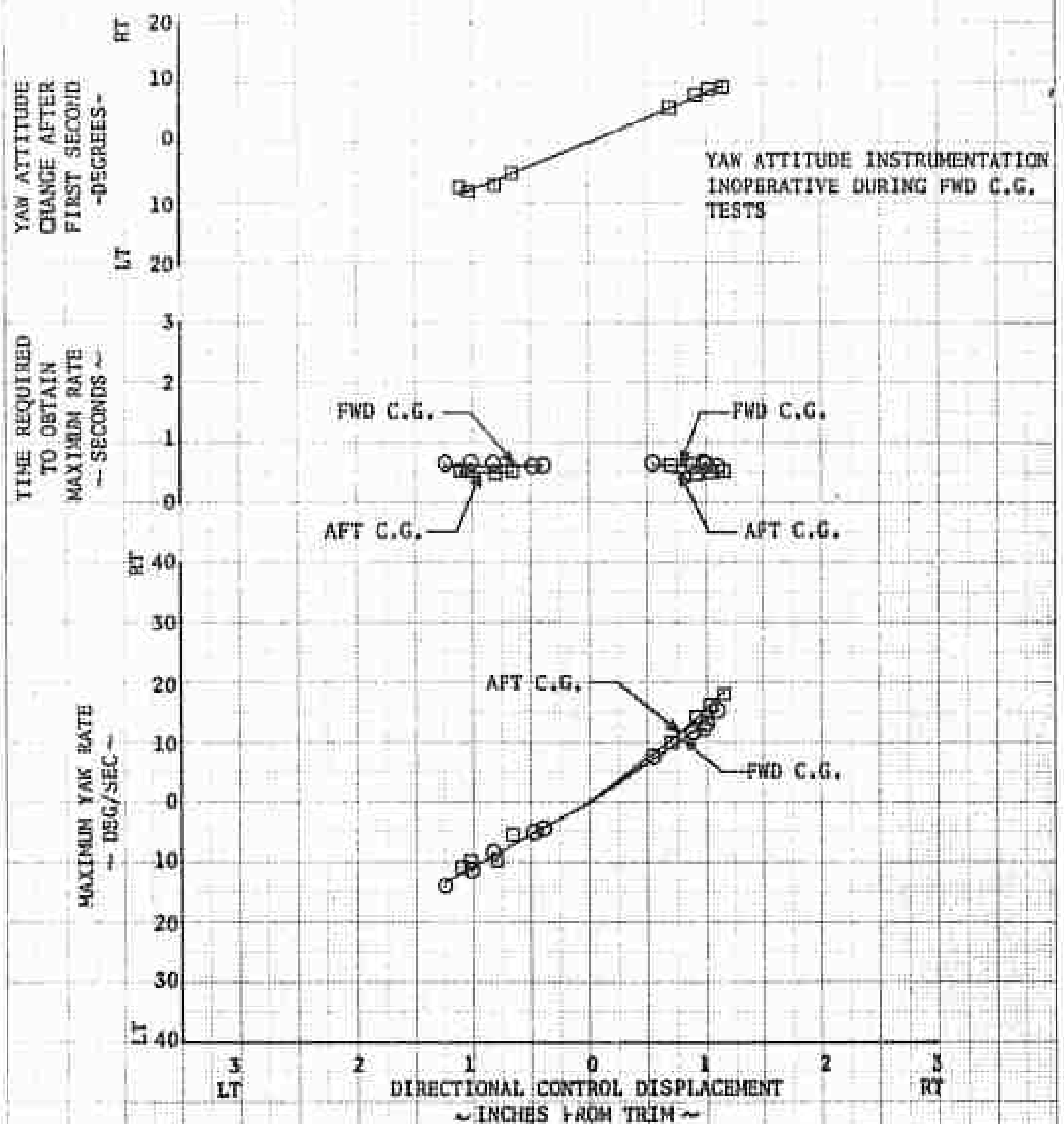


FIGURE NO. 209
DIRECTIONAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	7800	125.5(FWD)	2120	324

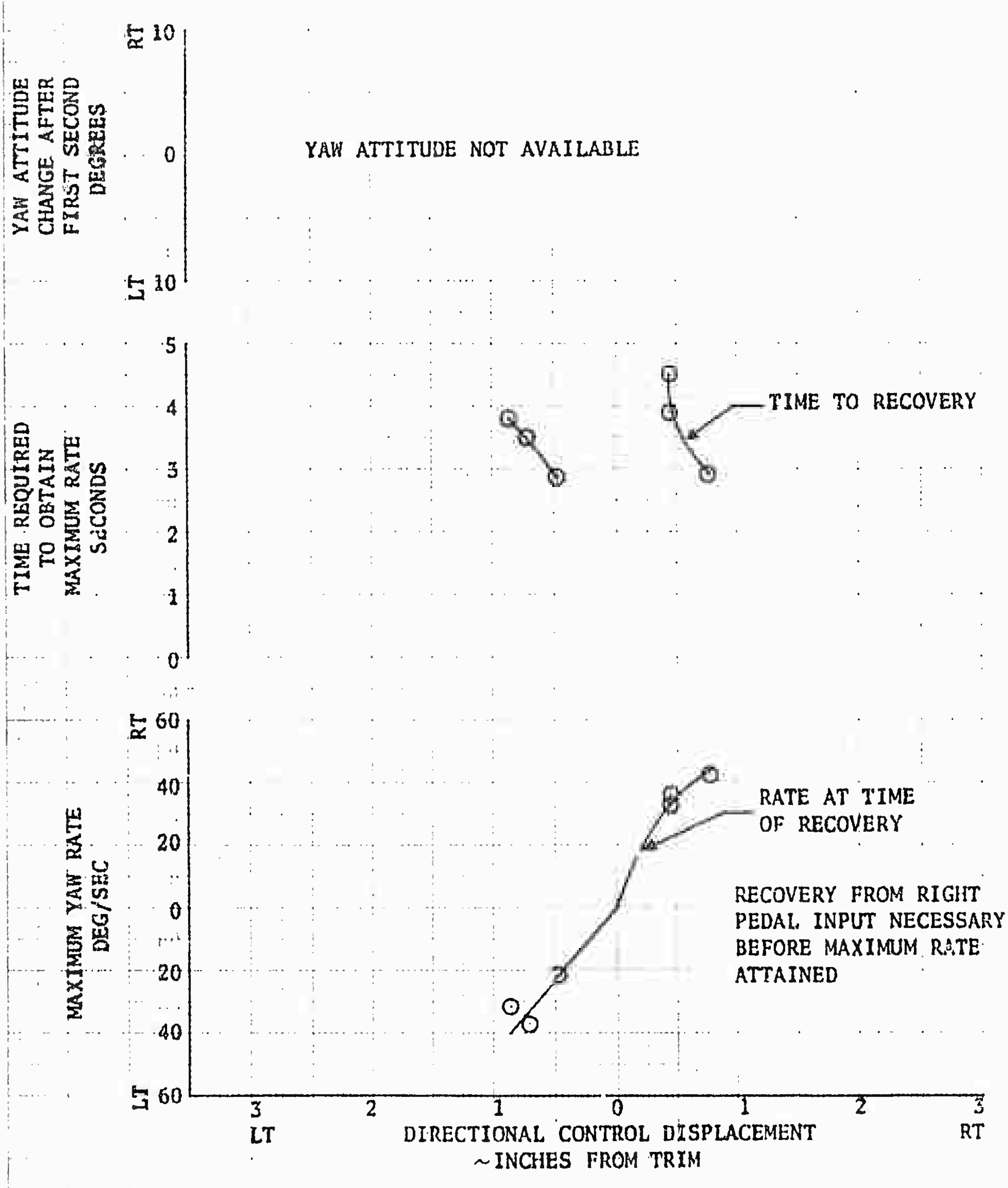


FIGURE NO. 210
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	8205	126.0(FWD)	5000	324
□	35	8155	134.0(AFT)	5000	324

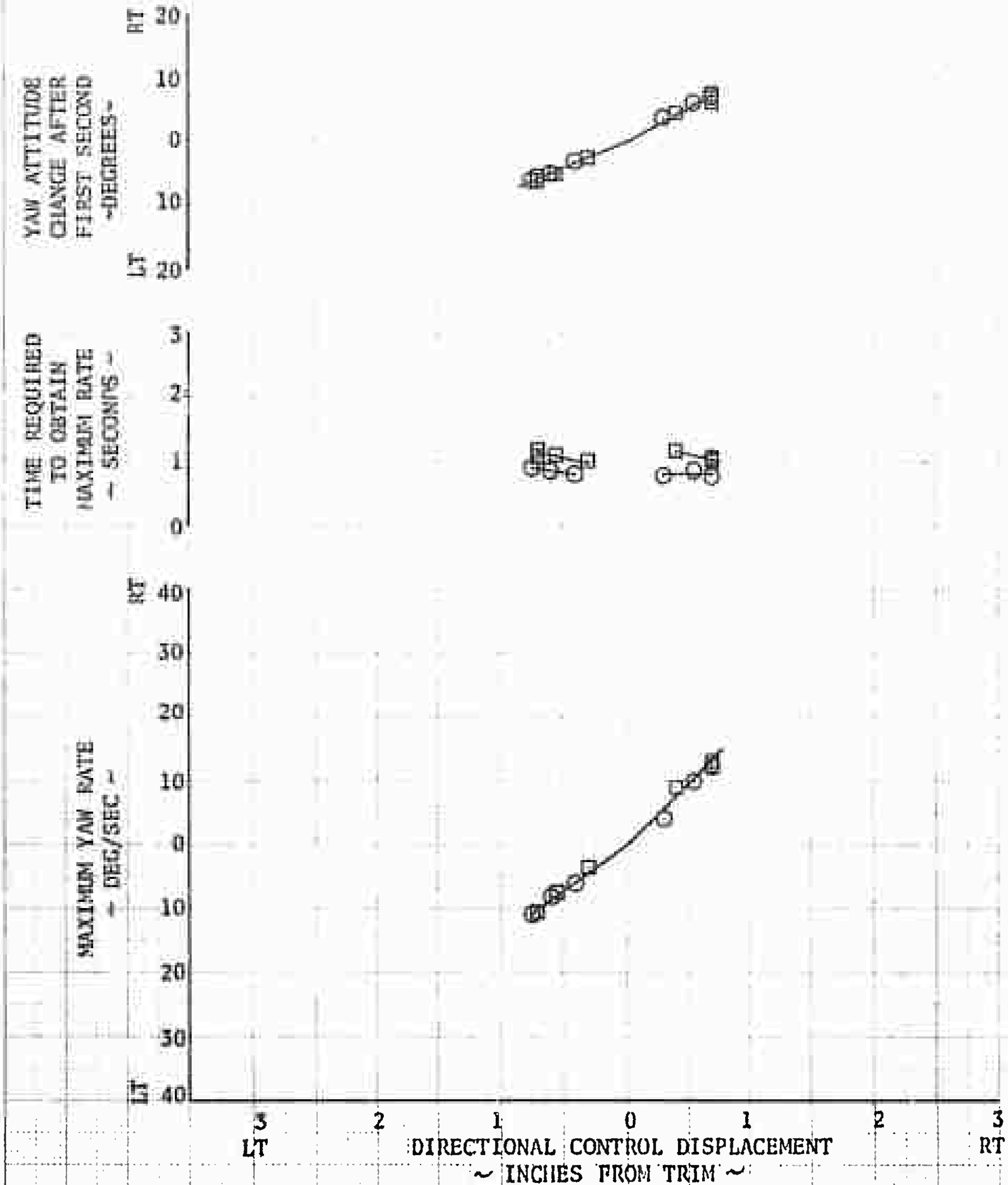


FIGURE NO. 211
DIRECTIONAL CONTROL RESPONSE
HOVER
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
HOVER	8250	128.5(FWD)	2040	324

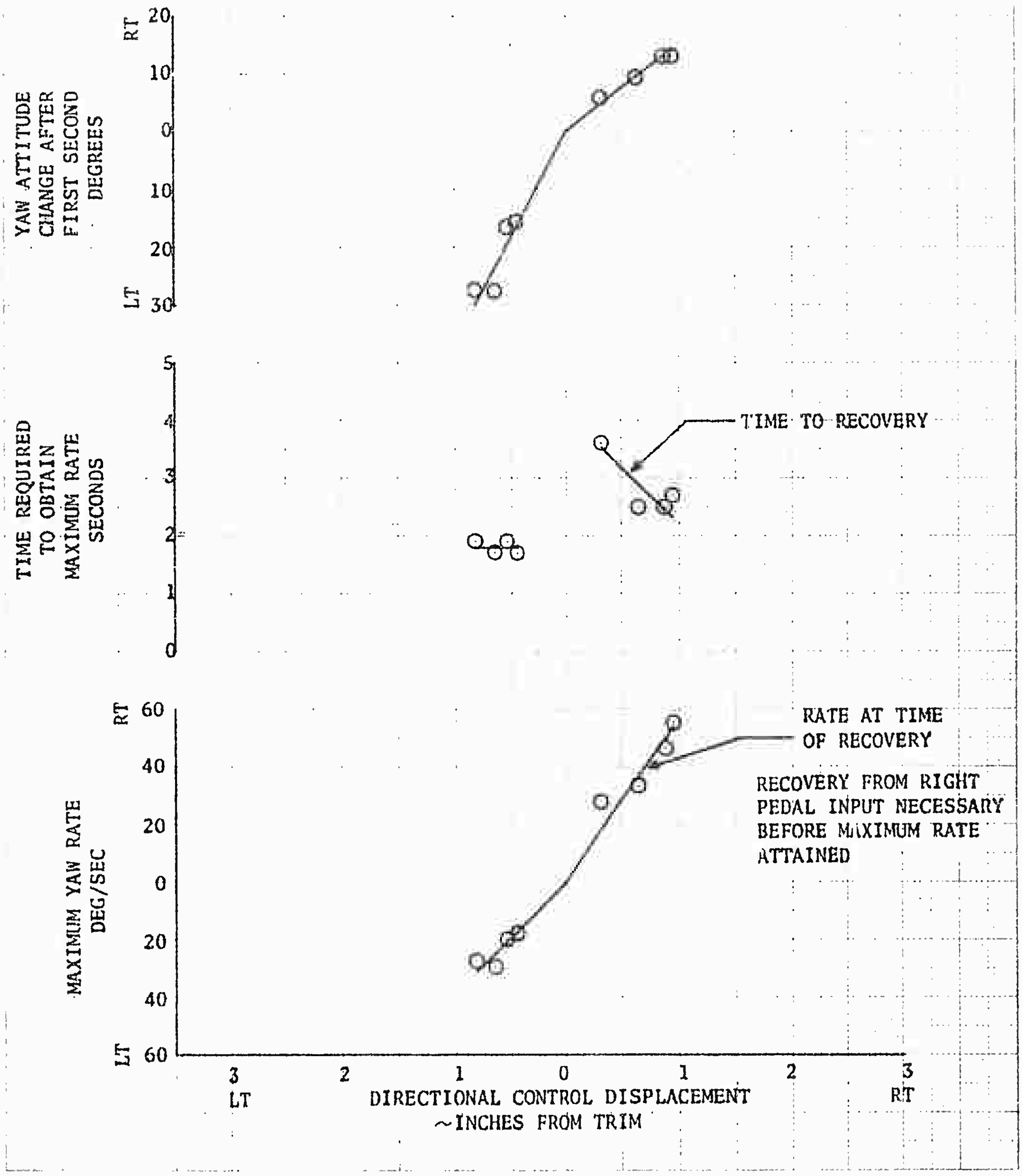


FIGURE NO. 212
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	92	8205	126.0(FWD)	5000	324
□	92	8155	134.0(AFT)	5000	324

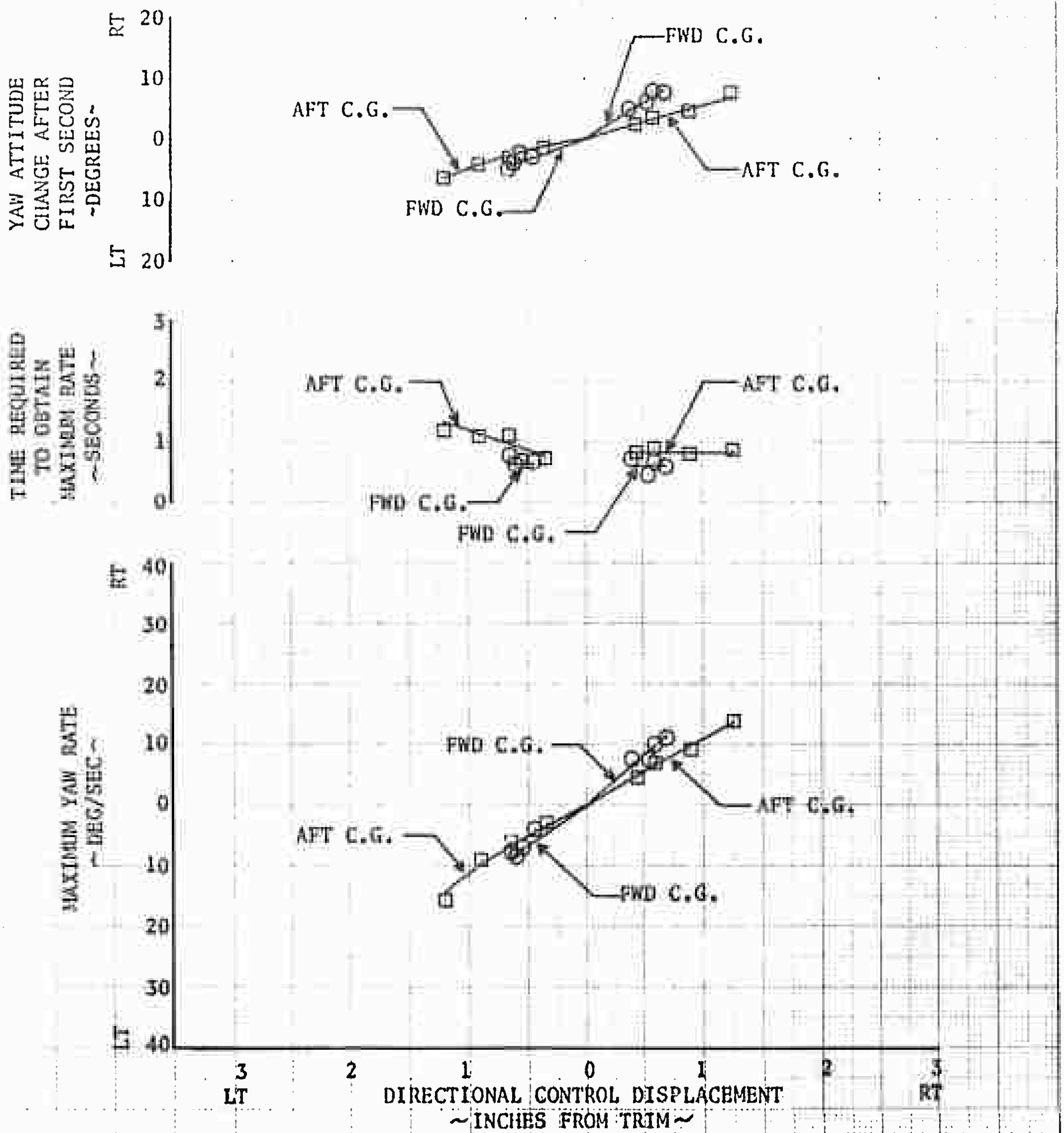


FIGURE NO. 213
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	113	8205	126.0(FWD)	5000	324
□	113	8155	134.0(AFT)	5000	324

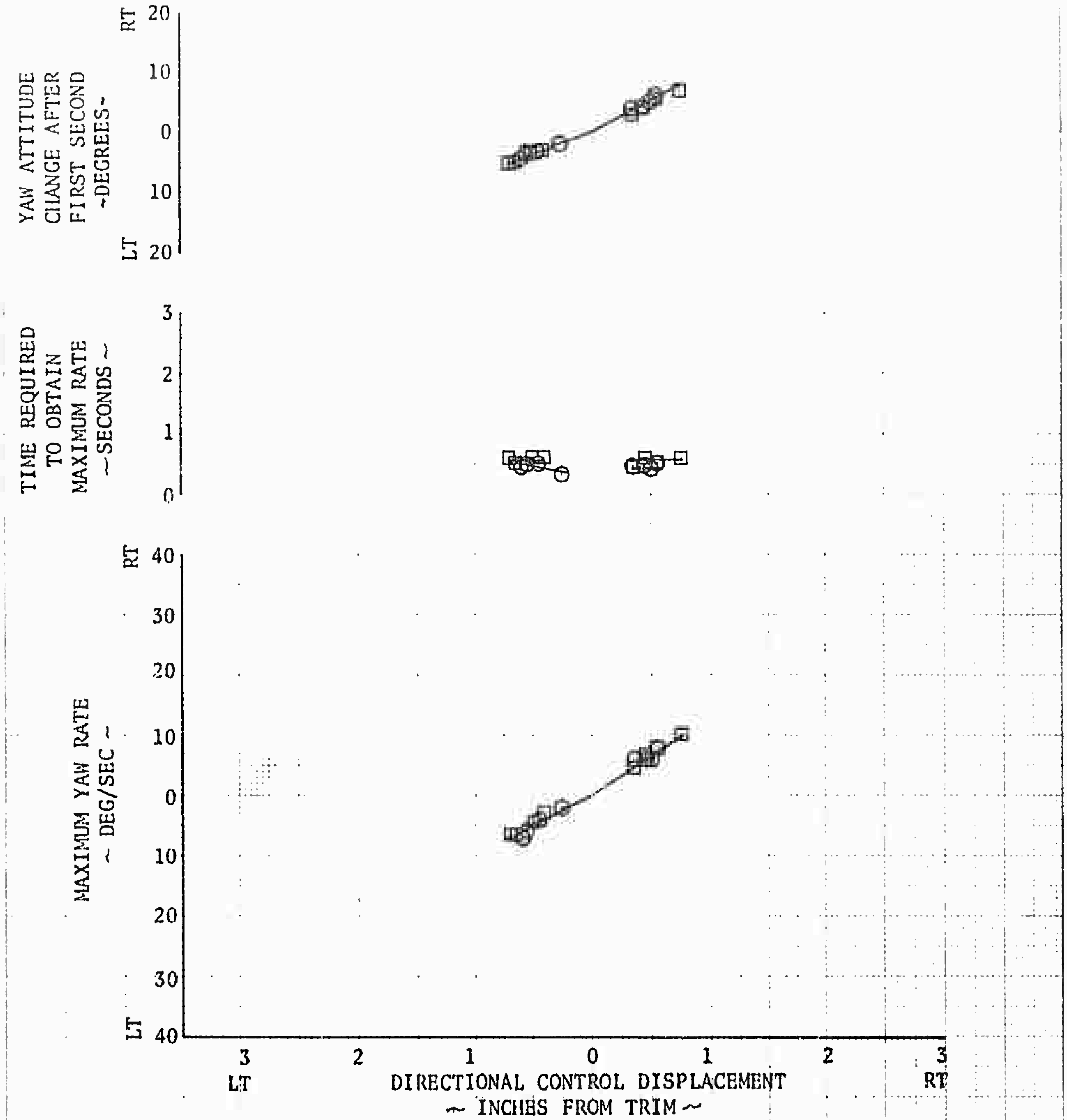


FIGURE NO. 214
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	35	9280	126.5(FWD)	5000	324
□	35	9115	131.8(AFT)	5000	324

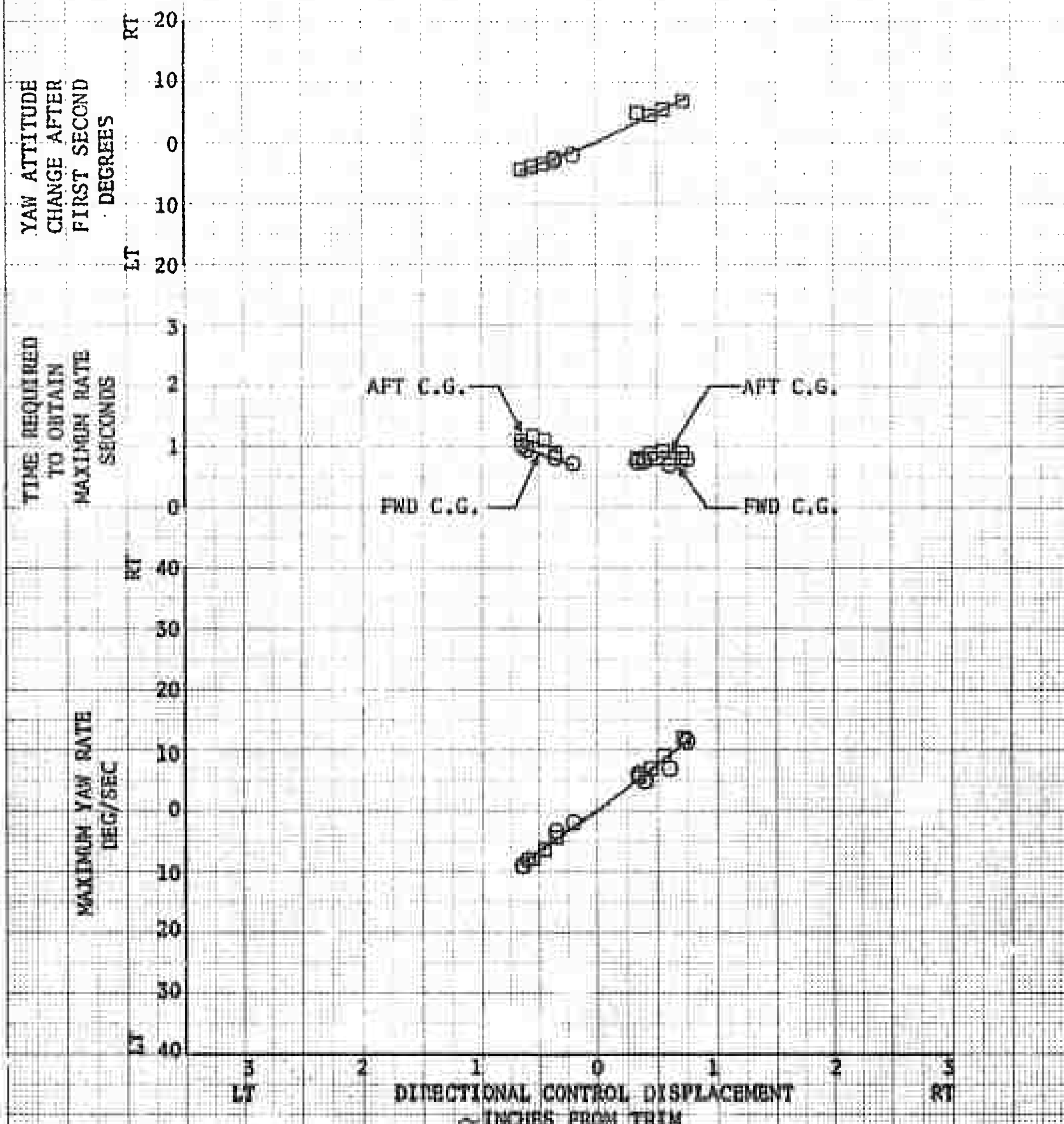


FIGURE NO. 215
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	88	9280	126.5(FWD)	5000	324
□	88	9115	131.8(AFT)	5000	324

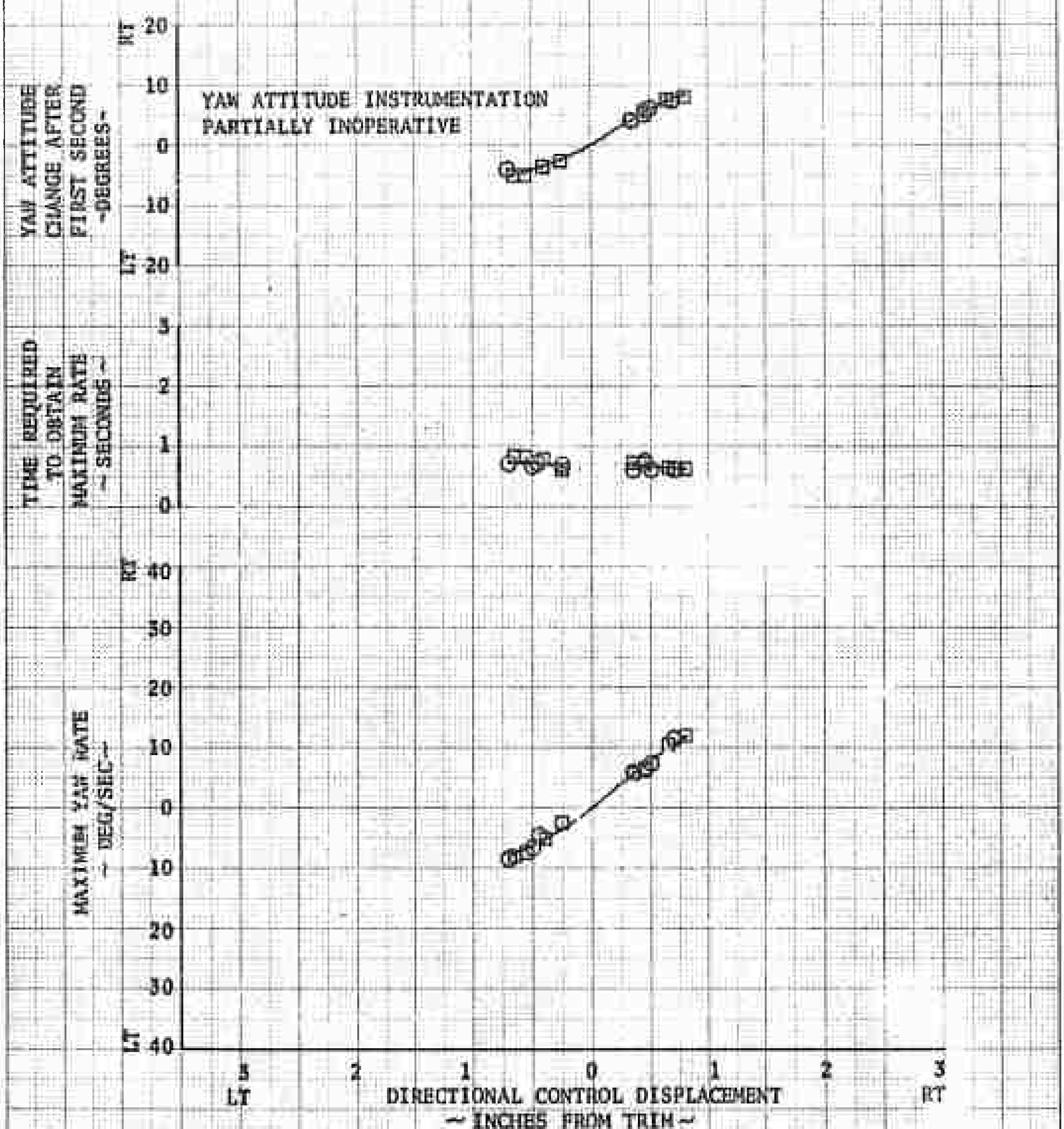


FIGURE NO. 216
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	108	9280	126.5(FWD)	5000	324
□	108	9115	131.8(AFT)	5000	324

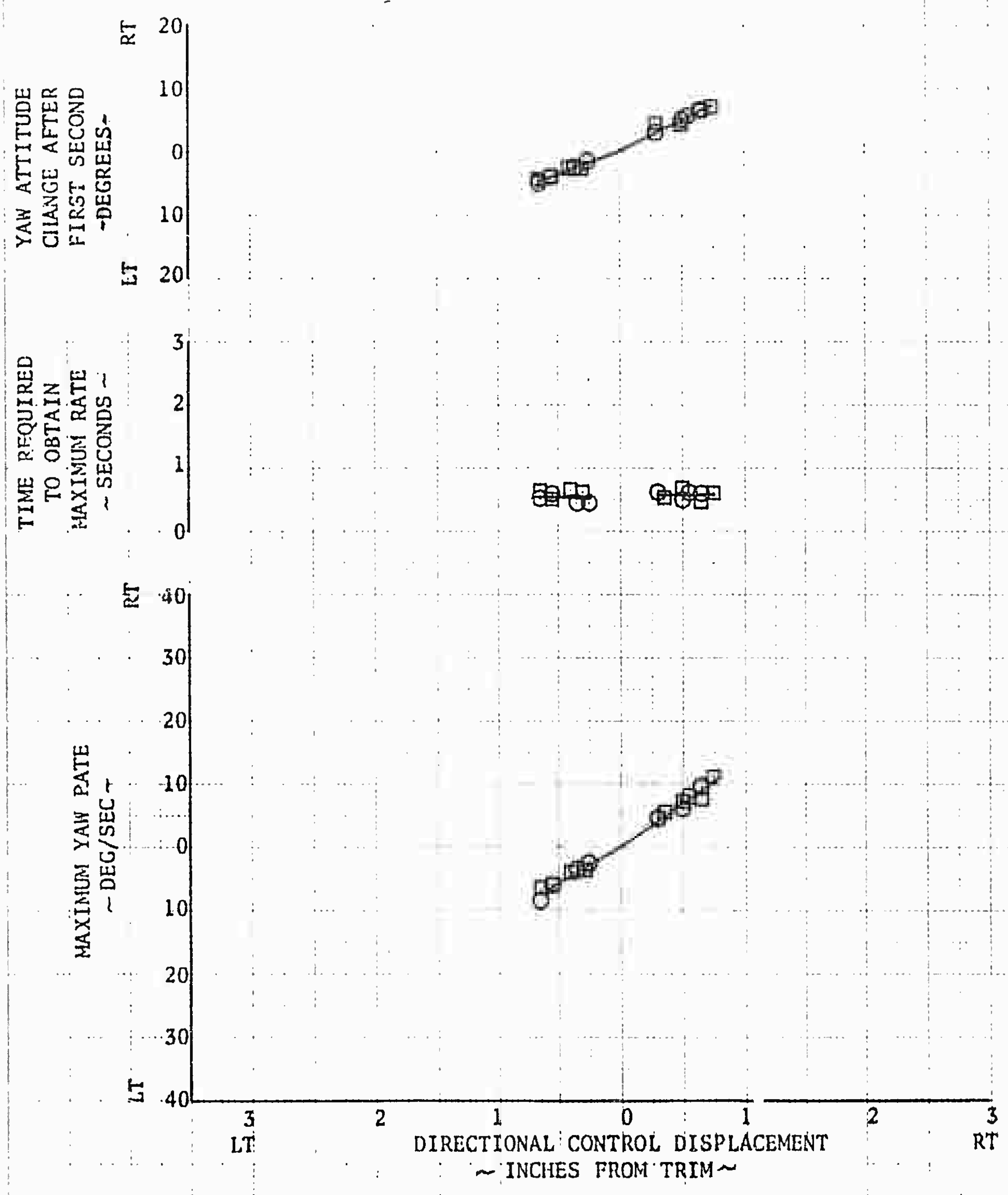


FIGURE NO. 217
DIRECTIONAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
52	6930	135.0(AFT)	5000	324

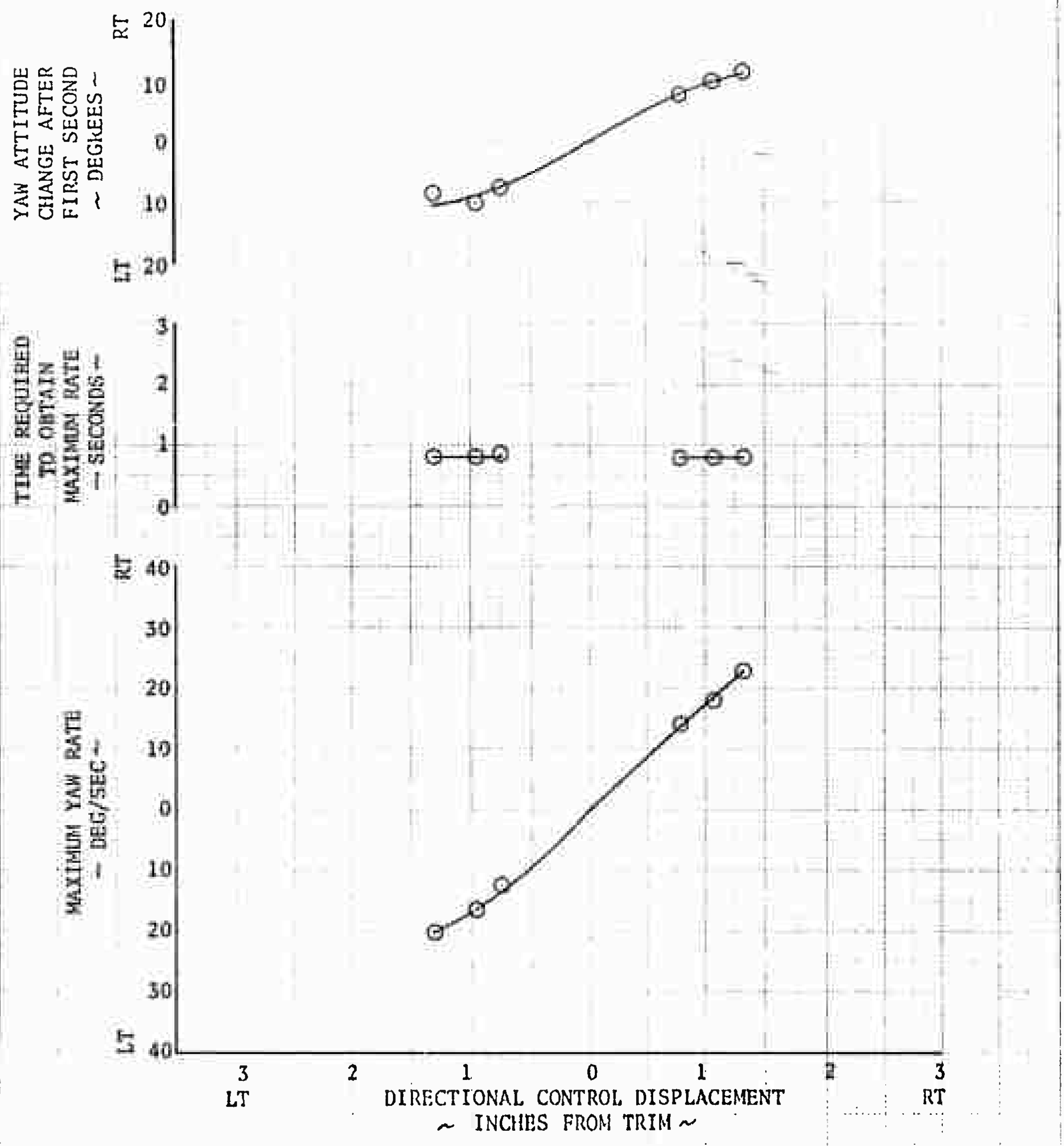


FIGURE NO. 218
DIRECTIONAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	8205	126.0(FWD)	5000	324
□	57	8245	133.9(AFT)	5000	324

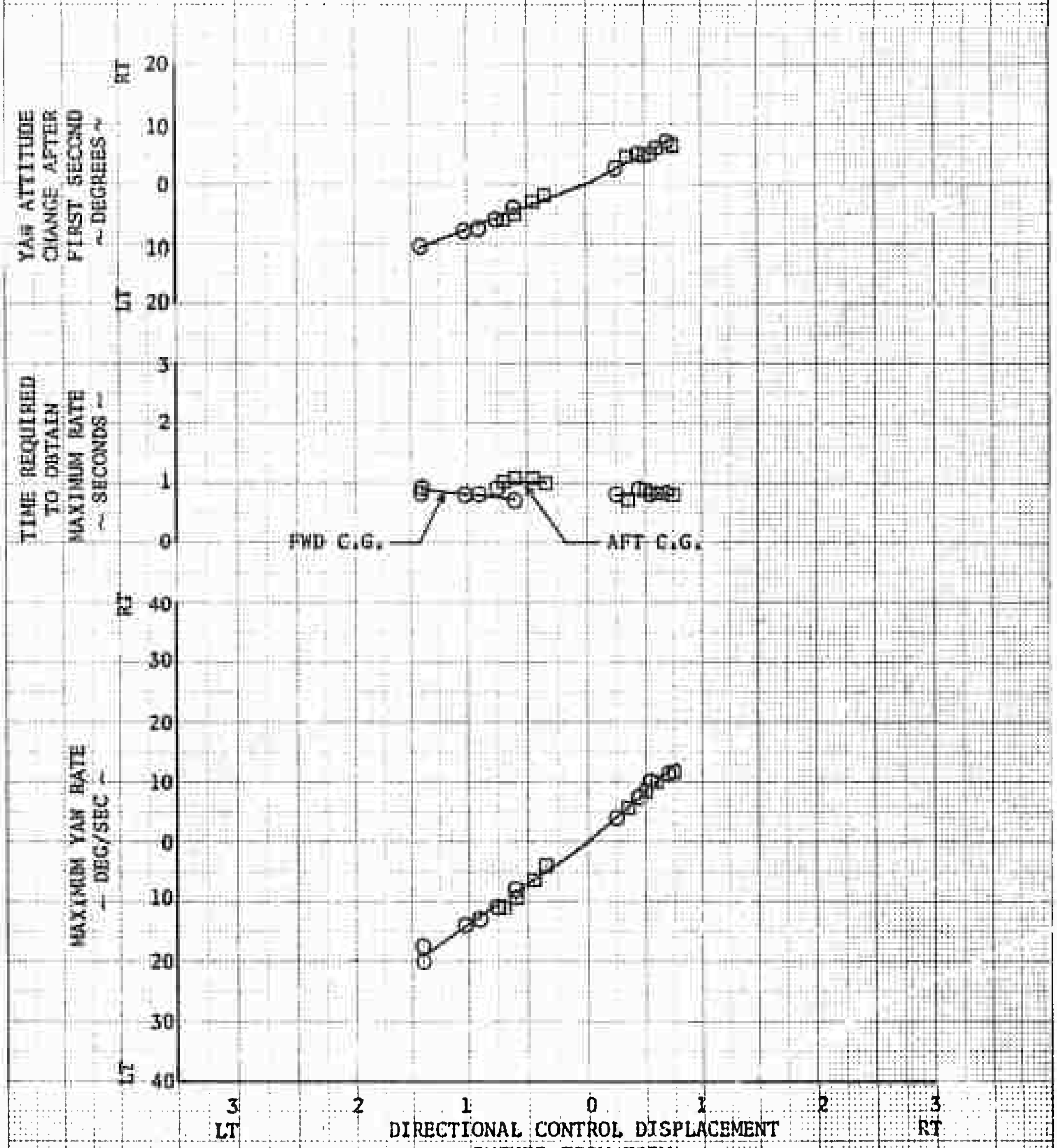


FIGURE NO. 219
DIRECTIONAL CONTROL RESPONSE
MAXIMUM POWER CLIMB
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	57	9280	126.5(FWD)	5000	324
□	57	9115	131.8(AFT)	5000	324

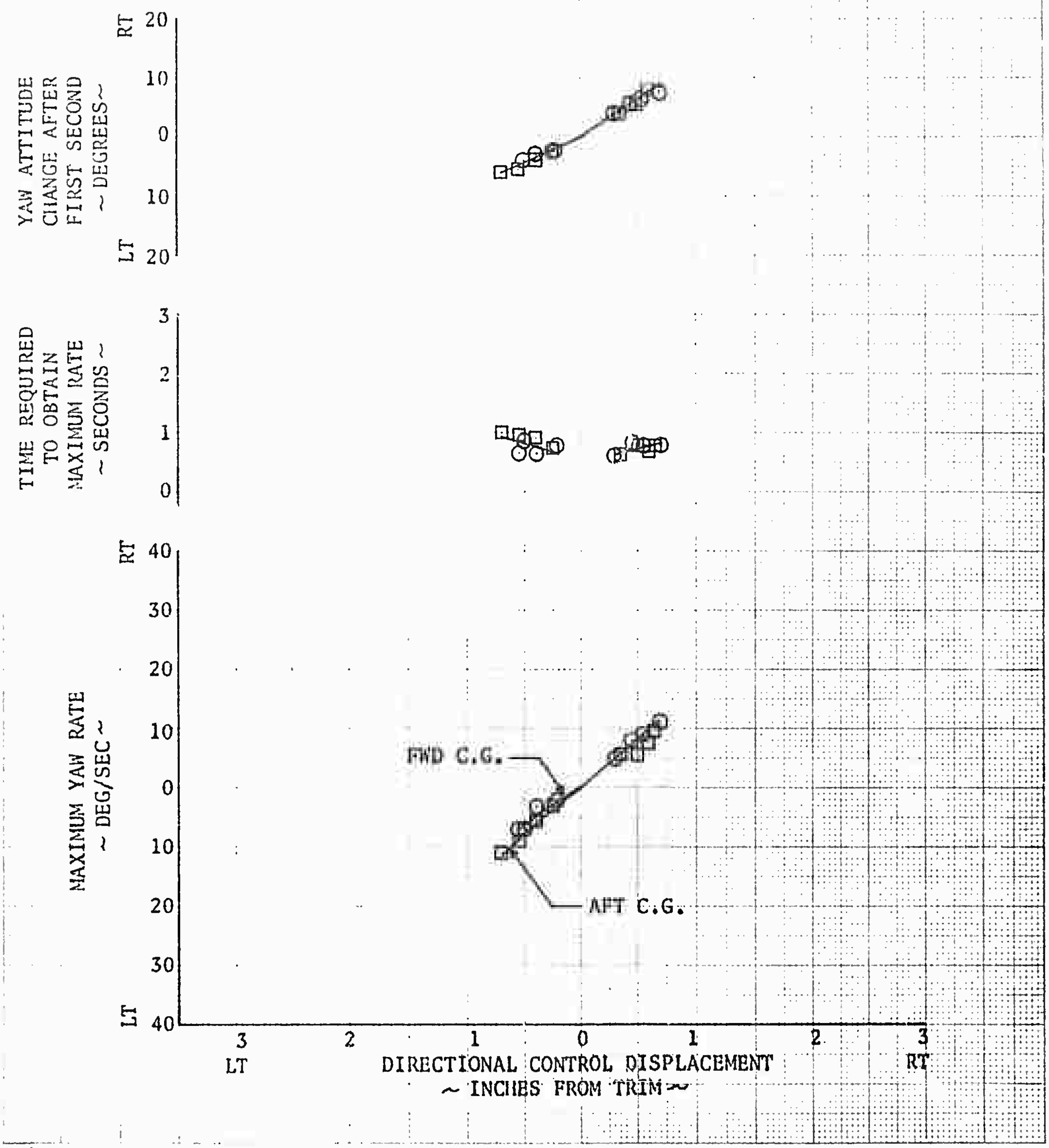


FIGURE NO. 220
DIRECTIONAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
□	60	6930	135.0(AFT)	5000	324
■	104	6930	135.0(AFT)	5000	324

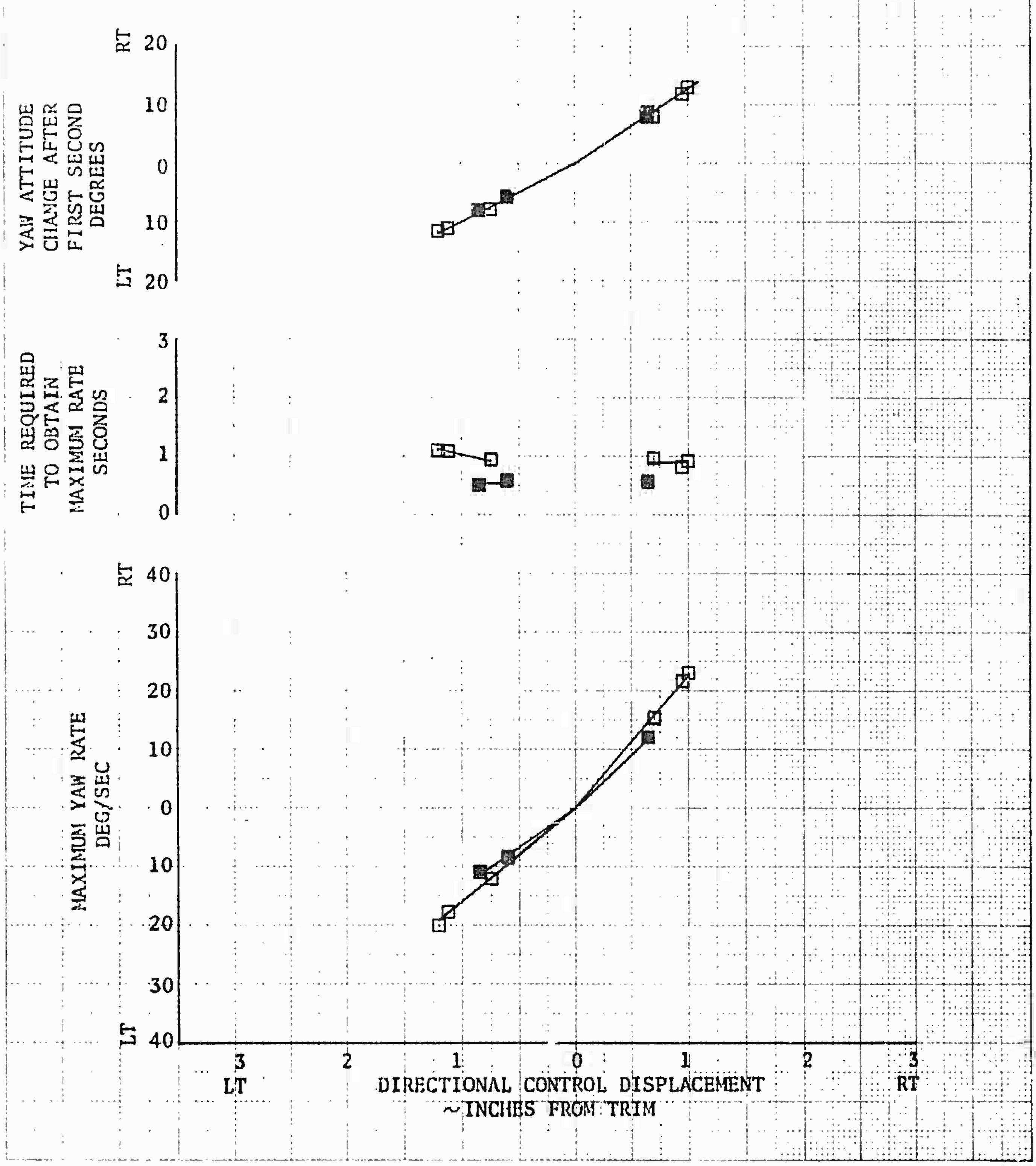


FIGURE NO. 221
DIRECTIONAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	8205	126.0 (FWD)	5000	324
□	60	8245	133.9 (AFT)	5000	324
●	104	8205	126.0 (FWD)	5000	324

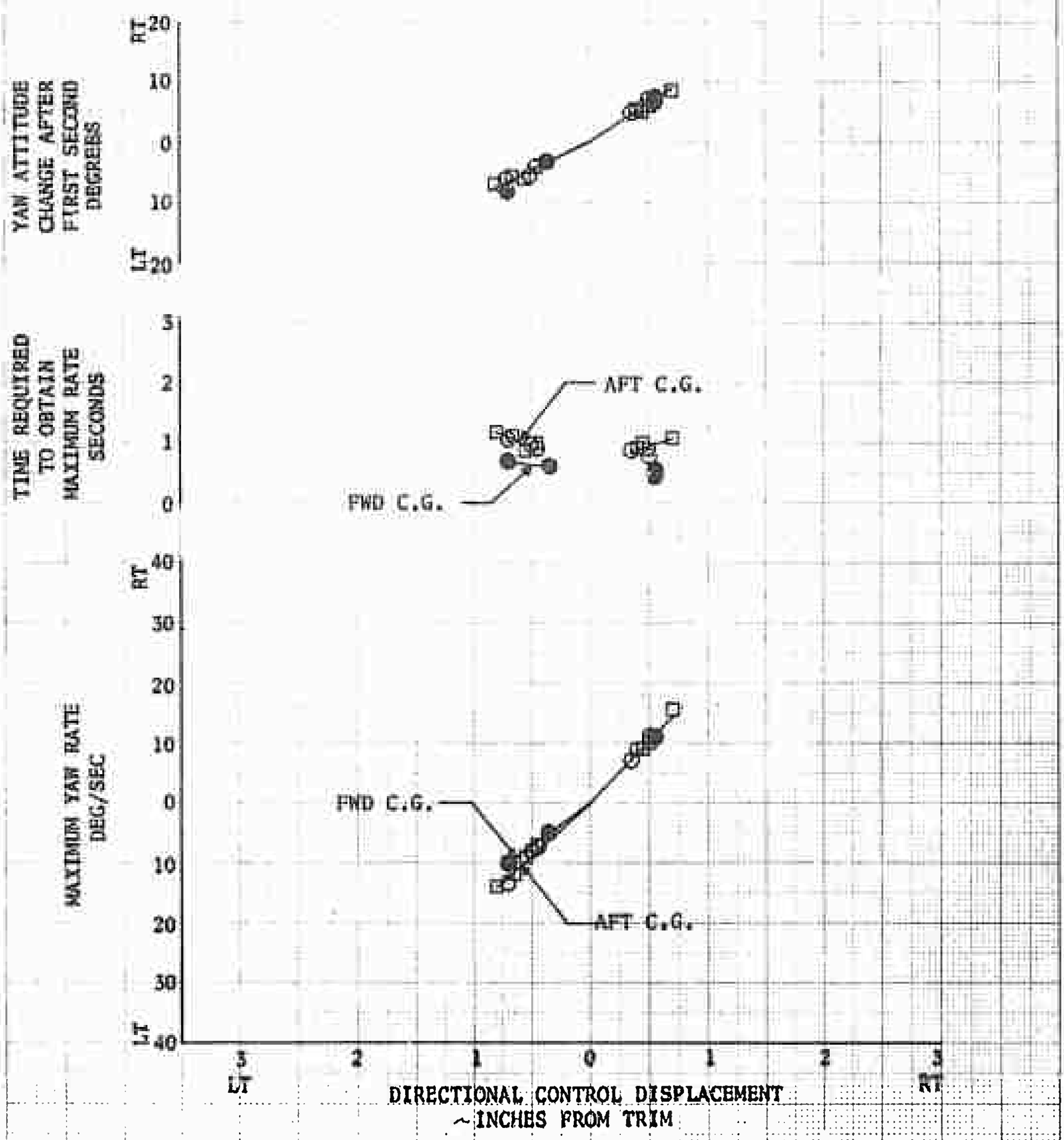


FIGURE NO. 222
DIRECTIONAL CONTROL RESPONSE
AUTOROTATION
UH-1B/540 USA S/N 63-8684

SYM	CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	CG STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
○	60	9280	126.5(FWD)	5000	324
□	60	9115	131.8(AFT)	5000	324

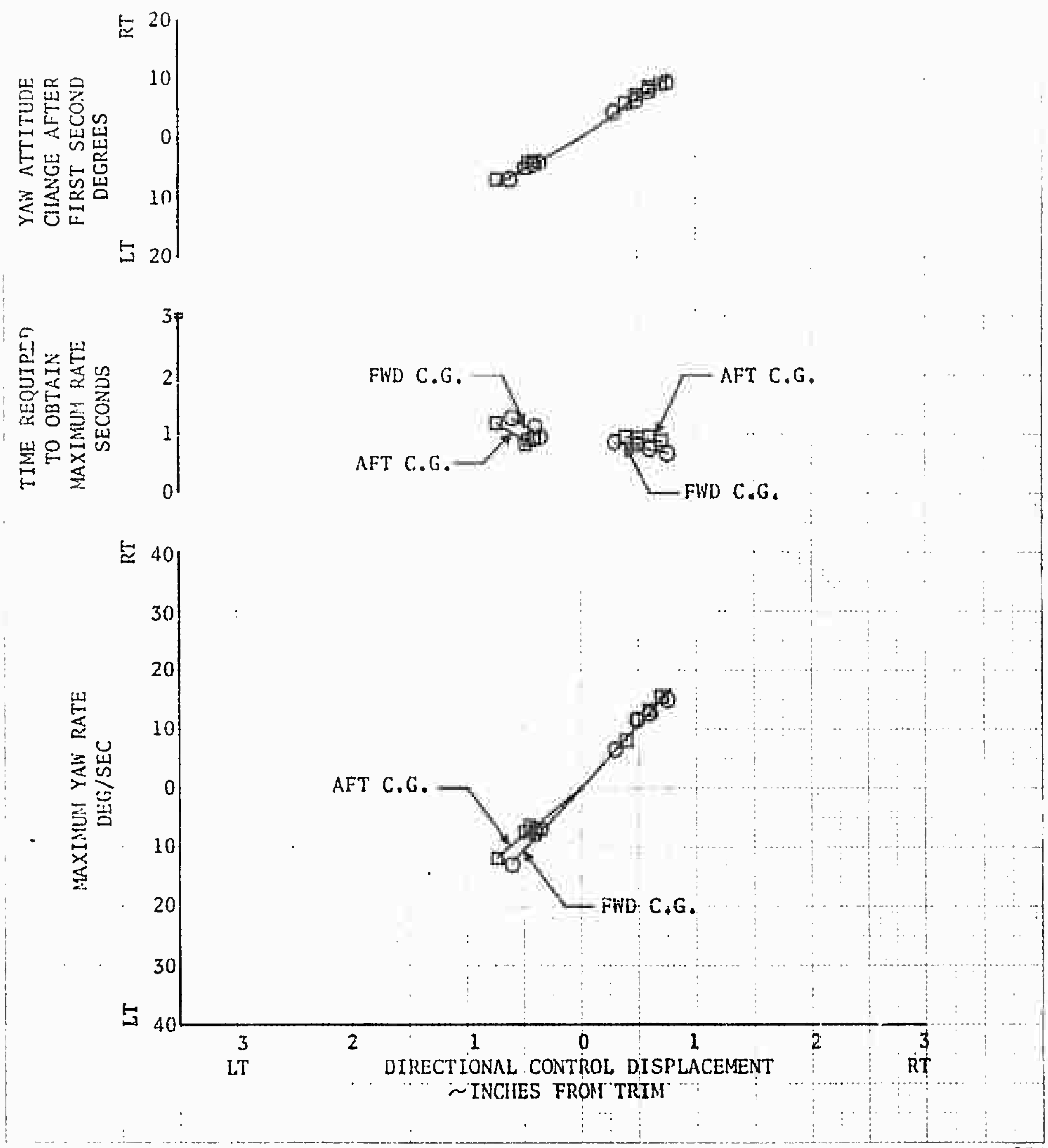
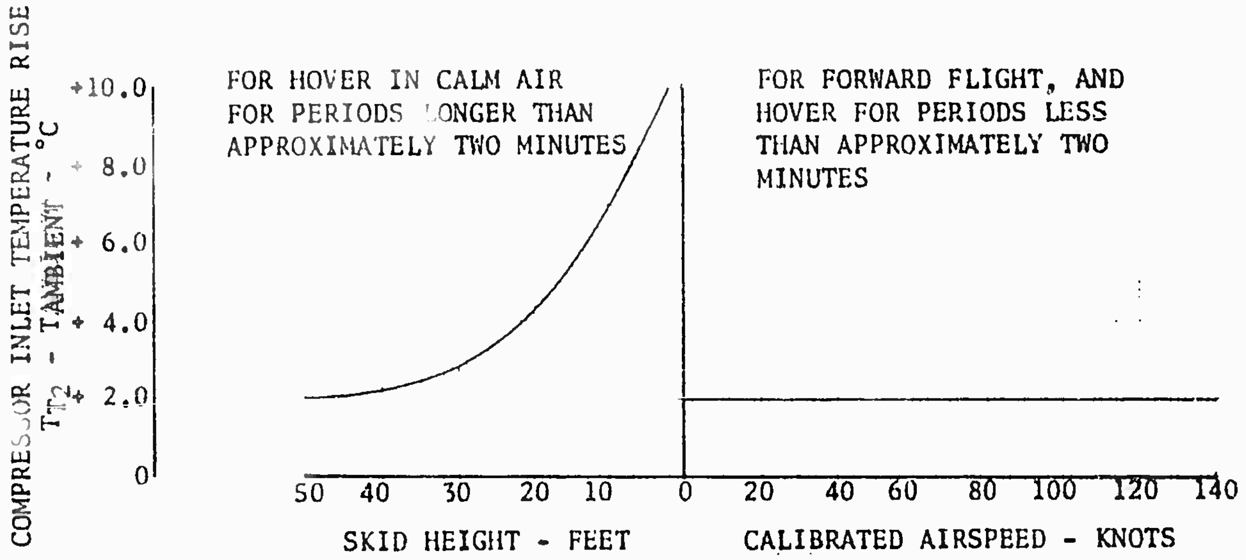


FIGURE NO. 223
ENGINE INLET CHARACTERISTICS
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:

1. SHAFT HORSEPOWER AVAILABLE AND SUMMARY PERFORMANCE CALCULATIONS BASED ON SOLID CURVES BELOW.
2. SOLID CURVES OBTAINED FROM REFERENCE NO. J, APPENDIX VI.
3. DASHED CURVE REPRESENTS ENGINE INLET PRESSURE RATIO MEASURED DURING STABILIZED LEVEL FLIGHT AND HOVER.



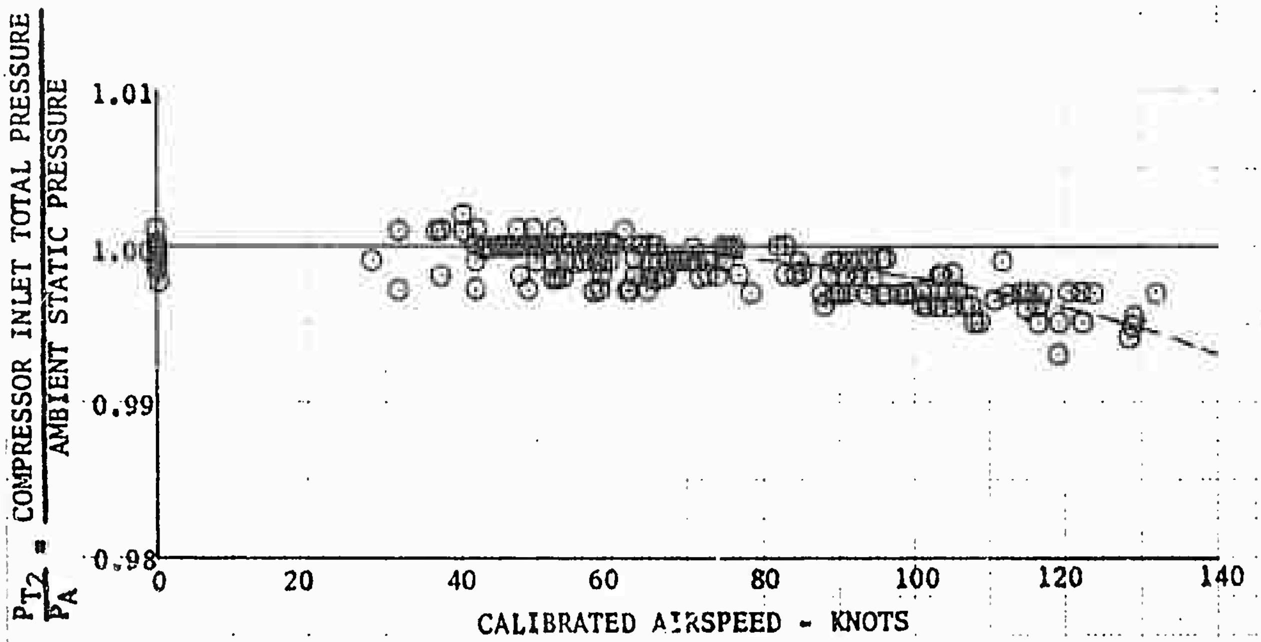


FIGURE NO. 224
NORMAL RATED SHAFT HORSEPOWER AVAILABLE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:

1. SHAFT HORSEPOWER AVAILABLE BASED ON LYCOMING T53-L-11 ENGINE MODEL SPECIFICATION
2. COMPRESSOR INLET TEMPERATURE RISE = +2°C
3. COMPRESSOR INLET PRESSURE RATIO $\left(\frac{P_{T_2}}{P_A}\right)$ = 1.00
4. GENERATOR ELECTRICAL LOAD = [illegible]
5. PERCENT AIR BLEED $\left(\frac{W_{bl}}{W_A}\right)$ = 0.5%
6. ROTOR SPEED = 324 RPM

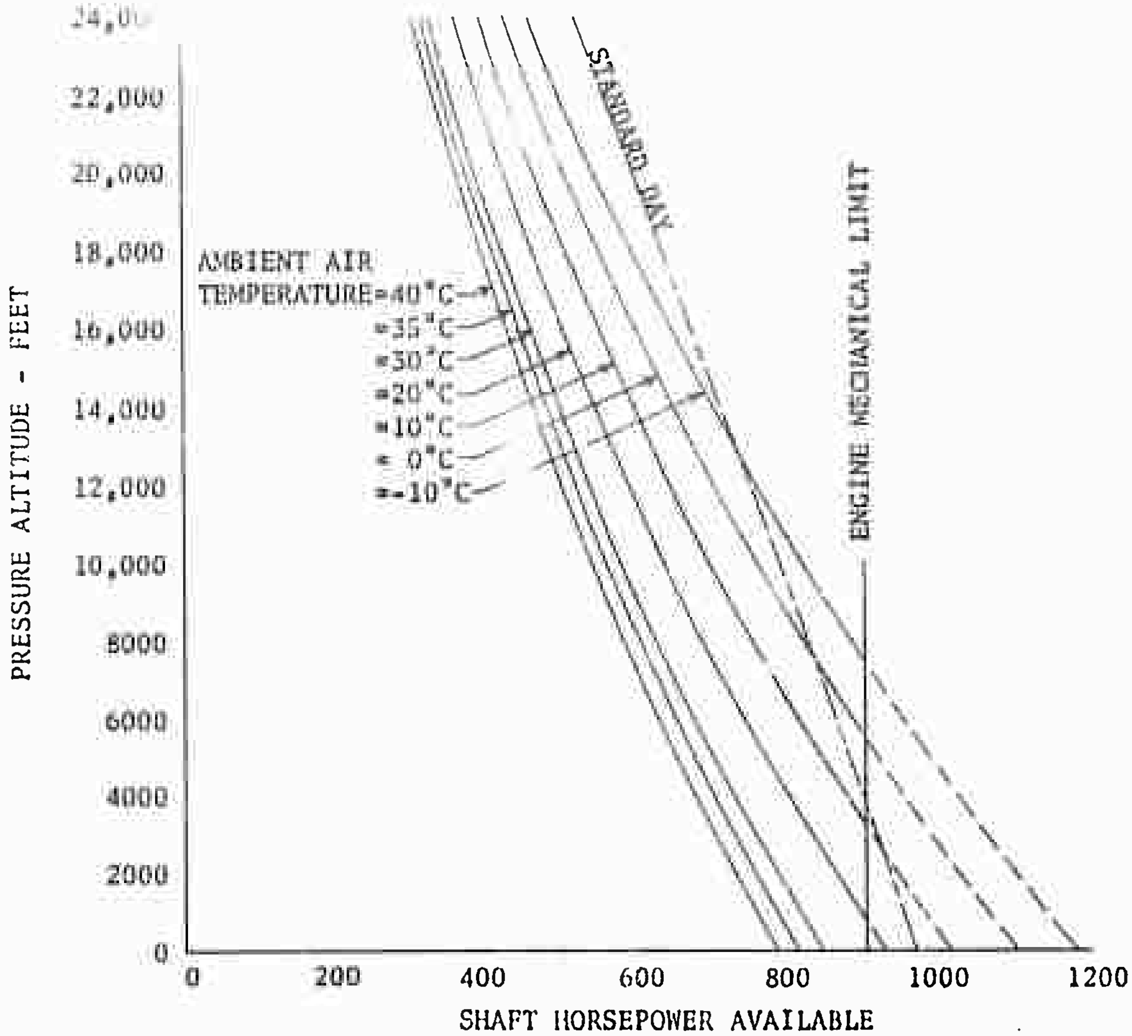


FIGURE NO. 225
TAKEOFF LIMIT SHAFT HORSEPOWER AVAILABLE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:

1. SHAFT HORSEPOWER AVAILABLE BASED ON LYCOMING T53-L-11 ENGINE MODEL SPECIFICATION
2. COMPRESSOR INLET TEMPERATURE RISE = +2°C
3. COMPRESSOR INLET PRESSURE RATIO $\left(\frac{P_{T_2}}{P_A}\right) = 1.00$
4. GENERATOR ELECTRICAL LOAD = ZERO
5. PERCENT AIR BLEED $\left(\frac{W_{b1}}{W_A}\right) = 0.5\%$
6. ROTOR SPEED = 324 RPM

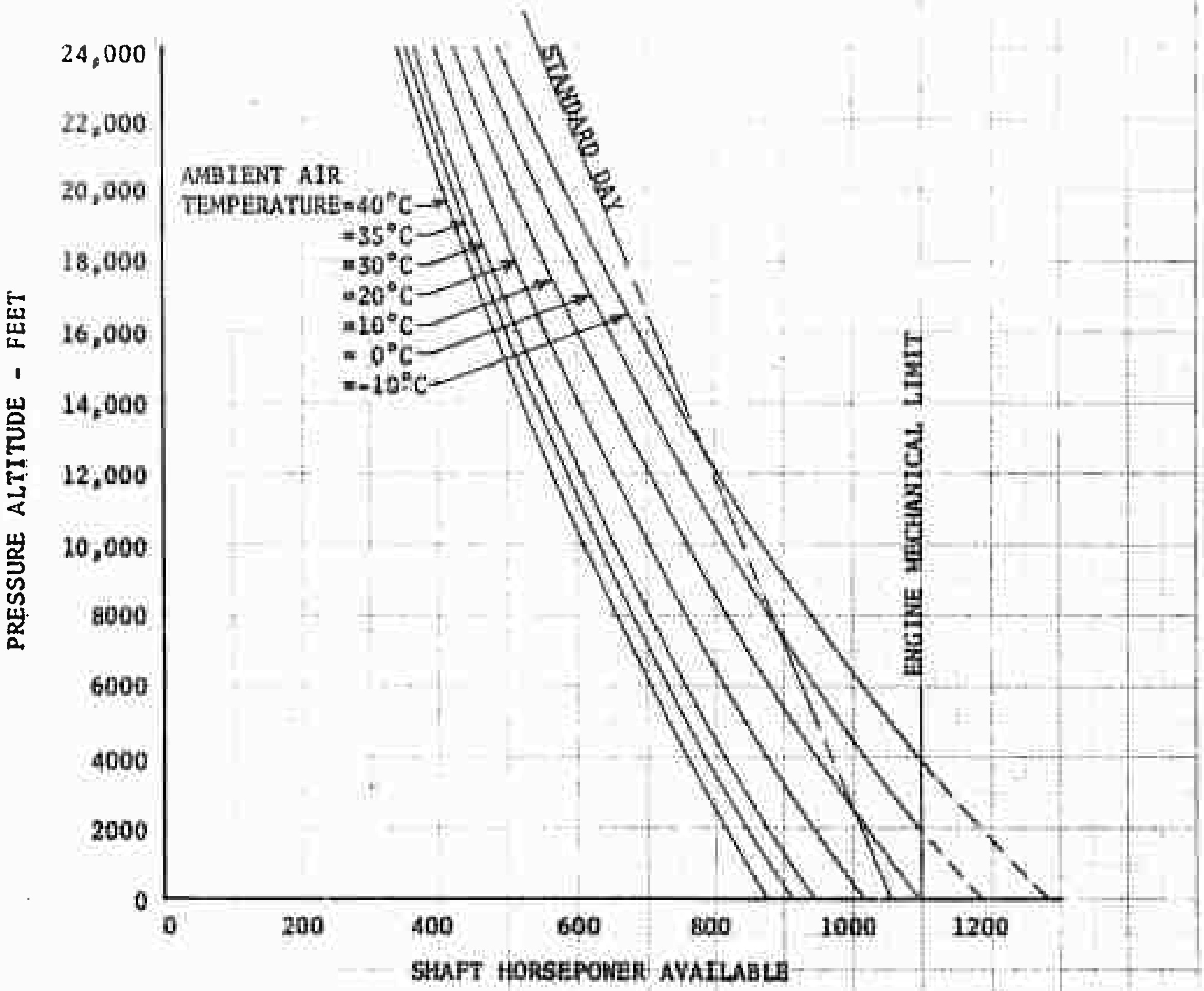


FIGURE NO. 226
TAKEOFF LIMIT SHAFT HORSEPOWER AVAILABLE
UH-1B/540 USA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:

1. SHAFT HORSEPOWER AVAILABLE BASED ON LYCOMING T53-L-11 ENGINE MODEL SPECIFICATION
2. COMPRESSOR INLET TEMPERATURE RISE = +10°C
3. COMPRESSOR INLET PRESSURE RATIO $(\frac{P_{T_2}}{P_A}) = 1.00$
4. GENERATOR ELECTRICAL LOAD = ZERO
5. PERCENT AIR BLEED $(\frac{W_{b1}}{W_A}) = 0.5\%$
6. ROTOR SPEED = 324 RPM

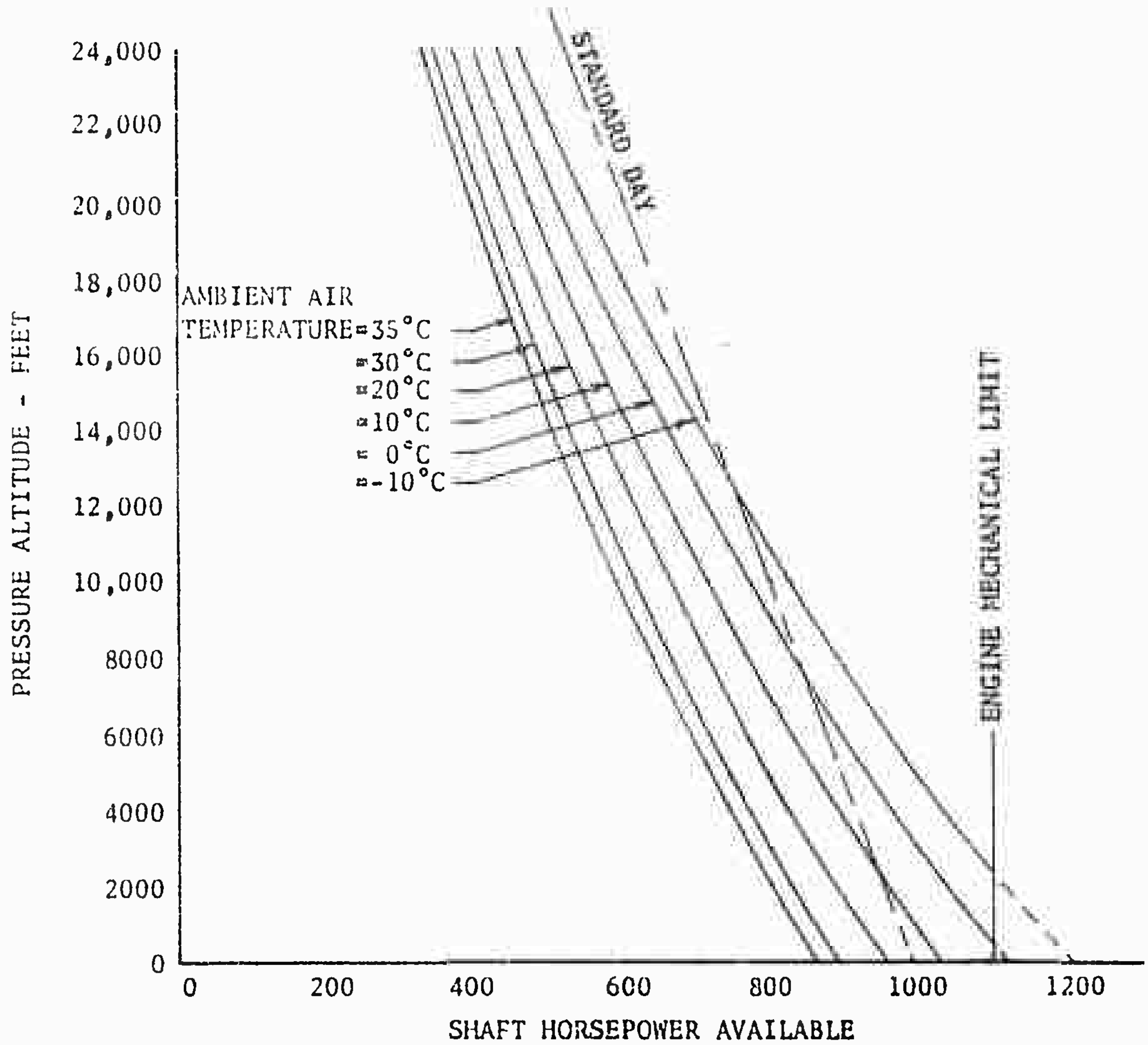
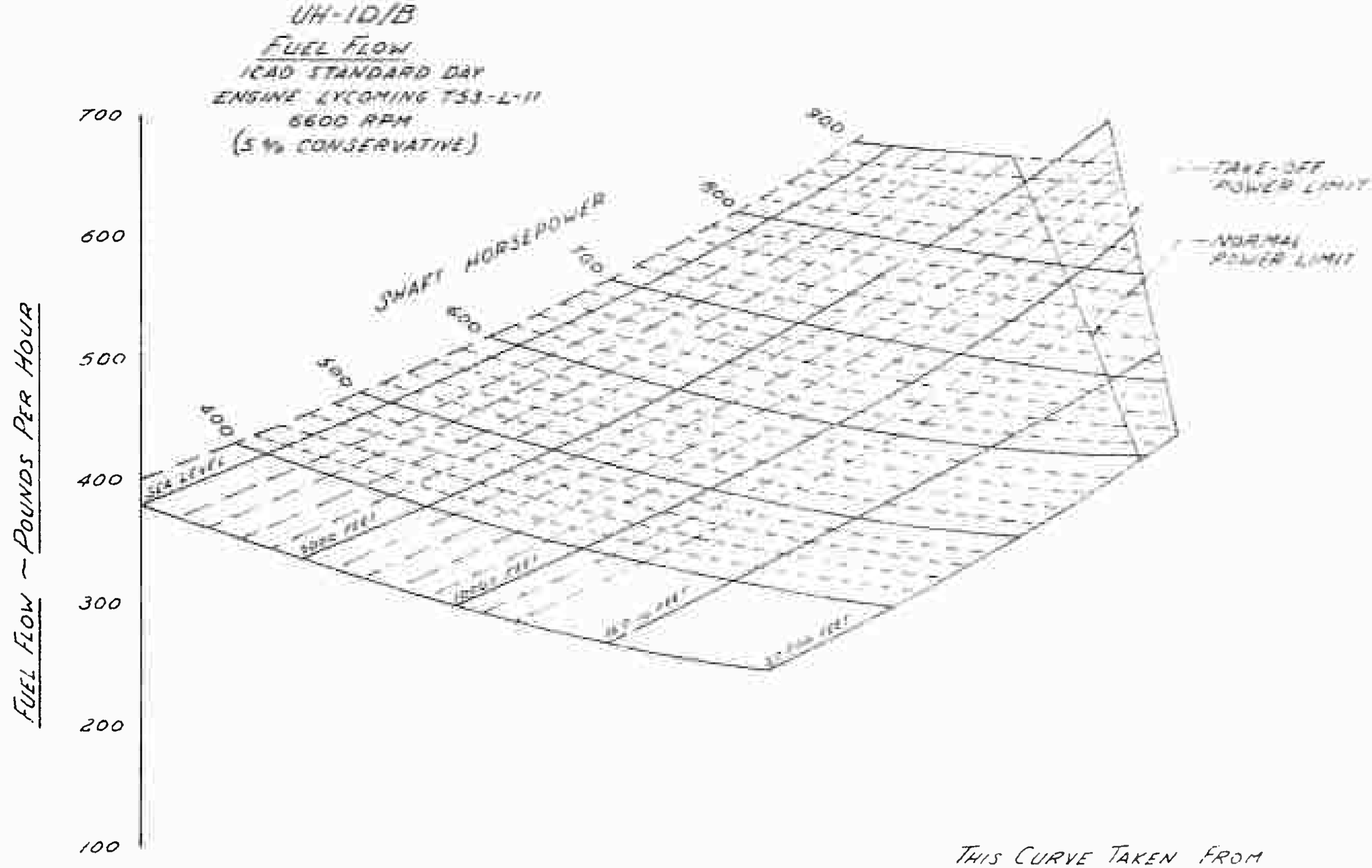


FIGURE NO 227
SPECIFICATION FUEL FLOW
UH-1B USA S/N 63-8664
BELL MODEL 540 ROTOR SYSTEM



THIS CURVE TAKEN FROM
BELL REPORT 205-099-705

FIGURE NO. 228
STATIC DROOP CHARACTERISTICS
UH-1B/540 UGA S/N 63-8684
T53-L-11 S/N LEO 9542

NOTES:
1. COLLECTIVE COMPENSATOR CAM INSTALLED.
2. POWER TURBINE SPEED SELECT (BEEP) SWITCH NOT USED AFTER TRIM POINT WAS SELECTED.
3. SHADED SYMBOL DENOTES TRIM POINT

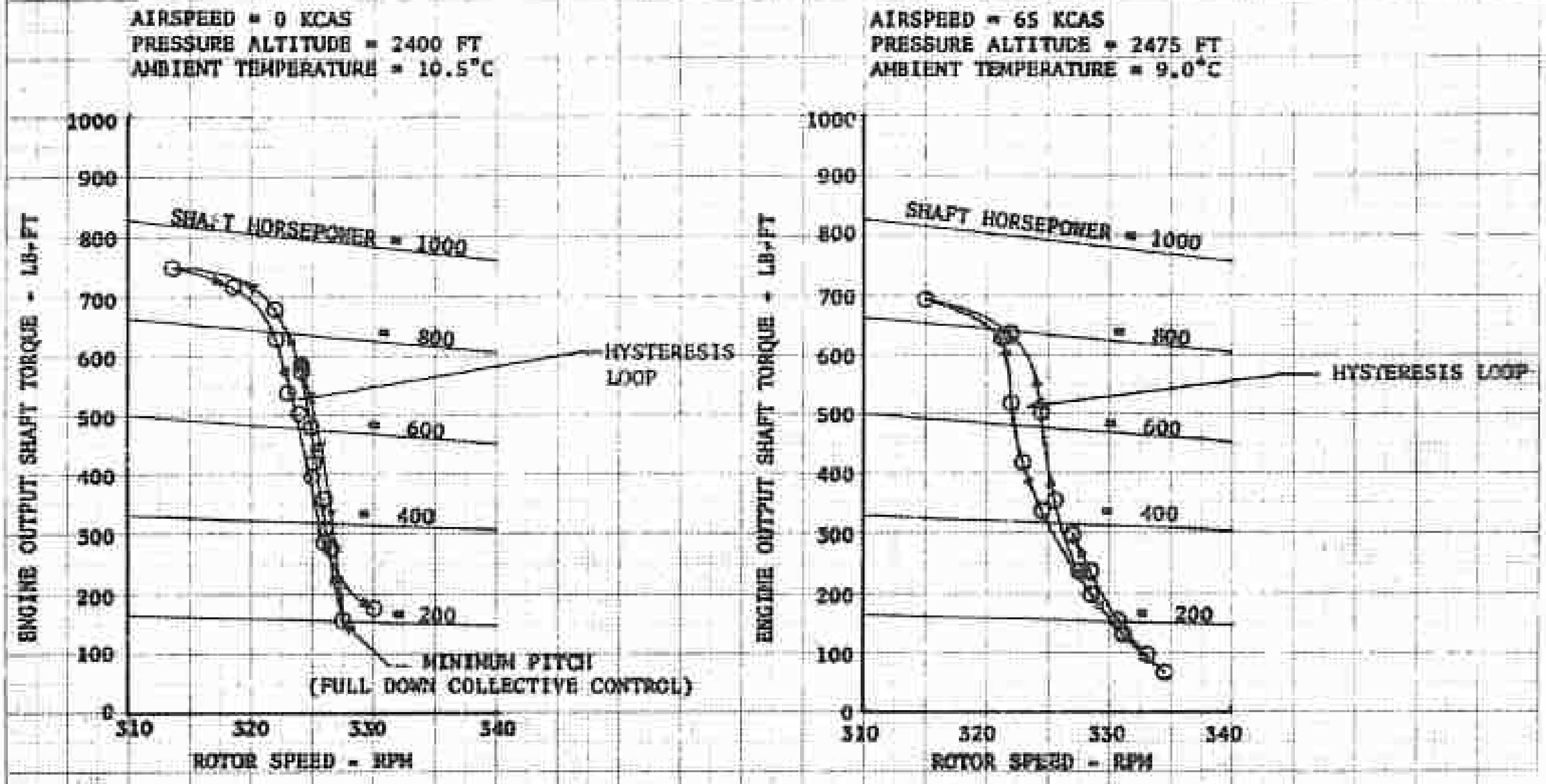


FIGURE NO. 229
AIRSPEED CALIBRATION
UH-1B/540 USA S/N 63-8684

STANDARD (SHIP'S) AIRSPEED SYSTEM
IN LEVEL FLIGHT

NOTES:
1. OUT OF GROUND EFFECT
2. GROSS WEIGHT = 6960 LBS
3. CENTER OF GRAVITY = 130.8 (MID)
4. ROTOR SPEED = 324 RPM

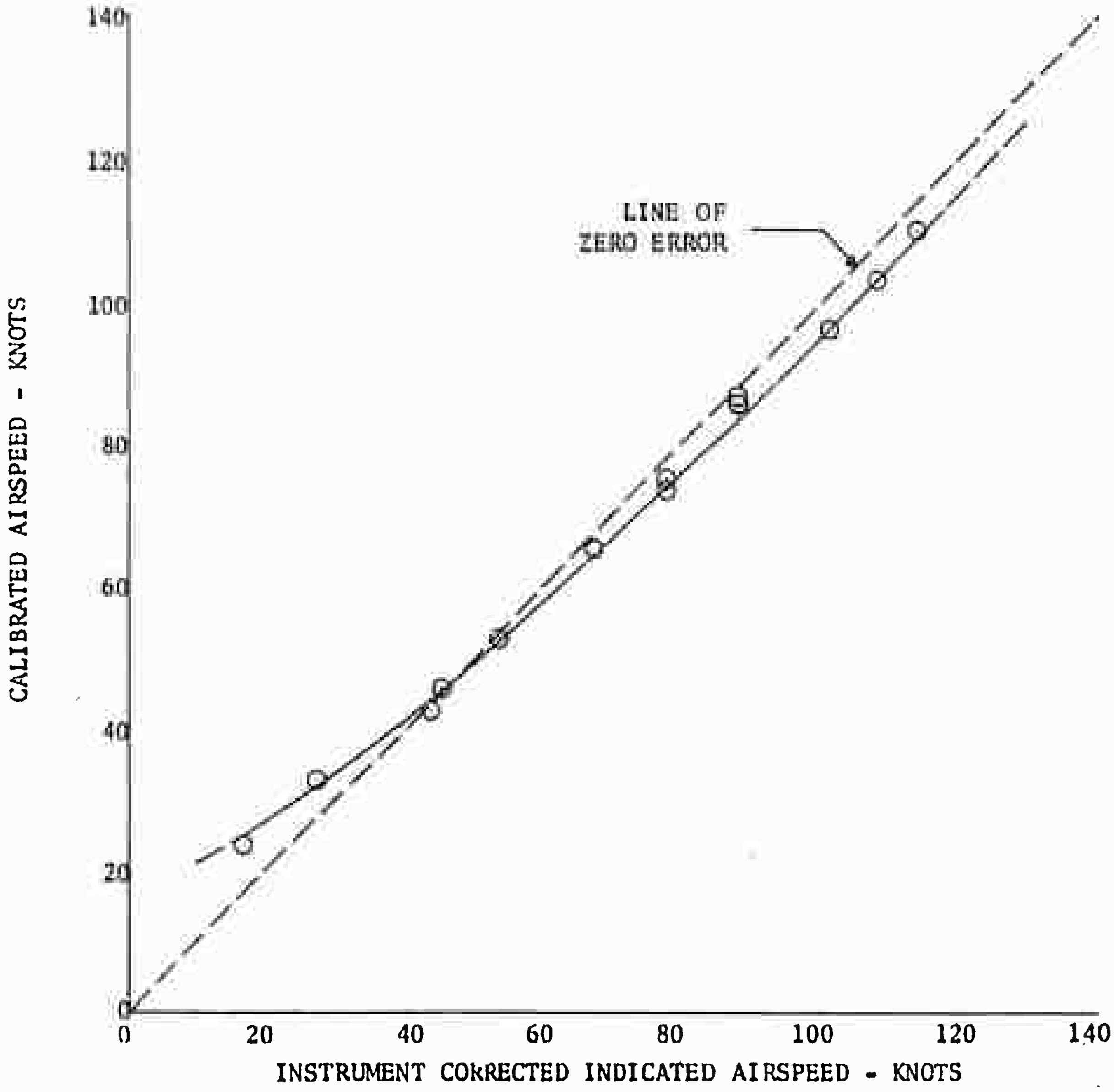


FIGURE NO. 230
AIRSPEED CALIBRATION
UH-1B/540 USA S/N 63-8684

STANDARD (SHIP'S) AIRSPEED SYSTEM
IN CLIMB AND AUTOROTATION

NOTES:
1. OPEN SYMBOLS DENOTE CLIMB.
2. SHADED SYMBOLS DENOTE AUTOROTATION.
3. OUT OF GROUND EFFECT.
4. GROSS WEIGHT = 6960 LBS
5. CENTER OF GRAVITY = 130.8 (MID)
6. ROTOR SPEED = 324 RPM

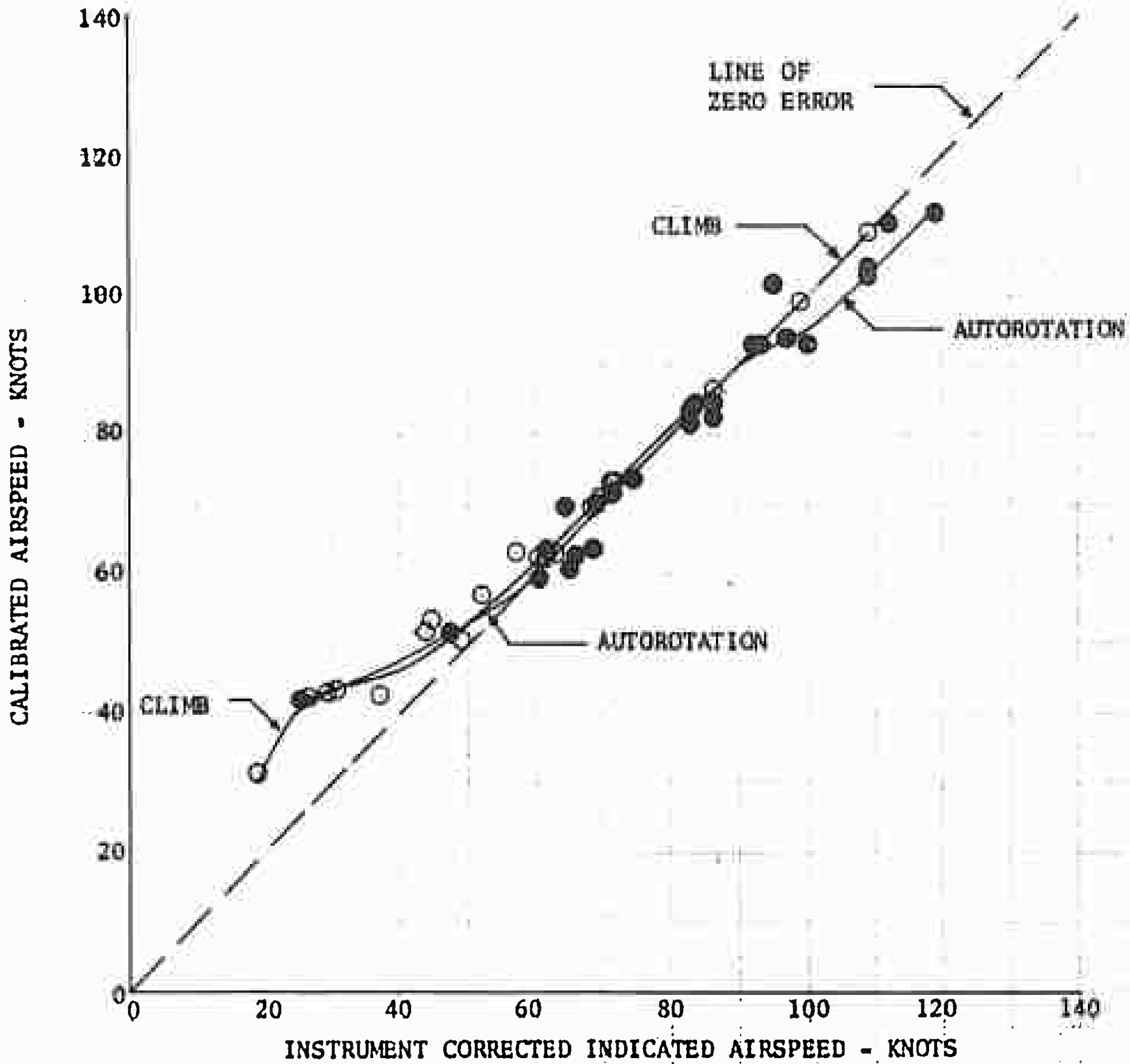
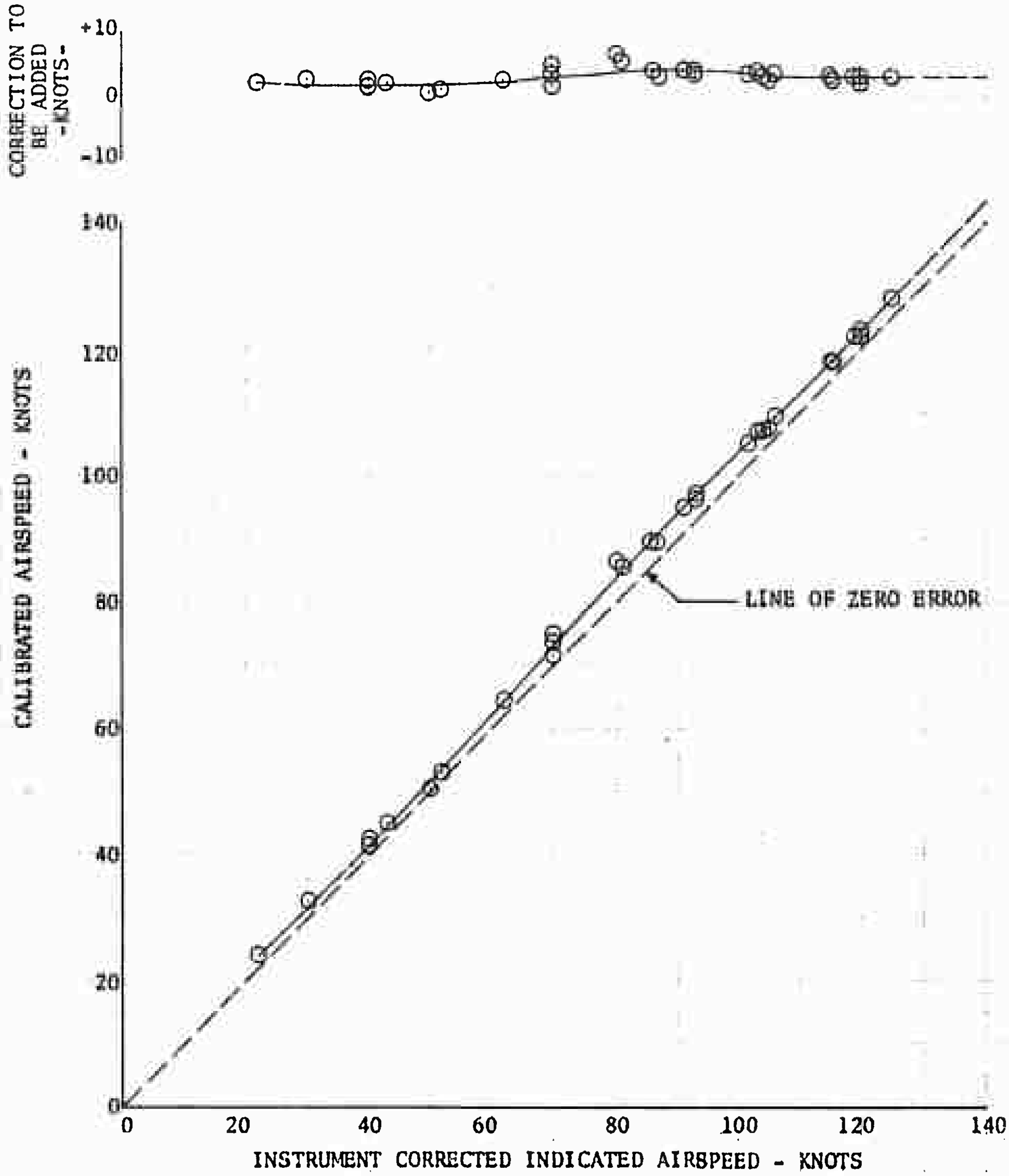


FIGURE NO. 231
AIRSPEED CALIBRATION
UH-1B/540 USA S/N 63-8684

TEST (BOOM) AIRSPEED SYSTEM

NOTES:
1. OUT OF GROUND EFFECT
2. GROSS WEIGHT = 6960 LBS
3. CENTER OF GRAVITY = 130.8
4. ROTOR SPEED = 324 RPM



Appendix II SYMBOLS and ABBREVIATIONS

1.0 Listed and defined in the following table are the symbols and abbreviations used in this report.

Symbols and Abbreviations	Definition	Units
A	Rotor Disc Area	ft^2
C.G.	Center of Gravity	in
C_P	Power Coefficient	--
C_T	Thrust Coefficient	--
DEG	Degrees	deg
dHp/dt	Slope of Pressure Altitude versus Time Plot	fpm
DWN	Down	--
FIG	Figure	--
FPM	Feet per minute	fpm
FT	Feet	ft
FWD	Forward	--
G	Acceleration	unit gravity
GW	Gross Weight	lb
H_D	Density Altitude	ft
H_P	Pressure Altitude	ft
IGE	In Ground Effect	--
in	Inches	in
K_P	Climb Correction Power Constant	--
K_W	Climb Correction Gross Weight Constant	$\frac{ft}{lb\ min}$

Symbols and Abbreviations	Definition	Units
KCAS	Knots Calibrated Airspeed	kts
KIAS	Knots Indicated Airspeed	kts
KTAS	Knots True Airspeed	kts
KTS	knots	kts
LB	Pounds	lbs
LT	Left	--
MAX	Maximum	--
Min	Minimum	--
Min	Minutes	min
N	Angular Velocity	rpm
NAMPP	Nautical Air Miles Per Pound of Fuel	--
NAMT	Nautical Air Miles Traveled	--
OGE	Out of Ground Effect	--
P	Pressure	--
per rev	Per Main Rotor Revolution	--
R	Rotor Radius	ft
R/C	Rate of Climb	fpm
R/D	Rate of Descent	fpm
REF	Reference	--
RPM	Revolutions Per Minute	rpm
RT	Right	--
Sec	Seconds	--

Symbols and Abbreviations	Definition	Units
SHP	Shaft Horsepower	--
SL	Sea Level	--
S/N	Serial Number	--
STD	Standard	--
T	Temperature	--
t	Time	--
T/C	Time to Climb	min
V_{cal}	Calibrated Airspeed	kts
V_{ne}	Never Exceed Airspeed	kts
V_T	True Airspeed	kts
W_A	Engine Air Flow	lb/hour
W_{lb}	Engine Bleed Air Flow	lb/hour
W_f	Fuel Flow	lb/hour
Δ	Difference	--
δ	Pressure Ratio	--
°C	Degrees Centigrade	deg
$\delta_{lat\ cyclic}$	Lateral Cyclic Stick Displacement	in
δ_{pedal}	Directional Control Pedal Displacement	in
dt	Time Increment	min
d_β	Sideslip Angle Increment	deg
d_θ	Roll Angle Increment	deg
=	is equal to	--
<	is less than	--

Symbols and Abbreviations	Difinition	Units
$\leq$	is less than or equal to	--
Ω	Main Rotor Angular Velocity	radians/sec
%	Percent	--
ρ	Air Mass Density	$\frac{\text{Slugs}}{\text{ft}^3}$
θ	Temperature Ratio	--

2.0 Listed below are the subscripts used in this report:

A	Ambient
std	Standard
T	Total
t	Test
w	Referring to Gross Weight
1,2,3---	Referring to Engine Station Number

Appendix III TEST METHODS and DATA REDUCTION PROCEDURES

1.0 INTRODUCTION

1.1 NON-DIMENSIONAL METHOD

In hover, takeoff, and level flight helicopter performance analysis, the results of performance tests may be generalized to extended usefulness through non-dimensional analysis. Test results obtained at specific test conditions may be used to define accurately performance at conditions not specifically tested. The following non-dimensional coefficients were used to generalize the hover, takeoff, and level flight performance test results obtained during this flight test program.

$$\text{Power Coefficient} = C_P = \frac{500\ (\text{SHP})}{\rho A\ (\Omega R)^3}$$

$$\text{Thrust Coefficient} = C_T = \frac{\text{Gross Weight}}{\rho A\ (\Omega R)^2}$$

$$\text{Tip Speed Ratio} = \mu = \frac{(1.688)\ (V_T)}{\Omega R}$$

1.2 INSTRUMENTATION

All quantitative data obtained during this flight test program were derived from special sensitive instrumentation installed and maintained by the USAAVNTA. Data were obtained from three sources:

a. Oscillograph

b. Photo recorder

c. Sensitive instrumentation in standard instrument panel (hand-recorded)

All instrumentation was calibrated to define instrument error. A detailed tabulation of the instrumentation used is given in appendix VI.

1.3 WEIGHT AND BALANCE

A high degree of control was maintained on weight and balance of the test helicopter. Variations of empty gross weight and C.G. due to changes in instrumentation or helicopter components were defined by periodically weighing the helicopter. Fuel load was defined by measuring the specific weight of the fuel after each refueling, then 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 C.G. were controlled by using ballast.

2.0 PERFORMANCE TEST METHODS AND DATA REDUCTION PROCEDURES

2.1 HOVER

2.1.1 To define hovering performance, both the free-flight and tethered hovering techniques were used. During free-flight hovering tests, the helicopter was stabilized at the desired skid height. When the helicopter was stable, the parameters necessary to define gross weight, shaft horsepower, and ambient air conditions were recorded. Skid height was stabilized by the pilot through radio direction from a ground observer watching a weighted, measured cord suspended from the helicopter. During tethered hovering, the helicopter cargo hook was attached to a cable anchored to the ground. A load cell was installed between the helicopter and the ground to measure cable tension. Increasing cable tension had the same effect on hovering performance as increasing gross weight. When power required and cable tension were stabilized, the parameters necessary to define gross weight, cable tension, shaft horsepower, and ambient air conditions were recorded. During all hovering performance tests, wind was less than 3 knots.

2.1.2 Hovering data collected in terms of gross weight, shaft horsepower and ambient air conditions were converted to define the relationship between the non-dimensional thrust coefficient (C_T) and power coefficient (C_P). This relationship was unique for each skid height. Fairings for the non-dimensional hovering performance curves were cross-plotted to define the variation of power coefficient with skid height at a constant thrust coefficient. Summary hovering performance was calculated from the non-dimensional hovering curves by dimensionalizing the curves at selected ambient conditions with maximum power available defined by the standard power charts.

2.2 TAKEOFF

2.2.1 Takeoff performance was defined by measuring the horizontal distance that the helicopter required to take off and clear an obstacle 50 feet high. This distance was primarily a function of airspeed and the amount of power available above that required to hover at a reference skid height of 2 feet. Expressed in nondimensional terms:

$$\Delta C_P = (C_P) \text{ available at test conditions} - (C_P) \text{ required to hover at 2-foot skid height}$$

2.2.2 A series of maximum performance takeoffs was conducted at a single ΔC_P through a range of airspeed. This series defined the variation of takeoff distance with airspeed for a single ΔC_P. Day-to-day temperature variation permitted testing through a range of ΔC_P by changing only helicopter gross weight. Curves of distance required versus airspeed at various values of ΔC_P were carpet-plotted. This carpet plot defined takeoff performance throughout a wide range of gross weights, pressure altitudes, ambient temperatures, and airspeeds. All tests were conducted with winds less than 4 knots. A Fairchild Flight Analyzer was used to determine horizontal and vertical distances and true airspeeds.

2.3 CLIMB

2.3.1 Continuous climb performance tests were conducted by establishing takeoff-rated power and airspeed for maximum rate of climb at near sea-level density altitude and continuing the climb to service ceiling. Climbs were conducted at four gross weights. To insure the validity of the test results, two climbs were done at each gross weight. Airspeed for maximum rate of climb for each gross weight was determined, from analysis of level flight performance data, as the airspeed for minimum power required. This value was confirmed by flying sawtooth climbs through a range of airspeeds. Sawtooth climbs were also conducted at a constant airspeed with a range of power settings to define the power correction factor, K_P.

2.3.2 Climb tests were conducted on nonstandard days; therefore, several corrections were necessary to define standard-day climb performance. The observed rate of change of pressure altitude was converted to tapeline rate of climb by the expression:

$$R/C_t = dh_p/dt \; (T_t/T_{std})$$

At the test density altitude, the variation of rate of climb for nonstandard power available was calculated by the expression:

$$\Delta(R/C)_{power} = K_P \frac{(SHP_{std} - SHP_t)\;(33{,}000)}{(GW)_t}$$

Sawtooth climbs showed:

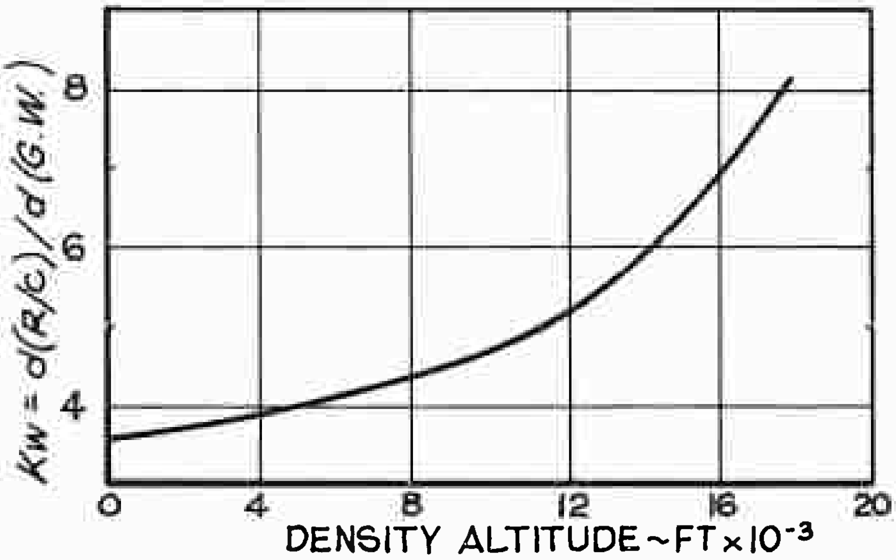
$K_P = 0.85$

The variation of rate of climb for nonstandard gross weight was calculated by the expression:

$$\Delta(R/C)_{weight} = K_W\ (GW_t - GW_{std})$$

Climbs at various gross weights showed that K_W varied as shown in figure III-A.

FIGURE III A
Climb Correction Factor for Gross Weight



The standard-day rate of climb was then calculated:

$$(R/C)_{std} = (R/C)_t + \Delta(R/C)_{power} + \Delta(R/C)_{weight}$$

2.4 LEVEL FLIGHT

2.4.1 Level flight performance was defined by measuring the shaft horsepower required to maintain level flight throughout the airspeed range of the helicopter. A constant thrust coefficient (C_T) was maintained by increasing altitude as fuel was consumed. A broad range of C_T's was flown. The results of the level flight tests were converted to non-dimensional form and carpet-plotted as power coefficient (C_P) versus C_T with lines of constant tip-speed ratio. This carpet plot defined level flight performance for all gross weights, density altitudes, and airspeeds throughout the range of C_T's tested.

2.4.2 Specific range performance was calculated from the relationship of the true airspeed at any power setting to the engine fuel flow at that power setting. For any given gross weight and standard-day ambient conditions:

$$\text{Specific range} = \frac{\text{true airspeed}}{\text{fuel flow}} = \text{Nautical Air Miles Per Pound of Fuel}$$

Fuel flow at any power setting and standard-day altitude was derived from Engine Model Specification No. 104.28, T53-L-11 Engine (reference 1). Specific range performance was summarized in terms of range factor which was a unique function of thrust coefficient.

$$\text{Range factor} = \text{gross weight} \times .99 \text{ maximum specific range}$$

2.5 AUTOROTATION

Autorotation performance data were acquired during both continuous and sawtooth autorotations. Continuous autorotation data were obtained following other tests such as continuous climbs whenever a significant decrease in altitude was required. Sawtooth authorotations were conducted in conjunction with sawtooth climbs. Rate-of-descent variation with airspeed was defined by stabilizing at a constant airspeed with a rotor speed of 324 rpm and measuring rate of descent. To determine the effect of rotor speed upon rate of descent, airspeed was stabilized and rotor speed was varied. The observed rate of descent was corrected to tapeline rate of descent with the expression:

$$R/D_{tapeline} = (dh_p/dt)\ (T_t/T_{std})$$

3.0 STABILITY AND CONTROL

3.1 STATIC LONGITUDINAL STABILITY

Static longitudinal stability was defined in terms of both cyclic control positions in stabilized, coordinated flight (trim curves) and collective-fixed static longitudinal stability. Trim curves were obtained by stabilizing airspeed in zero-sideslip climb, level flight, and autorotation. Control positions required were recorded on an oscillograph. Collective-fixed static longitudinal stability was defined by stabilizing at a trim airspeed in coordinated flight and recording the control requirements to increase and decrease airspeed about the trim point. Results of the static longitudinal stability tests were summarized in terms of longitudinal cyclic stick gradients as a function of airspeed (inches/knot).

3.2 STATIC LATERAL-DIRECTIONAL STABILITY

Static lateral-directional stability was defined by stabilizing at a trim airspeed in coordinated, zero-sideslip flight, then changing sideslip angle. Collective pitch and airspeed were maintained constant and a straight flight path over the ground was maintained. Control positions, helicopter attitudes, and sideslip angles were recorded on an oscillograph. Results of the static lateral-directional stability tests were summarized in terms of control position gradients and helicopter attitude gradients with sideslip angle.

3.3 SIDEWARD AND REARWARD FLIGHT

Sideward and rearward flight tests were conducted by stabilizing the helicopter in sideward or rearward flight and recording the required control positions. A truck with a calibrated speedometer was used as an aid in stabilizing the helicopter and as an airspeed reference. Tests were done with winds less than 3 knots.

3.4 DYNAMIC LONGITUDINAL STABILITY

Dynamic longitudinal stability was defined by the reaction of the helicopter following a longitudinal disturbance. A longitudinal gust disturbance from a trim condition was simulated by inducting a 1-inch pulse stick input for 1 second, then returning to trim. The resulting angular accelerations, rates, and attitudes as a function of elapsed time were recorded on an oscillograph. A control jig was used to insure a precise control input and return to trim stick position.

3.5 DYNAMIC LATERAL-DIRECTIONAL STABILITY

Dynamic lateral-directional stability was defined by the reaction of the helicopter following a lateral or a directional disturbance. A gust disturbance from a trim condition was simulated by inducing a 1-inch pulse lateral cyclic or pedal input for 1 second. The resulting angular accelerations, rates, and attitudes as a function of elapsed time were recorded on an oscillograph. A control jig was used to insure a precise control input and return to trim control position.

3.6 THROTTLE CHOP

Throttle chops were conducted by stabilizing at a trim condition, then simulating an engine-power failure. The power loss was simulated by rapidly rotating the twist grip to flight-idle position. The trim control positions were maintained until recovery was necessary. Trim collective pitch setting was held for approximately 2 seconds to simulate pilot recognition and reaction time following an unanticipated power failure. The reaction of the helicopter following the throttle chop in terms of angular accelerations, rates, and attitudes was recorded on an oscillograph.

3.7 LONGITUDINAL CONTROLLABILITY

Longitudinal controllability was defined by the reaction of the helicopter to step longitudinal control inputs. At a stabilized trim condition, the cyclic stick was displaced longitudinally a measured amount and held until recovery was necessary. A control jig was used to insure precise inputs. At the same trim condition, progressively larger step inputs were made up to a maximum of approximately 1 inch. Longitudinal sensitivity was the maximum pitch acceleration per inch of stick displacement. Longitudinal response was the maximum pitch rate per inch of stick displacement. Longitudinal control power was the pitch attitude change 1 second after a 1-inch stick displacement.

3.8 LATERAL CONTROLLABILITY

Lateral controllability was defined in the same way as longitudinal controllability except that reactions were about the roll axis following lateral cyclic inputs.

3.9 DIRECTIONAL CONTROLLABILITY

Directional controllability was defined in the same way as longitudinal controllability except that reactions were about the yaw axis following pedal inputs.

4.0 MISCELLANEOUS

4.1 STATIC DROOP

Static droop was defined at both a hover and at 65 KCAS. The static droop at zero airspeed was defined by stabilizing at a rotor speed of 324 rpm while hovering out of ground effect. Engine power was then changed in increments and stabilized engine torque and rotor speed were recorded throughout the power range available. The power turbine speed select (beep) switch was not actuated throughout the test. Following the zero airspeed tests the helicopter was accelerated to 65 KCAS. At 65 KCAS, power was again varied throughout the complete range available without using the beep switch.

4.2 AIRSPEED CALIBRATION

Both the standard and the test (boom) airspeed system were calibrated by comparing their readings to a true source. A trailing bomb, calibrated in a wind tunnel, was suspended from the helicopter with a 50-foot cable to avoid proximity effects. The helicopter was then stabilized throughout its airspeed range in level flight, climb, and autorotation. By comparing the airspeed corrected for instrument errors of the standard and boom systems to the reference bomb, the system position errors were defined.

Appendix IV FINDINGS

1.0 Listed in this appendix are the significant findings of this flight test. These findings are listed in order of discussion in section 2, Details of Test.

1.1 The IGE hovering performance of the UH-1B/540 was satisfactory. The hover ceiling for a 2-foot skid height and 9500-pound gross weight on a standard day was 4400 feet. The UH-1B/540 could hover IGE at 60 to 130 pounds higher gross weight than the standard UH-1B at gross weights below 8500 pounds.

1.2 The OGE hover performance of the UH-1B/540 was less than that of the standard UH-1B. The standard UH-1B could hover at 170 to 210 pounds higher gross weight than the UH-1B/540, when the standard UH-1B was not limited by maximum gross weight.

1.3 It was difficult to achieve a stabilized hover at skid heights between 10 and 25 feet due to random disturbances about all three axes. This condition was not hazardous, but the pilot should be aware of it before conducting operations requiring maximum hovering performance and precision at these skid heights.

1.4 Takeoff performance was satisfactory. There were no helicopter flight characteristics detrimental to obtaining maximum takeoff performance. Engine transient torque response was excellent with uniform torque increase easily corrected with pedal.

1.5 A collective pitch position indicator was very helpful in obtaining maximum takeoff performance and in establishing stabilized rotor speed during autorotation. This instrument should be incorporated as a standard cockpit instrument.

1.6 Climb performance was satisfactory. Both the sea-level rate of climb and the service ceiling of the UH-1B/540 were greater than those of the standard UH-1B. Standard-day service ceiling was increased approximately 3500 feet. Standard-day sea-level rate of climb was increased 50 to 100 feet per minute.

1.7 Level flight performance, with respect to maximum airspeeds available in level flight, was excellent. Maximum airspeed was limited by takeoff-rated shaft horespower available for nearly all conditions of gross weight and density altitude. Compared with the standard UH-1B, the increases in standard-day level flight airspeeds were approximately 15 to 35 KTAS under similar conditions at density altitudes below 5000 feet.

1.8 Specific range of the UH-1B/540 at optimum cruise speed between sea level and 5000 feet on a standard day was approximately 10 percent lower than that of the standard UH-1B.

1.9 Either a forward or an aft C.G. location was detrimental to the level flight performance.

1.10 At gross weights less than approximately 6600 pounds, airspeed for minimum rate of descent in autorotation was approximately 60 KTAS at density altitudes from 5000 to 10,000 feet. At gross weights more than approximately 8200 pounds, airspeed for minimum rate of descent was approximately 63 KTAS at density altitudes from 5000 to 10,000 feet. Minimum rate of descent was between approximately 1800 and 2000 feet per minute.

1.11 The collective pitch-rotor speed gradient was small. A large change in rotor speed resulted from a small change in collective pitch. This characteristic, along with RPM lag and overshoot due to high rotor inertia, resulted in difficulty in maintaining a selected rotor speed during autorotation.

1.12 Static longitudinal stability characteristics in level flight and autorotation were satisfactory. In coordinated level flight (trim curves) longitudinal cyclic stick gradients were positive for all conditions tested except for the normal helicopter stick reversal below 40 KCAS. Adequate control margins were present at all conditions but, near the aft C.G. limit of 138 inches, the forward stick position near power-limit airspeed was uncomfortable for an average-size pilot. With collective fixed, variation of airspeed about a 129-KCAS level flight trim point resulted in a slightly negative static longitudinal stick-position gradient at an aft C.G. (137.6 inches).

1.13 In a takeoff-rated power climb at light gross weight with a forward C.G., a discontinuity existed in the longitudinal cyclic stick position gradient. A change in airspeed of only 5 KCAS required a change in longitudinal stick position of 1.3 inches, resulting in an apparent instability. It was very difficult to stabilize airspeed at light gross weight near the airspeed for maximum rate of climb.

1.14 Static directional stability was positive at all conditions tested.

1.15 Effective dihedral varied from weakly positive to negative. High gross weight and aft C.G. increased the effective dihedral. The pronounced roll angle in a sideslip at high airspeed gave the pilot an erroneous impression of strong positive effective dihedral.

1.16 Sideward flight was possible both left and right at more than 35 KTAS.

1.17 Rearward flight was possible in smooth air at speeds up to 32 KTAS; however, only approximately 4-percent aft longitudinal cyclic travel remained at rearward airspeeds of more than 11 KTAS.

1.18 Dynamic longitudinal stability characteristics were excellent at all conditions tested.

1.19 Dynamic lateral-directional stability characteristics were poor. Following a lateral or a directional disturbance, a persistent "dutch roll" oscillation developed. In turbulence this characteristic was objectionable.

1.20 The reaction of the helicopter to a throttle chop at speeds above approximately 100 KCAS was objectionable. Following the throttle chop the helicopter would pitch down and roll left abruptly.

1.21 Longitudinal, lateral, and directional controllability characteristics were good at all gross weight and C.G. configurations.

1.22 Static droop characteristics of the test helicopter were unsatisfactory. The pilot was required to "beep" excessively to maintain approximately constant rotor speed during power changes.

1.23 A condition of self-excited, self-sustaining pylon motion was exhibited by the helicopter in powered flight in calm air. The pylon (main transmission, mast, and rotor) oscillated laterally with a high amplitude at a frequency of 2/3 cycle per main rotor revolution. The cause of this condition was not defined and its effect upon component life is not known.

Appendix V DESCRIPTION of MATERIEL

1.0 INTRODUCTION

1.0.1 The UH-1B/540 rotor helicopter is a general utility helicopter suitable for a variety of missions. Typical missions are transportation of personnel and equipment, medical evacuation, and use as a weapons platform. A variety of armament kits is available.

1.0.2 The test helicopter, USA S/N 63-8684, was a standard UH-1B modified by incorporating the 540 rotor and related systems.

1.1 MAIN ROTOR SYSTEM

The 540 "Door Hinge" rotor system is a two-bladed, semi-rigid system with a flex-beam hub. The flex-beam hub is a broad, thin steel plate by which the rotor system is given high in-plane stiffness but soft flapping restraint. Because of the high in-plane stiffness, large tip weights can be used to increase rotor inertia and reduce the beam oscillatory load. This results in a dynamically balanced design which minimizes oscillatory stress and rotor-induced airframe vibrations. Rotor centrifugal loads are transmitted to the flex-beam by a multi-wound wire torsion-tension strap. Control inputs about the feathering axis are imparted through a pitch horn located at the hub trailing edge. The feathering axis bearing resembles a door hinge in concept. A conventional stabilizer bar is used. Torque is transmitted to the rotor through a splined trunnion which also provides the teetering movement. Both the trunnion and feathering hinge bearings as well as all other rotor head bearings are teflon and require no lubrication. No collective counterweights are used.

1.2 FLIGHT CONTROLS

1.2.1 The primary flight controls are conventional and include the cyclic control stick, collective control stick, and directional control pedals. All flight controls are mechanical and are hydraulically boosted. All control motions are transmitted by push-pull rods and associated bell cranks. Force trim is provided for the cyclic stick to provide force gradients in the boosted system.

1.2.2 The elevator is an inverted airfoil giving a nose-up pitching moment at forward speed. The angle of incidence of the elevator is variable through an interconnection to longitudinal cyclic stick position in order to increase the static longitudinal stability. The vertical fin is cambered to give a nose-left yawing moment at forward speed. This yawing moment reduces the amount of left pedal required to balance rotor torque at high speed.

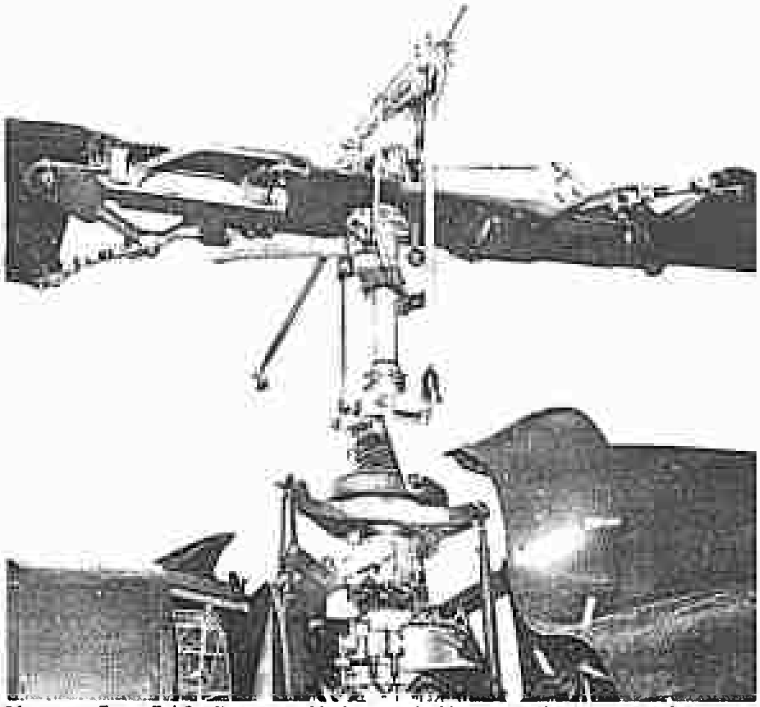


Photo 5 - 540 Rotor Hub and Upper Control System

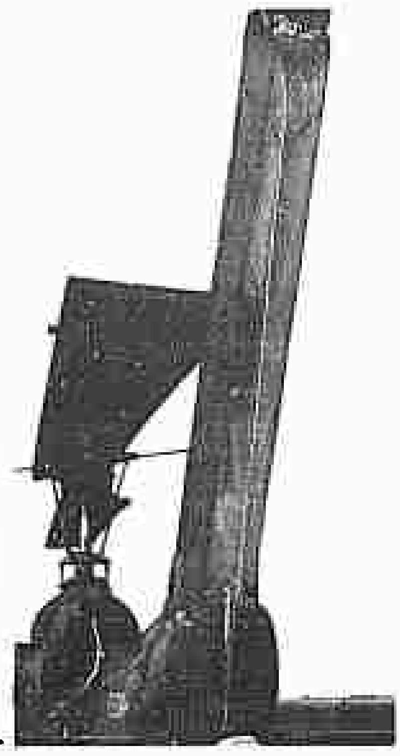


Photo 6 - Cambered Tail Rotor Pylon ▶

1.2.3 A dual boost system is used on main rotor controls with separate pumps, reservoirs, filters, switches, valves, pressure indicators, and associated lines. A tandem hydraulic servo-actuator is used on main rotor controls (two pistons, one shaft and housing). System 1 operates the directional control pedal boost and system 2 has provisions for accommodating armament systems requiring hydraulic power.

1.3 POWER PLANT

The power plant of the UH-1B/540 is the T53-L-11 turboshaft engine. The T53-L-11 engine consists primarily of an air inlet section, axial-centrifugal compressor, diffuser, combustion chamber, gas-producer turbine, power turbine, reduction gearbox and exhaust diffuser. The compressor consists of five axial stages and one centrifugal stage. A single-stage axial-flow turbine powers the compressor. An automatically controlled air bleed band on the axial compressor section improves engine acceleration. A single-stage axial power turbine supplies useful power through a power shaft, concentric to the gas producer shaft, to the reduction gearbox. In normal operation, engine power output is controlled by a proportional hydromechanical fuel control system. In general, the fuel control increases or decreases fuel flow to the engine in order to maintain a preselected output shaft speed regardless of engine load up to maximum capacity. An emergency fuel control system is provided. This system provides fuel flow to the engine proportionally to cockpit twist-grip rotation. Table I shows the sea-level, static, standard-day performance ratings:

TABLE I
T53-L-11 ENGINE PERFORMANCE RATINGS
SEA-LEVEL STANDARD-DAY STATIC

Rating	Shaft Horsepower	Gas Producer Speed rpm	Output Shaft rpm	Specific Fuel Consumption lb/SHP/hr
Takeoff (5-minute limit)	1100	24,770	6610	0.682
Military (30-minute limit)	1000	24,220	6610	0.690
Normal (Continuous)	900	23,670	6610	0.702

1.4 AIRCRAFT DIMENSIONS AND DESIGN INFORMATION

a. Overall Dimensions

(1) Aircraft length (rotor turning) 52 ft 8.84 in

(2) Fuselage length 36 ft 6.35 in

(3) Maximum fuselage width (horizontal stabilizer)	9 ft 4.0 in
(4) Minimum rotor ground clearance	5 ft 10.5 in

b. <u>Main Rotor</u>

(1) Rotor diameter	44 ft 0 in
(2) Chord	27 in
(3) Airfoil	Special 0009 1/3%. Symmetrical
(4) Twist	-10 deg
(5) Disc area	1520 ft^2
(6) Blade area	49.5 ft^2 per blade
(7) Solidity ratio	0.0651
(8) Rotational inertia	2800 $\frac{slugs}{ft^2}$
(9) Preconing angle	2.75 deg
(10) Collective pitch travel (75% radius)	0 to 20 deg
(11) Longitudinal cyclic travel (hub yoke)	$\pm$ 14 deg
(12) Lateral cyclic travel (hub yoke)	$\pm$ 10 deg

c. <u>Aircraft Weights</u>

(1) Detail specification empty weight (FY 64)	4842 lb
(2) Design gross weight	6600 lb
(3) Maximum overload gross weight	9500 lb

1.5 FLIGHT LIMITS

a. Center of Gravity

(1) Forward C.G.	Station 125 to 8150 lb. Varies linearly to station 126.7 at 9500 lb.
(2) Aft C.G.	Station 138 to 7000 lb. Varies linearly to station 132.0 at 9500 lb.

b. Airspeed

(1) At gross weights below 7500 lb	140 KCAS from sea level to 3000 ft density altitude. Decrease 3 KCAS per 1000 ft above 3000 ft H_D.
(2) At a gross weight of 8500 lb	130 KCAS from sea level to 3000 ft density altitude. Decrease 3 KCAS per 1000 ft above 3000 ft H_D.
(3) At a gross weight of 9500 lb	125 KCAS from sea level to 3000 ft density altitude. Decrease 3 KCAS per 1000 ft above 3000 ft H_D.

c. Rotor Speed

(1) Power on	314 rpm min
	324 rpm max
(2) Power off	300 rpm min
	339 rpm max

d. Maneuvering Flight Load Factors

(1) At 6600 lb gross weight	+3, -0.5
(2) At 9500 lb gross weight	+2.08, -0.35

e. Main Transmission Power Limit

1100 shaft horsepower at 314 rpm

Appendix VI TEST INSTRUMENTATION

Flight test instrumentation was installed in the test helicopter prior to the start of this evaluation. This instrumentation provided data from four sources: pilot's panel, engineer's panel, photo panel, and oscillograph. All instrumentation was calibrated. The flight test instrumentation was installed and maintained by the Instrumentation Branch, Logistics Division, USAAVNTA. The following parameters were presented:

a. Pilot's Panel

(1) Airspeed (Boom System)

(2) Rotor Speed

(3) Angle of Sideslip

(4) Rate of Climb

(5) Time of Day

(6) Longitudinal Cyclic Stick Position

(7) Lateral Cyclic Stick Position

(8) Collective Stick Position

(9) Rudder Pedal Position

(10) Gas Producer Speed

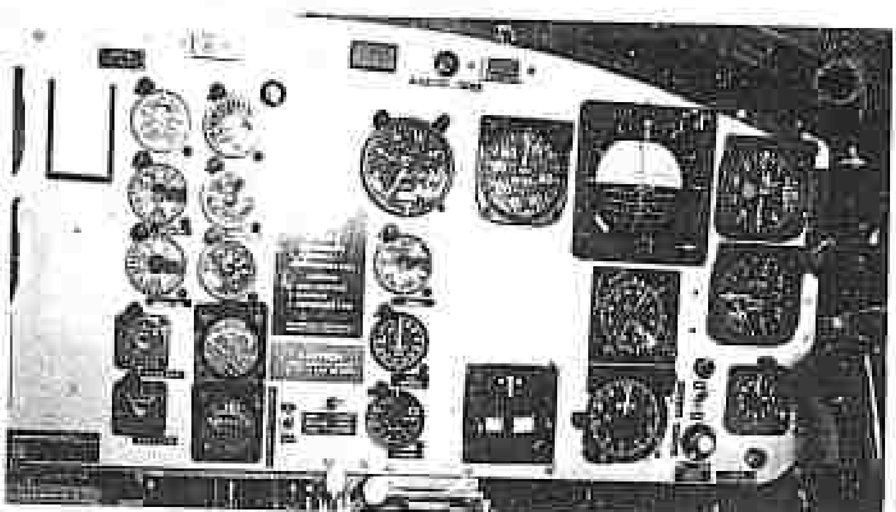


Photo 7 - Pilot's Instrument Panel

b. Engineer's Panel

(1) Compressor Inlet Total Temperature

(2) Compressor Inlet Total Pressure

(3) Torque (High and Low)

(4) Altitude (Boom System)

(5) Airspeed (Ship System)

(6) Free Air Temperature

(7) Fuel Flow (Stepper Motor System)

(8) Total Fuel Used

(9) Time of Day

(10) Coordination Counts (Photo Panel and Oscillograph)

(11) Gas Producer Speed

c. Photo Panel

(1) Compressor Inlet Total Temperature

(2) Compressor Inlet Total Pressure

(3) Torque (High and Low)

(4) Altitude (Boom System)

(5) Airspeed (Boom System)

(6) Free Air Temperature

(7) Total Fuel Used

(8) Time of Day

(9) Coordination Counts (Photo Panel and Oscillograph)

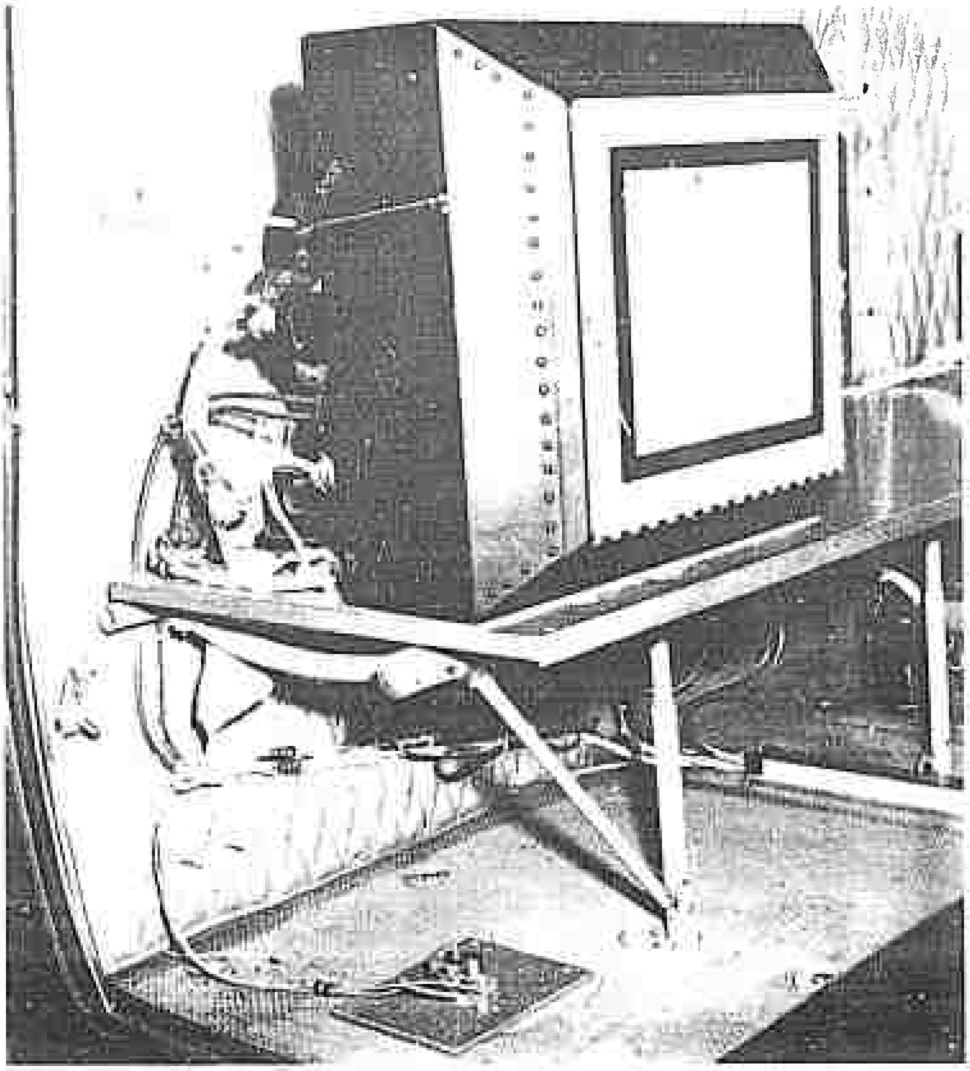


Photo 8 - Photo Panel

d. Oscillograph

(1) Longitudinal Cyclic Control Position

(2) Lateral Cyclic Control Position

(3) Directional Control Position

(4) Collective Pitch Control Position

(5) Angular Pitch Acceleration

(6) Angular Roll Acceleration

(7) Angular Yaw Acceleration

(8) Pitch Rate

(9) Roll Rate

(10) Yaw Rate

(11) Pitch Attitude

(12) Bank Attitude

(13) Yaw Attitude

(14) Angle of Attack

(15) Angle of Sideslip

(16) Center-of-Gravity Normal Acceleration

(17) Vertical Vibration at Copilot's Station

(18) Lateral Vibration at Copilot's Station

(19) Vertical Vibration at Aft Bulkhead

(20) Lateral Vibration at Aft Bulkhead

(21) Longitudinal Cyclic Control Force

(22) Lateral Cyclic Control Force

(23) Collective Pitch Control Force

(24) Pedal Force

(25) Rotor RPM (Linear)

(26) Throttle Twist Grip Position

(27) Engineer's Event

(28) Pilot's Event

(29) Instrumentation Voltage

(30) Photo Panel Frame Count

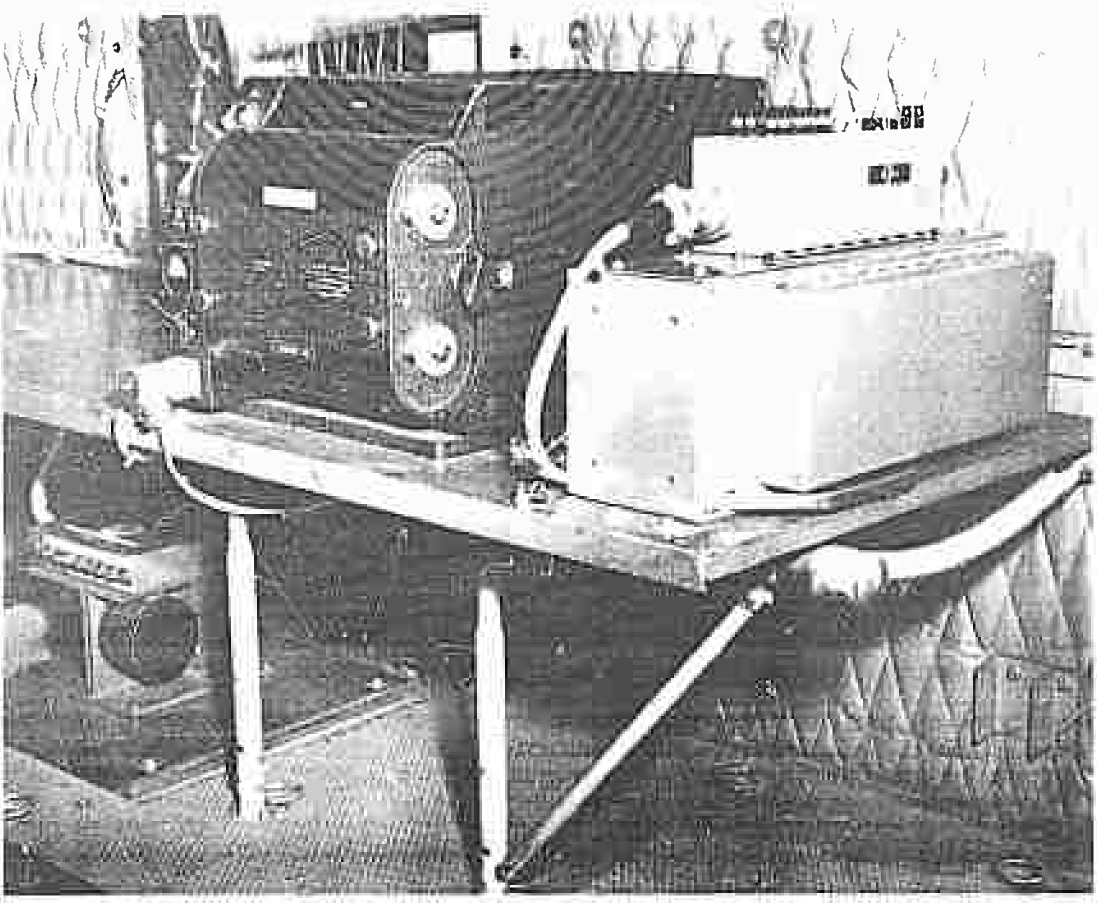


Photo 9 - Oscillograph Installation

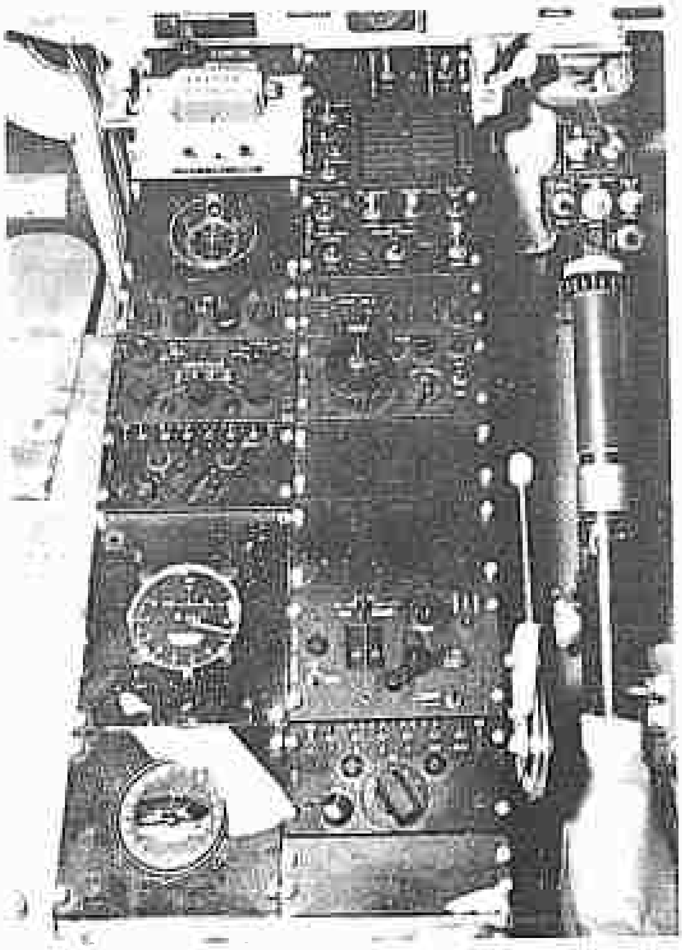


Photo 10
Cockpit Control Console

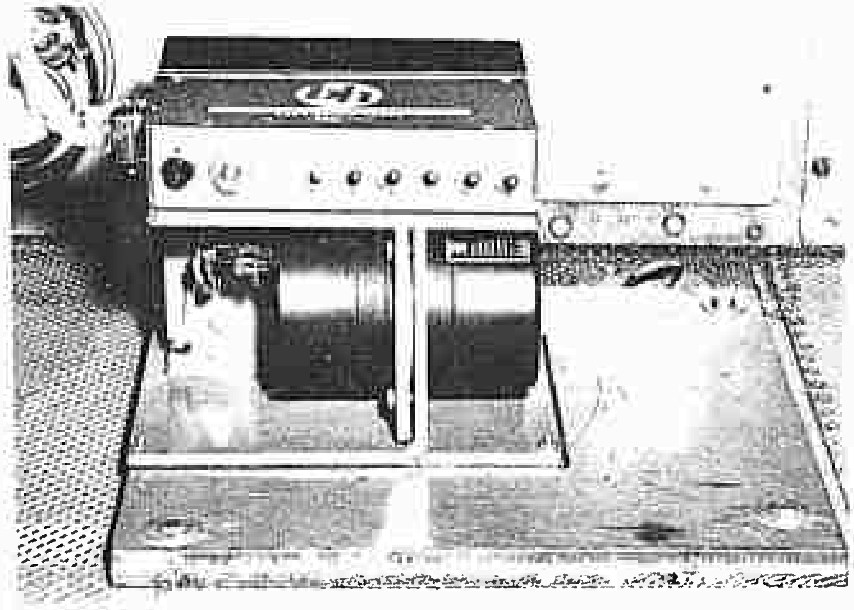


Photo 11
Attitude Gyro

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13. ABSTRACT

A Phase D engineering flight test of the UH-1B helicopter equipped with the Model 540 rotor system was conducted by the U. S. Army Aviation Test Activity (USAAVNTA). Objectives of the test were to determine the airworthiness and to define the performance characteristics and flying qualities of the helicopter. Test Results, where appropriate, were compared with previous test results of the standard UH-1B. Tests were conducted at Edwards Air Force Base, California, and at remote test sites in California and Colorado from 19 May 1965 through 30 April 1966. Total aircraft flight time was 336.30 hours. Quantitative helicopter performance was defined for hovering, takeoff, climb, level flight, and autorotation. Stability and control characteristics were investigated for varied conditions of altitude, airspeed, center-of-gravity location, and gross weight. Correction of the self-excited, self-sustaining pylon motion encountered or determination of its effect upon component stress and life is necessary to resolve the safety-of-flight implications of this deficiency. Correction of the shortcomings listed in this report would result in improved mission performance of the UH-1B equipped with the Model 540 rotor system.

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14. KEY WORDS	LINK A		LINK B		LINK C	
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