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AEFA

AIRWORTHINESS AND FLIGHT CHARACTERISTICS EVALUATION OF THE EH-60A (QUICK FIX) HELICOPTER

David B. Cripps
CPT, AV
Project Officer/Pilot

Donald L. Underwood
LTC, AV
Project Pilot

David A. Downey
CPT, AV
Project Pilot

George M. Yamakawa
Project Engineer

Charles Q. Crowell
Project Engineer

Joseph A. Lyle
CW4, USA
Project Pilot

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AVIATION ENGINEERING FLIGHT ACTIVITY
Edwards Air Force Base, California 93523-5000

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LTC Donald L. Underwood, CPT David A. Downey, George M. Yamakawa, Charles Q. Crowell, CW4 Joseph A. Lyle, CPT David B. Cripps,

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The U.S. Army Aviation Engineering Flight Activity conducted a limited Airworthiness and Flight Characteristics test of the EH-60A (Quick Fix) helicopter~~, from 25 November 1987 through 18 May 1988 at Edwards Air Force Base, California~~. During the test program, 49 flights were conducted for a total of 63.5 hours, of which 47.1 were productive. Initially the EH-60A was modified to the utility configuration where 22.3 productive hours were flown for airspeed calibration, level flight performance, and vibration characteristics. All tests were performed at a Quick Fix mission center of gravity of approximately 361.9 fuselage station for both the utility and Quick Fix configuration. Test results ~~were compared with data obtained during previous testing and evaluated against the Prime Item Development Specification~~. The Quick Fix configuration resulted in a 5.2 square feet increase in equivalent flat plate area which results in a 5% degradation in specific range at the recommended cruise airspeed, a 2% increase in fuel flow at the maximum endurance airspeed, and a 4 knot degradation in maximum level flight airspeed at sea level standard day conditions and mission gross weight (17,200 pound). The handling qualities of the Quick Fix configured EH-60A were essentially unchanged from the standard UH-60A helicopter. The clearance between the main rotor blades and direction finding dipole antennas during nose down slope landings was adequate. The absence of lower console lighting for the communication and navigation equipment was identified as a deficiency. The following previously

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ported shortcomings still exist: poor maneuvering stability characteristics, large lateral stick jump during mission maneuvers, high rev vibration levels, the insufficient legibility of the code numerals of the AN/APX-100(V) transponder, and the one way select nction of the code selector buttons of the AN/APX-100(V) transponder. The objectionable longitudinal stick jump was also entified as a shortcoming.

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INTRODUCTION

BACKGROUND

1. The EH-60A (Quick Fix) is a modified UH-60A helicopter configured for Electronic Warfare/Communications Intelligence Operations. Developed and managed by the Special Electronic Mission Aircraft (SEMA) Product Manager, the primary mission equipment is the AN/ALQ-151(V)2 electronic countermeasures system, which required the addition of a series of antennas to the external configuration of the aircraft. Originally developed by the Electronic Systems Laboratory, TRW Inc., a YEH-60A was evaluated by the U.S. Army Aviation Engineering Flight Activity (AEFA) in 1984 as part of the developmental effort (ref 1, app A). In April 1987, AEFA completed a Preliminary Airworthiness Evaluation of the production EH-60A (ref 2). New EH-60A airframes are currently being equipped with the Quick Fix mission package at Mojave, California, by Flight Systems Incorporated under contract to the system manufacturer, Tracor Aerospace Austin, Inc. The U.S. Army Aviation Systems Command (AVSCOM) tasked (ref 3) AEFA to conduct a quantitative evaluation of the EH-60A helicopter to determine aircraft performance and handling qualities.

TEST OBJECTIVES

2. The objectives of this Airworthiness and Flight Characteristics evaluation were to obtain quantitative data on the performance and flying qualities of the EH-60A (Quick Fix) helicopter and to ascertain any differences between that configuration and the UH-60A Black Hawk.

DESCRIPTION

3. The EH-60A Quick Fix helicopter is a twin-turbine engine, single-main rotor helicopter capable of identifying, locating, and jamming as necessary ground based electronic communications transmissions during day or night in visual or instrument meteorological conditions. Manufactured by Sikorsky Aircraft Division of United Technologies Corporation, the airframe is based on the UH-60A Black Hawk, with significant changes to accommodate the SEMA mission equipment. The primary mission equipment is the AN/ALQ-151(V)2 electronic countermeasures system and an increased suite of aircraft survivability equipment (ASE). The most significant external airframe changes for the Quick Fix mission are a single retractable whip antenna at the tail boom attachment to the fuselage on the bottom of the aircraft, two dipole antennas on each side of the tail boom, and ASE antenna mounts on both sides of the nose and aft fuselage. An electrically operated environmental control system is installed above the fuel cells aft of the cabin. The EH-60A has the conventional wheel-type landing gear of the UH-60A. The main and tail rotors are both four-bladed with the tail rotor mounted on the right side of the vertical tail pylon at a 20 degree upward cant. A movable horizontal stabilator located on the lower portion of the vertical tail pylon is programmed by the aircraft automatic flight control system. The helicopter is powered by two T700-GE-700 turboshaft engines having an uninstalled thermodynamic rating (30 minute) of 1553 shaft horsepower (shp) (power turbine speed of 20,900 rpm) each at sea level, standard day static conditions. Installed dual-engine power is transmission limited to 2828 shp.

4. The EH-60A helicopter, S/N 86-24569, used for this evaluation is a tenth-year production aircraft with the wire strike protection system (WSPS), the hover infrared suppression subsystem (HIRSS), and the production modifications to accommodate the Quick Fix mission equipment. The HIRSS inner baffle was installed for all tests. For the purpose of the evaluation, an air data boom was installed on the lower right forward fuselage extending upward and forward beyond the nose of the helicopter. Test instrumentation included a total air temperature sensor mounted on the forward left bottom of the aircraft just aft of the landing light and a telemetry antenna on the bottom of the tail boom just forward of the tail wheel. To determine the change in performance as the result of the Quick Fix mission equipment installation, baseline performance flights were conducted in a utility configuration. The utility configuration was the production EH-60A airframe, with the WSPS and HIRSS, modified to simulate the external configuration of the tenth-year production UH-60A. For the Quick Fix phase of the evaluation, all external mounts and antennas associated with the Quick Fix mission were installed. A more detailed description of the EH-60A is available in the Prime Item Development Specification (refs 4 and 5), the operator's manual (ref 6), and appendix B. Appendix B also includes a description of the test helicopter in both the utility and Quick Fix test configurations.

TEST SCOPE

5. This evaluation was conducted at Edwards Air Force Base, California (elevation 2302 feet). Forty-nine flights totaling 47.1 productive flight hours were conducted between 25 November 1987 and 18 May 1988. Two aircraft configurations were evaluated during the test, a utility configured EH-60A and the Quick Fix EH-60A. During the period of 5 February until 7 March 1988 the test aircraft was transferred to Tracor Aerospace Austin, Inc. at Mojave, California, for incorporation of the Quick Fix external equipment. The aircraft was operated within the limits of the operator's manual (ref 6) and the airworthiness release (ref 7) issued by AVSCOM. Testing was conducted in accordance with the test plan (ref 8) and Request for Additional Testing (ref 9) as authorized by AVSCOM (ref 10). Flight test conditions are shown in table 1. Performance and handling qualities flight testing in the Quick Fix configuration was conducted at EH-60A mission gross weights and center of gravity with the electronic countermeasure antenna extended. Handling qualities were evaluated with respect to the applicable requirements of MIL-H-8501A (ref 11). Test results were compared with the results of previous UH-60A and EH-60A tests (refs 1, 2, 12, 13 and 14).

TEST METHODOLOGY

6. Performance testing was conducted in accordance with reference 16. Handling qualities testing was conducted in accordance with flight test techniques described in reference 17. Flight test data were recorded on magnetic tape onboard the aircraft and via telemetry to the Real Time Data Acquisition and Processing System. Additionally, data were hand recorded from standard ship and sensitive calibrated cockpit instruments as well as sensitive calibrated instruments mounted at an engineer's station in the forward cabin area. A detailed listing of recorded parameters is contained in appendix C. Specific

Table 1. Test Conditions[1]

Test	Average Gross Weight (lb)	Average Longitudinal Center of Gravty (FS[2])	Average Density Altitude (ft)	Average Trim Calibrated Airspeed (kts)	External Configuration	Remarks
Level Flight Performance[3]	16,800 to 17,860	360.7	3880 to 13,220	42 to 158 (KTAS[4])	Utility	$N/\sqrt{\theta}$ = 258 rpm
	14,460 to 18,160	361.5	4400 to 12,690	39 to 159 (KTAS)	Quick Fix	$N/\sqrt{\theta}$ = 258 and 265 rpm
Control Positions in Trimmed Forward Flight	14,450 to 18,200	361.5	4360 to 12,400	34 to 149	Quick Fix	Obtained from level flight performance tests
Static Longitudinal Stability	17,250	362.5	6500	72	Quick Fix	
	16,890	361.2	6700	114		
Static Lateral-Directional Stability	15,430	359.6	6640	72	Quick Fix	
	16,650	360.4	6600	114		
Maneuvering Stability	17,030	361.9	7440	72	Quick Fix	
	16,300	359.2	7750	117		
Dynamic Stability	17,370	362.7	7480	72	Quick Fix	
	17,120	361.8	7580	108		
Controllability	17,290	362.4	7420	72	Quick Fix	
	17,290	362.3	2180	108		
Low Speed Flight Characteristics	16,910	361.1	2180	0 to 45 (KTAS)	Quick Fix	Azimuth: 0, 90, 180, and 270 degrees
Mission Maneuvers	17,280	365.6	6960	72	Quick Fix	Level turns
	17,130	365.1	7080	107		Level turns
	16,830	364.1	8590	115 to 135		Evasive maneuver
	16,580	363.1	8890	122		Autorotation
Main Rotor to Direction Finding Antenna Clearance	17,420	362.9	2840	N/A	Quick Fix	Antenna retracted, nose down slope
Vibration Characteristics	16,360 to 17,510	360.0	870 to 5270	0 to 197	Utility	Hover, low speed, climb, level, dive, descent, turns, sideslips, approach
	16,500 to 17,490	361.2	1730 to 8070	0 to 195	Quick Fix	
Airspeed Calibration	16,400 to 19,900	359.7	360 to 3020	39 to 159	Utility	
	15,020	363.7	4150	37 to 153	Quick Fix	

NOTES:

[1]Test conducted with doors and windows closed, SAS 1 and 2, TRIM, FPS-ON, bleed air system OFF, and mid lateral center of gravity. In the Quick Fix configuration, ECM antenna was always extended except during slope landing.
[2]FS: Fuselage station.
[3]Environmental control system OFF.
[4]KTAS: Knots true airspeed.

test techniques and the data reduction methods used for this evaluation are presented in appendix D. A Handling Qualities Rating Scale (fig. D-1, app D) was used to augment pilot comments relative to handling qualities. A Vibration Rating Scale (fig. D-2) was used to augment pilot comments relative to aircraft vibrations.

RESULTS AND DISCUSSION

GENERAL

7. Limited performance and handling qualities tests of the EH-60A were evaluated at Edwards Air Force Base, California. Tests were conducted with the EH-60A aircraft configured to the utility and Quick Fix configurations. The utility configuration was used as a baseline for comparison to the Quick Fix configuration level flight performance. The Quick Fix configuration resulted in a 5.2 ft^2 increase in equivalent flat plate drag which results in a 5% degradation in specific range at the recommended cruise airspeed, a 2% increase in fuel flow at the maximum endurance airspeed, and a 4 knot degradation in maximum level flight airspeed at sea level standard day conditions and mission gross weight. The handling qualities of the Quick Fix configured EH-60A were essentially unchanged from those of the UH-60A. The absence of lower console lighting for the communication and navigation equipment was identified as a deficiency. The following previously reported shortcomings still exist: poor maneuvering stability characteristics, large lateral stick jump during mission maneuvers, high 4/rev vibration levels, the insufficient legibility of the code numerals of the AN/APX-100(V) transponder and the one way select function of the code selector buttons of the AN/APX-100(V) transponder. The objectionable longitudinal stick jump was also identified as a shortcoming.

LEVEL FLIGHT PERFORMANCE

8. Level flight performance tests were conducted at the conditions listed in table 1 to determine power required and fuel flow of the EH-60A at various airspeeds. The aircraft was tested at an average longitudinal center of gravity (cg) of fuselage station 361, which is representative of the nominal EH-60A mission profile. Techniques used in obtaining and analyzing level flight performance data are described in detail in appendix D. The aircraft was flown in wings level, zero lateral acceleration (using sensitive lateral accelerometer) flight. All performance data were corrected for estimated drag of external test instrumentation. Mission equipment was not operated during level flight performance tests.

9. Level flight performance testing in the utility configuration yielded results consistent with previous testing (ref 12, app A). Dimensional data for the utility configuration are presented in figures E-5 to E-8, appendix E. Testing in the Quick Fix configuration yielded an increase in equivalent flat plate area (ΔF_e) of 5.2 ft^2, which was essentially constant for all advance ratios and thrust coefficients evaluated. Dimensional data for the Quick Fix configuration are presented in figures E-9 to E-16. Nondimensional level flight performance data for the Quick Fix configuration are presented in figures E-2 to E-4. A comparison of level flight performance for the utility and Quick Fix configurations is presented in figure E-1 for sea level standard day conditions. At these conditions the Quick Fix configuration resulted in approximately a 5% degradation of specific range at the recommended cruise airspeed, a 2% increase in fuel flow at maximum endurance airspeed, and a 4 knot true airspeed (KTAS) degradation in maximum level flight airspeed from the utility configuration. A summary of maximum endurance of the Quick Fix configured aircraft for standard day conditions is presented as figure E-17. A nondimensional maximum endurance summary is presented as figure E-18.

10. Engine characteristics were consistent with previous testing (ref 12). Data are presented in figures E-19 to E-24, and are included for future engineering analysis.

HANDLING QUALITIES

Control Positions in Trimmed Forward Flight

11. Control positions in trimmed forward flight were evaluated concurrently with level flight performance testing at the conditions listed in table 1. Data were obtained in wings level, ball-centered flight in 5 knot increments with control forces trimmed to zero, and are presented in figures E-25 through E-32. The variation of longitudinal control position with airspeed was generally conventional, requiring increased forward longitudinal control displacement with increased trim airspeed. Increased right lateral control displacement was required with increased trim airspeed throughout the range of trim airspeeds evaluated. At airspeeds below approximately 80 knots calibrated airspeed (KCAS), right directional control position increased with increasing trim airspeed. Directional control position above 80 KCAS was essentially constant. Adequate control margins in all flight control axes existed throughout the range of trimmed airspeeds tested. The control positions of the EH-60A Quick Fix configuration are similar to the UH-60A, and are satisfactory.

Static Longitudinal Stability

12. The collective-fixed static longitudinal stability was evaluated in level flight at the conditions presented in table 1. The aircraft was initially stabilized in ball-centered flight at trimmed airspeeds of 72 and 114 KCAS. With collective fixed, airspeed was incrementally varied about trim. Test data are presented in figure E-33. Static longitudinal stability was positive at 72 KCAS and neutral to slightly positive at 114 KCAS, as indicated by the requirement for forward longitudinal control displacement and push forces to maintain airspeeds greater than trim airspeed, and by aft longitudinal control displacement and pull forces to maintain airspeeds less than trim airspeed. The static longitudinal stability characteristics of the Quick Fix configured EH-60A are similar to those of the UH-60A, comply with the requirements of the Prime Item Development Specification (PIDS), reference 5, and are satisfactory.

Static Lateral-Directional Stability

13. The static lateral-directional stability was evaluated in level flight at the conditions presented in table 1. The aircraft was initially stabilized in ball-centered flight at trimmed airspeeds of 72 and 114 KCAS. With collective fixed, sideslip was incrementally varied to the sideslip limit both right and left of trim while maintaining a steady heading at the trim airspeed. Test data are presented in figure E-34. Static directional stability was positive as indicated by the requirement for increased left directional control displacement with increasing right sideslip, and increased right directional control displacement with increasing left sideslip. Dihedral effect was positive as indicated by the requirement for increased right lateral control displacement with increasing right sideslips, and increased left lateral control displacement with increasing left sideslips. Sideforce

characteristics were positive as indicated by increasing right roll attitude with increasing right sideslips, and increased left roll attitude with increasing left sideslips. The static lateral-directional stability characteristics of the Quick Fix configured EH-60A are similar to those of the UH-60A, comply with the requirements of the PIDS, reference 5, and are satisfactory.

Maneuvering Stability

14. Maneuvering stability was evaluated at the conditions presented in table 1. The aircraft was initially stabilized in ball-centered flight at trimmed airspeeds of 71 and 117 KCAS. With collective fixed and at constant airspeed, the normal acceleration was incrementally increased by incrementally increasing bank angle to the bank angle limit, both in left and right turns. Test data are presented in figures E-35 and E-36. At 71 KCAS, the stick-fixed maneuvering stability was slightly positive (aft longitudinal control displacement required for increased load factor) both to the left and right up to approximately 1.4 g's, and thereafter neutral (no corresponding longitudinal control displacement required for increased load factor). At 117 KCAS, the stick-fixed maneuvering stability was essentially neutral both to the left and right for all increased load factor. For both trim airspeeds tested, beyond 45 degrees bank angle, continuous moderate (0.5 to 1.0 inches) longitudinal and lateral control inputs were required to maintain airspeed within ±5 KCAS and bank angle ±5 degrees (Handling Qualities Rating Scale (HQRS) 7). The poor maneuvering stability characteristics (especially above 1.4 g's) will limit the effectiveness of the Quick Fix configured EH-60A to perform various evasive maneuvers and is a shortcoming which was identified in a previous evaluation (ref 15).

Dynamic Stability

15. Short and long-term dynamic stability was evaluated with SAS 1 and 2, TRIM, Flight Path Stabilization (FPS)-ON at the conditions presented in table 1. The short-term response was simulated in all control axes by making single-axis, 1 inch pulse inputs which were held for approximately 0.5 second. The longitudinal long-term stability was evaluated by trimming the aircraft in level, ball-centered flight, and then displacing the aircraft from trim airspeed approximately 10 knots, smoothly returning the longitudinal control to its trim position, and observing the subsequent aircraft response with the controls released. The short-term response of the aircraft was heavily damped, as shown in figures E-37 to E-48. Single axis disturbances in all axes were damped to one-half amplitude well within one cycle. The stick-free lateral-directional and longitudinal (short-term) response characteristics exhibited one to two small overshoots, and were not objectionable. Airspeed remained within 2 knots of trim airspeed, and aircraft pitch and roll attitudes returned quickly to the trim condition. The long-term response of the aircraft was heavily damped, with only one overshoot of approximately 4 knots. The long-term mode was not easily excited with FPS engaged. Actual flights in light to occasional moderate turbulence did not excite the long-term response of the aircraft. The dynamic stability characteristics of the Quick Fix configured EH-60A are similar to those of the UH-60A, comply with the requirements of the PIDS, reference 5, and are satisfactory.

Controllability

16. Controllability tests were conducted in level flight at the conditions presented in table 1. The aircraft was initially stabilized in ball-centered flight at a trim airspeed, and then a control input (step) of a measured size was rapidly applied. Following the input, flight controls were held fixed until a maximum rate was established or until recovery was necessary. The magnitude of the input was varied by using an adjustable rigid control fixture. Controllability was measured as a function of aircraft attitude displacement in a given time (control power), angular velocity (control response), and angular acceleration (control sensitivity) about each aircraft axis. Test results are presented in E-49 to E-51. The controllability characteristics of the Quick Fix configured EH-60A were essentially unchanged from those of the UH-60A, comply with the requirements of the PIDS, reference 5, and are satisfactory.

Low Speed Flight Characteristics

17. Low speed flight characteristics were evaluated from hover to 45 KTAS on relative azimuths of 0, 90, 180, and 270 degrees at the conditions presented in table 1. Tests were conducted in calm winds at 30 feet above ground level with the electronic countermeasure antenna extended. Data are presented in figures E–52 and E–53. Adequate control margins remained at all airspeeds and relative azimuths tested. Control positions relative to true airspeed and azimuth were consistent with previous testing of UH–60A aircraft. The highest required pilot compensation occurred at 25 and 30 KTAS at the 270 degree relative azimuth, where frequent small (±0.5 in.) longitudinal, lateral and directional control inputs were required (HQRS 5). The low speed flight characteristics of the Quick Fix configured EH–60A are similar to those of the UH–60A, comply with the requirements of the PIDS, reference 5, and are satisfactory.

Mission Maneuvering Characteristics

General:

18. A limited quantitative and qualitative assessment of the mission maneuvering characteristics of the EH-60A aircraft was conducted to evaluate instrument flight and evasive maneuver handling qualities. The maneuvers performed were: an instrument takeoff, left and right banks at 74 and 107 KCAS to 30 degree roll attitudes, high speed dive with 180 degree heading change at both left and right 60 degree roll attitudes, diving left and right spirals, autorotation with left and right 180 degree heading change, and a standard autorotation. These tests were accomplished with the automatic flight control system ON and at the conditions listed in table 1. Representative time histories of each maneuver are presented in figures E-54 through E-77. All maneuvers were flown in accordance with and to the performance standards described in the UH-60 Aircrew Training Manual (ref 18). All tasks were completed with minimal (HQRS 3) to moderate (HQRS 4) pilot compensation required in pitch and roll control.

Trimmability:

19. During the course of the mission maneuver evaluation, the trimmability characteristics of the EH-60A flight control system were evaluated. During each

maneuver, pilot trim system control inputs were accomplished through either the cyclic BEEP TRIM switch or the cyclic TRIM RELEASE switch. Activation of the TRIM RELEASE switch after displacing the control stick approximately 20 percent against the force gradients resulted in a 0.5 inch longitudinal and 1.0 inch lateral stick jump (fig. E-72). Pitch attitude excursions were common when activating the TRIM RELEASE against the force gradients. At 60 degree bank and 20 degree of pitch roll and pitch attitude excursions required excessive pilot compensation to prevent exceeding roll and pitch attitude limitations. The objectionable lateral stick jump characteristics of the EH-60A have been noted in previous UH-60A evaluations (ref 13) and remain a shortcoming. The objectionable longitudinal stick jump characteristics of the EH-60A is also a shortcoming.

MAIN ROTOR TO DIRECTION FINDING ANTENNA CLEARANCE

20. Clearance between the main rotor and the direction finding (DF) dipole antennas was evaluated during nose down slope landings in calm winds at the conditions presented in table 1. The left and right rear DF dipole antennas were removed from the aircraft, and the right rear antenna was replaced with a balsa wood witness stick assembly (figs. 1 and 2). The witness stick assembly extended 5.0 inches higher than the DF dipole antennas, and was constructed in 1.0 inch breakaway intervals to ascertain clearance of the actual antenna height should a part of the witness stick assembly be hit by the rotor blades. During nose down slope landings to the down slope limit of 6 degrees (fig. 3), the witness stick was not struck, indicating rotor to antenna clearance remained greater than 5.0 inches at all times. The clearance between main rotor blades and DF dipole antennas during nose down slope landings was adequate.

VIBRATION CHARACTERISTICS

21. The vibration characteristics of the EH-60A were qualitatively evaluated throughout the test program and quantitatively evaluated at the conditions listed in table 1. Three axis vibration data were measured at the aircraft cg, left-side stabilator spar tip, right-side stabilator spar tip and stabilator actuator attaching point. Main rotor harmonics of one per-revolution (1/rev), 2/rev, 4/rev, 6/rev and 8/rev are presented in figures E-78 through E-98 for the cg location and tail rotor harmonics of 1/rev, 2/rev, 3/rev, 4/rev and 5/rev are presented in figures E-99 to E-119 for the stabilator locations.

22. The 4/rev was the predominate harmonic with the higher vibration levels occurring in the vertical axis. At the cg station the vibration characteristics between the utility and Quick Fix configured EH-60A showed similar results in all axes and harmonics. The exception to the similarity was the 4/rev in the vertical axis during constant bank turns at 125 KCAS. The vibration levels in the utility configuration started at 0.2 g at a load factor of 1.16 and decreased to 0.11 g at a load factor of 1.82 while the Quick Fix configuration showed a constant 0.1 g at all load factors. At the stabilator locations the vibration levels between both configurations of the EH-60A were similar in all axes and harmonics; however, higher 4/rev vibration levels in the longitudinal axis in the Quick Fix configuration were observed during level flight, high power dive, low speed flight at

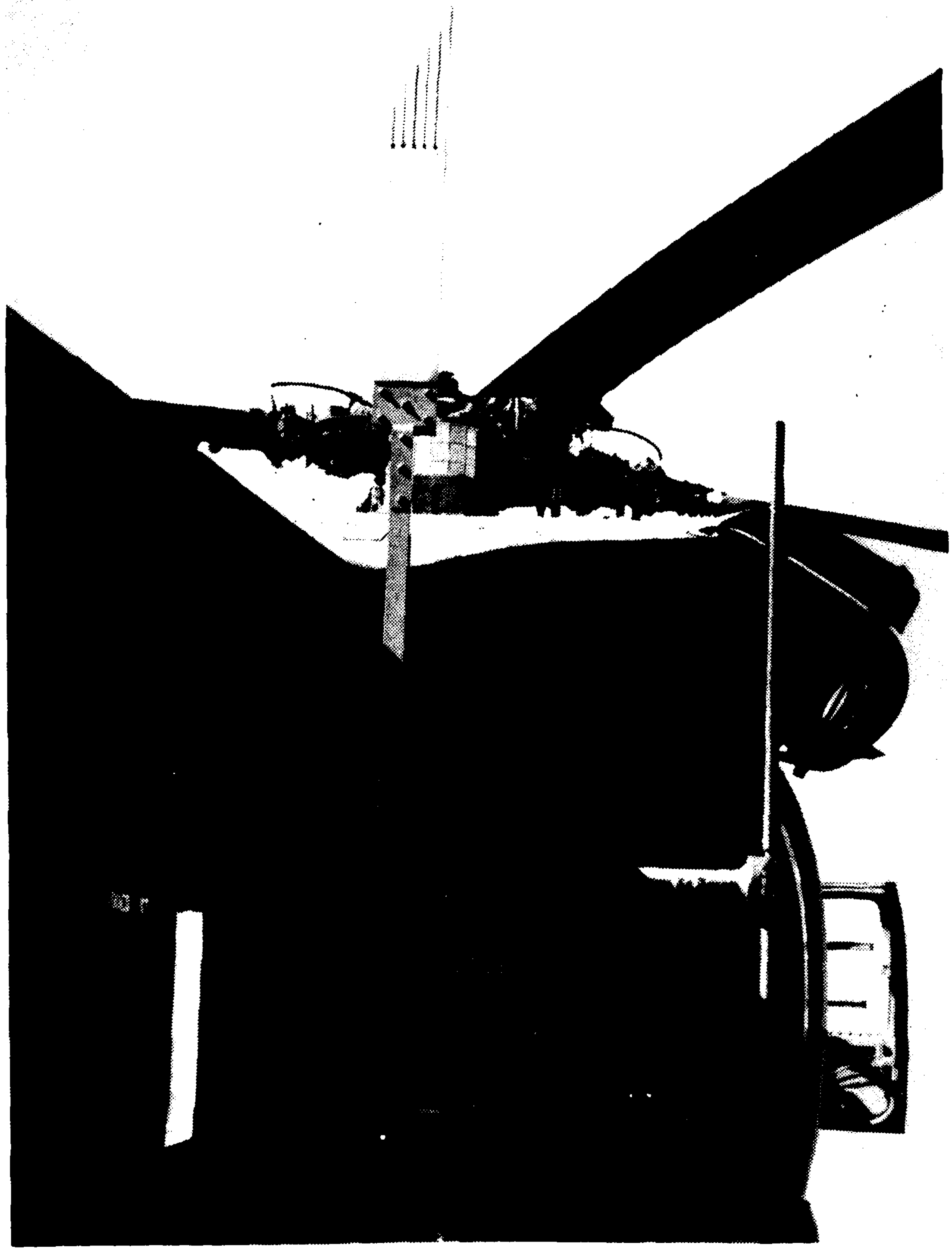


Figure 1. Balsa Wood Witness Stick

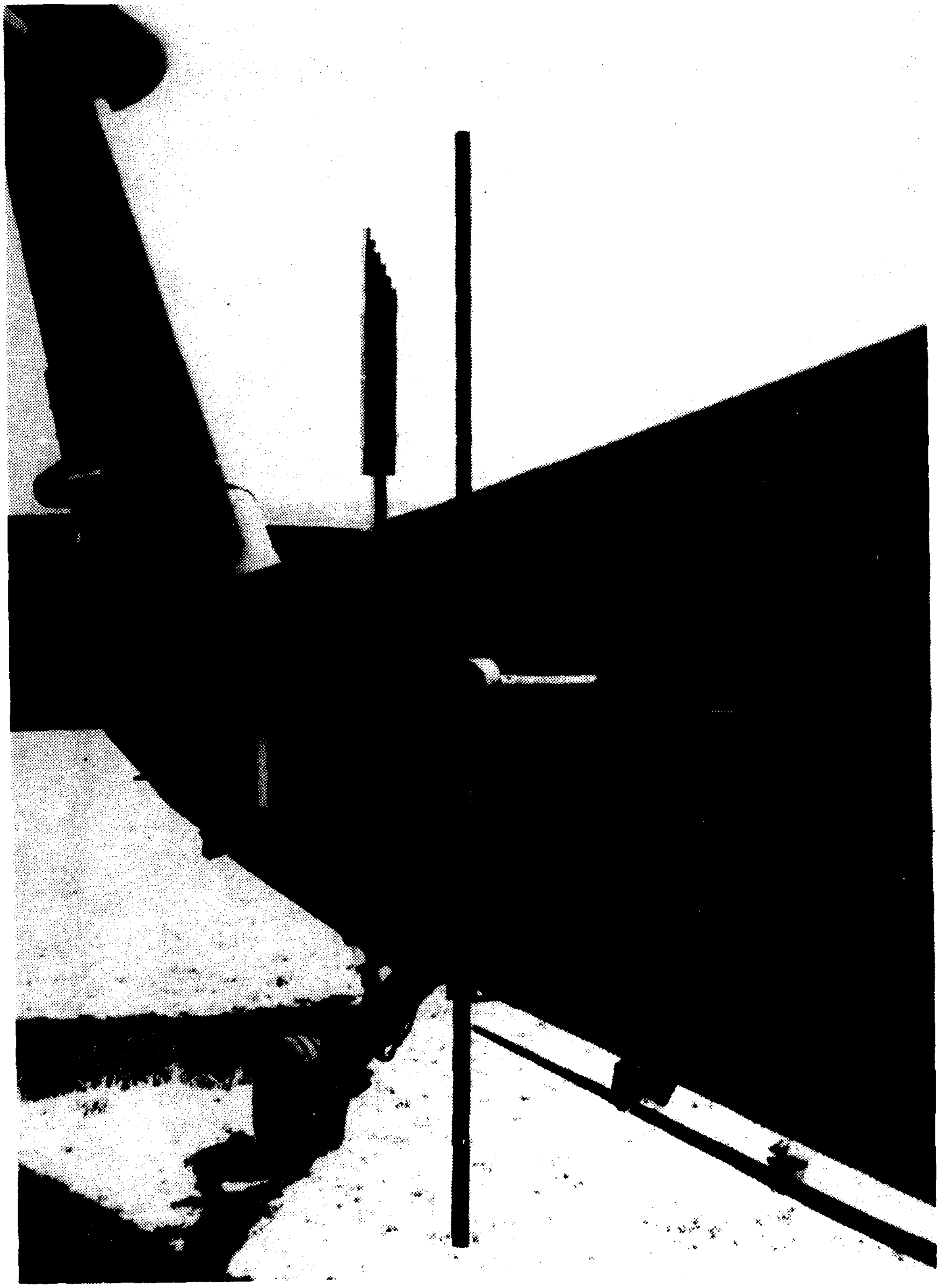


Figure 2. Balsa Wood Witness Stick

Figure 3. Slope Landing

0 degree azimuth, approach to hover, and descent (figs. E-99, E-103, and E-104). The highest vibration was measured at the left-side stabilator spar tip location during high power dive at 198 KCAS where the 4/rev vertical acceleration measured in excess of 4.3 g.

23. Qualitatively, a moderate-intensity medium-frequency vibration (Vibration Rating Scale) (VRS) 6) was experienced at the pilot/copilot stations at airspeeds below 50 KCAS during level flight performance testing in both the utility and Quick Fix configurations. During low speed flight, the vibration levels at the pilot/copilot stations on the 0 and 90 degree relative azimuth was unchanged from the UH-60A. At 180 and 270 degree relative azimuth, airframe vibration of the Quick Fix configuration was noticeably higher than the UH-60A. The highest vibration (VRS 6) occurred between 20 to 45 KTAS at 270 degree relative azimuth. The vibration characteristics of the Quick Fix configured EH-60A were not significantly different from the UH-60A. The excessive 4/rev vibrations significantly increased pilot workload during certain maneuvers and are a shortcoming which was identified in previous evaluations (refs 13 and 14).

COCKPIT AND MISCELLANEOUS EVALUATION

AN/APX-100(V) Transponder

24. The code numerals of the AN/APX-100(V) transponder were evaluated for functional legibility during both day and night operations, inflight and on the ground with static rotor conditions. The AN/APX-100(V) transponder is located in the rear center section of the lower console between the pilots and mounted in a near horizontal position. The purpose of the code numerals is to display the selected "squawk" code to the pilots. The code numerals are approximately 0.165 inches high and covered with a clear plastic window. The windows are 0.155 inches wide by 0.224 inches high. The small size of the numerals combined with the reflections off the window lens make the numerals extremely difficult to read under the best of conditions. The dust that collects over the window lens further reduces the numeral legibility. To read the numerals, the pilot was required to position his head and body to reduce the reflections off the window lens and reduce the oblique viewing angle, permitting a more direct view through the window to the numeral. The pilot body and head movements were excessive, taking away from more important piloting tasks. The position of the transponder in the console permits access by both pilots and little would be gained by moving it to either side of the console. The numerical display would still be difficult to read. The insufficient legibility of the code numerals as a result of the small size of the code numerals and viewing windows of the AN/APX-100(V) transponder is a shortcoming which was identified in a previous evaluation (ref 13).

25. The code selector buttons of the AN/APX-100(V) transponder were evaluated for function. The buttons are push type spring loaded return and raised off the face of the transponder. There is a button for each code numeral of the mode 1 and 3/A codes. Pushing a button changes the numeral by a value of one in increasing integers from 0 through 7. Should an error be made and the desired code number is passed over, the pilot is required to cycle through the entire sequence before the desired code may be set.

This is an unnecessary demand on the pilot's attention requiring an extraordinary effort for a minor operation. The one way action through the numerals of the code selector buttons of the AN/APX-100(V) transponder is a shortcoming which was identified in a previous evaluation (ref 13).

Lower Console Lighting

26. The center lower console lighting was evaluated for function and effectiveness during night flight and on a static aircraft in a blacked out hangar with night vision goggles (NVG). The test EH-60A has the night vision blue-green cockpit lighting modification. On the lower console only the aircraft peculiar system panels have the blue-green lighting. None of the panels of the navigation and communication systems to include the intercommunication control panels and transponder have backlighting. To operate any of the communications or navigation equipment at night the pilot is required to direct a flashlight or a cockpit utility light to each control head. This additional light requirement becomes especially burdensome when flying with NVG. The additional light source must be readily accessible and must be used every time an operation with a communications or navigation system is required. Single handed operations of the communications and navigation system is impossible. There is a significant increase in pilot workload for even the slightest manipulation of an avionics control, a requirement which is unacceptable for even dual pilot night vision system operations. The necessity to distract a pilot to set and confirm avionics configuration significantly reduces crew effectiveness and compromises the safety of night operations. The absence of lower console lighting for the communications and navigation equipment in the EH-60A is a deficiency which should be corrected immediately.

Radar Sig ıal Detector Antenna Installation

27. The aft spiral antennas of the AN/APR-39(V)1 radar signal detection set were evaluated for possible masking due to location. The antenna installation is the same for both the EH-60A and UH-60A. The aft spiral antennas are located on the end of the tail boom lower fairing as depicted in figure B-20, appendix B. The location of the antennas is such that with the stabilator in a full trailing edge down position, the antennas are masked by the stabilator. When measured on a parked level aircraft, the stabilator trailing edge extends 5 inches below the antennas. At airspeeds less than 40 knots indicated airspeed (KIAS), the stabilator is programmed full trailing edge down. The nose high attitude of the aircraft in low speed flight further increases the masking for the antennas. The masking of the antennas may reduce the effectiveness of the radar signal detector during low speed, nap-of-the-earth (NOE), or hovering flight, compromising the aircraft survivability in a threat radar environment. The aft spiral antennas of the AN/APR-39(V)1 radar signal detection set should be evaluated for effectiveness as installed on the tail boom lower fairing of the EH-60A and UH-60A during low speed, NOE flight, and hovering operations.

AIRSPEED CALIBRATION

28. The standard ship's airspeed system on the EH-60A Quick Fix configuration was calibrated in level flight. A calibrated T-34 pace aircraft and a calibrated trailing bomb

were used to determine position error at the conditions presented in table 1. The position error of the ship's airspeed system is presented in figure E-120. In level flight, the position error varied from -10 knots at 30 KIAS to 0 knots at 155 KIAS. The position error in both the utility and the Quick Fix configurations are essentially the same, and represent essentially the same position errors as reported in previous tests (ref 12). Additional testing to determine the position error of the airspeed system during climbing and descending flight should be conducted.

CONCLUSIONS

GENERAL

29. The following conclusions were reached based on the Airworthiness and Flight Characteristics evaluation of the EH-60A (Quick Fix) helicopter.

a. The Quick Fix configuration resulted in an increase of 5.2 ft^2 of equivalent flat plate area compared to the utility configuration (para 9).

b. The handling qualities of the Quick Fix configured EH-60A were essentially unchanged from previous tested UH-60A (para 7).

c. The clearance between the main rotor blades and DF dipole antennas during nose down slope landings was adequate (para 20).

d. One deficiency and six shortcomings were identified during this evaluation.

DEFICIENCY

30. The absence of lower console lighting for communications and navigation equipment (para 26).

SHORTCOMINGS

31. The following shortcomings noted in previous evaluations and not attributable to the Quick Fix configuration were identified and are listed in decreasing order of relative importance.

a. Large lateral stick jumps when cyclic control forces were zeroed utilizing the trim release switch following cyclic control displacement against the electromechanical force gradient (para 19).

b. Poor maneuvering stability characteristics (especially above 1.4 g's) (para 14).

c. Excessive 4/rev vibrations which significantly increased pilot workload during certain maneuvers (para 23).

d. The insufficient legibility of the code numerals as a result of the small size of the code numerals and viewing windows of the AN/APX-100(V) transponder (para 24).

e. The one way action through the numerals of the code selector buttons of the AN/APX-100(V) transponder (para 25).

32. The objectionable longitudinal stick jumps when cyclic control forces were zeroed utilizing the trim release switch following control displacement against the electromechanical gradient, was also identified as a shortcoming (para 19).

RECOMMENDATIONS

33. Correct the deficiency.

34. Correct the shortcomings.

35. The effectiveness of the aft spiral antennas of the AN/APR-39(V)1 radar signal detection set as installed on the tail boom lower faring of the EH-60A and UH-60A should be evaluated during low speed, nap of the earth flight, and hovering operations (para 27).

36. Additional testing should be conducted to determine the position error of the airspeed system during climbing and descending flight (para 28).

APPENDIX A. REFERENCES

1. Final Report, AEFA Project No. 83-20, *Limited Airworthiness and Flight Characteristics (A&FC) of the Quick Fix Configuration*, October 1984.

2. Report, AEFA Project No. 87-06, *Preliminary Airworthiness Evaluation of the EH-60A Aircraft*, April 1987.

3. Letter, AMSAV-8, Headquarters AVSCOM, 23 February 1987, subject: Airworthiness and Flight Characteristics Test of the EH-60A, AEFA Project No. 87-07 (Test Request).

4. Prime Item Development Specification (PIDS) UH-60A Black Hawk Aircraft, Sikorsky Aircraft Division, DARCOM-CP-2222-S1000F, 18 December 1981.

5. Prime Item Development Specification (PIDS) EH-60A Quick Fix Aircraft, Sikorsky Aircraft Division, Specification SES-700103G, 20 September 1984.

6. Technical Manual, TM 55-1520-237-10, *Operator's Manual, UH-60A and EH-60A Helicopter*, Headquarters Department of the Army, 8 January 1988, with change 1 dated 29 March 1988.

7. Letter, AMSAV-E, Headquarters AVSCOM, 28 September 1987, 29 October 1987, 25 November 1987, 7 January 1988 and 29 April 1988, subject: Airworthiness Release for EH-60A S/N 86-24569 to Conduct an Airworthiness and Flight Characteristics Evaluation, AEFA Project 87-07.

8. Test Plan, AEFA Project No. 87-07, *Airworthiness and Flight Characteristics Evaluation of the EH-60A (Quick Fix) Black Hawk Helicopter*, August 1987.

9. Letter, SAVTE-TB, U.S. Army Aviation Engineering Flight Activity, 17 February 1988, subject: AEFA Project No. 87-07, Airworthiness and Flight Characteristics of the EH-60A (Quick Fix) Helicopter, Request for Additional Testing.

10. Letter, AMSAV-8, Headquarters AVSCOM, 14 March 1988, subject: Airworthiness and Flight Characteristics Test of the EH-60A, AEFA Project 87-07, Request for Additional Testing.

11. Military Specification, MIL-H-8501A, *Helicopter Flying and Ground Handling Qualities, General Requirements for*, 7 September 1961, with Amendment 1, 3 April 1962.

12. Final Report, AEFA Project No. 83-24, *Airworthiness and Flight Characteristics Test of a Sixth Year Production UH-60A*, June 1985.

13. Final Report, AEFA Project No. 77-17, *Airworthiness and Flight Characteristics Evaluation, UH-60A (Black Hawk) Helicopter*, September 1981.

14. Final Report, AEFA Project No. 81-16, *UH-60A Expanded Gross Weight and Center of Gravity Evaluation*, August 1985.

15. Final Report, AEFA Project No. 84-28, *Flight Evaluation of the UH-60A Helicopter with the Pitch Bias Actuator Centered and Electrically Disconnected*, September 1986.

16. Pamphlet, U.S. Army Material Command, AMCP 706-204, *Engineering Design Handbook, Helicopter Performance Testing*, 1 August 1974.

17. Flight Test Manual, Naval Air Test Center, FTM No. 105, *Helicopter Stability and Control*, November 1983, Preliminary Edition.

18. Training Circular, FC 1-212, *Aircrew Training Manual (Utility Helicopter, UH-60)*, 31 August 1984.

APPENDIX B. DESCRIPTION

GENERAL

1. The test aircraft, S/N 86-24569, is a production EH-60A helicopter as depicted in figures B-1 through B-8. The EH-60A is significantly different from the utility Black Hawk. Both current production models have incorporated the wire strike protection system (WSPS) and the hover infrared suppression subsystem (HIRSS). The EH-60A has an electrically operated environmental control system (ECS) with an air conditioner rated at 57,000 BTU/HR and a heat augmentation unit rated at 10,000 BTU/HR. The system is mounted above the fuel cells behind the cabin and is designed to provide conditioned air to the cabin and cockpit. Controls for the ECS are located on the aft center section of the upper console and installation includes the addition of two advisory lights on the caution/advisory panel; AIR COND ON and CABIN HEAT ON. Installation provisions include a screened opening on the right aft side of the fuselage as depicted in figure B-9. Access to the Quick Fix avionics located in the aft fuselage is permitted through two doors (fig. B-9) in the right side of the transition area. On the left side of the fuselage aft transition area are two screened openings which provide cooling air for the avionics (fig. B-10). An additional access door and small screened opening are located on the forward right side of the tail boom at the attachment to the fuselage (fig. B-9). The floor of the EH-60A has a different cargo attachment pattern. The cargo hook mounting points are not installed on the EH-60A and the compartment is covered on the bottom with a riveted panel. There is no access door to the hook compartment in the cabin floor. Enhanced navigation for the EH-60A is provided by the AN/ASN-132(V) integrated inertial navigation system which can function as a stand-alone navigation system or in concert with ground based TACAN stations for position updating. The instrument panel and lower console of the EH-60A are presented in figures B-11 and B-12.

QUICK FIX MISSION EQUIPMENT

General

2. The primary mission equipment of the EH-60A is the AN/ALQ-151(V)2 electronic countermeasures (ECM) system. The ALQ-151 is an ECM system designed to locate ground based electronic emitters and electronically jam them as required. Developed initially for the EH-1 helicopter, the system requires two operators who sit at consoles in the cabin of the EH-60A as depicted in figure B-13. The direction finder operator is seated at the left console station to identify and locate threat electronic emitters. The countermeasures operator controls the ECM functions, jamming threat electronic emissions as required. The countermeasures system is an airborne adaptation of the AN/TLQ-17A countermeasures set. To enhance mission accomplishment and provide for aircraft survivability, the EH-60A has an extensive suite of aircraft survivability equipment to include: AN/ALQ-156(V)2 missile detector, AN/ALQ-162(V)2 continuous wave radar jammer, AN/ALQ-144 infrared jammer, M130 chaff/flare dispensers, and the AN/APR-139(V)1 radar warning receiver.

AN/ALQ-151(V)2 Electronic Countermeasures System

3. The mission equipment of the AN/ALQ-151 ECM system occupies virtually the entire cabin floor area of the EH-60A as depicted in figure B-13. Two operator consoles are

located immediately behind the pilots. Forward facing side by side operator seats are of the same design as the pilot seats and placed aft of the consoles. A single UH-60A troop seat, for an instructor or alternate operator, is behind the operator positions. Two Quick Fix equipment racks occupy the remaining aft portion of the cabin.

Dipole Direction Finding Antennas

4. Four dipole direction finding antennas, two on each side, are mounted on the left and right sides of the tail boom at fuselage station (FS) 536 and 595.5. Each vertically oriented antenna consist of two monopole elements. Each monopole element is 32.5 inches long and constructed from 1 inch diameter hollow aluminum tubing with a wall thickness of 0.080 inch. Each pair of antenna elements is installed vertically in a phenolic block attached to a standoff mounted to an attachment pad on the tail boom. Installation is depicted in figures B-14 and B-15. Originally 40.5 inches long, the monopole elements evolved through a reduction in size to the current production length of 32.5 inches. Main rotor strikes on the upper elements with the initial length resulted in the decrease in antenna length.

Electronic Countermeasures Antenna

5. The ECM antenna is an eight pound 109 inch long monopole antenna attached to an electrical actuator mounted on the bottom of the fuselage at the tail boom attachment point (FS 483) (fig. B-16). Used for jamming selected transmissions, the ECM antenna is constructed of 1/8 inch thick hollow aluminum tubing. The antenna diameter tapers from 3.0 inches at the base to 0.5 inches at the tip. The actuator pivots the antenna from a stowed horizontal position along the bottom of the tail boom to a downward vertical position. Extension and retraction of the antenna is controlled via three modes by an antenna relay assembly located in the mission equipment rack behind the operators. A three position switch on the pilot's instrument panel, marked RETRACT, OFF, and EXTEND, permits normal operation of antenna actuator. The copilot's AN/APN-209(V) radar altimeter, when ON and functioning, controls antenna extension and retraction through the LO SET BUG setting of the radar altimeter. When the aircraft is below the LO SET BUG setting, antenna extension is disabled and automatic retraction will occur. An emergency retract switch on the antenna relay assembly permits the ECM operator to retract the antenna should the normal operating modes fail. The caution/advisory panel has a caution light, ANTENNA EXTENDED, and an advisory light, ANTENNA RETRACTED, to advise the pilots of antenna position. The ANTENNA RETRACTED advisory light is activated by a micro switch in the antenna actuator informing the pilots that the antenna is fully retracted. The ANTENNA EXTENDED caution light will illuminate: any time the antenna is not retracted and the helicopter descends below the LO SET BUG on the copilot's radar altimeter, the radar altimeter is turned OFF, or power is lost to the antenna control system. The ECM operator has an ANTENNA DEPLOYED light on his console informing the operator of full antenna extension.

UHF Antennas

6. Two boat hull shaped UHF antennas are installed on the bottom of the aircraft in addition to the flat type UHF antenna standard on UH-60A aircraft (fig. B-17). The boat

hull antennas provide for additional UHF voice and data link transmission. One antenna is installed on the plate covering the cargo hook compartment of the UH-60A, and the other is mounted where the doppler navigation system antenna is on the UH-60A.

AIRCRAFT SURVIVAL EQUIPMENT

AN/ALQ-156(V)2 Missile Detector

7. The AN/ALQ-156(V)2 missile detector system provides a doppler radar aura about the helicopter to warn the flight crew of an approaching missile. The system consists of a receiver/transmitter, a control/indicator unit, and four antennas. The system may be operated in concert with the M130 chaff/flare dispensers to automatically dispense flares in response to an incoming missile. The four flat plate antennas are mounted to coffee can type mounts at left and right nose, and aft fuselage attachment points as depicted in figures B-18 and B-19. The antenna array provides 360 degree coverage for the helicopter, and the system is effective at nap-of-the-earth or higher flight altitudes.

AN/ALQ-162(V)2 Continuous Wave Radar Jammer

8. The AN/ALQ-162(V)2 continuous wave radar jammer provides a defense against surface to air and air to air missiles that use a reflected continuous radar signal from the target to guide the missile. A half sphere antenna is mounted on the nose and tail of the aircraft. On the EH-60A, the nose antenna and mount are faired into the vibration absorber access panel just below the nose avionics access door (fig. B-18). The tail antenna and mount are faired into the skin of the right side of the vertical pylon as depicted in figure B-20. A section of radar signal wave guide is routed on the surface of the bottom of the aircraft from the nose aft along the left bottom side of the helicopter to the aft section of the fuselage (figs. B-21 through B-23). A short section of wave guide is installed horizontally on the right side of the vertical pylon from the antenna fairing forward to just short of the tail rotor drive shaft cover of the vertical pylon (fig. B-24).

AN/ALQ-144 Infrared Jammer

9. The AN/ALQ-144 is a fuel fired, infrared countermeasures system designed to deceive or confuse an infrared guided missile. The system consists of a control panel in the right center section of the instrument panel (fig. B-12) and a transmitter installed in a mount on the main rotor pylon aft of the main rotor (fig. B-25). The jammer runs continuously when ON providing 360 degree protection coverage against infrared missiles. A caution light, IRCM INOP, of the caution/advisory panel provides the crew with an indication of a malfunction in the system or that the transmitter is in a cool down cycle.

M130 Chaff/Flare Dispensers

10. Two M130 chaff/flare dispensers, mounted to the left side of the tail boom just aft of the tail boom attachment to the fuselage as depicted in figure B-26, provide countermeasures for infrared and radar guide weapon systems. Each dispenser is composed of an electronic module, a dispenser assembly, and a payload module. A control panel is installed in the lower console of the cockpit as depicted in figure B-13. A

FLARE RELEASE button is located left of the instrument panel center (fig. B-12) and a CHAFF DISPENSE switch is attached in a bracket to the right aft end of the lower console (fig. B-13). Each payload module has provisions for 30 chaff or 30 flare cartridges. The chaff dispenser is mounted to fire a chaff cartridge up and aft. The flare dispenser points down and aft. When ARMED, the flare dispenser can operate in conjunction with the AN/ALQ-156 missile detection system, the missile detector firing a flare upon detecting an approaching missile.

AN/APR-139(V)1 Radar Warning Receiver

11. The AN/APR-139(V)1 radar warning receiver provides the flight crew with visual and aural indications of pulse type radar guided weapon systems which could be a threat to the aircraft. The system consists of a control panel, a visual display, a processor unit, four spiral antennas, and a single blade antenna. The control panel is mounted in the lower console (fig. B-13) and provides for system master power and preflight test initiation. The visual display is a cathode ray tube mounted in the center section of the instrument panel (fig. B-12) and provides the flight crew with an indication of the relative azimuth off the nose of the aircraft to possible threat radar systems. A spiral antenna is mounted on the left and right quarter sections of the nose (fig. B-18). The two aft spiral antennas are installed on the end of the tail boom lower fairing just below the stabilator attachment point (fig. B-20). The blade antenna is mounted on the bottom of the aircraft between the main landing gear.

TEST CONFIGURATIONS

General

12. For the purposes of the evaluation, the test aircraft was fitted with an instrumentation package which included the external installation of an air data boom, a total air temperature sensor, and a telemetry antenna and mount. The air data boom was mounted along the right side of the aircraft belly bending upward and forward of the nose as depicted in figure B-27. The boom installation on this aircraft was 18 inches longer than that used on previous test aircraft. The purpose of the longer boom was to eliminate gross weight/thrust effects experienced with previous installations on the calibration of the boom airspeed system. The total air temperature sensor was mounted on the belly of the aircraft below the copilot's station (fig. B-28). The telemetry antenna was mounted just forward of the tail wheel yoke assembly attachment point to the tail boom as depicted in figure B-29. The evaluation was divided into two phases. The full WSPS and all the components of the HIRSS, to include the inner baffle, were installed for both phases of the evaluation. The configuration for each phase is discussed below.

Utility Configuration

13. To determine the performance effects of the Quick Fix external equipment, a performance baseline was established on the test aircraft configured to replicate as closely as possible the external configuration of a current production UH-60A. This provided the added benefit of establishing the effects on UH-60A performance of the WSPS and the HIRSS installations. To achieve the utility configuration, the following was accomplished:

a. The screened openings in the transition area of the aft fuselage were covered to include incorporation of a spring loaded step in the cover of the ECS inlet. The covers are depicted in figures B-30 through B-32.

b. The boat hull shape UHF antennas were removed from the belly and cover plates installed (fig. B-28).

c. The ECM antenna stow bracket was disassembled and removed leaving the riveted mount on the tail boom as depicted in (fig. B-33).

d. Removal of both the chaff and flare M130 dispensers to include the mounts for the flare dispenser, which are not available on current production UH-60A helicopters. The M130 dispensers utility configuration is presented in figure B-34.

An under view of the bottom of the utility configured aircraft is presented in figure B-35.

Quick Fix Configuration

14. Upon completion of the utility performance baseline testing, the aircraft was configured for the Quick Fix phase of the evaluation. The Quick Fix configuration encompassed the installation of all the external equipment associated with the Quick Fix mission as stated below. Instrumentation equipment and ballast box installation precluded the use of the cabin area for any of the Quick Fix internal equipment.

a. The four dipole antennas of the AN/ALQ-151 were installed on the tail boom. The boat hull UHF antennas were reinstalled on the bottom of the aircraft. A control unit was built to permit extension and retraction of the installed ECM antenna and the storage bracket for the antenna was reinstalled. All screened opening covers for the utility test were removed.

b. The mounts and antennas for the AN/ALQ-156 system were installed.

c. The antenna mounts and fairings for the AN/ALQ-162 were installed. A counterfeited belly wave guide section was fabricated and mounted to resemble the actual wave guide installation, which was unavailable for the evaluation. A facsimile antenna was installed on the forward mount. A plate was installed over the aft antenna mount and the tail pylon wave guide section was not installed.

d. The transmitter for the AN/ALQ-144 was installed but was nonoperational.

e. The M130 chaff dispenser was reinstalled along with the flare dispenser and mounts.

Figure B-1. Front View

Figure B-2. Right Front Quartering View

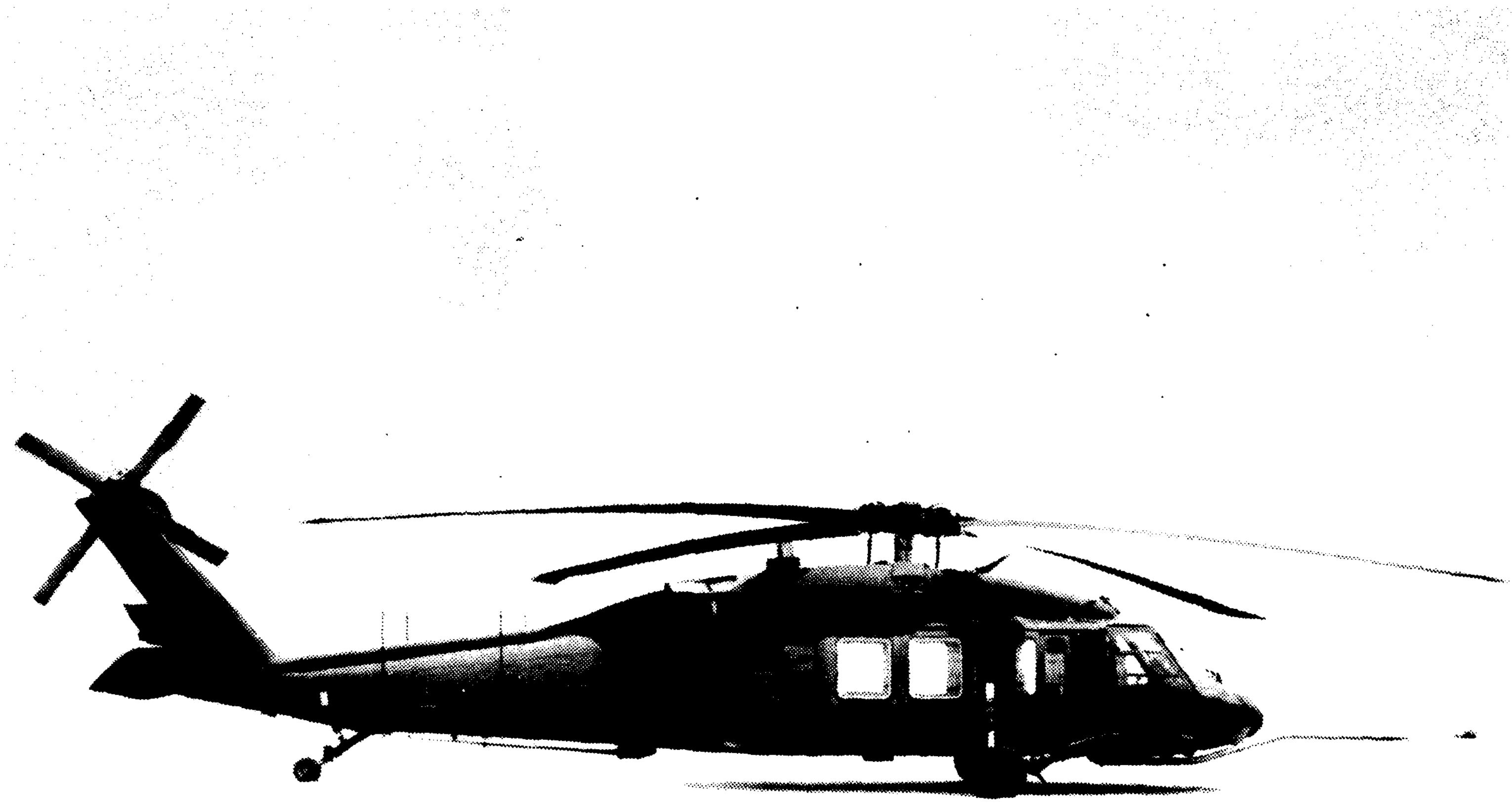


Figure B-3. Right View

Figure B-4. Right Rear Quartering View

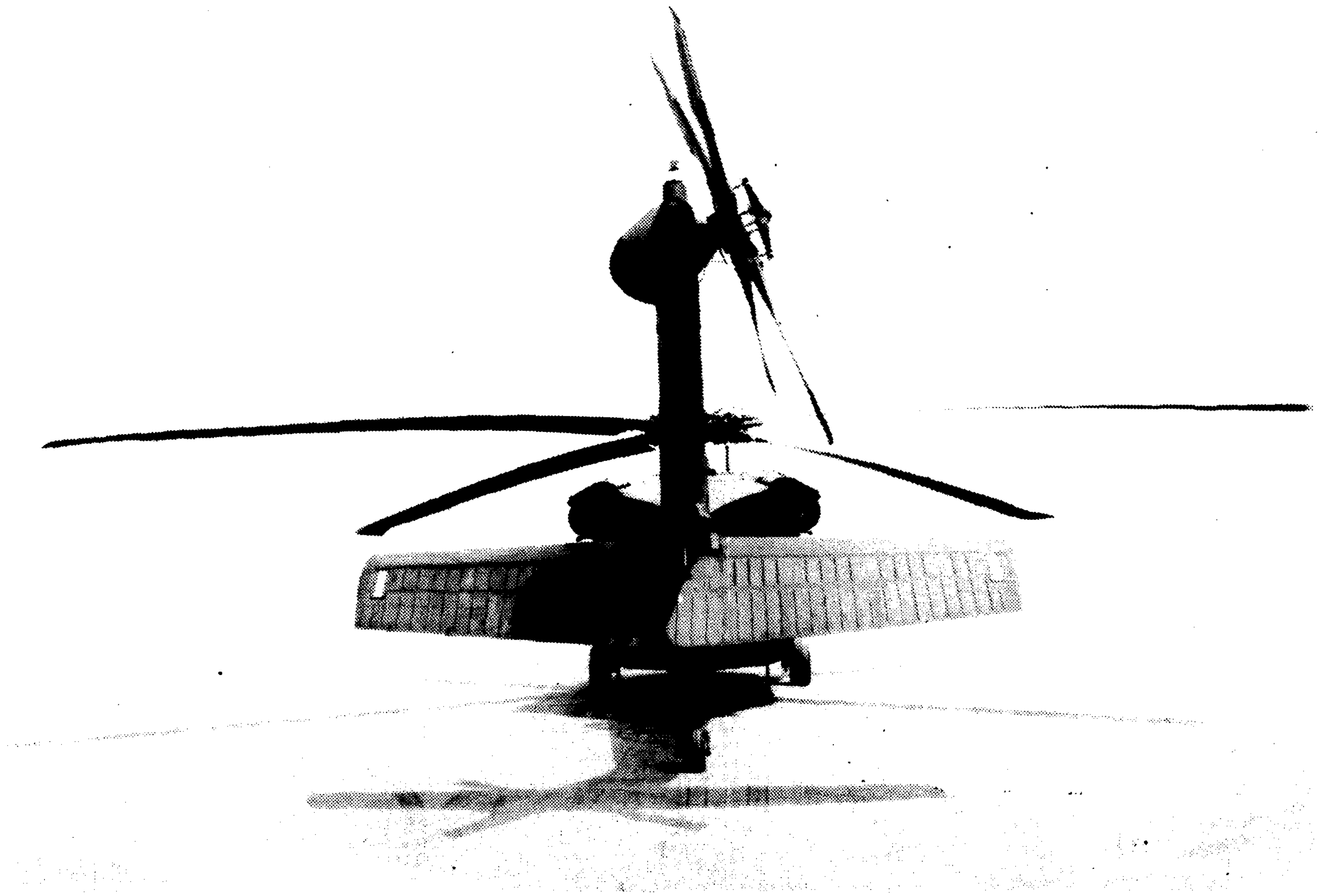


Figure B-5. Rear View

Figure B-6. Left Rear Quartering View

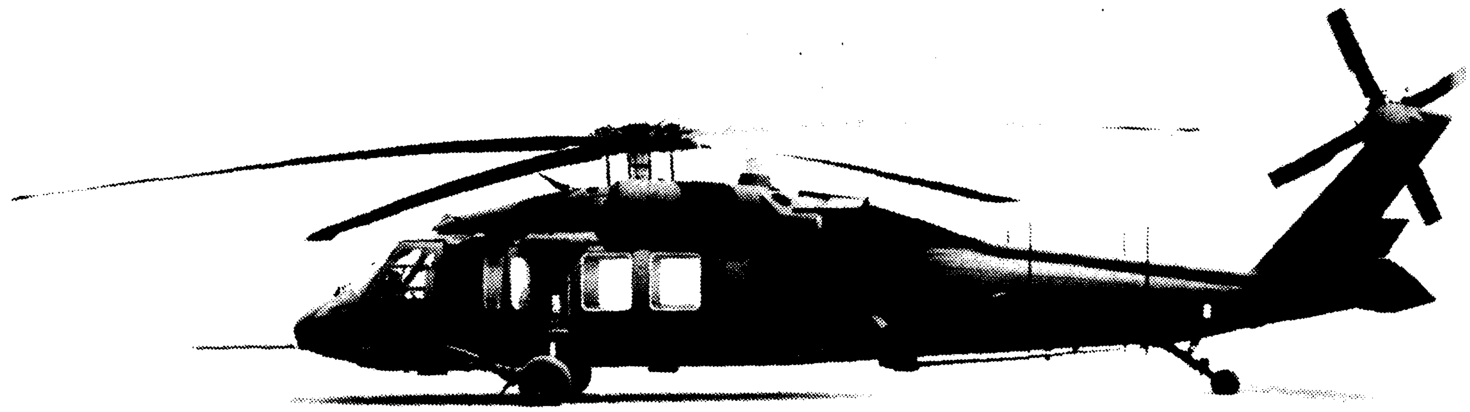


Figure B-7. Left View

Figure B-8. Left Front Quartering View

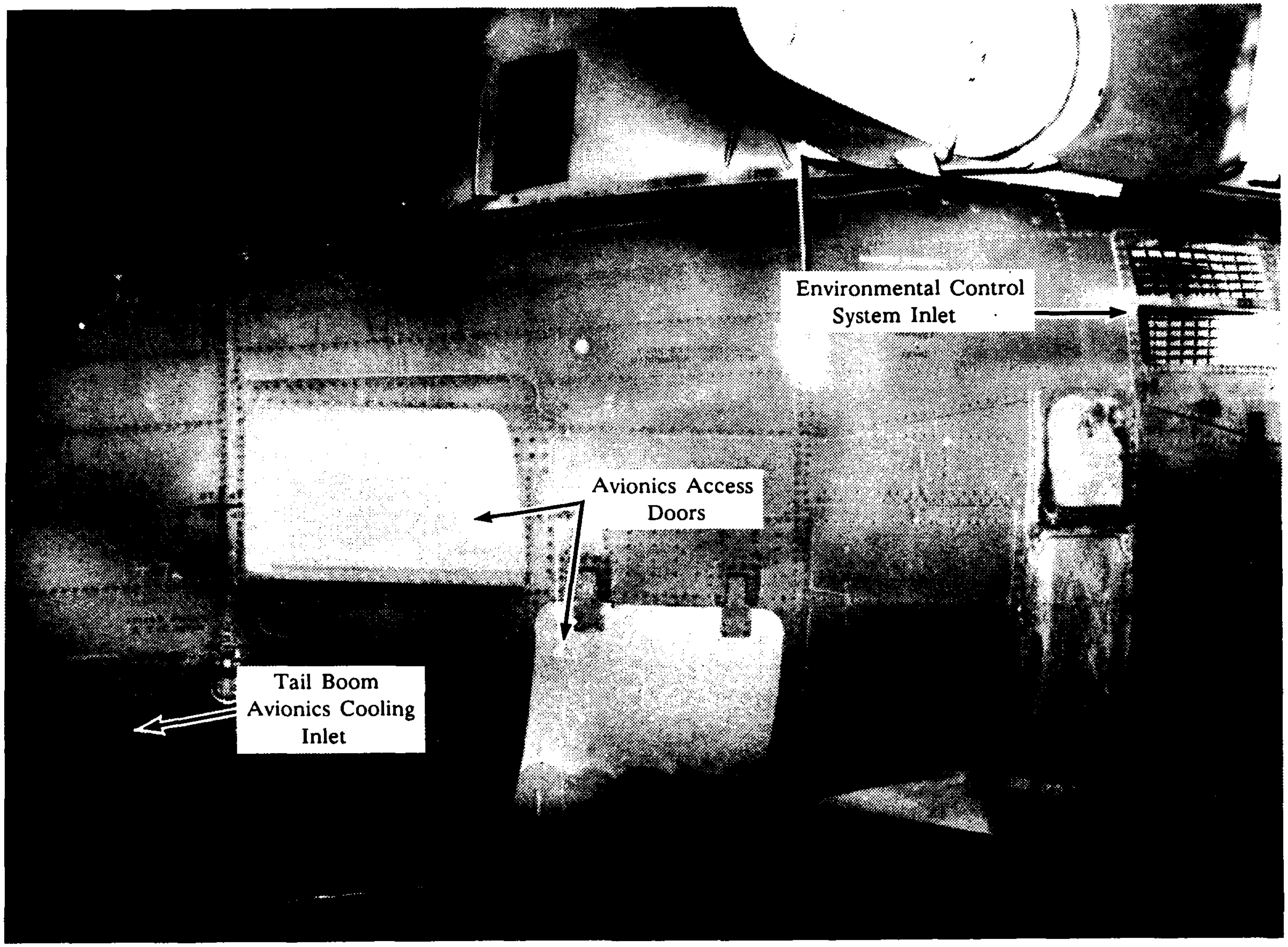


Figure B-9. Right Rear Fuselage

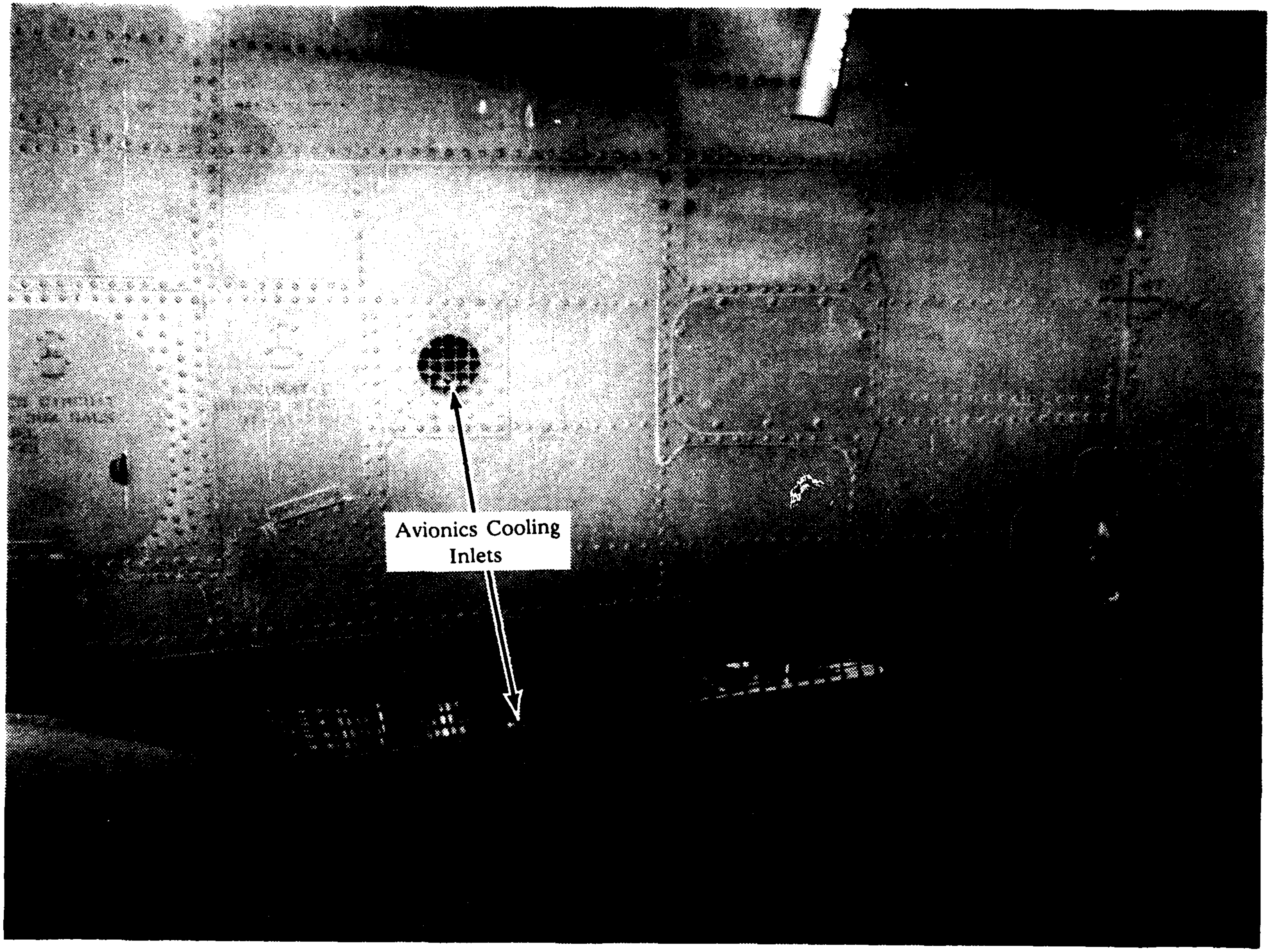


Figure B-10. Left Rear Fuselage

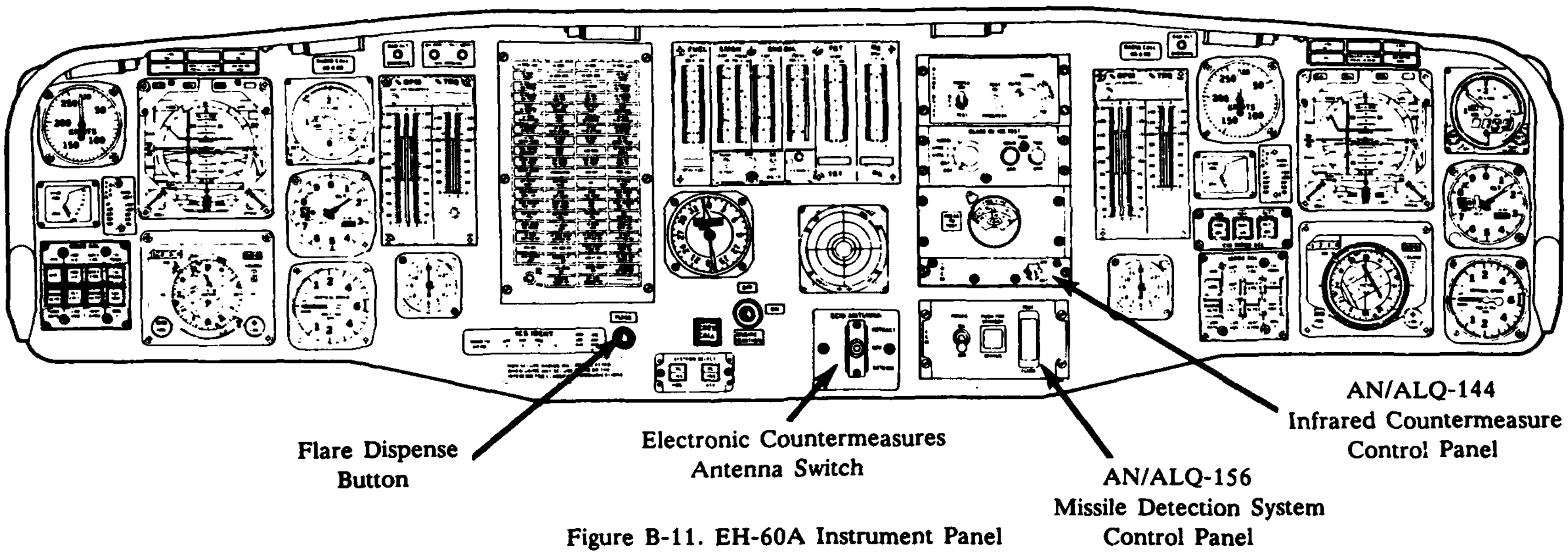


Figure B-11. EH-60A Instrument Panel

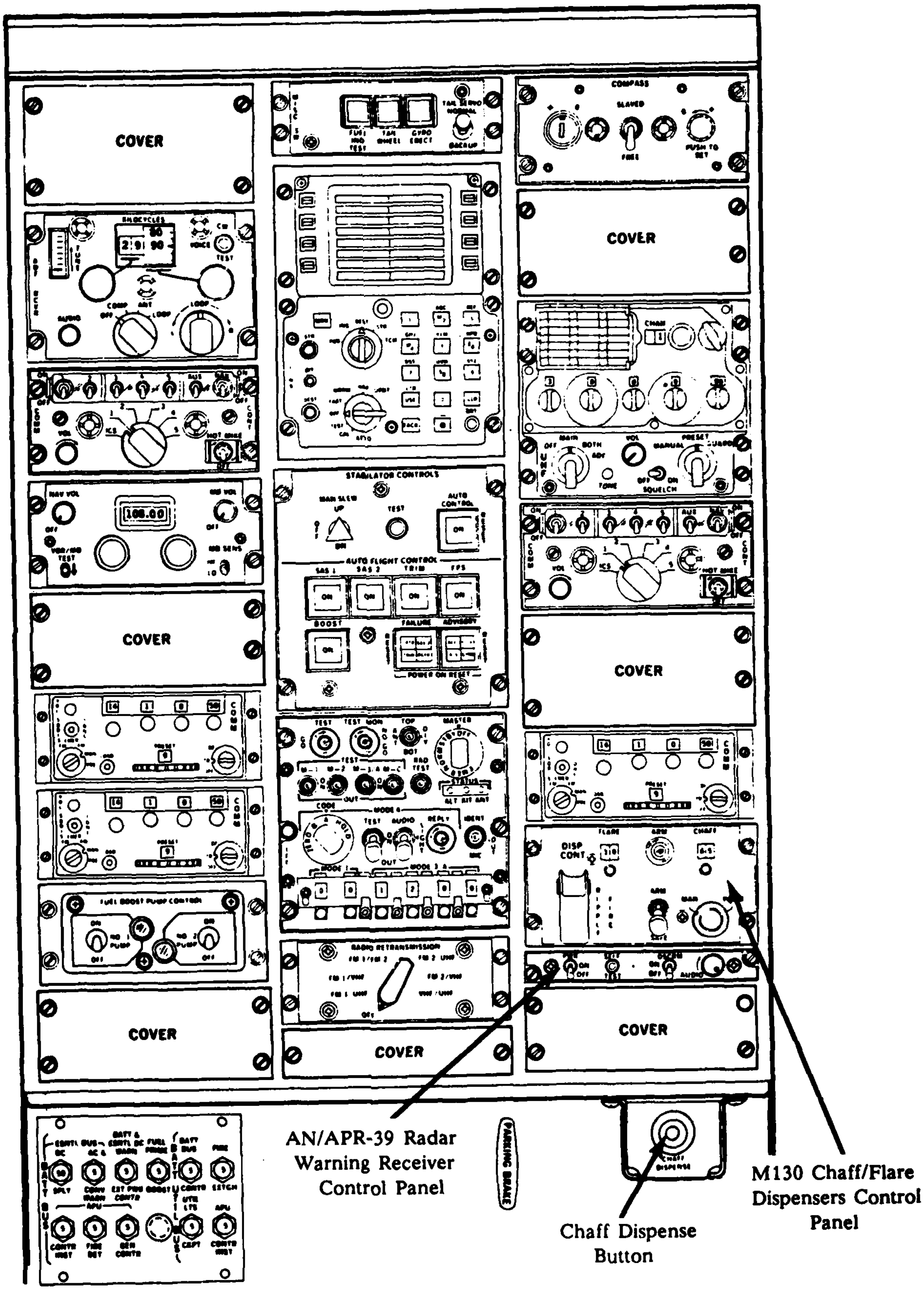


Figure B-12. EH-60A Lower Console

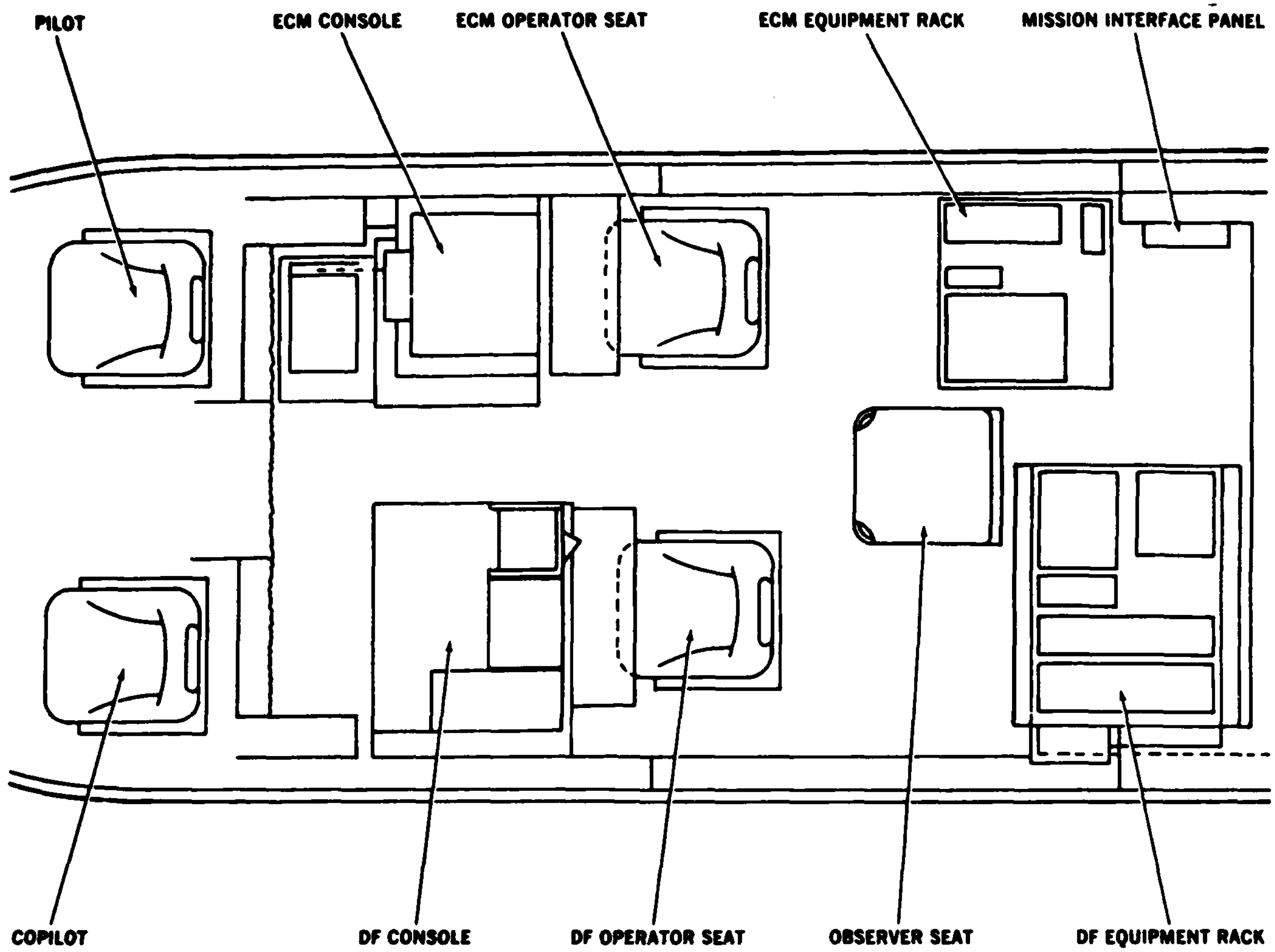


Figure B-13. EH-60A Cabin/Cockpit Arrangement

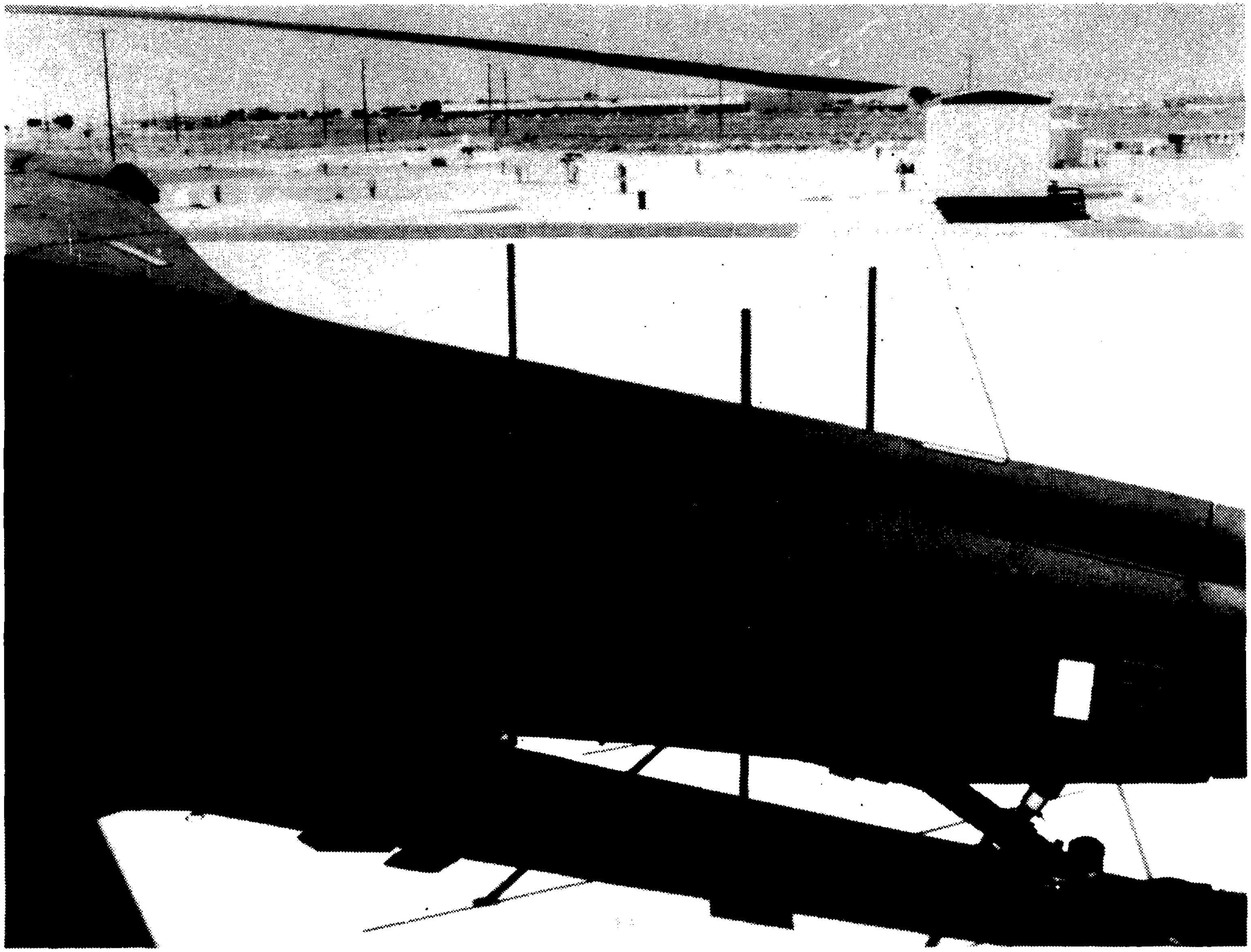


Figure B-14. Dipole Direction Finding Antenna Installation

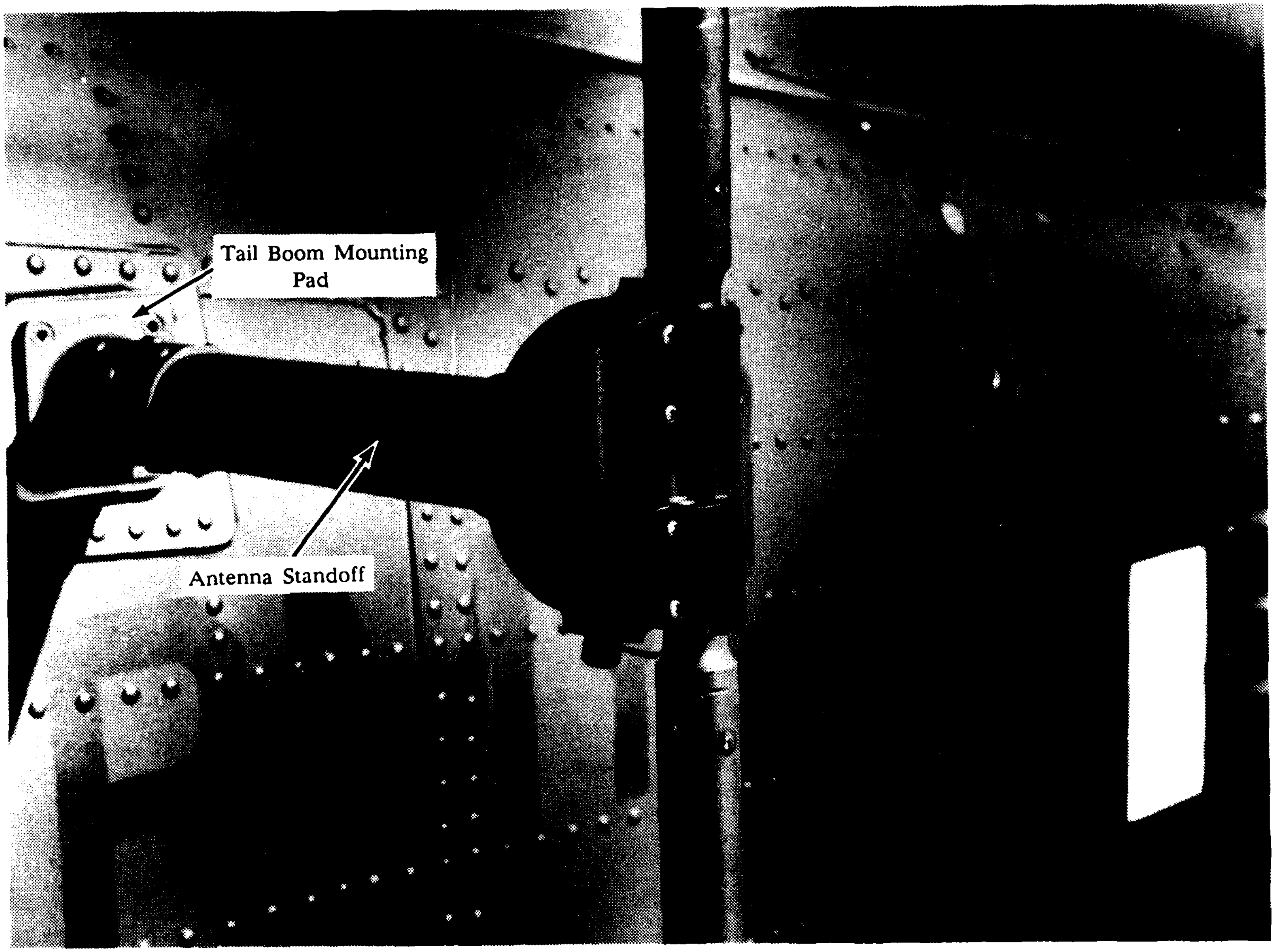


Figure B-15. Single Dipole Antenna Installation

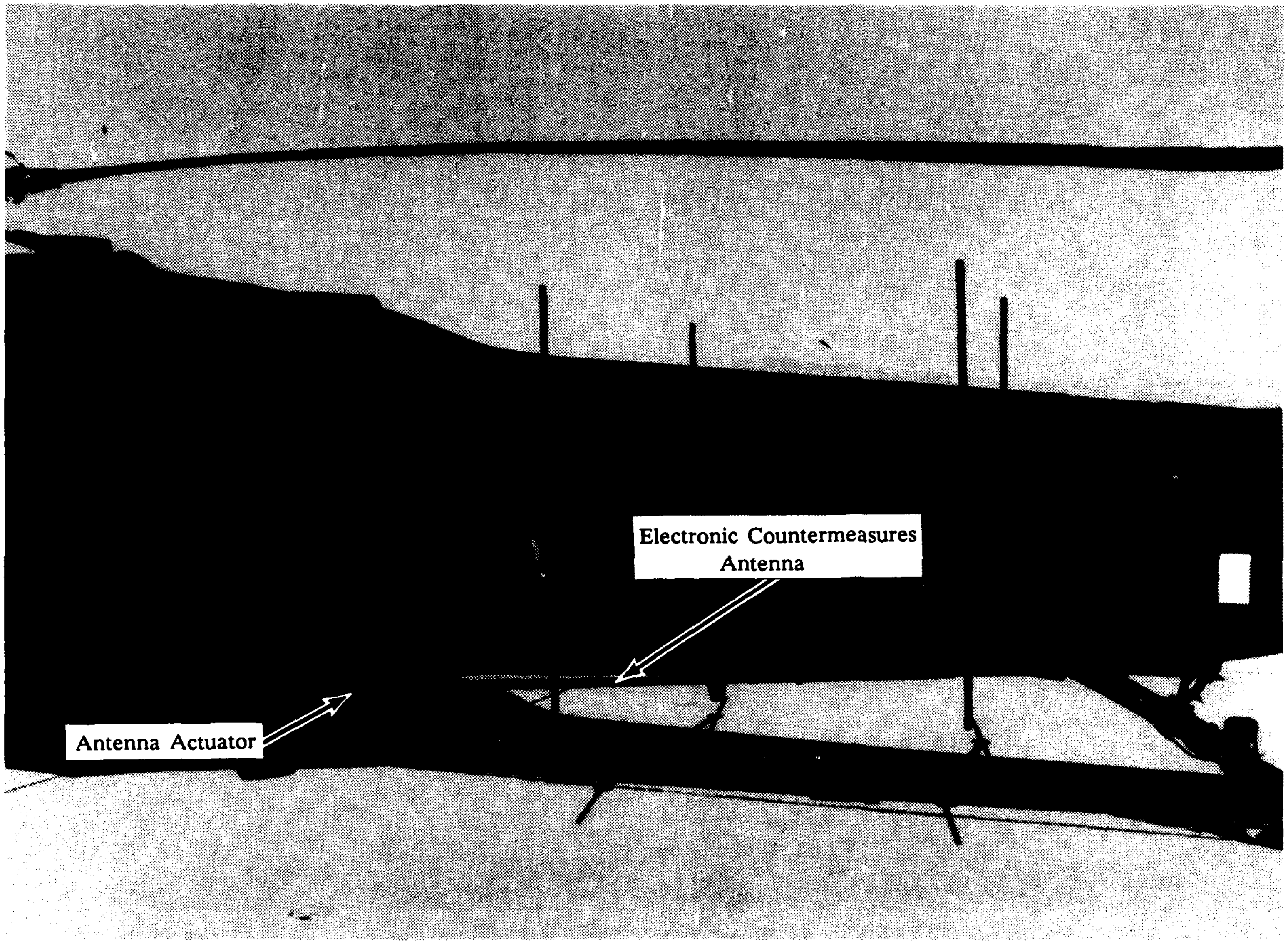


Figure B-16. Electronic Countermeasures Antenna Installation

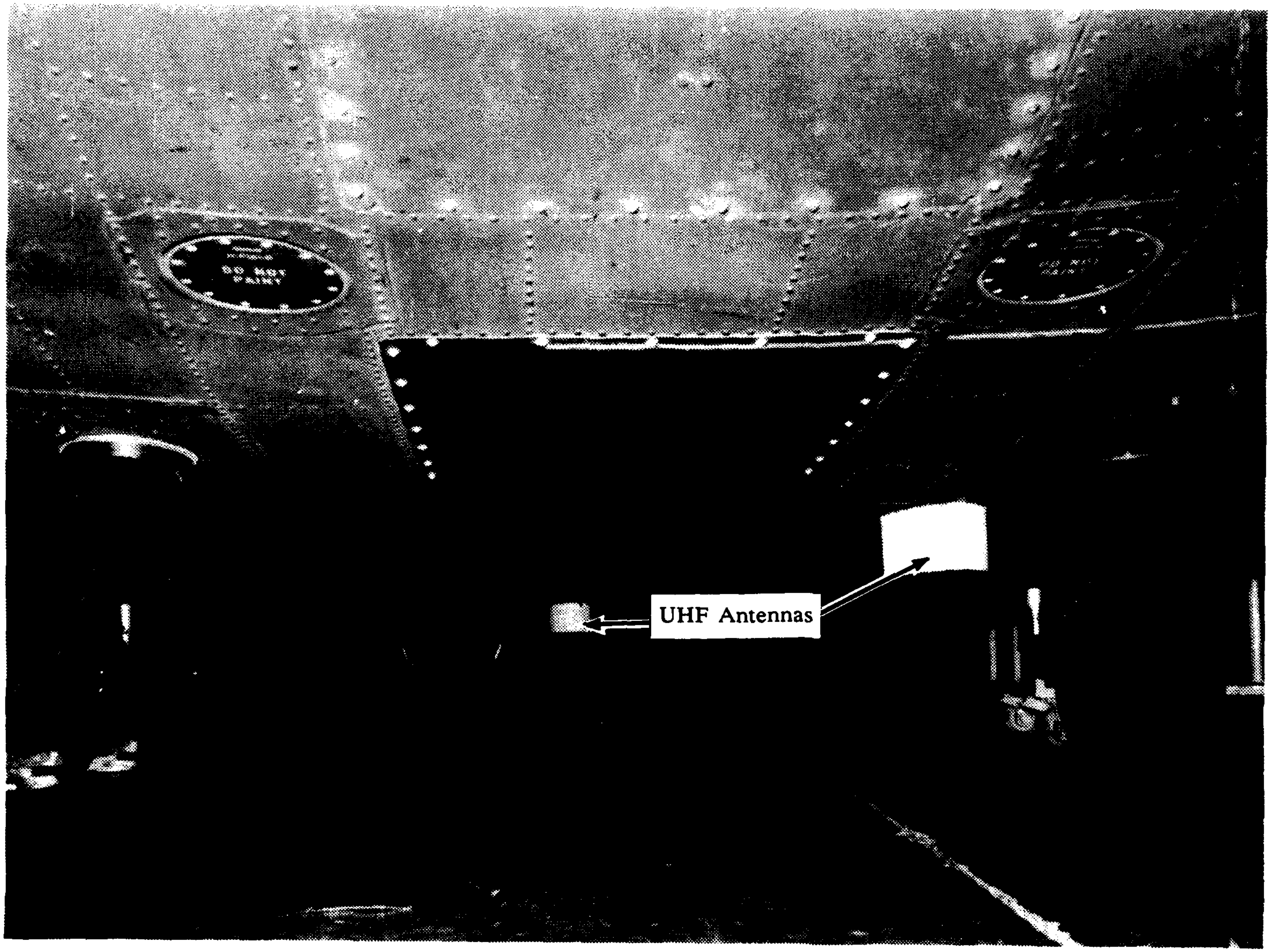


Figure B-17. UHF Antenna Installation

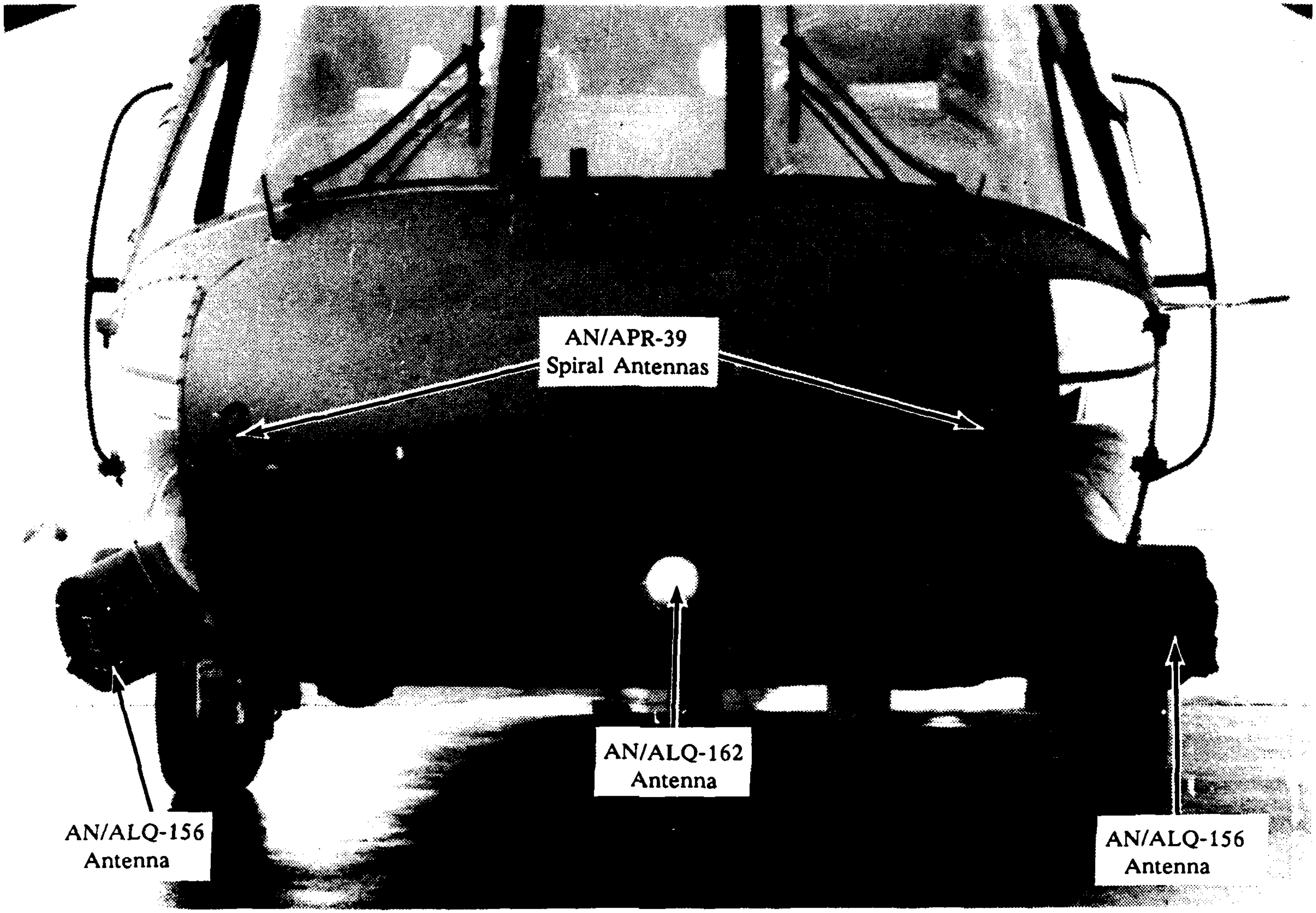


Figure B-18. Forward View Antenna Installation

Figure B-19. Aft View Antenna Installation

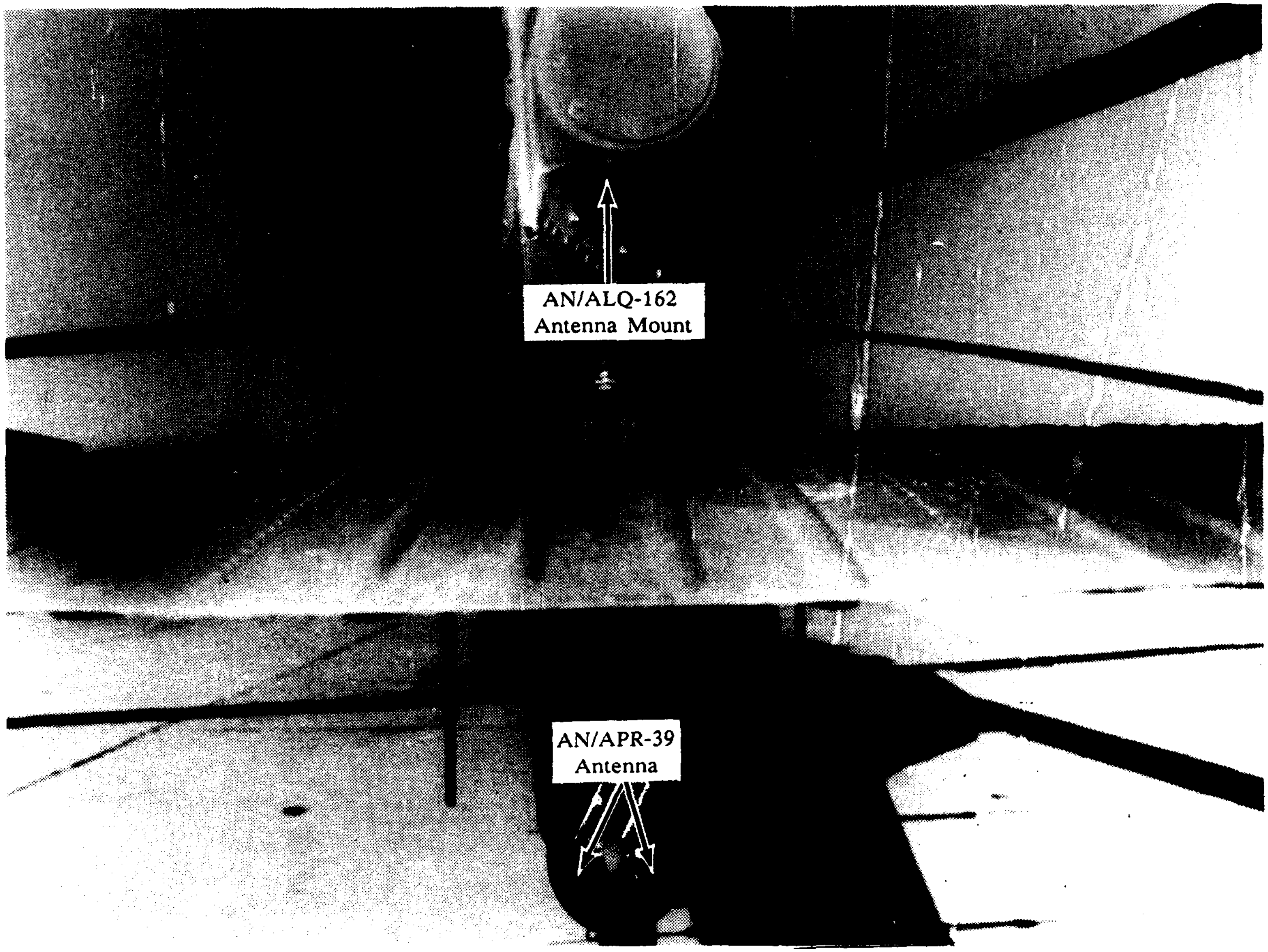


Figure B-20. Tail Pylon Antenna Installation (Stabilator Up)

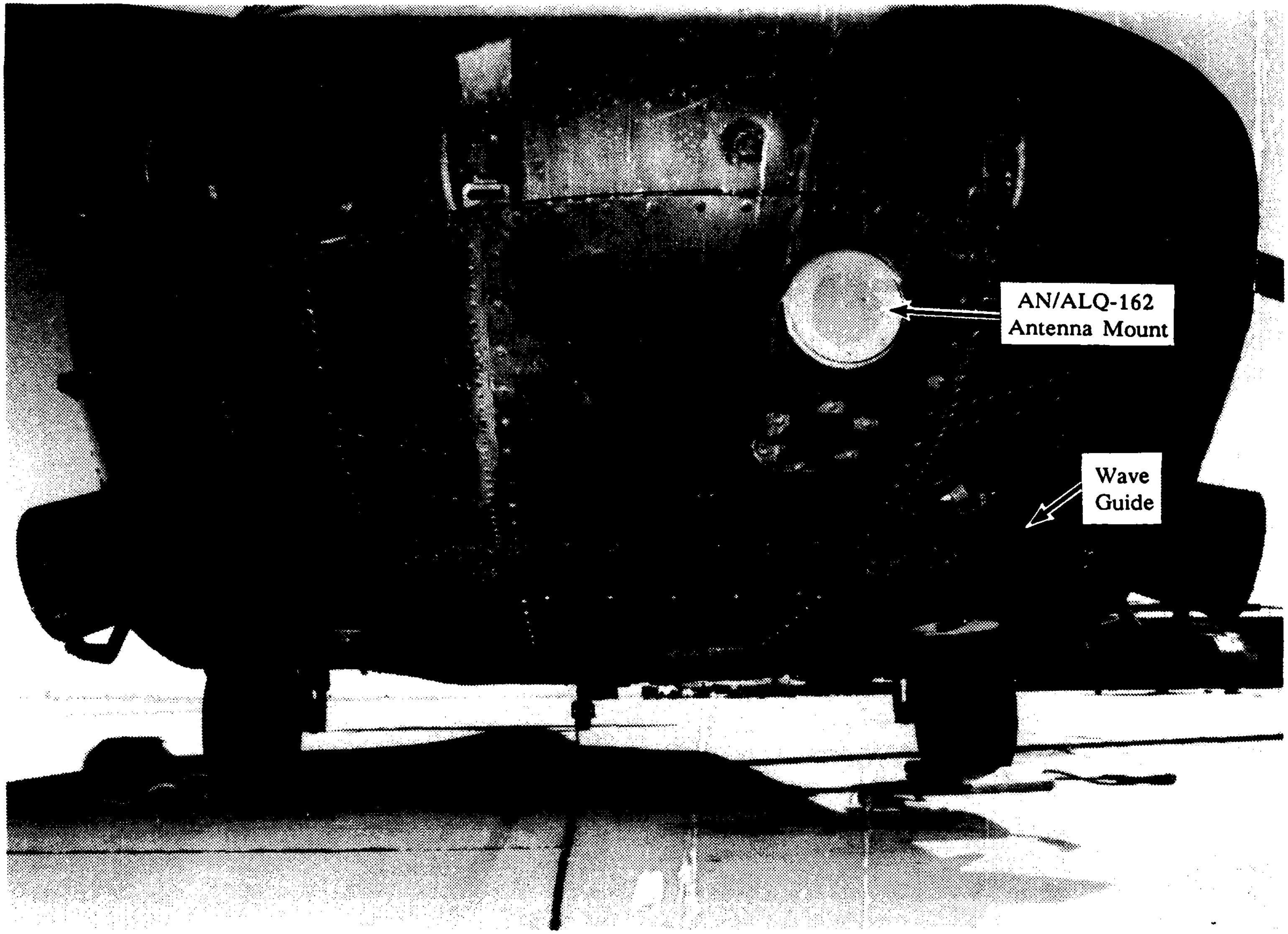


Figure B-21. Forward View AN/ALQ-162 Wave Guide Installation

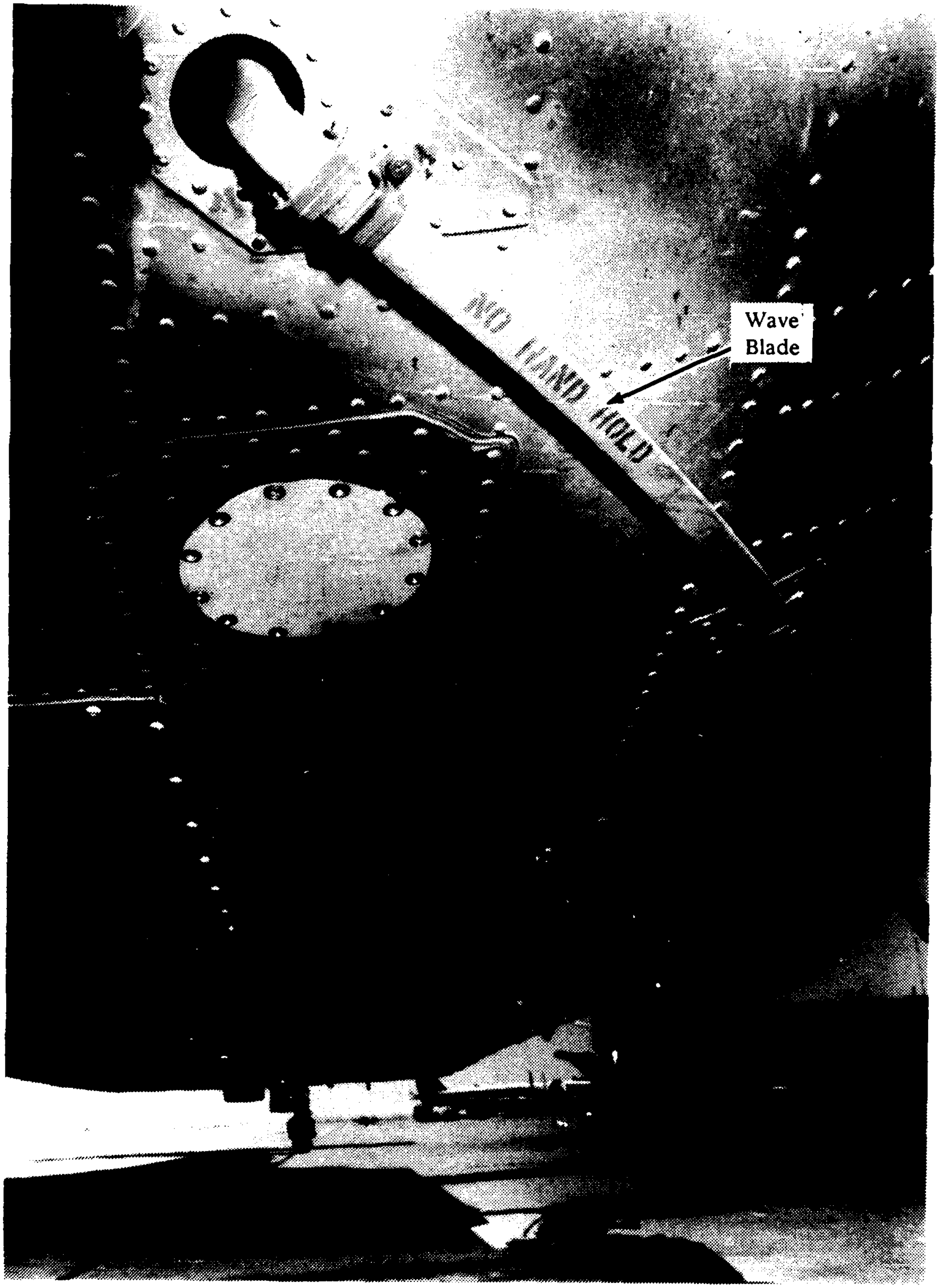


Figure B-22. Forward Bottom View AN/ALQ-162 Wave Guide Installation

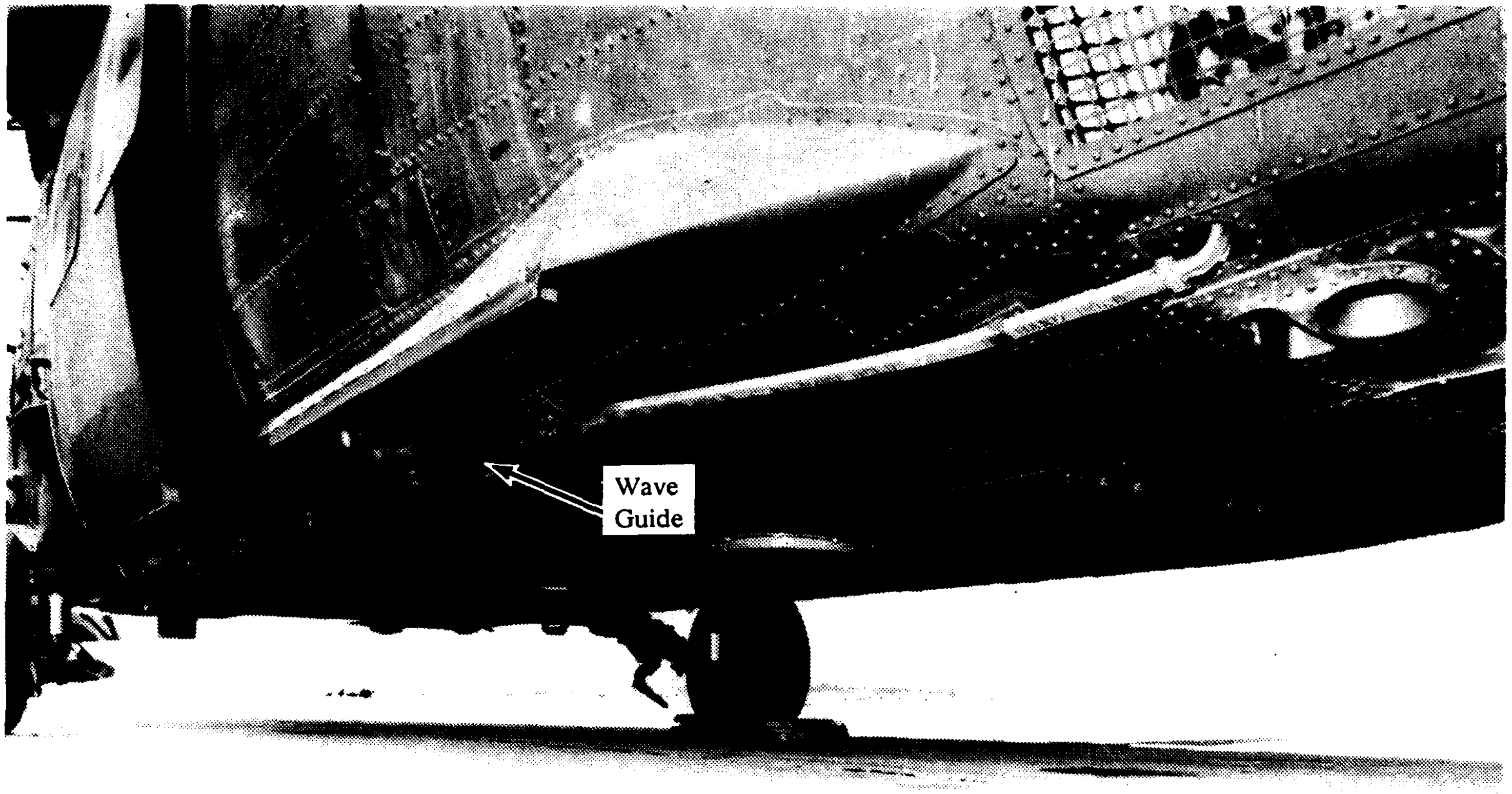


Figure-23. Left Rear Bottom View AN/ALQ-162 Wave Guide Installation

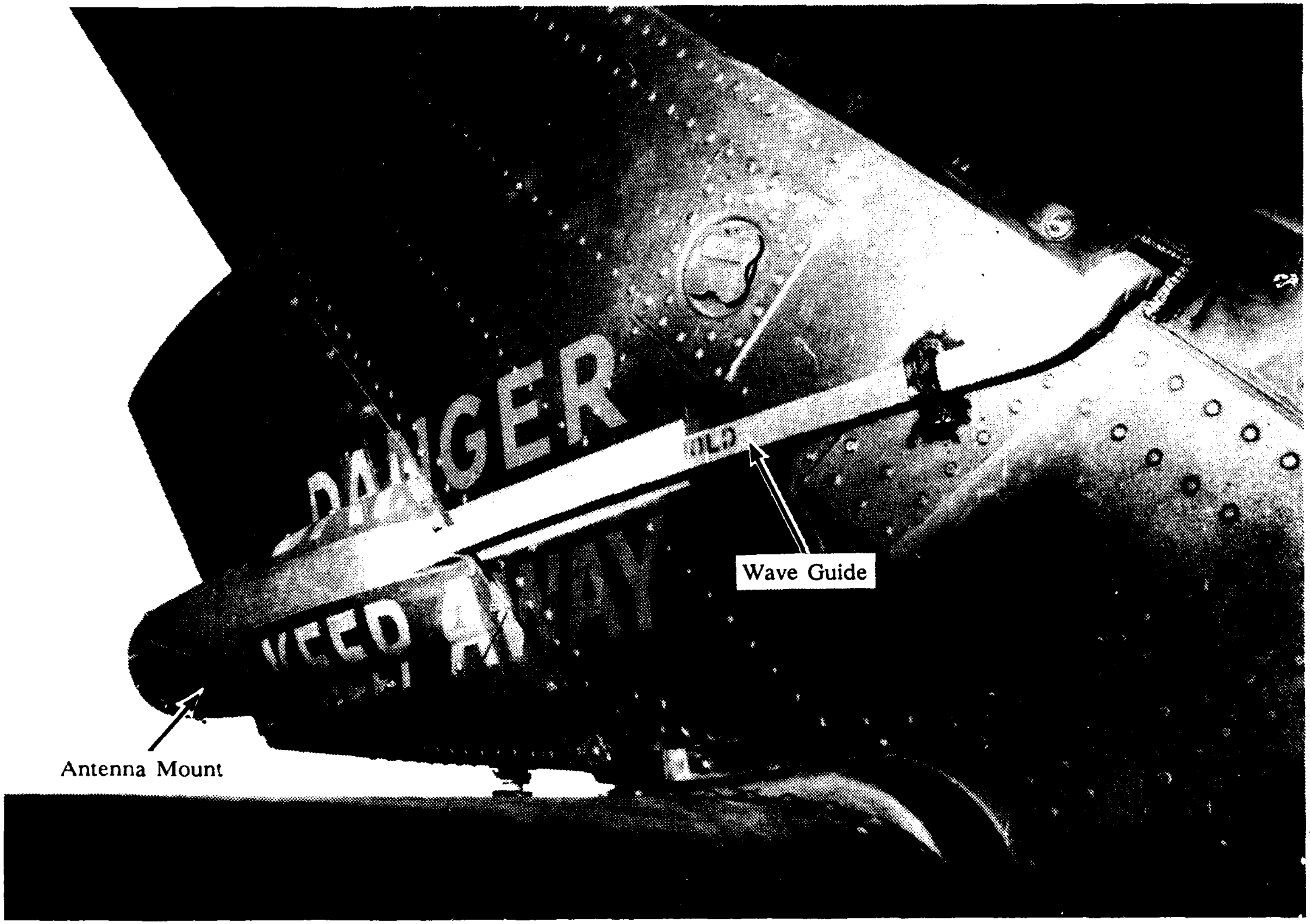


Figure B-24. Right Tail Pylon AN/ALQ-162 Antenna and Wave Guide Installation

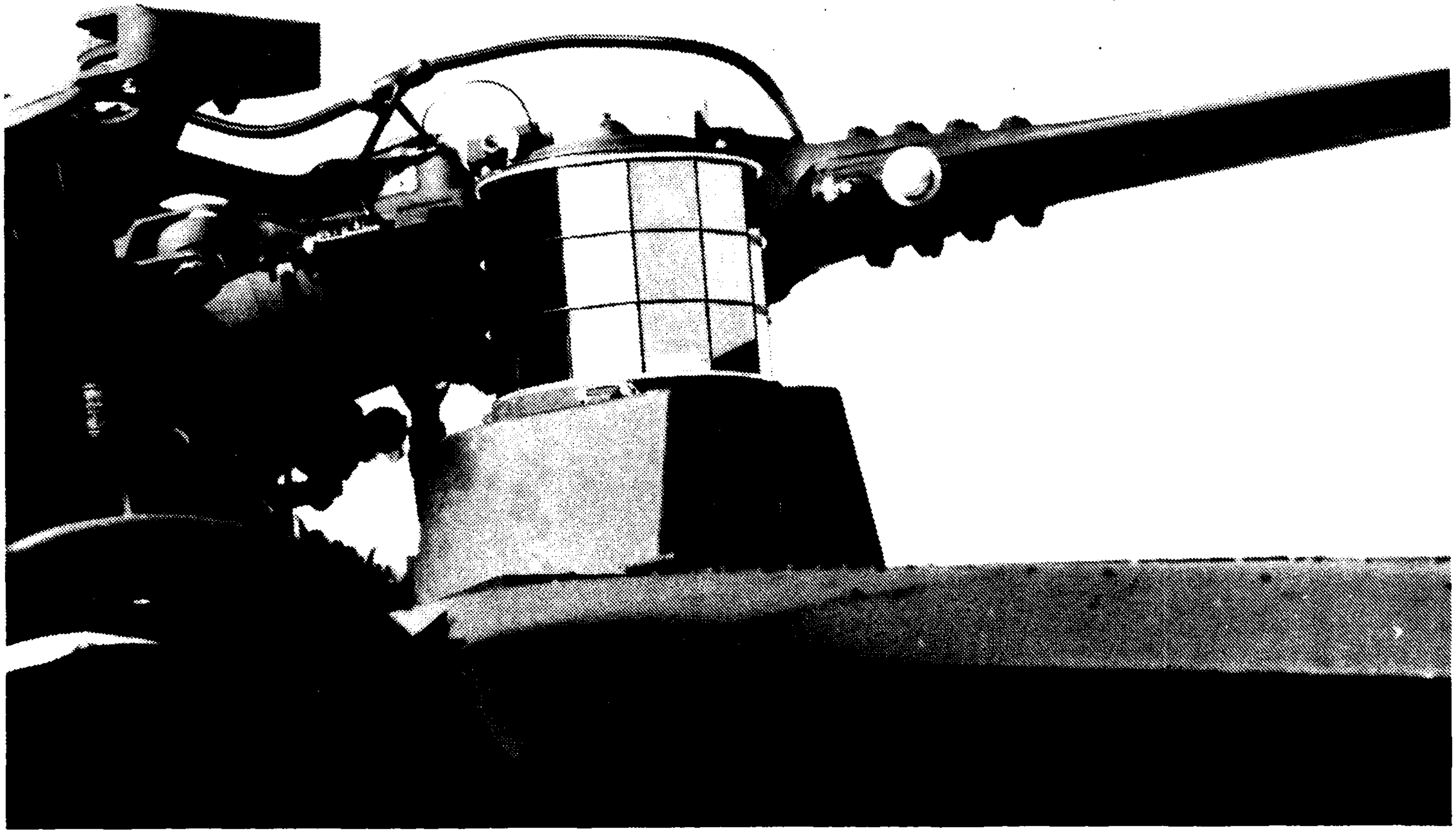


Figure B-25. AN/ALQ-144 Infrared Jammer and Mount

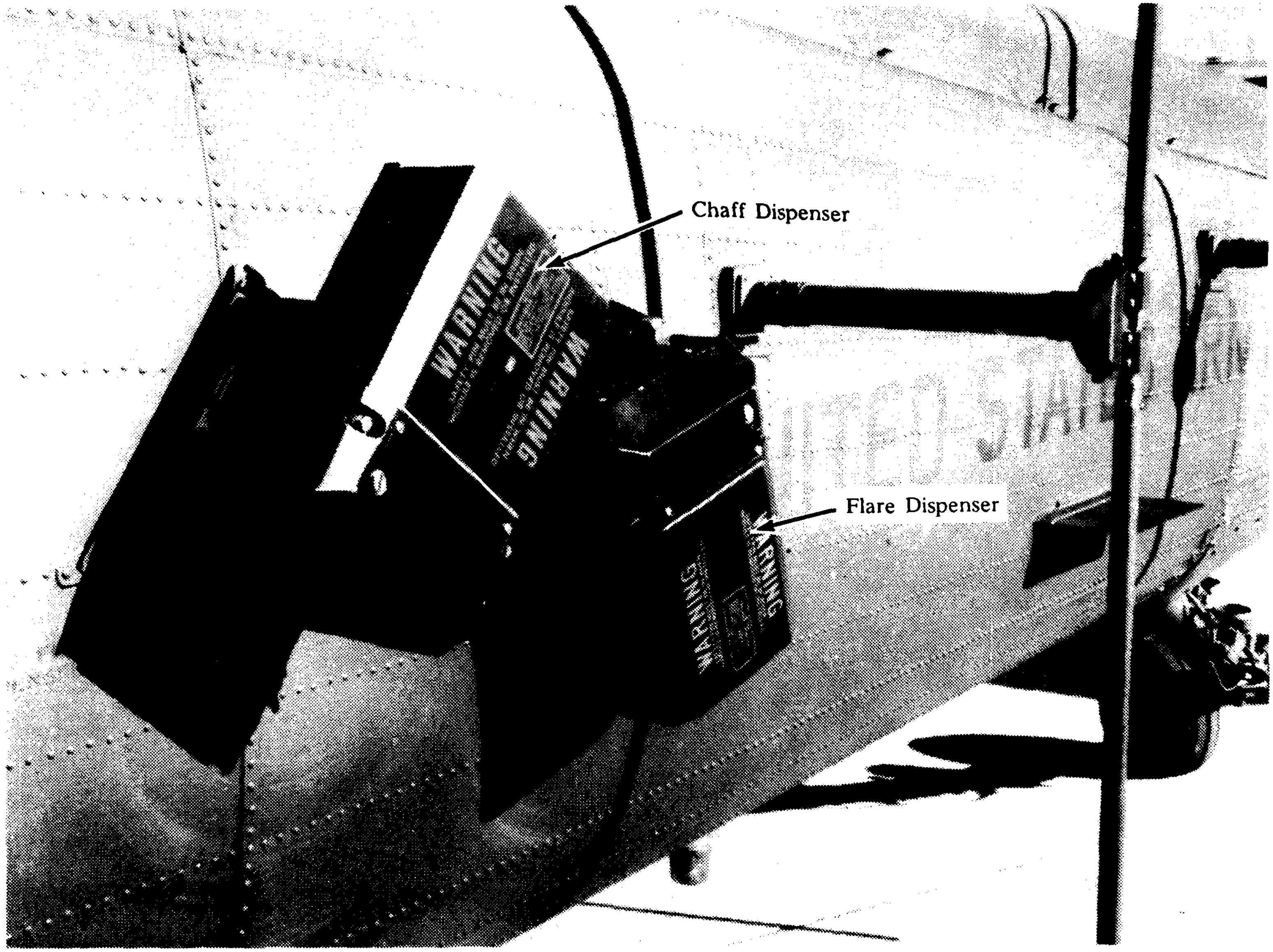


Figure B-26. M130 Chaff/Flare Dispensers

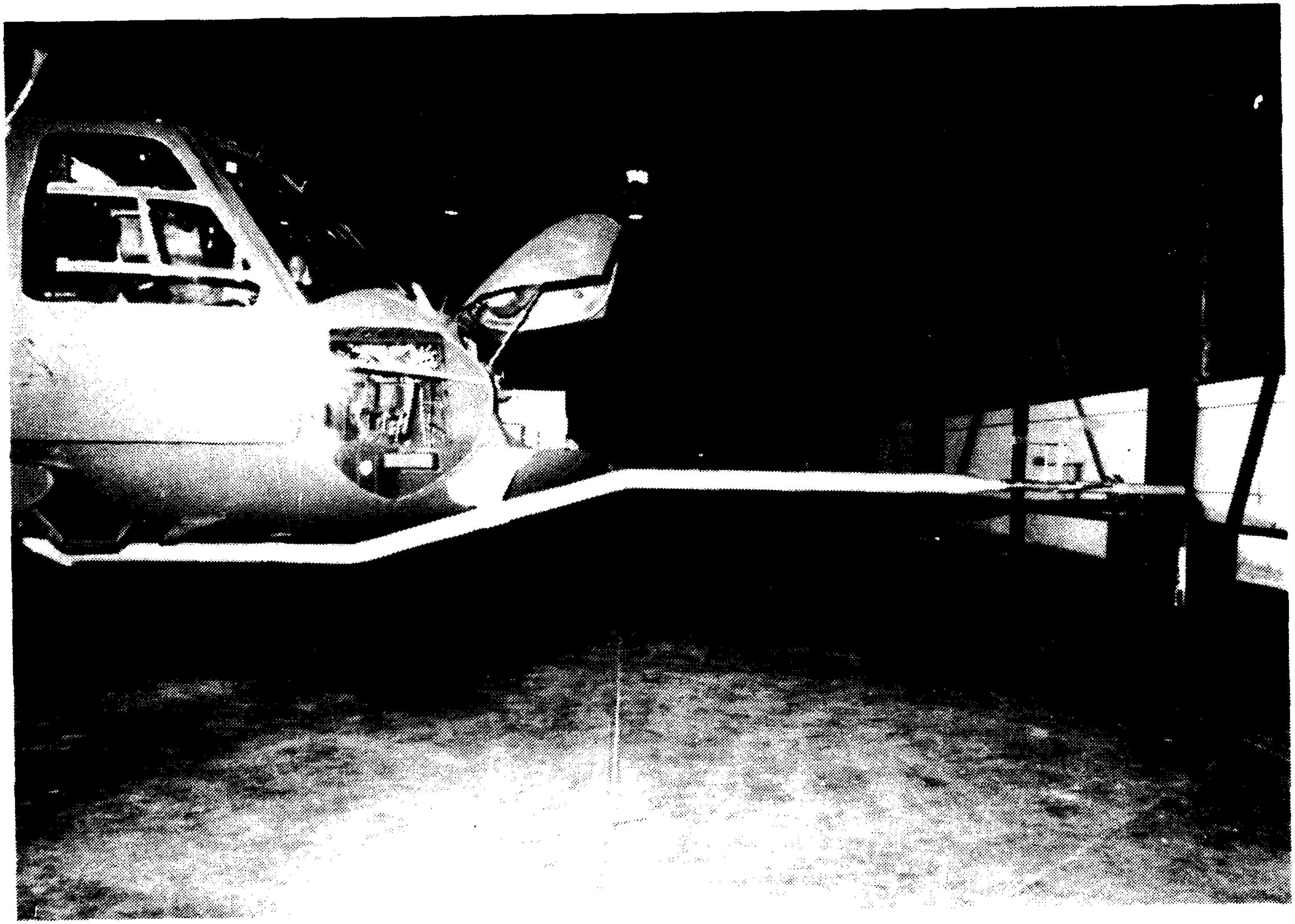


Figure B-27. Air Data Boom

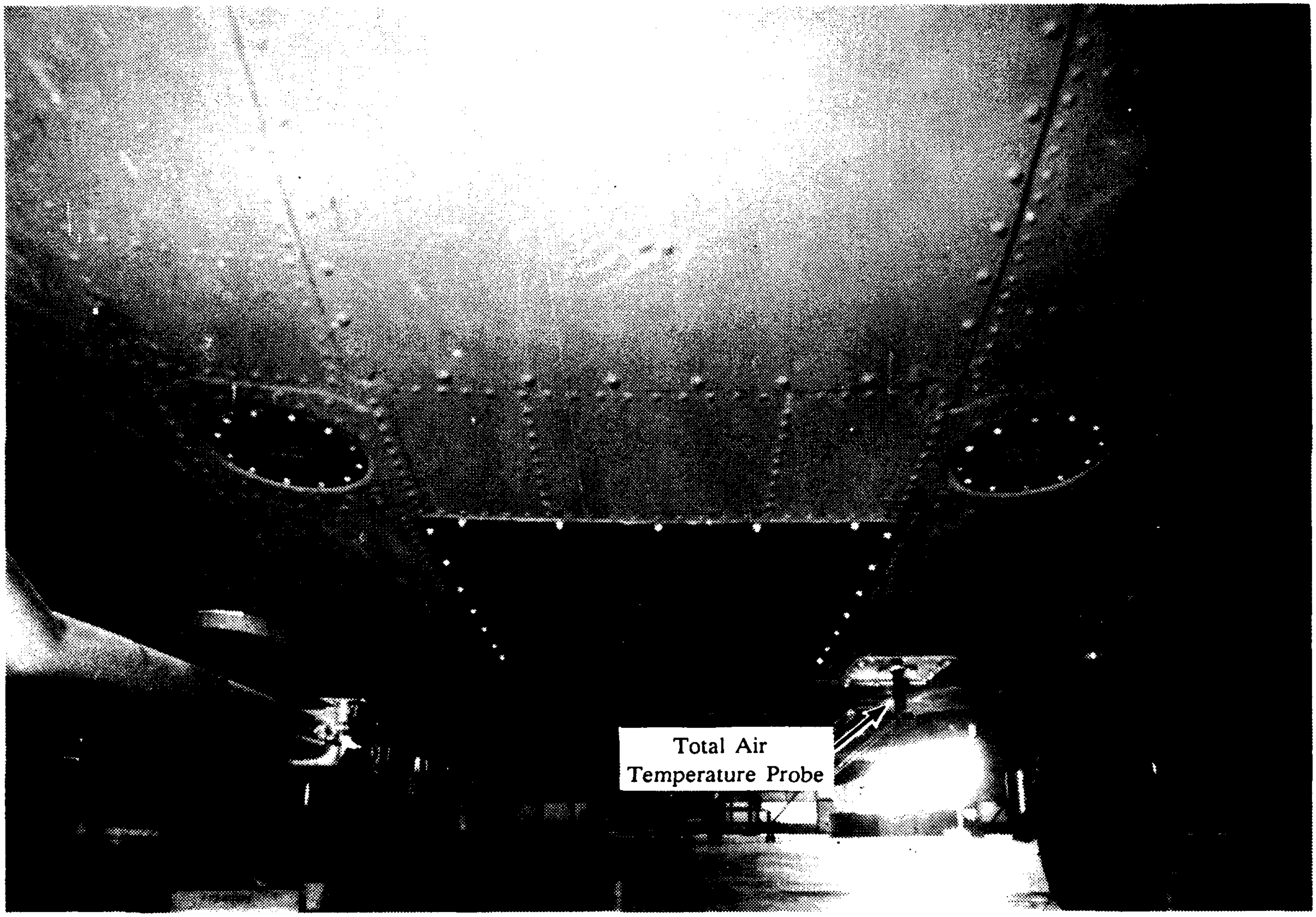


Figure B-28. Under View

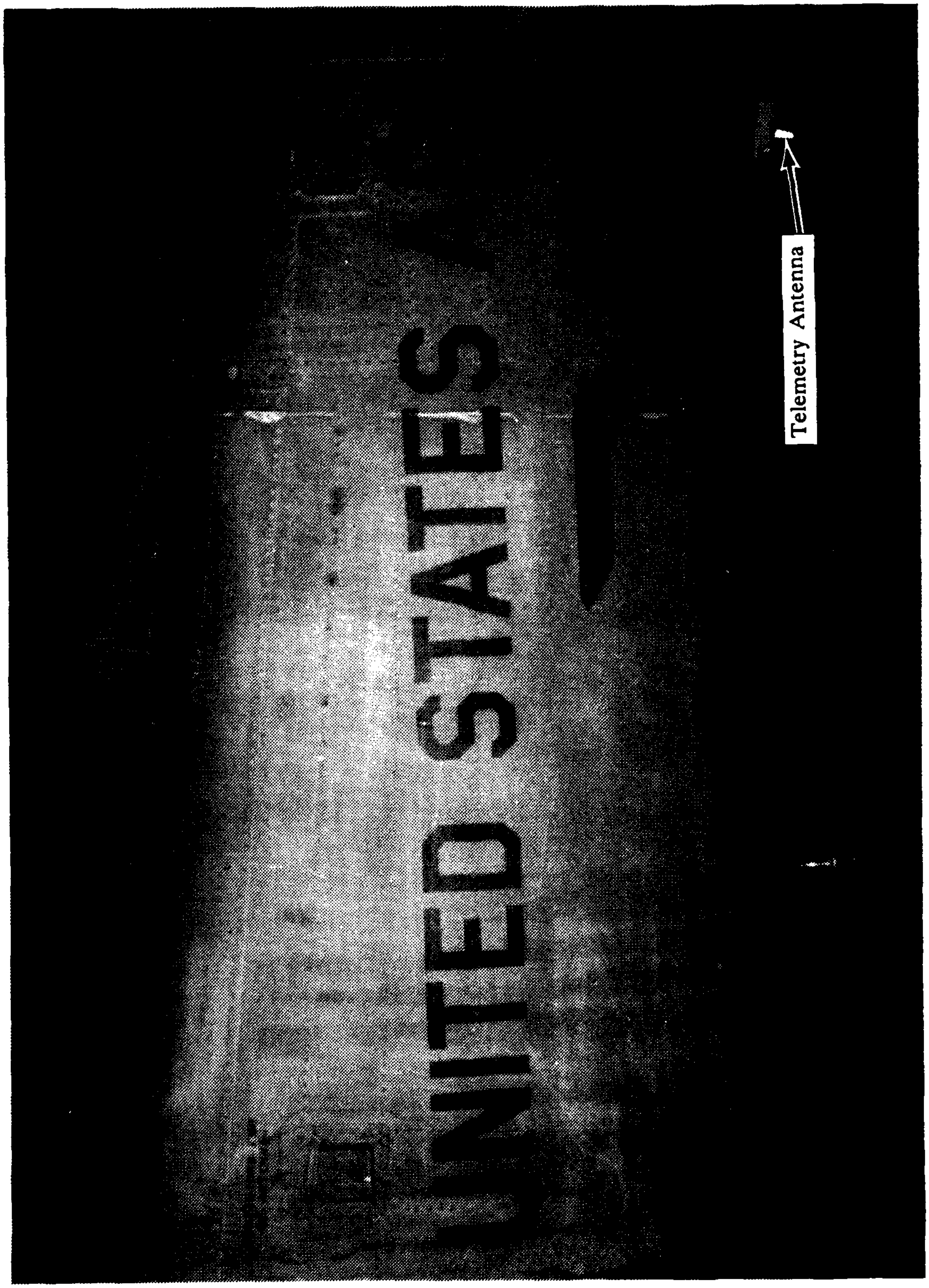


Figure B-29. TM Antenna Installation

Figure B-30. Environmental Control System Inlet Cover

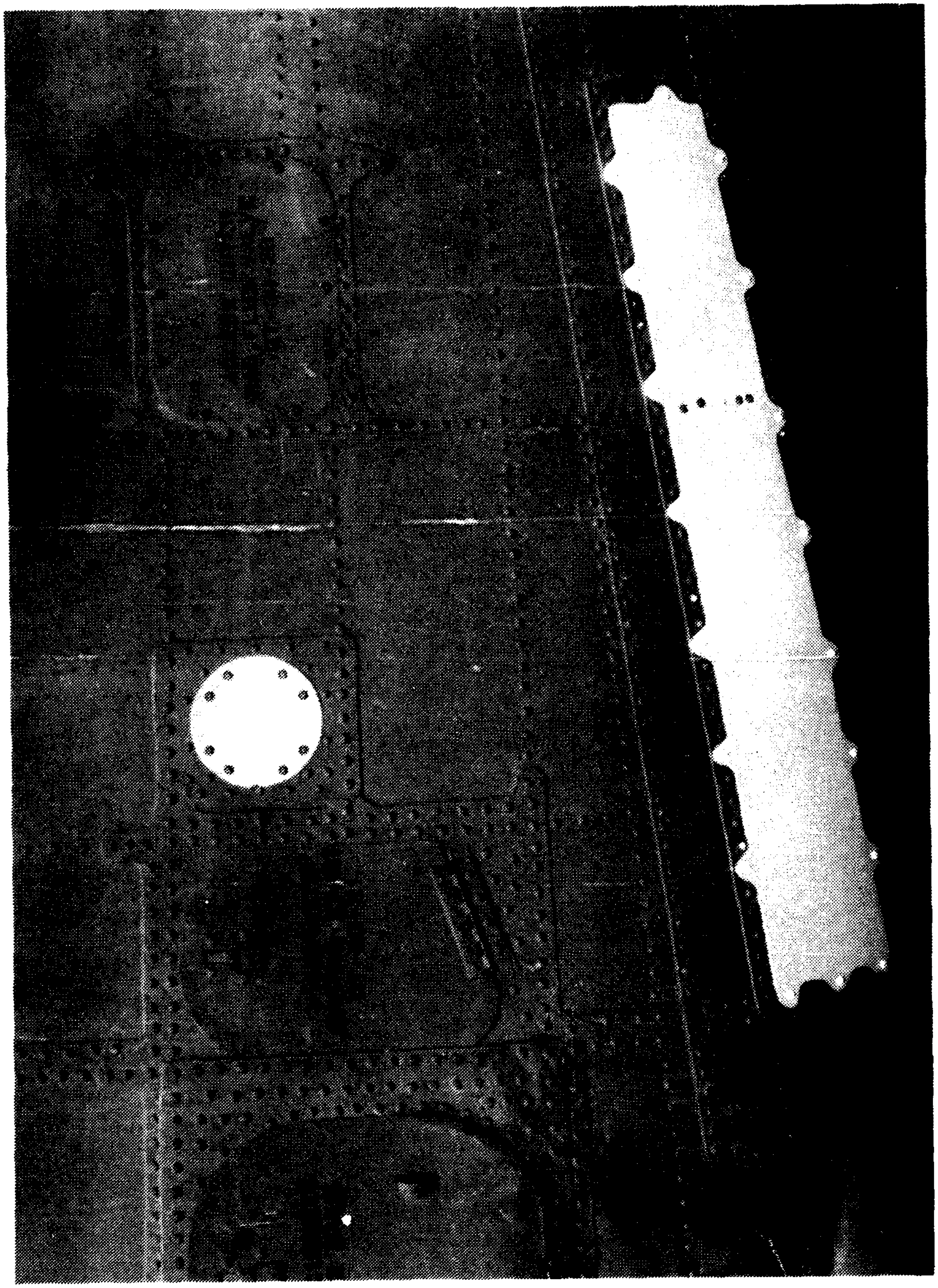


Figure B-31. Left Aft Fuselage Avionics Inlet Cooling Screen Cover

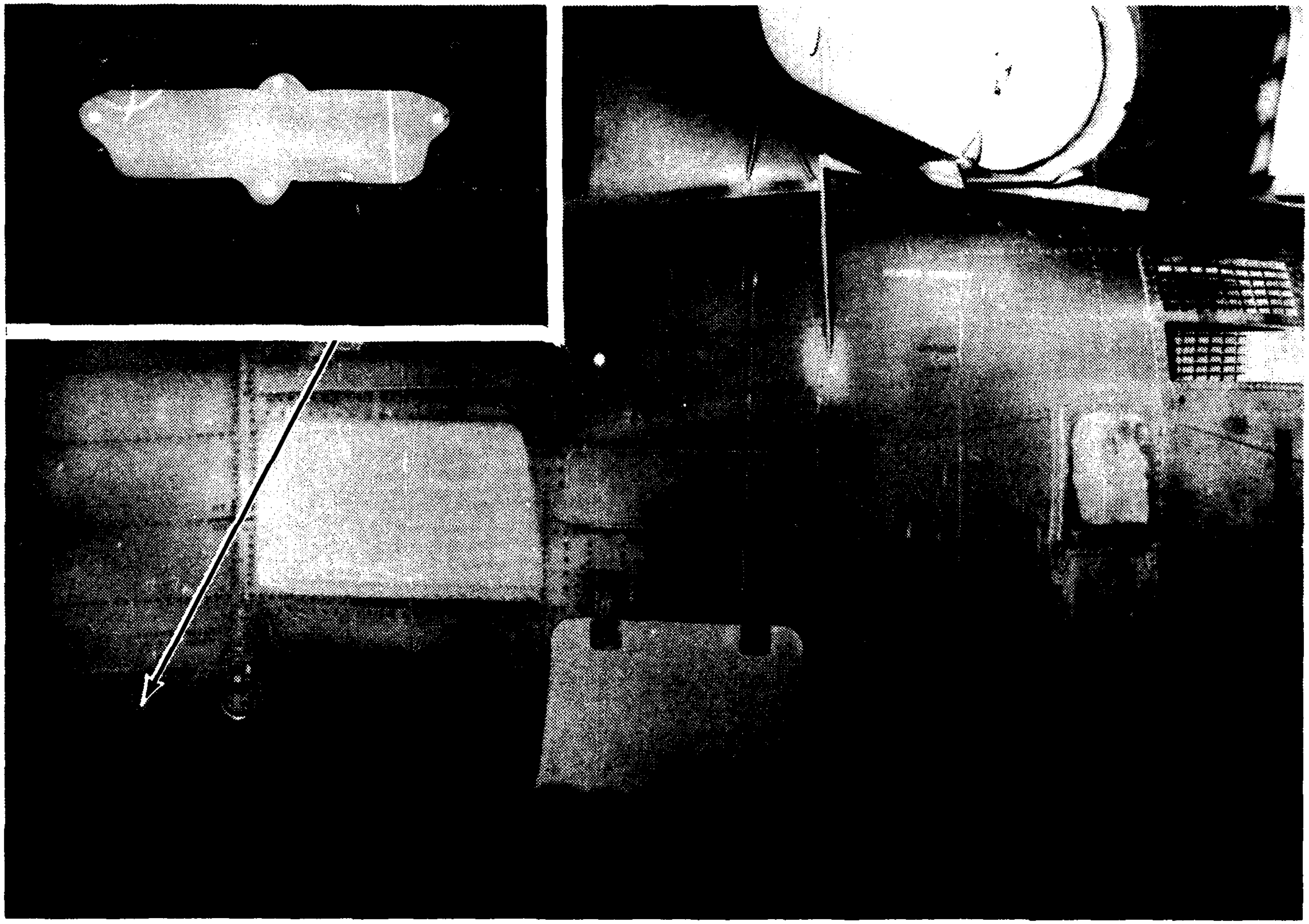


Figure B-32. **Right Forward Tail Boom Cooling Screen Cover**

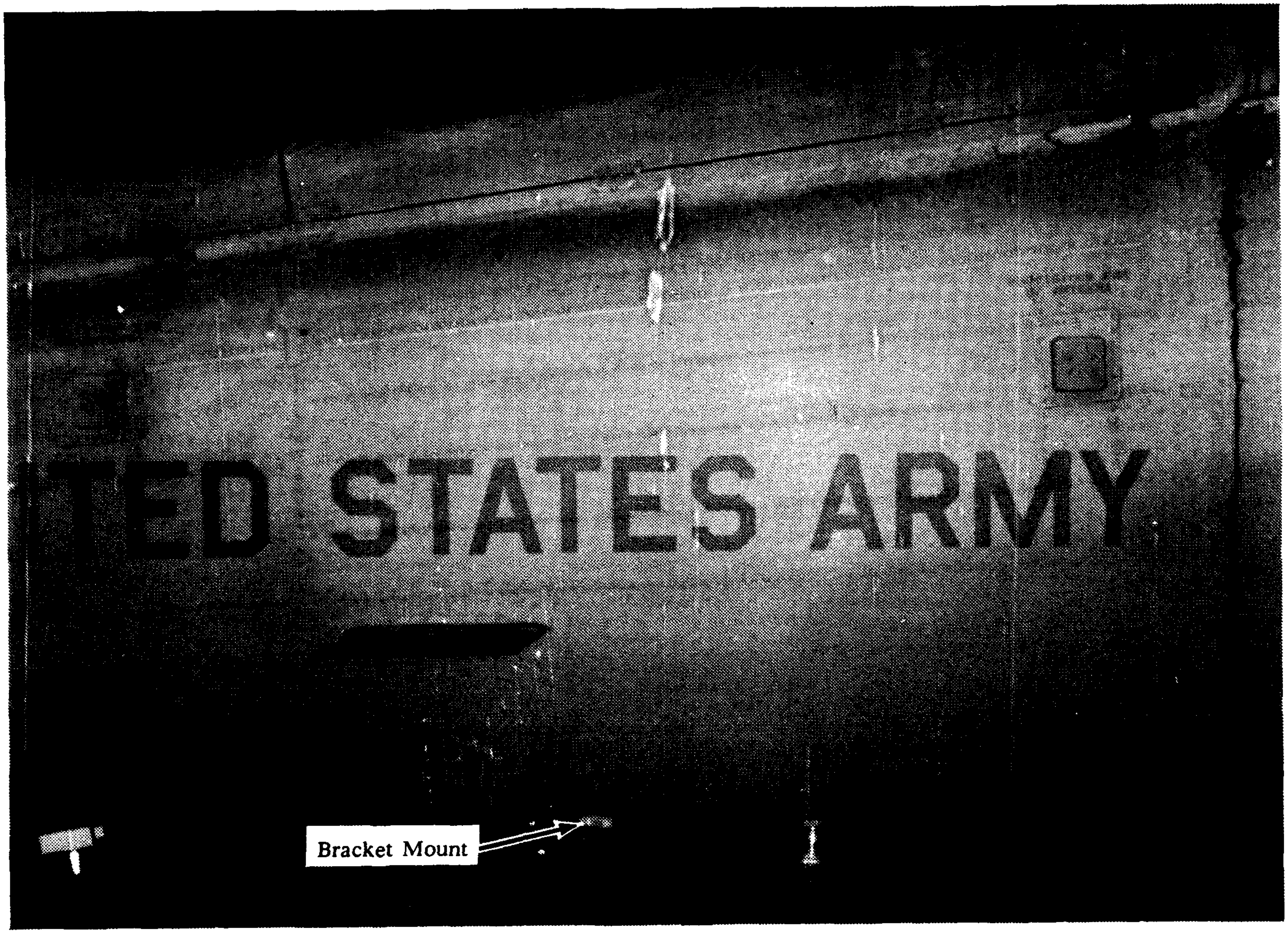


Figure B-33. ECM Antenna Stow Bracket Mount

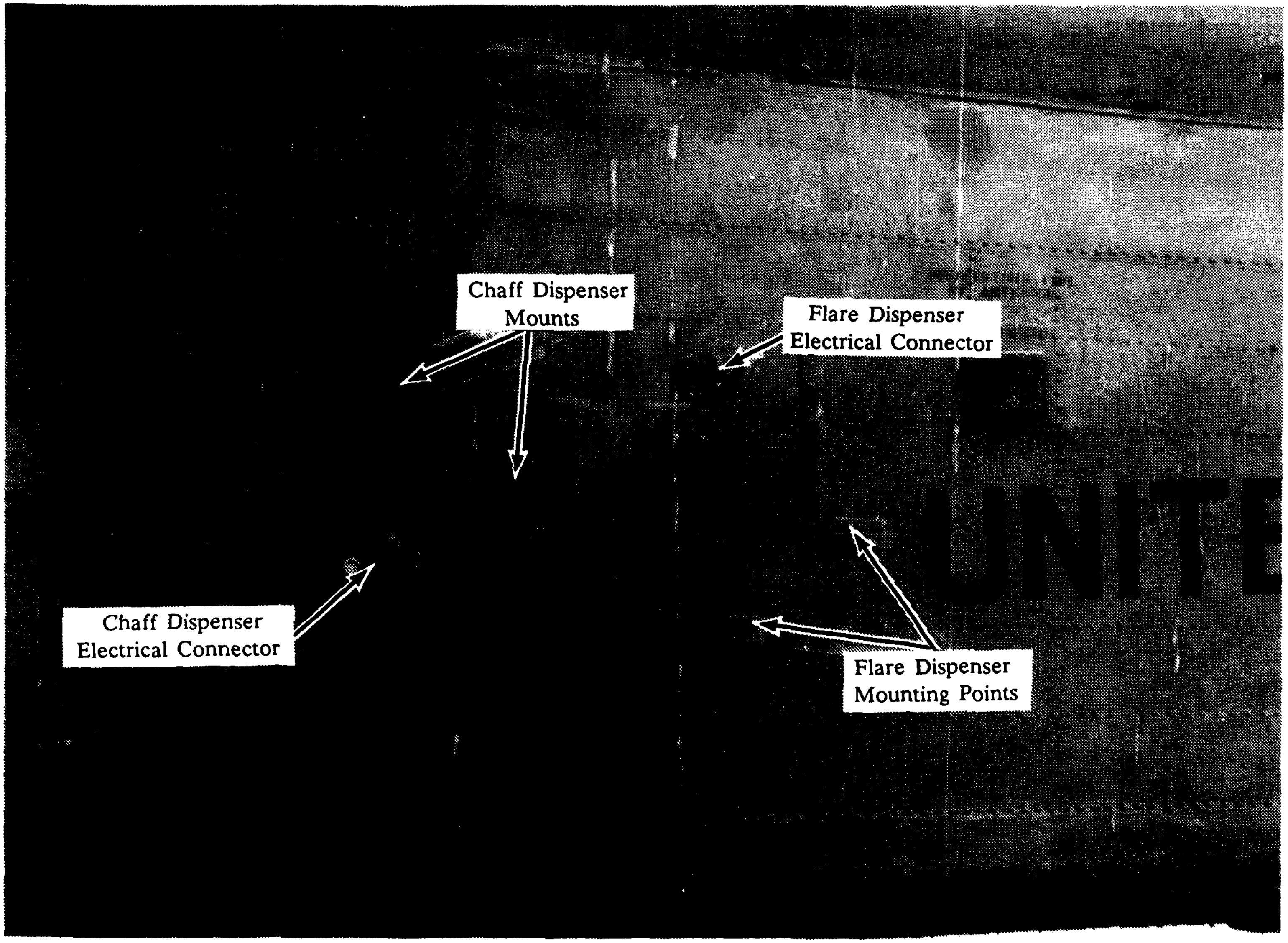


Figure B-34. Chaff/Flare Dispenser Removed

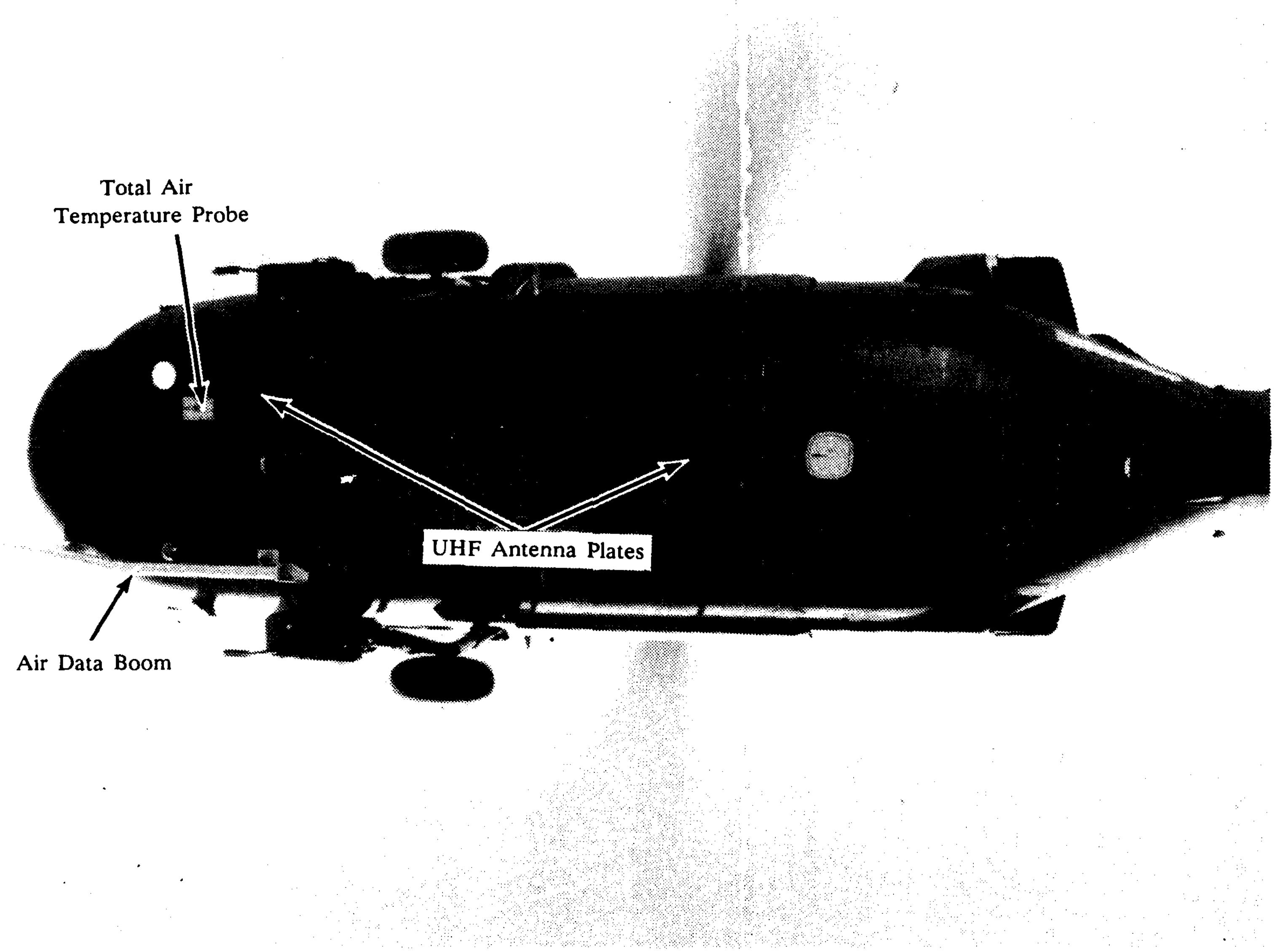


Figure B-35. Under Bell Utility Configured EH-60A

APPENDIX C. INSTRUMENTATION

1. An airborne data acquisition system was installed, operated and maintained by the U.S. Army Aviation Engineering Flight Activity. The system included transducers, potentiometers, wiring, signal conditioning, pulse code modulation (PCM) encoding, magnetic tape recording of all parameters, cockpit displays of selected parameters, and the capability to telemeter the data to a ground station.

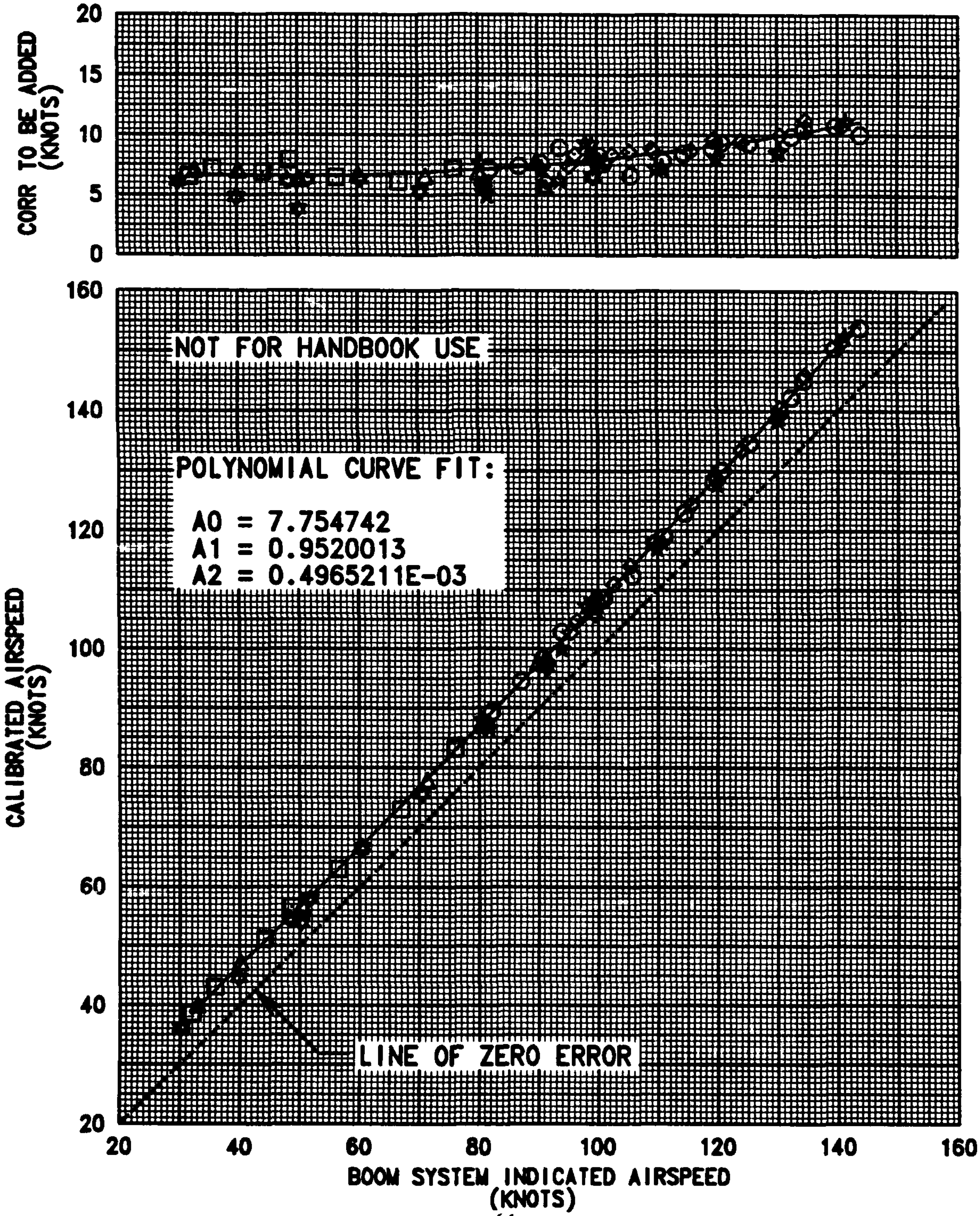
2. An air data boom extending forward from the nose of the aircraft was installed. This boom incorporated angle of attack and angle of sideslip sensors, and a swiveling pitot-static tube. The test boom airspeed system was calibrated in level flight. A ground speed course, a calibrated T-34 pace aircraft, and a calibrated trailing bomb (finned pitot-static system) were used to determine the position error. The position error of the boom airspeed system is presented in figure C-1.

3. Parameters measured, recorded and/or displayed are as follows:

Parameter	PCM	Pilot Panel	Copilot Panel	Engineer Panel
Aircraft angular velocity				
Pitch	Yes	---	---	---
Roll	Yes	---	---	---
Yaw	Yes	---	---	Yes
Aircraft attitudes				
Pitch	Yes	Std	Std	---
Roll	Yes	Std	Std	---
Heading	Yes	Std	Std	---
Airspeed				
Boom	Yes	Yes	---	---
Ship	Yes	---	Std	---
Altitude				
Boom	Yes	Yes	---	---
Ship	Yes	---	Std	---
Radar	Yes	Std	Std	---
Ambient total air temperature	Yes	---	Std	Yes
APU fuel used totalizer	---	---	---	Yes
Boom angle of attack	Yes	---	---	---
Boom angle of sideslip	Yes	Yes	---	---
CG linear accelerations				
Normal	Yes	Yes	---	---
Longitudinal	Yes	---	---	---
Lateral	Yes	Yes	---	---
Control mixer input positions				
Longitudinal	Yes	---	---	---
Lateral	Yes		---	---
Directional	Yes	---	---	---

FIGURE C-1
BOOM SYSTEM AIRSPEED CALIBRATION IN LEVEL FLIGHT
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG ROTOR SPEED (RPM)	TEST METHOD	AIRCRAFT CONFIGURATION
□	17040	360.9	0.1 LT	690	-2.5	259	GRND SPD	UTILITY
△	19060	358.0	0.1 LT	360	-4.5	258	GRND SPD	UTILITY
○	16400	359.1	0.1 LT	3020	9.5	257	T34 PACE	UTILITY
◇	19900	360.8	0.1 LT	2520	4.5	258	T34 PACE	UTILITY
☆	14720	363.6	0.0	4650	16.0	258	T34 PACE	QUICK FIX
✡	15320	364.8	0.0	3640	13.0	258	TRAIL BOMB	QUICK FIX



Control positions				
Longitudinal	Yes	Yes	---	---
Lateral	Yes	Yes	---	---
Directional	Yes	Yes	---	---
Collective	Yes	Yes	---	---
Engine (both)				
Fuel flow rate	Yes	---	---	Yes
Fuel used totalizer	Yes	---	---	Yes
Gas generator speed	Yes	Std	Std	---
Turbine gas temperature	Yes	Std	---	---
Torque	Yes	Std	Std	---
Event switch/markers	Yes	Yes	---	Yes
Main rotor speed	Yes	Std	---	---
Primary servo positions				
Forward	Yes	---	---	---
Aft	Yes	---	---	---
Lateral	Yes	---	---	---
Rate of climb	---	Std	Std	---
Record number	Yes	---	---	Yes
SAS output position				
Longitudinal	Yes	---	---	---
Lateral	Yes	---	---	---
Directional	Yes	---	---	---
Stabilator position	Yes	Std	Std	---
Time Code	Yes	---	---	Yes
Vibration accelerometers (Triaxial)				
Center of gravity	Yes	---	---	---
Left-side stabilator spar tip	Yes	---	---	---
Right-side stabilator spar tip	Yes	---	---	---
Stabilator actuator attaching point	Yes	---	---	---

APPEDIX D. TEST TECHNIQUES AND DATA ANALYSIS METHODS

GENERAL

1. Performance data were obtained using the basic methods described in Army Materiel Command Pamphlet AMCP 706-204 (ref 16, app A). Performance testing was conducted in coordinate (ball-centered) flight. Handling qualities data were evaluated using standard test methods described in Naval Air Test Center Flight Test Manual FTM No. 101 (ref 17).

AIRCRAFT WEIGHT AND BALANCE

2. The aircraft was weighed in the instrumented configuration with full oil and unusable fuel prior to the start of the airworthiness and flight characteristics evaluation program. The weight of the aircraft in the normal utility configuration was 12,380 pounds with the longitudinal center of gravity (cg) located at fuselage station (FS) 360.1. In the Quick Fix configuration, the aircraft weighed 12,720 pounds with the longitudinal cg located at FS 361.3. The fuel cells were calibrated using external sight gages to measure fuel quantity in each fuel cell. The measured fuel capacity using the gravity fueling method was 362 gallons. The fuel weight for each test flight was determined prior to engine start and after engine shutdown by using the external sight gage readings and the measured fuel specific gravity. The calibrated cockpit fuel totalizer indicators were used to determine the fuel used during a test point. A nominal fuel temperature of 55°C was used in the determination of engine fuel consumption. At the end of each flight, the cockpit fuel totalizers were compared to the sight gage readings. Aircraft cg was obtained by placing ballast at various FS.

PERFORMANCE

General

3. Helicopter performance was generalized through the use of nondimensional coefficients as follows using the 1968 US Standard Atmosphere:

a. Coefficient of Power (C_P):

$$C_P = \frac{SHP(550)}{\varrho A(\Omega R)^3} \quad (1)$$

b. Coefficient of thrust (C_T):

$$C_T = \frac{GW}{\varrho A(\Omega R)^2} \quad (2)$$

c. Advance ratio (μ):

$$\mu = \frac{V_T(1.68781)}{\Omega R} \qquad (3)$$

Where:

SHP = Engine output shaft horsepower (both)
ϱ = Ambient air density (lb-sec^2/ft^4)
A = Main rotor disc area = 2262 ft^2
Ω = Main rotor angular velocity (radians/sec)
R = Main rotor radius = (26.8333 ft)
GW = Gross weight (lb)
V_T = True airspeed (kt) $= \frac{V_E}{\sqrt{\varrho/\varrho_o}}$
1.68781 = Conversion factor (ft/sec-kt)
ϱ_o = 0.00237689 (lb-sec^2/ft^4)
V_E = Equivalent airspeed (kt) $= a_o\left\{5\left(\frac{P_a}{P_{a_o}}\right)\left[\left(\frac{Q_c}{P_a}+1\right)^{2/7} - 1\right]\right\}^{1/2}$
a_o = 661.4786 kt
P_{a_o} = 29.92125 in.-Hg
Q_c = Dynamic pressure (in.-Hg)
P_a = Ambient air pressure (in.-Hg)
100% rotor speed = 257.9 rpm
ΩR = 724.693 ft/sec
$(\Omega R)^2$ = 525,179.90 (ft/sec)^2
$(\Omega R)^3$ = 380,594, 176.4 (ft/sec)^3

4. The engine output shaft torque was determined by use of the engine torque sensor. The power turbine shaft contains a torque sensor tube that mechanically measures the total twist of the shaft. A concentric reference shaft is secured by a pin at the front end of the power turbine drive shaft and is free to rotate relative to the power turbine drive shaft at the rear end. The relative rotation is due to transmitted torque, and the resulting phase angle between the reference teeth on the two shafts is picked up by the torque sensor. This torque sensor was calibrated in a test cell by the engine manufacturer. The output from the engine torque sensor was recorded on the on-board data recording system. The output shp was determined from the engine's output shaft torque and rotational speed by the following equation.

$$SHP = \frac{Q(N_p)}{5252.113} \qquad (4)$$

Where:

Q = Engine output shaft torque (ft-lb)
N_P = Engine output shaft rotational speed (rpm)
5252.113 = Conversion factor (ft-lb-rev/min-shp)

Level Flight Performance

5. Level flight performance was determined by using equations 1 through 3, rewritten in the following format.

$$C_P = \frac{SHP(4.610447)}{\delta\sqrt{\theta}\left[\frac{N_R}{\sqrt{\theta}}\right]^3} \tag{5}$$

$$C_T = \frac{GW(0.02355505)}{\delta\left[\frac{N_R}{\sqrt{\theta}}\right]^2} \tag{6}$$

$$\mu = \frac{V_T(0.600648)}{\sqrt{\theta}\left[\frac{N_R}{\sqrt{\theta}}\right]} \tag{7}$$

Changes in horsepower due to changes in flat plate area were determined from the following equation.

$$\Delta SHP = \frac{(\Delta F_e)(\sigma)(V_T)^3}{96252.62} \tag{8}$$

Where:

δ = Pressure ratio $= \frac{P_a}{P_{a_o}}$

θ = Temperature ratio $= \frac{OAT + 273.15}{288.15}$

OAT = Ambient air temperature (°C)

$\sigma = \delta/\theta$

4.610447 = Conversion factor for EH-60A (rev^3/min^3-SHP)

0.02355505 = Conversion factor for EH-60A (rev^2/min^2-lb)

0.600648 = Conversion factor for EH-60A (rev/min-kt)

ΔF_e = Change in equivalent flat plate area (ft^2)

6. Each speed power was flown in ball-centered flight by reference to a sensitive lateral accelerometer at a predetermined coefficient of thrust (C_T) and referred rotor speed ($N/\sqrt{\theta}$). To maintain the ratio of gross weight to pressure ratio (W/δ) constant, altitude

was increased as fuel was consumed. To maintain $N/\sqrt{\theta}$ constant rotor speed was decreased as temperature decreased. Power corrections for rate-of-climb and acceleration was determined (when applicable) by the following equations.

$$SHP_{R/C} = \frac{(R/C_{TL})(GW)}{33,000(K_p)} \tag{9}$$

$$SHP_{ACCEL} = 1.6098x10^{-4}\left(\frac{\Delta V}{\Delta t}\right)(V_T)(GW) \tag{10}$$

Where:

R/C_{TL} = Tapeline rate of climb (ft/min) = $\left(\frac{\Delta H_P}{\Delta t}\right)\left(\frac{OAT + 273.15}{OAT_S + 273.15}\right)$

$\frac{\Delta H_P}{\Delta t}$ = Change in pressure altitude per unit time (ft/min)

OAT_S = Standard ambient temperature at pressure altitude of $\frac{\Delta H_P}{\Delta t}$ (^oC)

K_P = 0.76 (determined from previous testing)

$1.6098\ x\ 10^{-4}$ = Conversion factor (SHP-sec/kt^2-lb)

$\frac{\Delta V}{\Delta t}$ = Change in airspeed per unit time (kt/sec)

Reduction in power required was made for the effect of external instrumentation drag. This was determined by the following equation.

$$SHP_{instr\ drag} = \frac{\Delta F_e(\varrho/\varrho_o)(V_T)^3}{96252.62} \tag{11}$$

Where:

ΔF_e = 0.69 ft^2 (estimated)
96252.62 = Conversion factor (ft^2-kt^3/shp)

Power required for level flight at the test conditions was determined using the following equation.

$$SHP_t = SHP - SHP_{R/C} - SHP_{ACCEL} - SHP_{INSTRDRAG} \tag{12}$$

7. The Prandtl-Glauert function ($[1 - Mach^2]^{0.5}$) at an effective mach radius was used to correct for compressibility effects. The effective mach radius was found by reducing the test C_P to an incompressible value ($C_{P_{inc}}$) until the $C_{P_{inc}}$ for different referred rotor speeds at the same C_T formed a unique curve. This was done by iterating between the effective mach radius value (% of main rotor radius) and $C_{P_{inc}}$. The faired curve for speed powers of $N/\sqrt{\theta} = 265$ rpm was obtained using the following equations.

$$Cp_{inc} = Cp_{258}[1 - (0.827 \; x \; MAT_{258})^2]^{0.5} \tag{13}$$

$$Cp_{265} = \frac{Cp_{inc}}{[1 - (0.827 \; x \; MAT_{265})^2]^{0.5}} \tag{14}$$

Where:

Cp_{inc} = Coefficient of power, incompressible

Cp_{258} = Coefficient of power obtained from figs. E-2 through E-4

0.827 = Effective mach radius (obtained through iteration)

MAT = Advancing tip mach number = 0.00251689 $(1 + \mu)(N/\sqrt{\theta})$

0.00251689 = Conversion factor for EH-60A (min/rev)

Cp_{265} = Coefficient of power for 265 rpm

Equations 13 and 14 maybe used to obtain power required from $N/\sqrt{\theta}$ = 258 to 265 rpm.

8. Test-day level flight data was corrected to a standard condition by the following equations.

$$SHP_s = SHP_t \frac{(\delta_s)\sqrt{\theta_s}\left[\frac{N_R}{\sqrt{\theta}}\right]_S^3}{(\delta_t)\sqrt{\theta_t}\left[\frac{N_R}{\sqrt{\theta}}\right]_t^3} \tag{15}$$

$$V_{T_s} = V_{T_t} \frac{\sqrt{\theta_s}\left[\frac{N_R}{\sqrt{\theta}}\right]_S}{\sqrt{\theta_t}\left[\frac{N_R}{\sqrt{\theta}}\right]_t} \tag{16}$$

Where:

subscript t = Test day
subscript s = Standard

9. The specific range (SR) data were derived from the test level flight power required and fuel flow (W_F). Level flight performance SHP and W_F data for each engine were referred as follows.

$$SHP_{REF} = \frac{SHP_t}{\delta(\theta)^{0.5}} \tag{17}$$

$$W_{F_{REF}} = \frac{W_{F_t}}{\delta(\theta)^{0.55}} \tag{18}$$

A curve fit was subsequently applied to the referred data of each engine. The equations are as follows.

Left Engine:

$$W_{F_{REF}} = 142.6017 + (0.3914083 \ x \ SHP_{REF}) + (-0.00001452765 \ x \ SHP_{REF}{}^2) \quad (19)$$

Right Engine:

$$W_{F_{REF}} = 172.703 + (0.3176797 \ x \ SHP_{REF}) + (0.00002039503 \ x \ SHP_{REF}{}^2) \quad (20)$$

Test day W_{F_t} was corrected to a standard condition W_{F_s} using the following equation.

$$W_{F_s} = W_{F_t} + \Delta W_F \quad (21)$$

Where:

$\Delta W_F =$ Change in fuel flow between SHP_t and SHP_s

The following equation was used for determination of SR.

$$SR = \frac{V_{T_s}}{W_{F_s}} \quad (22)$$

10. Changes in the equivalent flat plate area due to change in aircraft configuration (Quick Fix to utility) were calculated from equation 9 solved for ΔF_e.

11. Referred engine parameters were monitored throughout the test program to check for engine deterioration and/or instrumentation problems. In addition to the referred parameters of SHP (equation 17) and WF (equation 18), the gas generator speed (N1) and turbine gas temperature (MGT) were referred as follows.

$$N1_{REF} = \frac{N1}{\theta^{0.5}} \quad (21)$$

$$MGT_{REF} = \frac{MGT + 273.15}{\theta^{0.85}} - 273.15 \quad (22)$$

HANDLING QUALITIES

General

12. Conventional test techniques were used during the conduct of the handling qualities test. All tests were conducted during ball-centered flight. Detailed descriptions of all test techniques are contained in reference 16, appendix A.

VIBRATION

13. Vibration data were analyzed using a CPSI MAP 200 array processor. The analyzer converted the data from the time domain (acceleration as a function of time) to the

frequency domain (acceleration as a function of frequency). The data were analyzed using a frequency range from zero to 100 hertz (Hz) and frequency resolution of 0.3 Hz. In order to minimize random variation in acceleration amplitude, the data were averaged over a 15-second time interval using ensemble averaging.

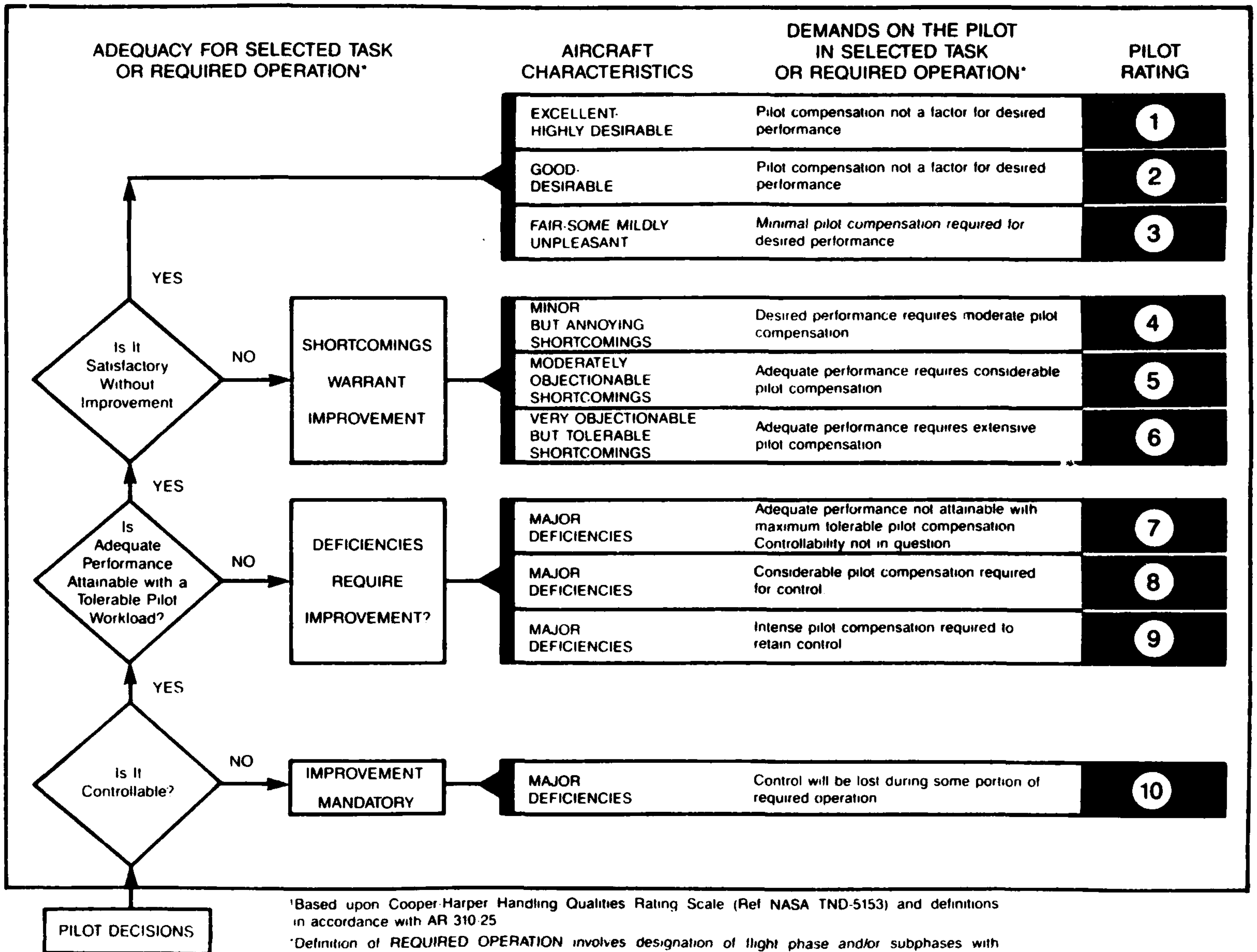
DEFINITIONS

Deficiency

14. A defect or malfunction discovered during the life cycle of an item of equipment that constitutes a safety hazard to personnel; will result in serious damage to the equipment if operation is continued; or indicates improper design or other cause of failure of an item or part, which seriously impairs the equipment's operational capability.

Shortcoming

15. An imperfection or malfunction occurring during the life cycle of equipment which must be reported and which should be corrected to increase efficiency and to render the equipment completely serviceable. It will not cause an immediate breakdown jeopardizing safe operation, or materially reduce the usability of the material or end product.



[1]Based upon Cooper-Harper Handling Qualities Rating Scale (Ref NASA TND-5153) and definitions in accordance with AR 310-25

*Definition of REQUIRED OPERATION involves designation of flight phase and/or subphases with accompanying conditions

Figure D-1. Handling Qualities Rating Scale

DEGREE OF VIBRATION	DESCRIPTION[1]	PILOT RATING
No vibration		0
Slight	Not apparent to experienced aircrew fully occupied by their tasks, but noticeable if their attention is directed to it or if not otherwise occupied.	1, 2, 3
Moderate	Experienced aircrew are aware of the vibration but it *does not affect* their work, *at least* over a short period.	4, 5, 6
Severe	Vibration is immediately apparent to experienced aircrew even when fully occupied. Performance of primary task is affected or tasks can only be done with difficulty.	7, 8, 9
Intolerable	Sole preoccupation of aircrew is to reduce vibration level.	10

[1]Based on the Subjective Vibration Assessment Scale developed by the Aeroplane and Armament Experimental Establishment, Boscombe Down, England.

Figure D-2. Vibration Rating Scale

APPENDIX E. TEST DATA

FIGURE E-1
LEVEL FLIGHT PERFORMANCE COMPARISON
EH-60A USA S/N 86-24569

GROSS WEIGHT (LB)	LONGITUDINAL CG LOCATION (FS)	PRESSURE ALTITUDE (FT)	AMBIENT TEMPERATURE (°C)	ROTOR SPEED (RPM)	C_T
17,200	361.2	SEA LEVEL	15.0	258	0.006187

NOTES:
1. QUICK FIX DATA OBTAINED FROM FIGS. E-2 THRU E-4.
2. UTILITY DATA OBTAINED FROM FIGS. E-2 THRU E-4, WITH $\Delta FE = -5.2\ FT^2$ INCORPORATED.
3. FUEL FLOW FOR SPECIFIC RANGE CALCULATION BASED ON INSTALLED TEST ENGINES (FIGS E-21 THRU E-24).

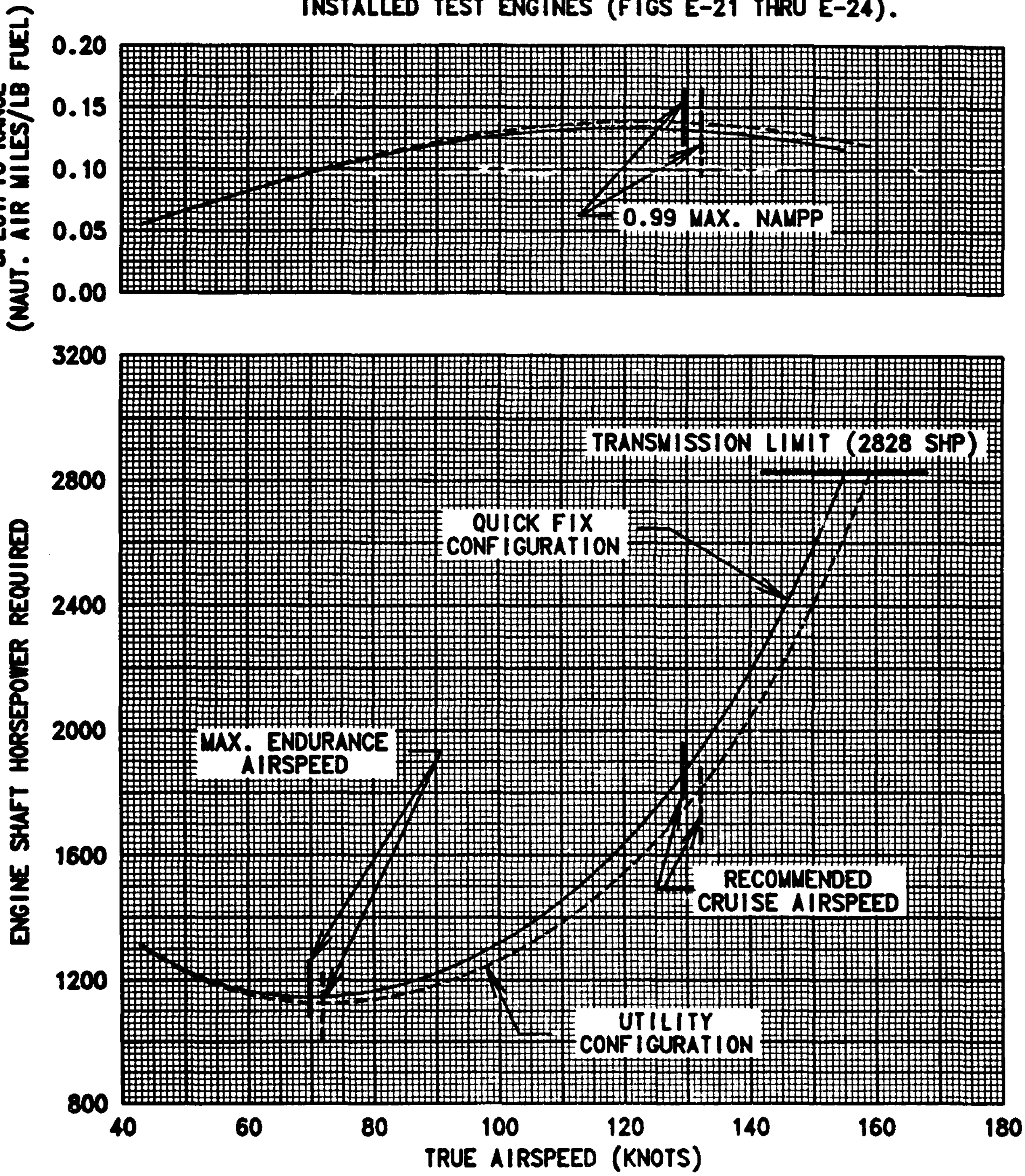


FIGURE E-2
NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE
EH-60A USA S/N 86-24569
$N/\sqrt{\theta}$ = 258.0 RPM

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION.
4. AVERAGE LONGITUDINAL CENTER OF GRAVITY LOCATION AT FS 361.2.
5. AVERAGE LATERAL CENTER OF GRAVITY LOCATION AT BL 0.0 MID.
6. POINTS DERIVED FROM FIGURES E-9 THRU E-13

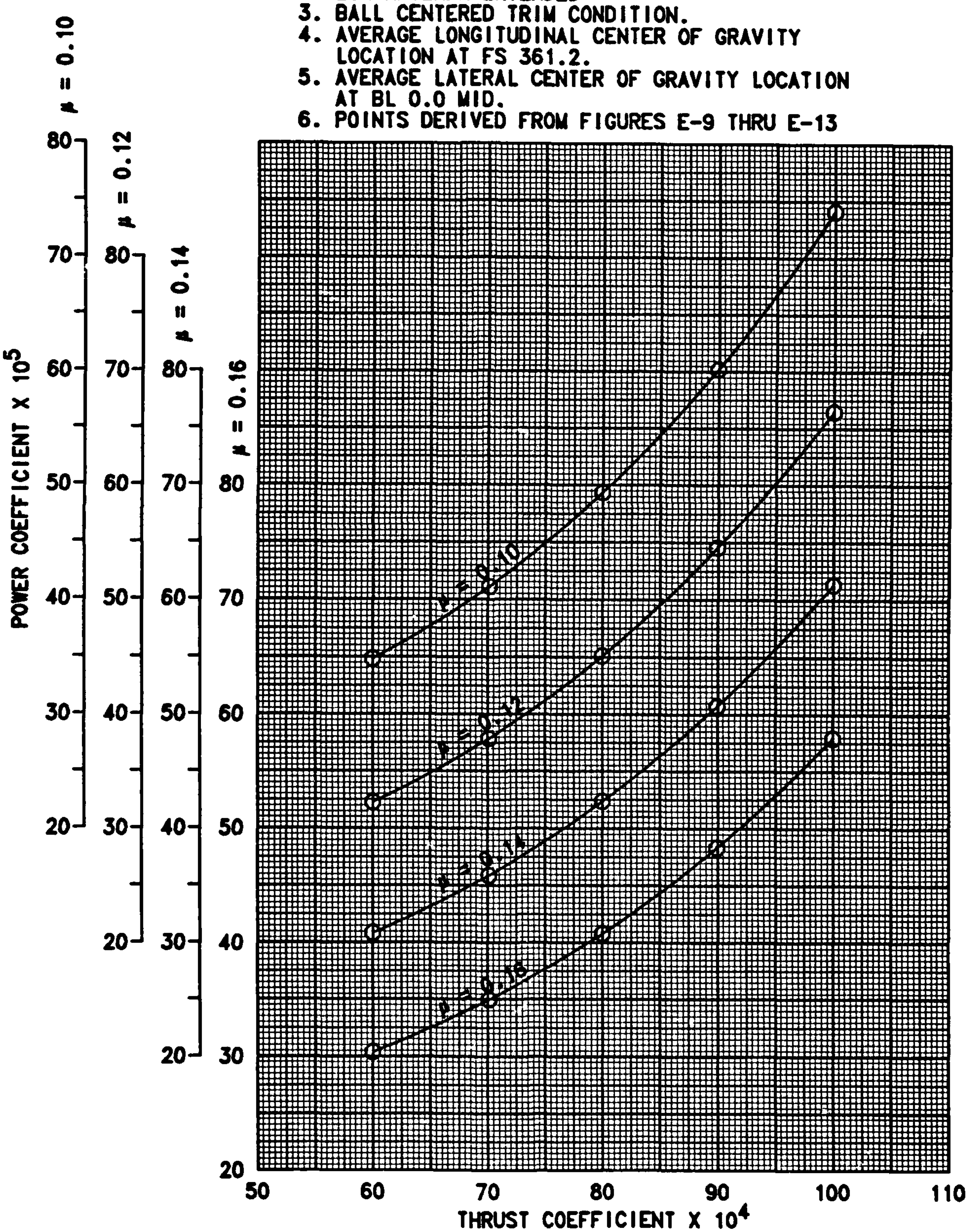


FIGURE E-3
NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE
EH-60A USA S/N 86-24569
$N/\sqrt{\theta}$ = 258.0 RPM

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION.
4. AVERAGE LONGITUDINAL CENTER OF GRAVITY LOCATION AT FS 361.2.
5. AVERAGE LATERAL CENTER OF GRAVITY LOCATION AT BL 0.0 MID.
6. POINTS DERIVED FROM FIGURES E-9 THRU E-13.

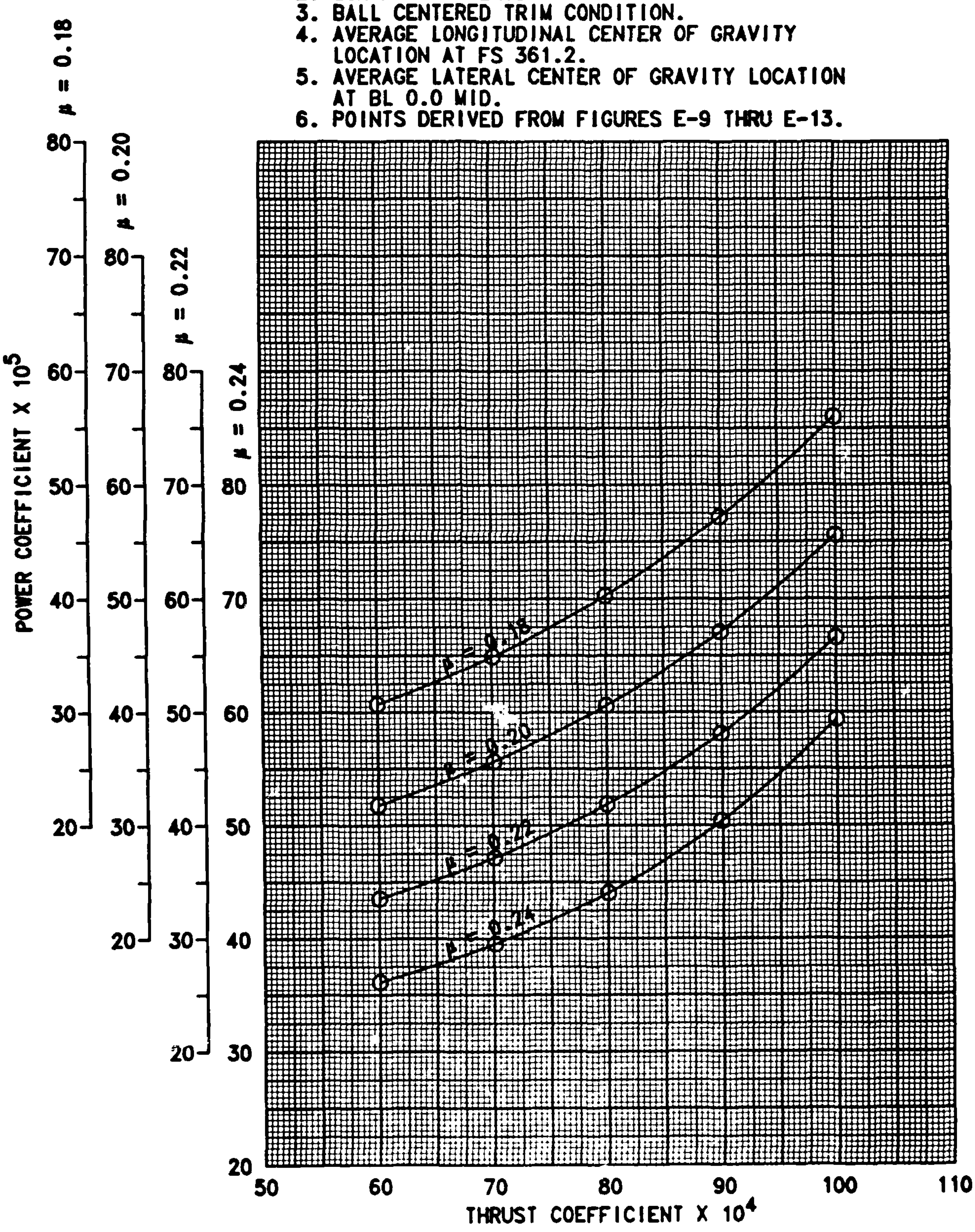


FIGURE E-4

NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

$N/\sqrt{\theta}$ = 258.0 RPM

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION.
4. AVERAGE LONGITUDINAL CENTER OF GRAVITY LOCATION AT FS 361.2.
5. AVERAGE LATERAL CENTER OF GRAVITY LOCATION AT BL 0.0 MID.
6. POINTS DERIVED FROM FIGURES E-9 THRU E-13

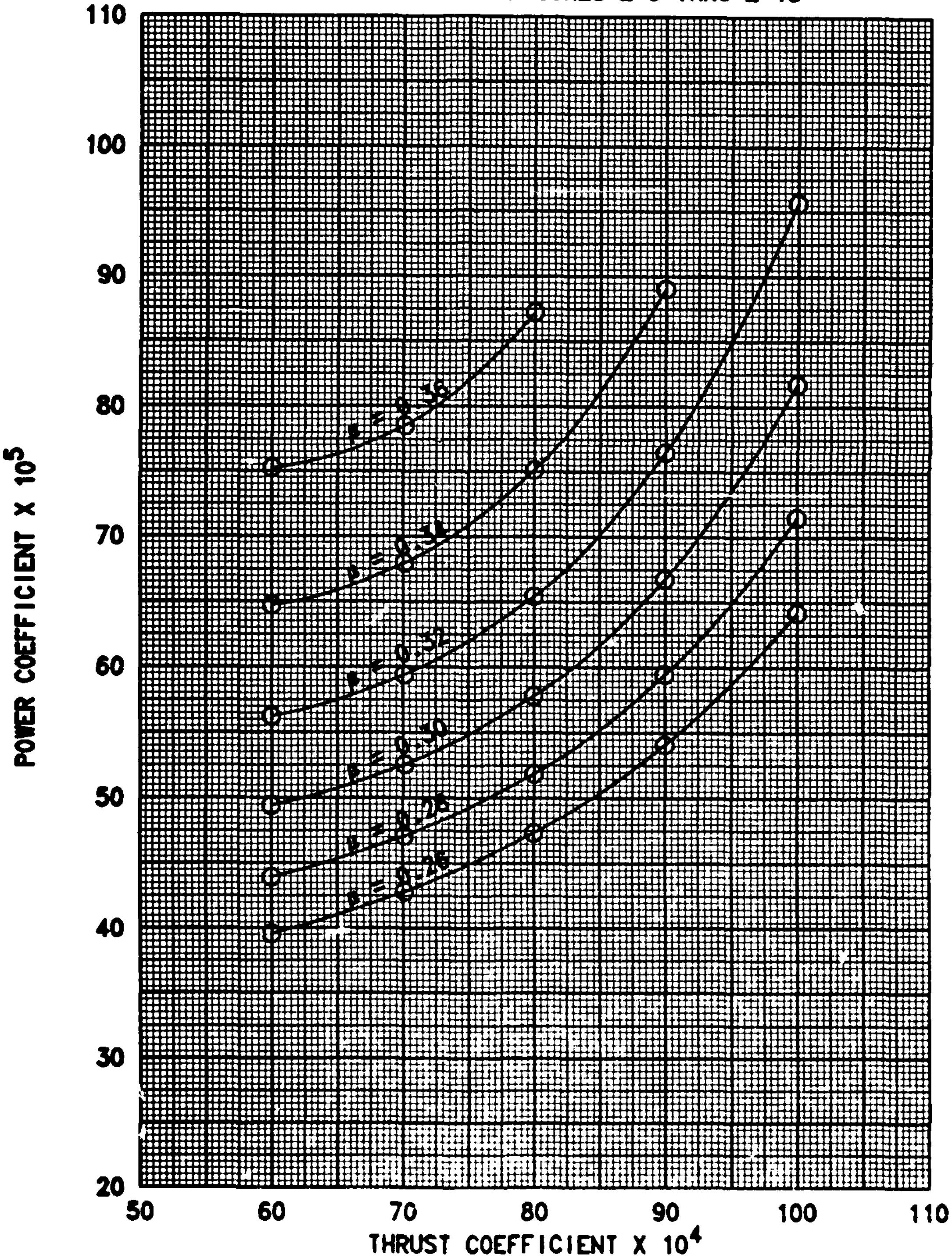


FIGURE E-5

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
16800	360.1	0.1 LT	3880	1.5	258.0	0.006998

NOTES: 1. UTILITY CONFIGURATION
2. BALL CENTERED TRIM CONDITION

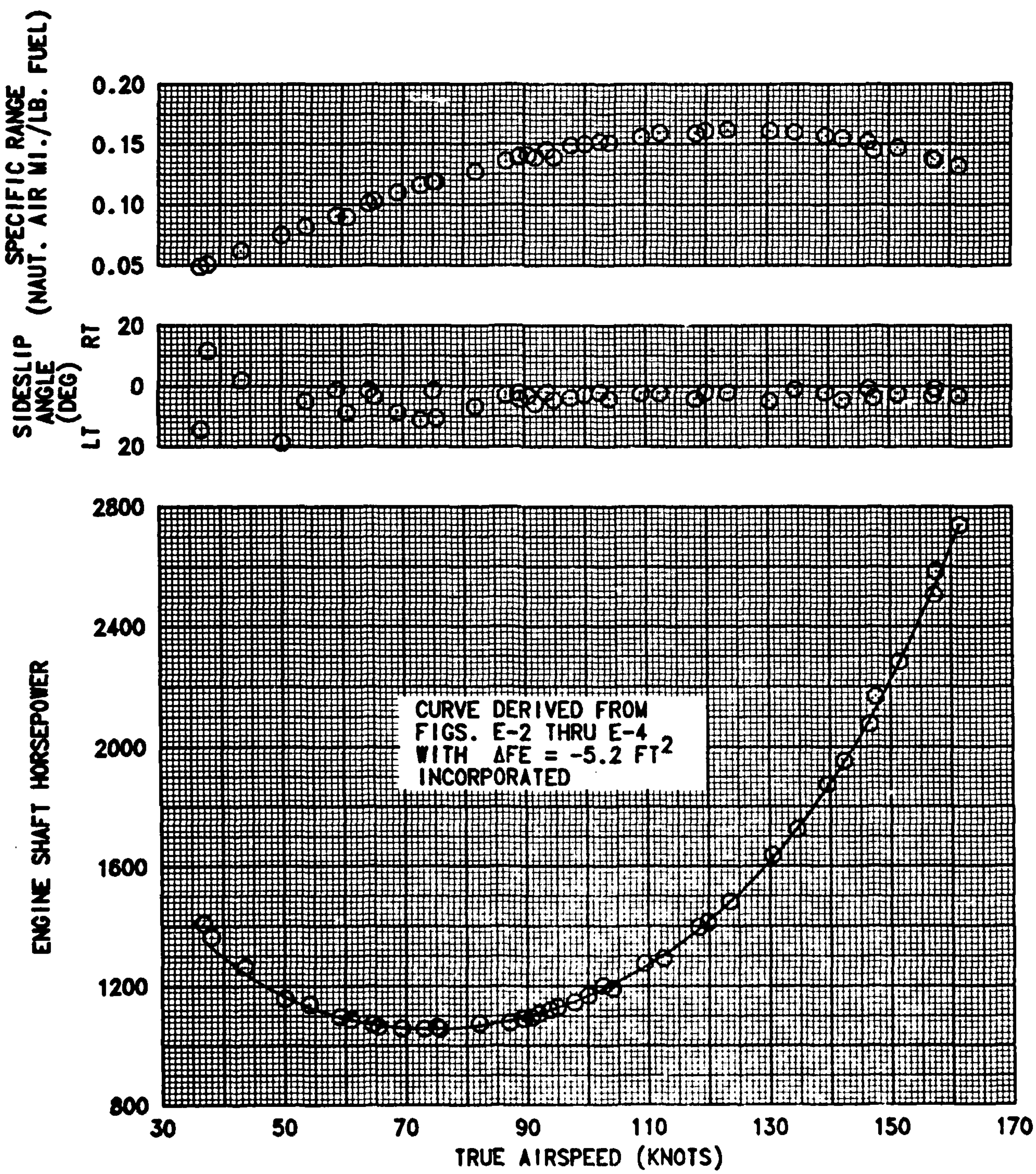


FIGURE E-6
LEVEL FLIGHT PERFORMANCE
EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
17050	360.8	0.1 LT	7680	0.5	258.0	0.008003

NOTES: 1. UTILITY CONFIGURATION
2. BALL CENTERED TRIM CONDITION

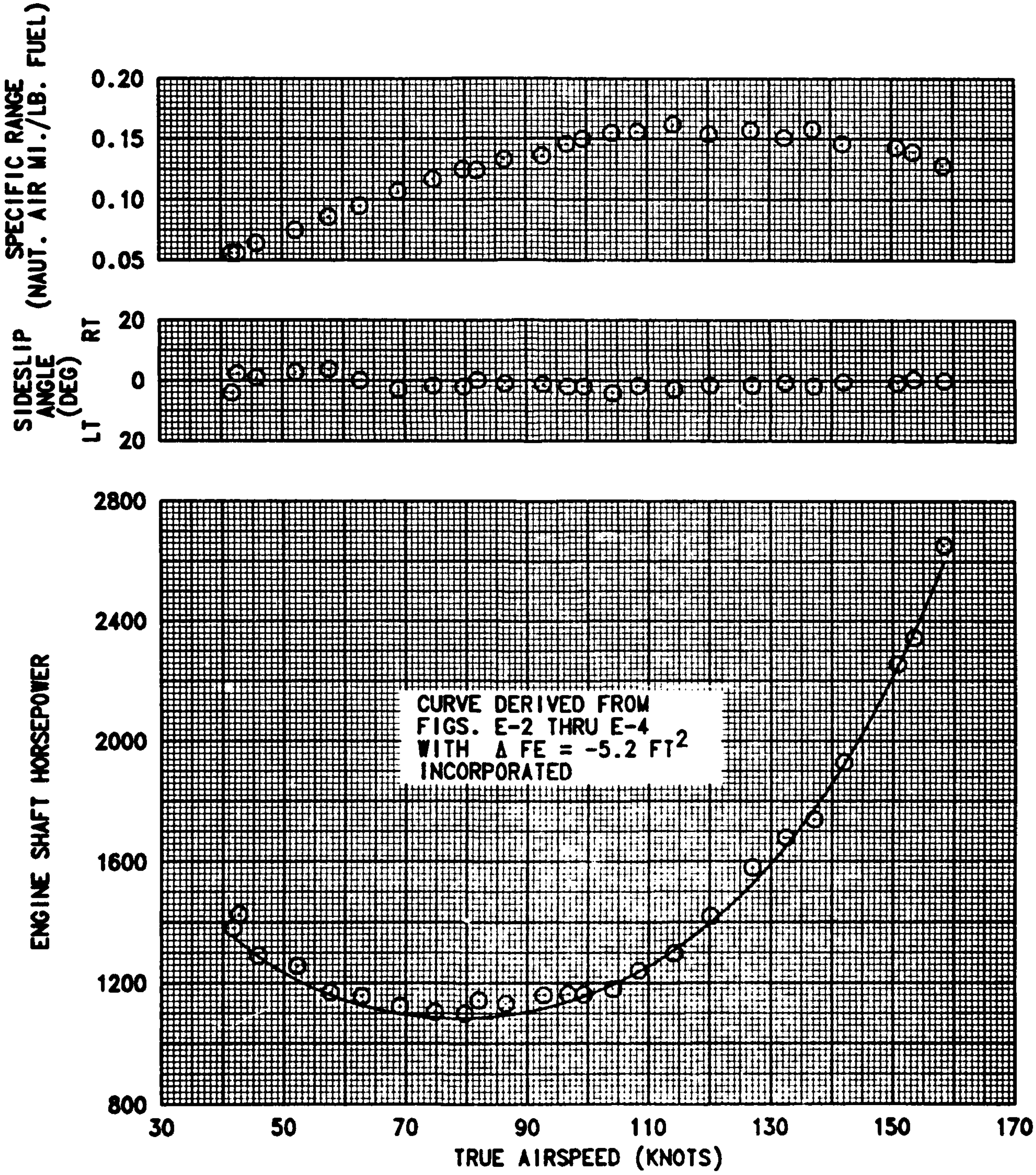


FIGURE E-7
LEVEL FLIGHT PERFORMANCE
EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
17830	360.8	0.1 LT	10370	3.5	258.2	0.008989

NOTES: 1. UTILITY CONFIGURATION
2. BALL CENTERED TRIM CONDITION

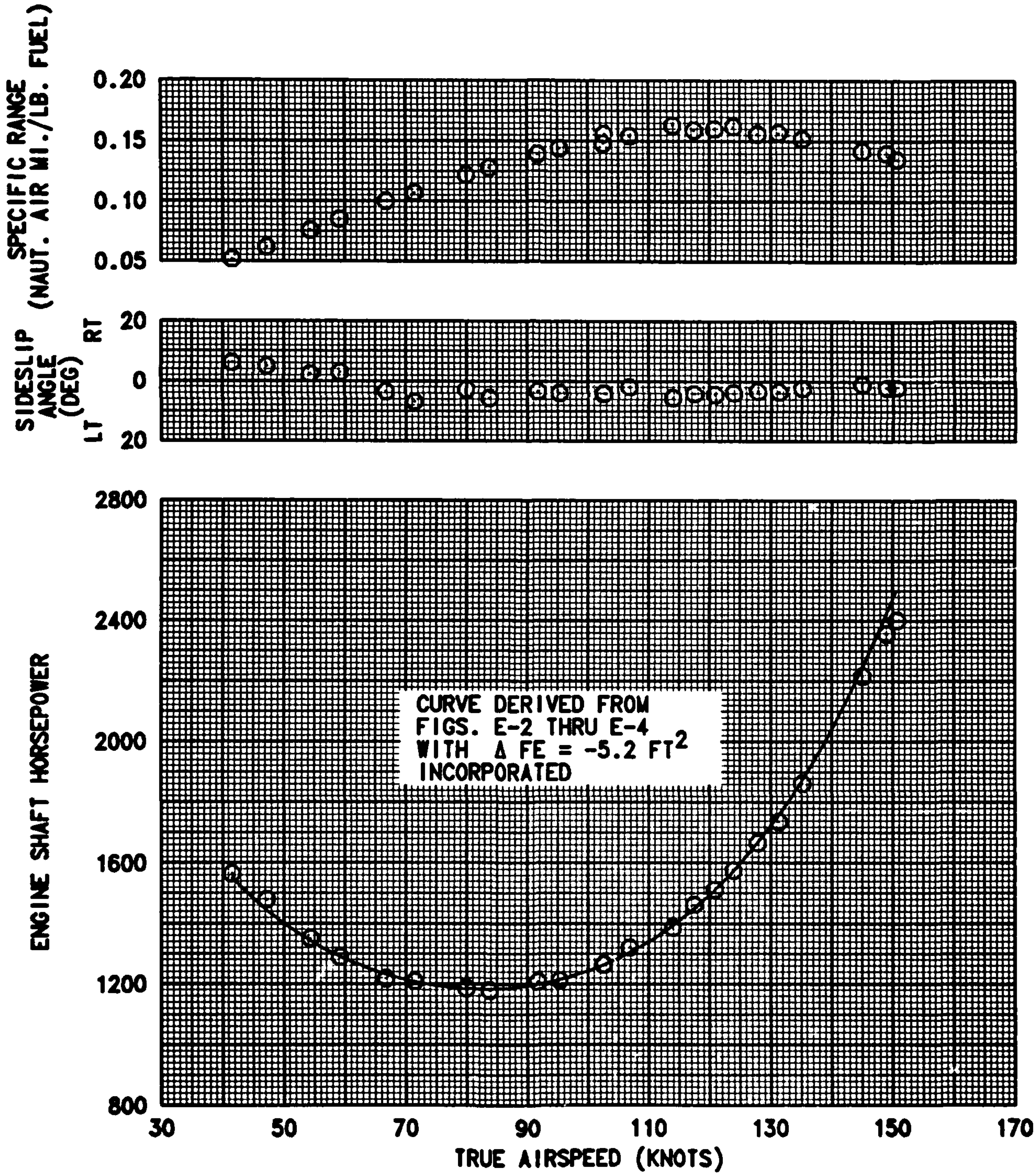


FIGURE E-8

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
17860	360.9	0.1 LT	13220	0.0	258.1	0.009994

NOTES: 1. UTILITY CONFIGURATION
2. BALL CENTERED TRIM CONDITION

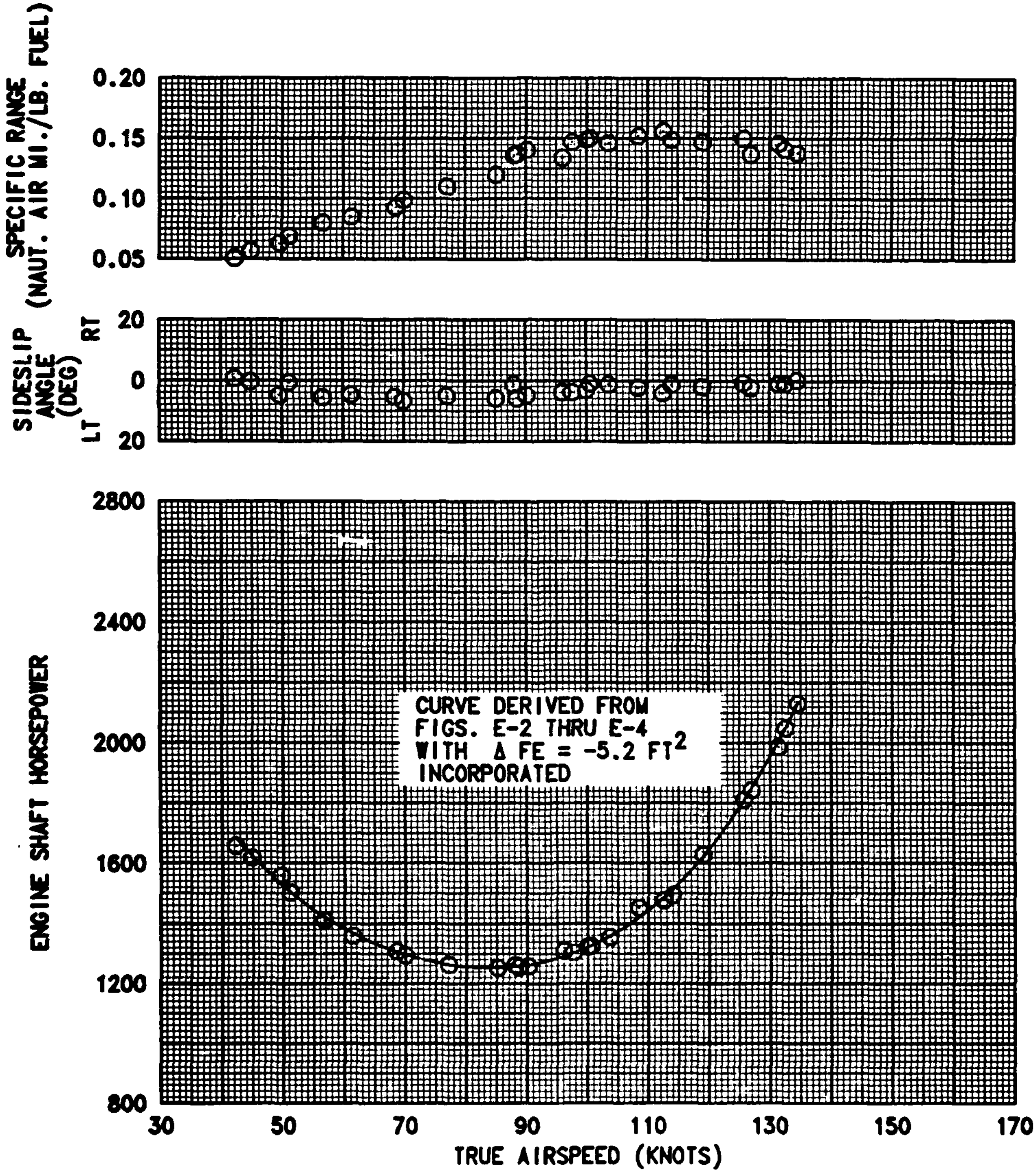


FIGURE E-9

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
14460	361.5	0.0	5280	14.5	258.0	0.005999

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

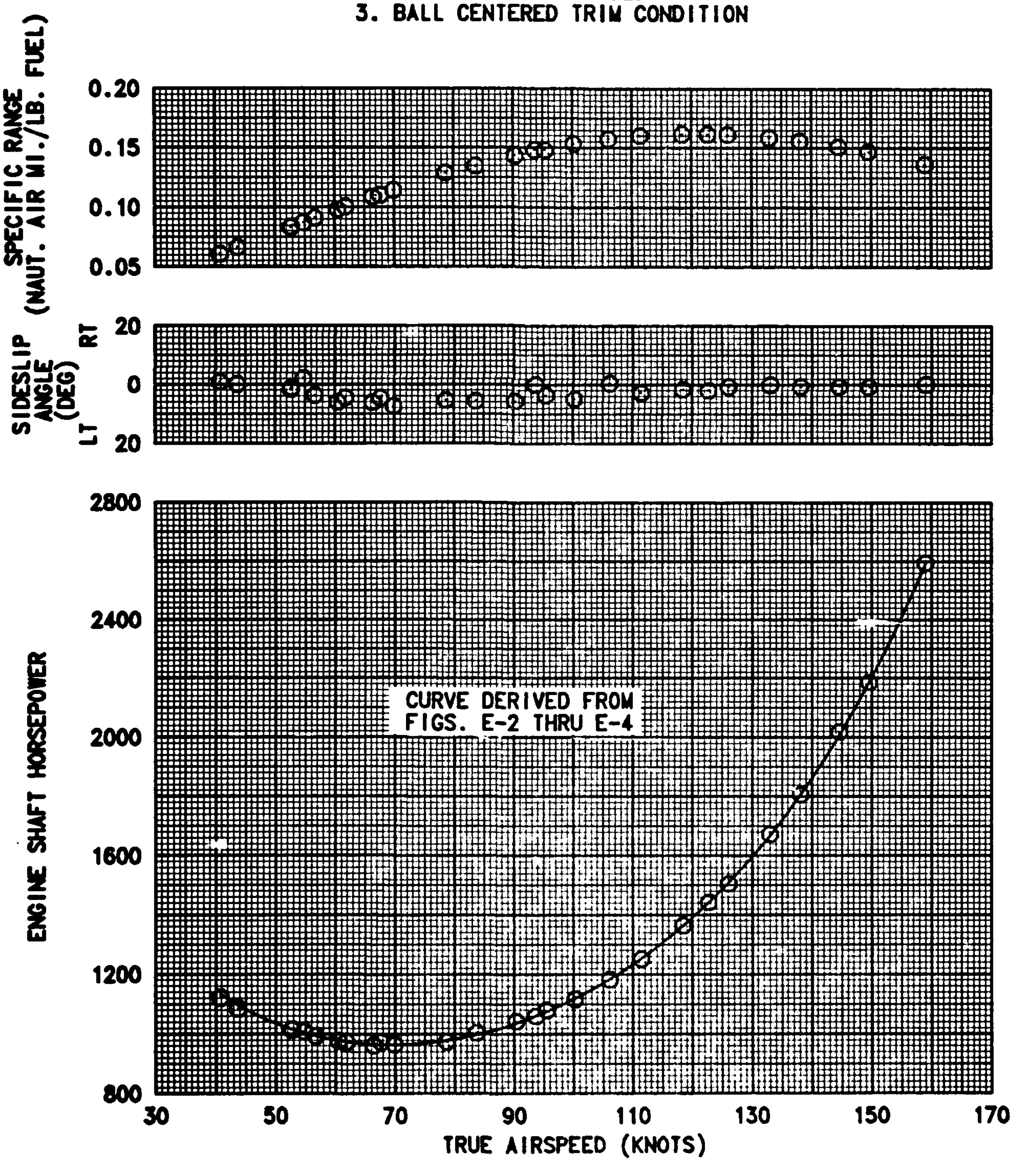


FIGURE E-10

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
16830	360.8	0.0	4400	6.5	257.7	0.007010

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

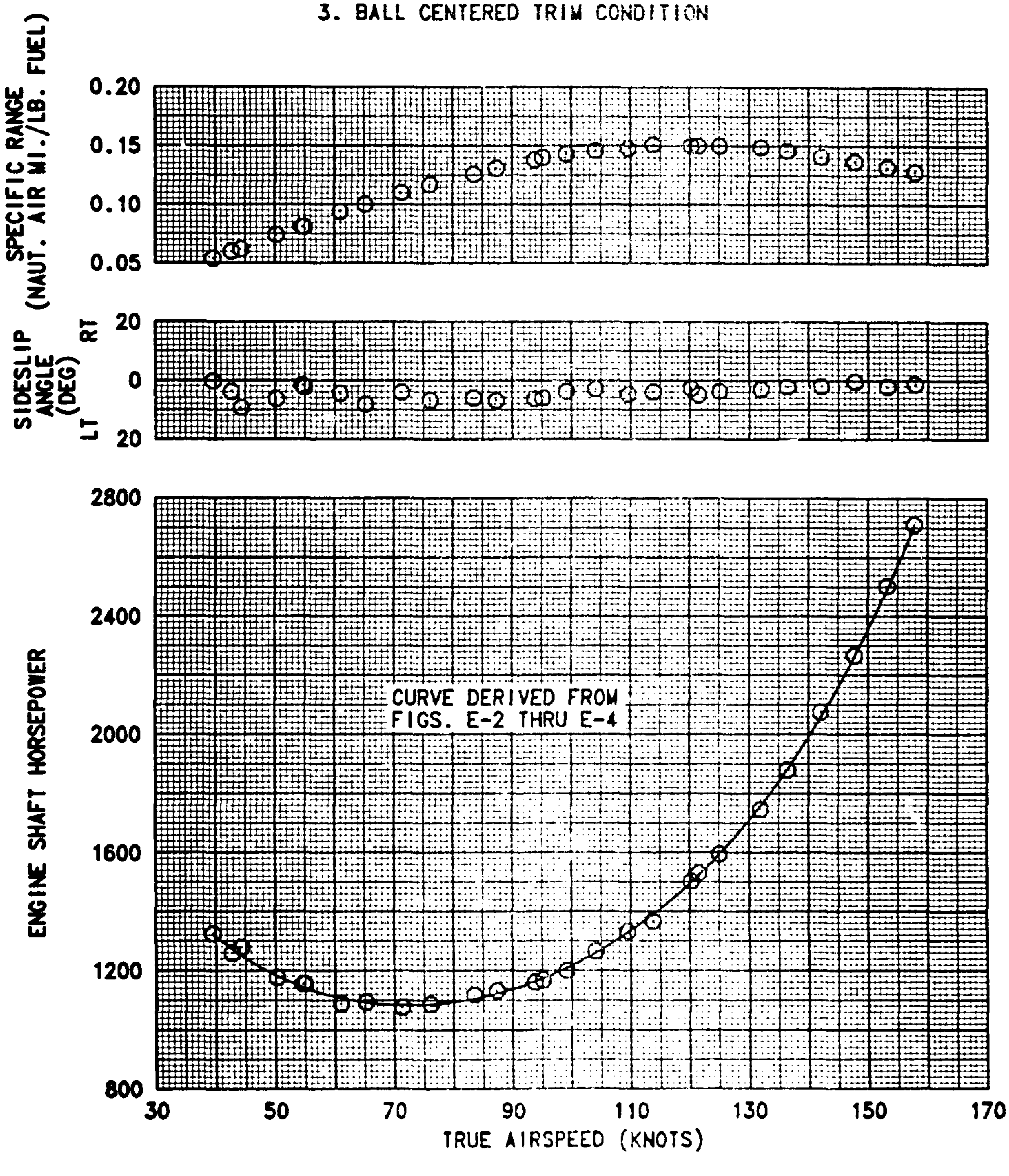


FIGURE E-11

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
16730	360.9	0.0	8620	3.5	258.0	0.007997

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

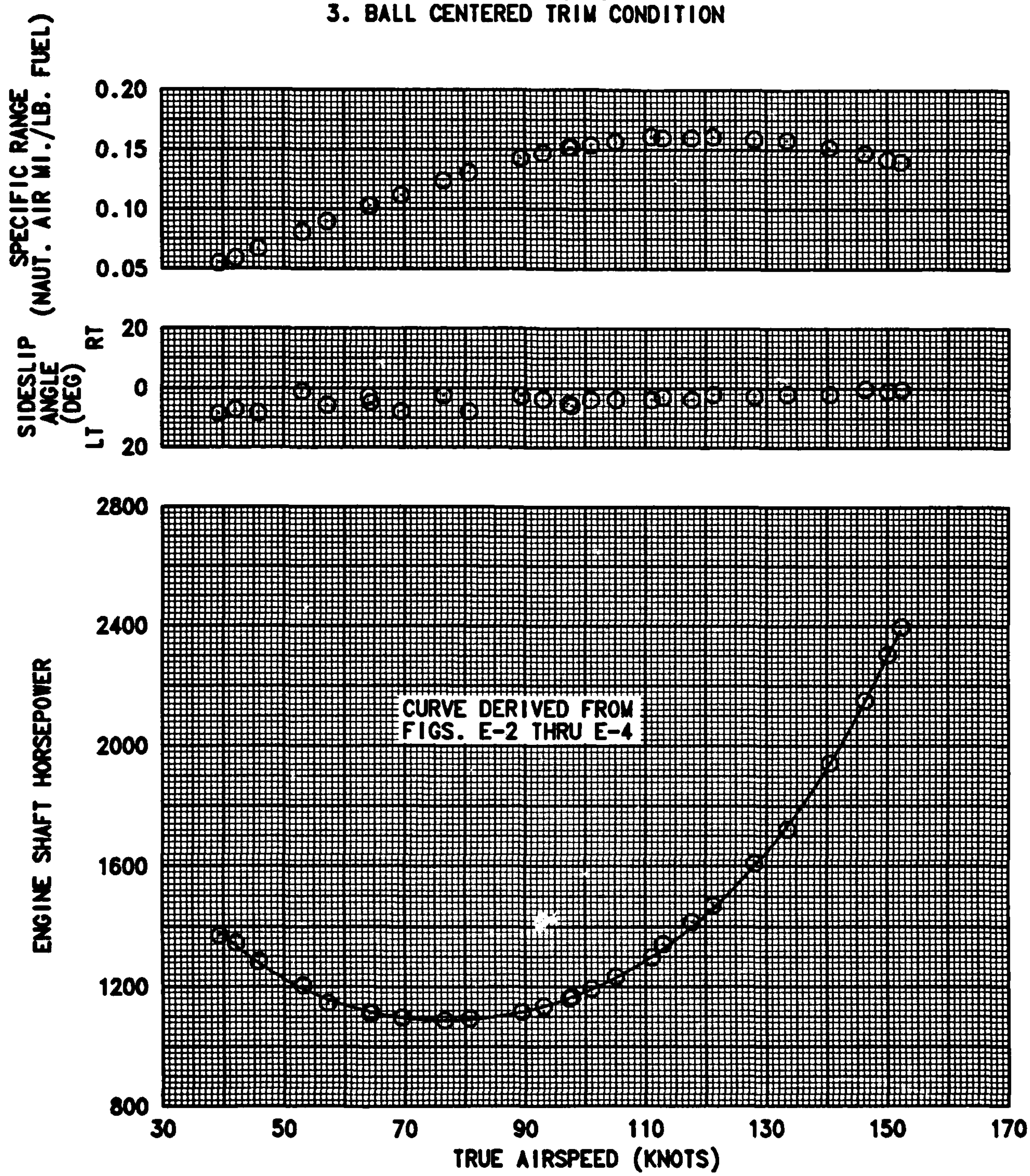


FIGURE E-12

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
18150	361.6	0.0	9740	3.0	258.1	0.008994

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

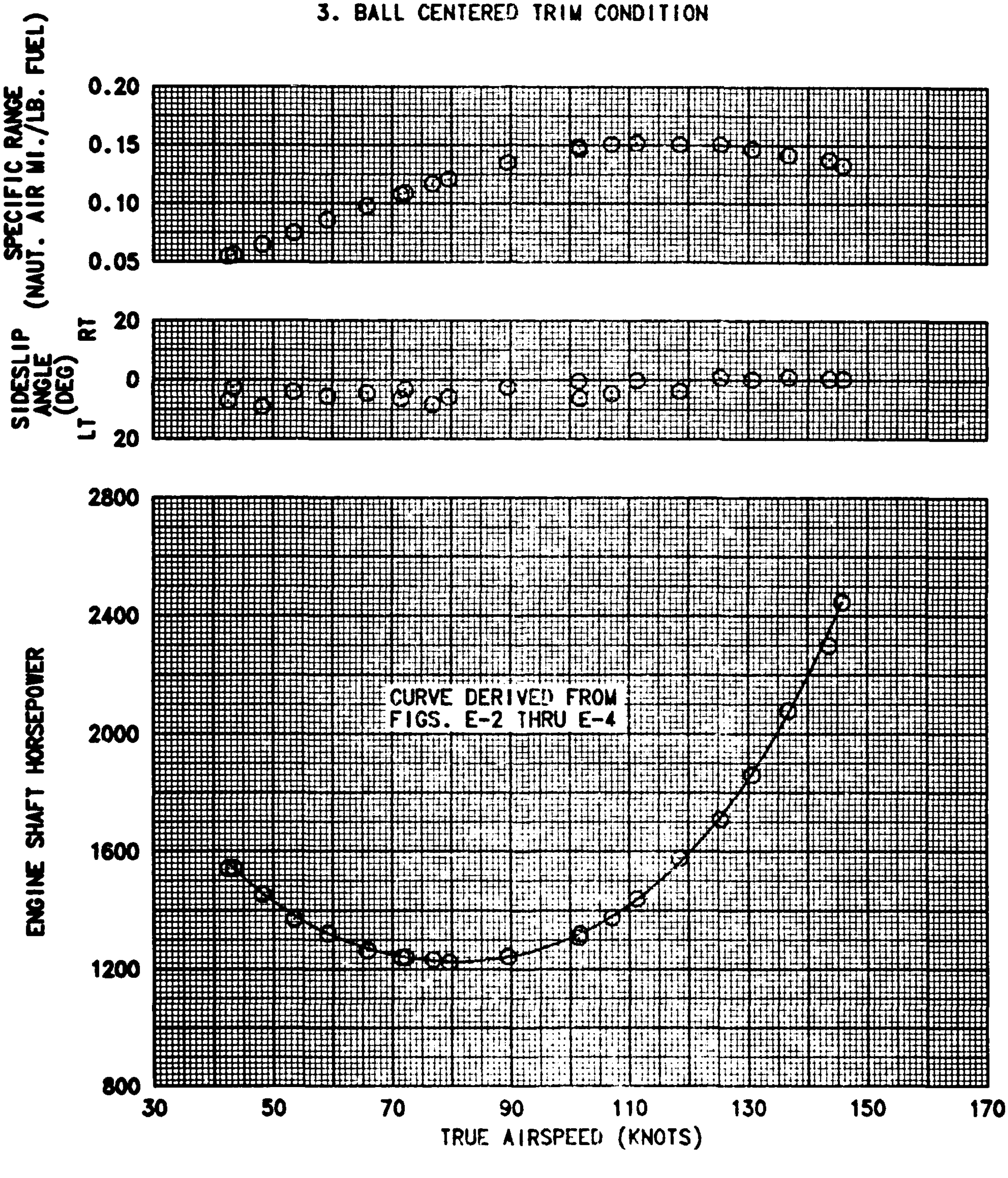


FIGURE E-13

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
18160	361.9	0.0	12690	0.0	258.0	0.009998

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

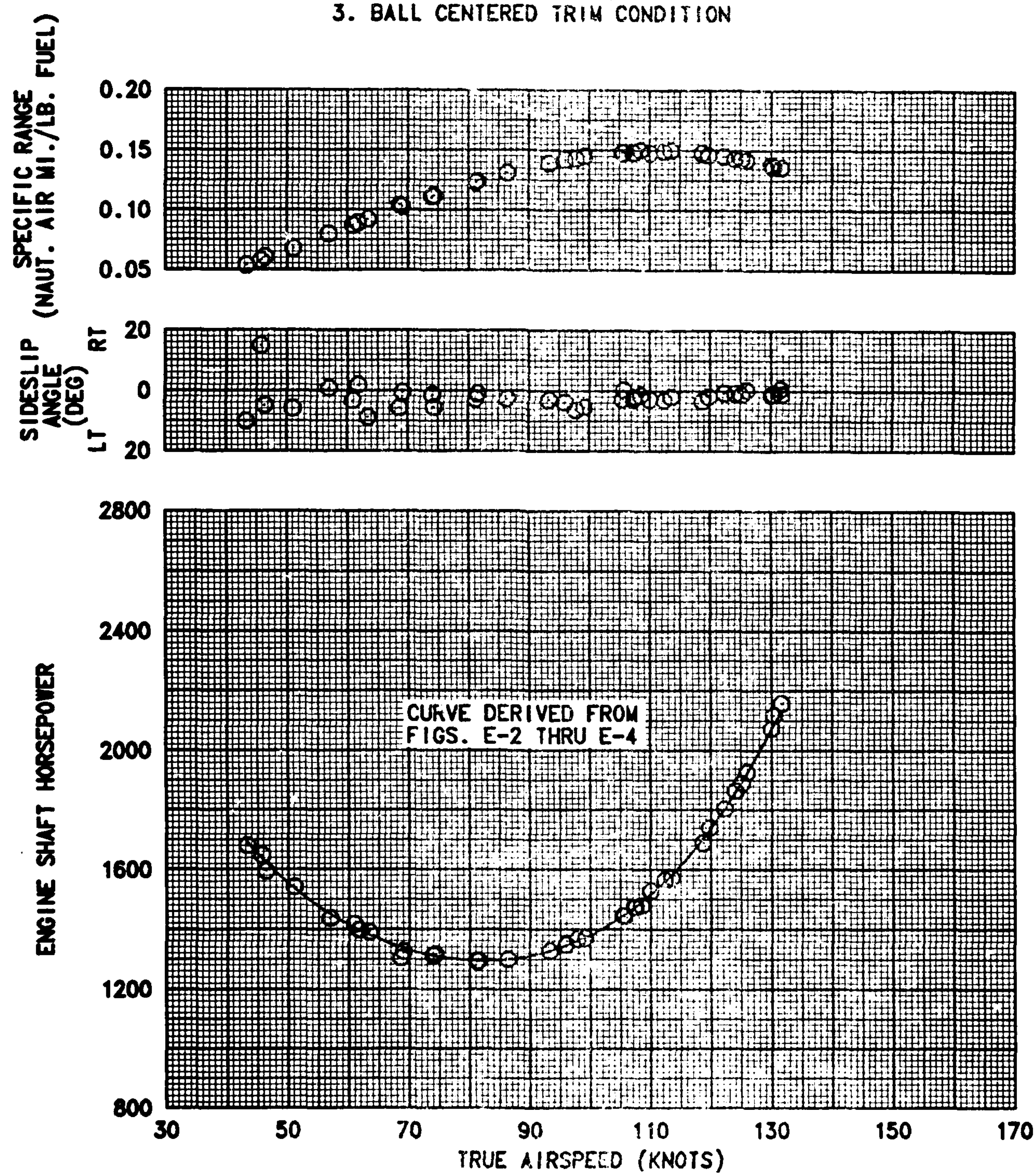


FIGURE E-14
LEVEL FLIGHT PERFORMANCE
EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
14570	362.1	0.0	9720	-3.0	264.9	0.007002

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

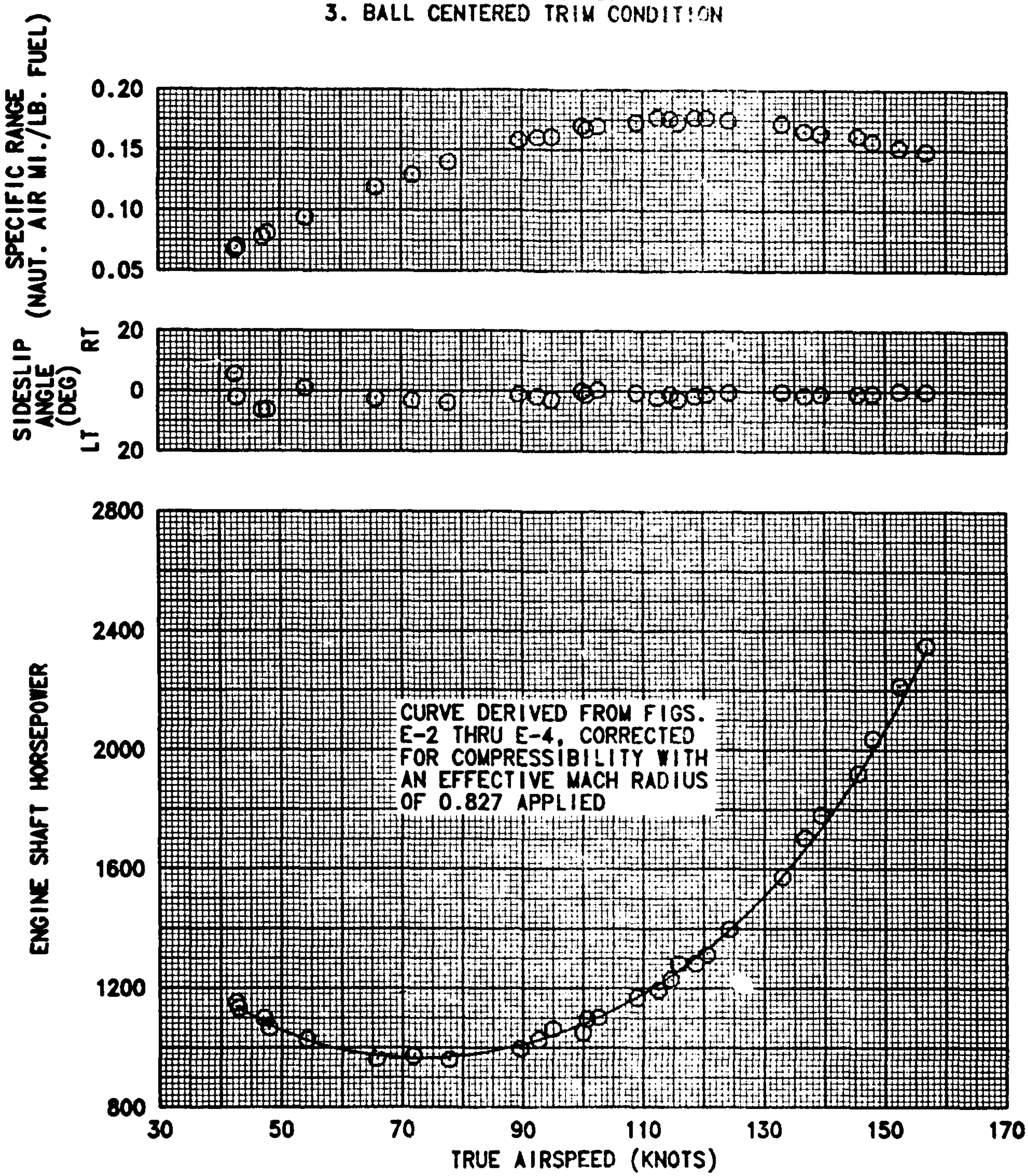


FIGURE E-15

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
17080	362.1	0.0	8690	-5.0	265.0	0.008002

NOTES:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

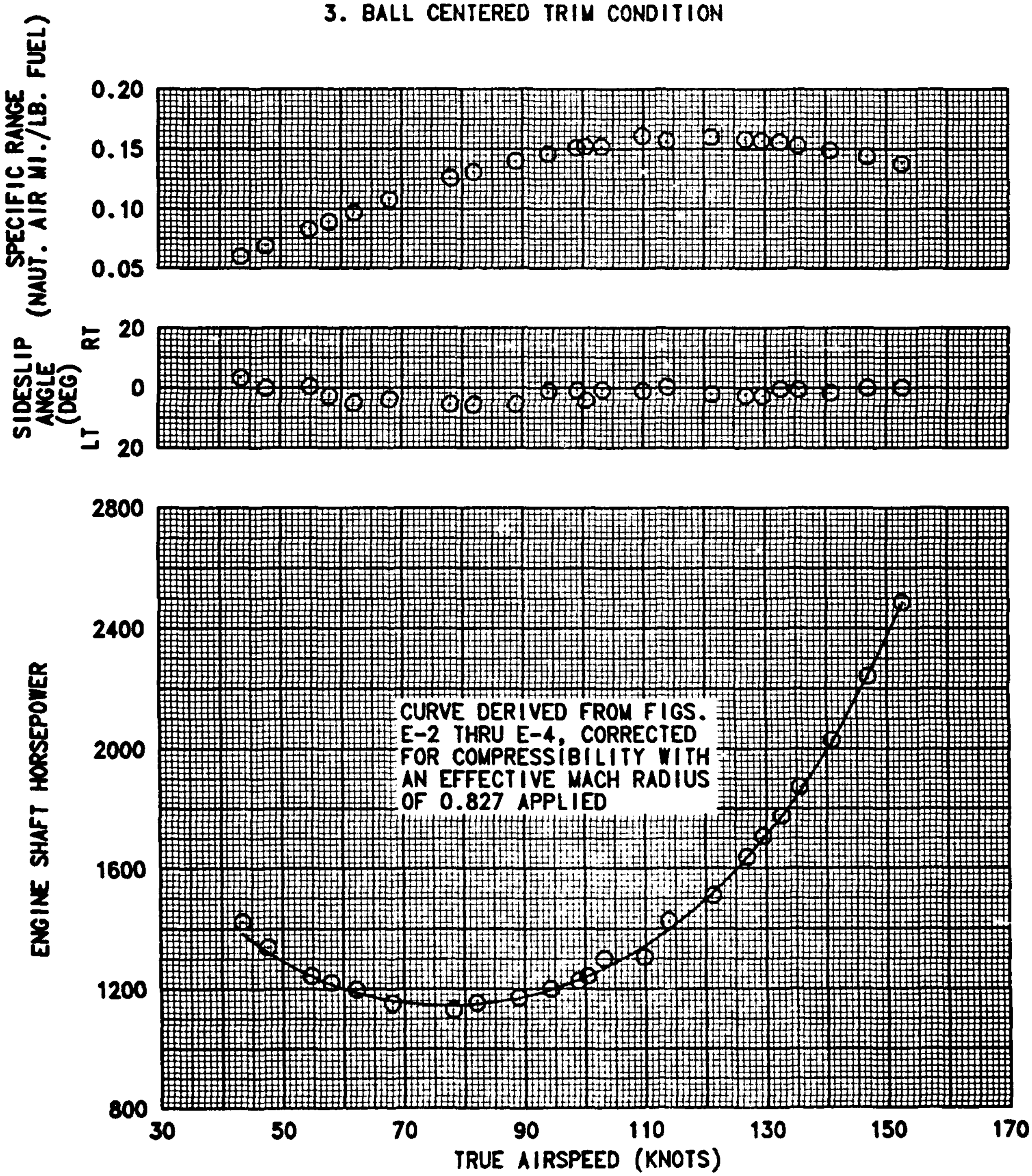


FIGURE E-16

LEVEL FLIGHT PERFORMANCE

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG REFERRED ROTOR SPEED (RPM)	AVG COEFFICIENT OF THRUST
18040	361.2	0.0	11450	1.5	264.9	0.009006

NOTES: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL CENTERED TRIM CONDITION

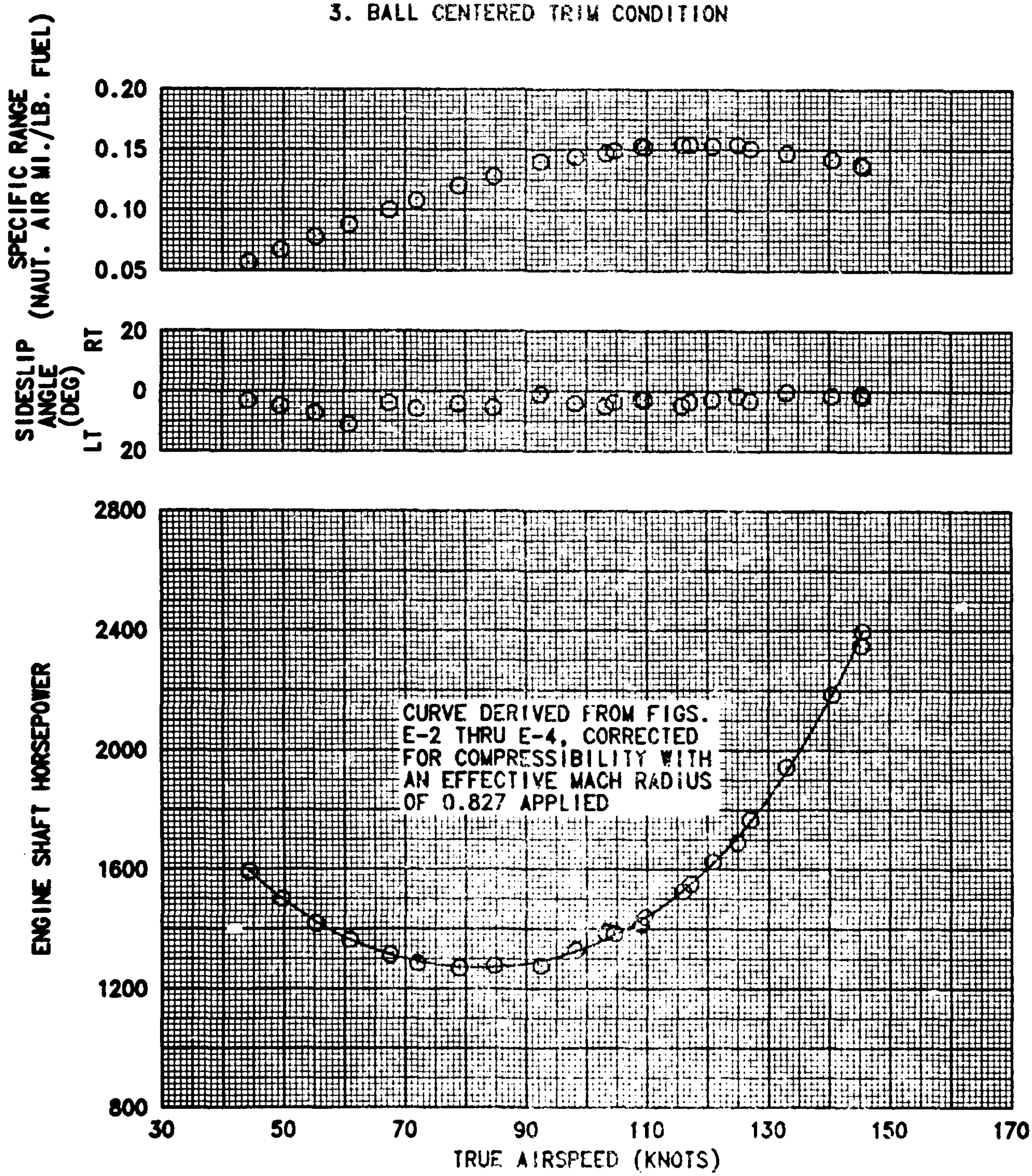


FIGURE E-17

MAXIMUM ENDURANCE SUMMARY

EH-60A USA S/N 86-24569
ROTOR SPEED = 258 RPM
CG LOCATION = 361.2 FS
STANDARD DAY CONDITIONS
QUICK FIX CONFIGURATION

NOTES:
1. DATA BASED ON FIGS. E-2 THRU E-4.
2. DASHED LINES DENOTE EXTRAPOLATED DATA.
3. FUEL FLOW DATA BASED ON INSTALLED TEST ENGINES (FIGS. E-21 THRU E-24).
4. COMPRESSIBILITY CORRECTION WITH AN EFFECTIVE MACH RADIUS OF 0.827 APPLIED TO REFERRED ROTOR SPEEDS OF 262.6 RPM (5000 FT) AND 267.4 RPM (10000 FT).

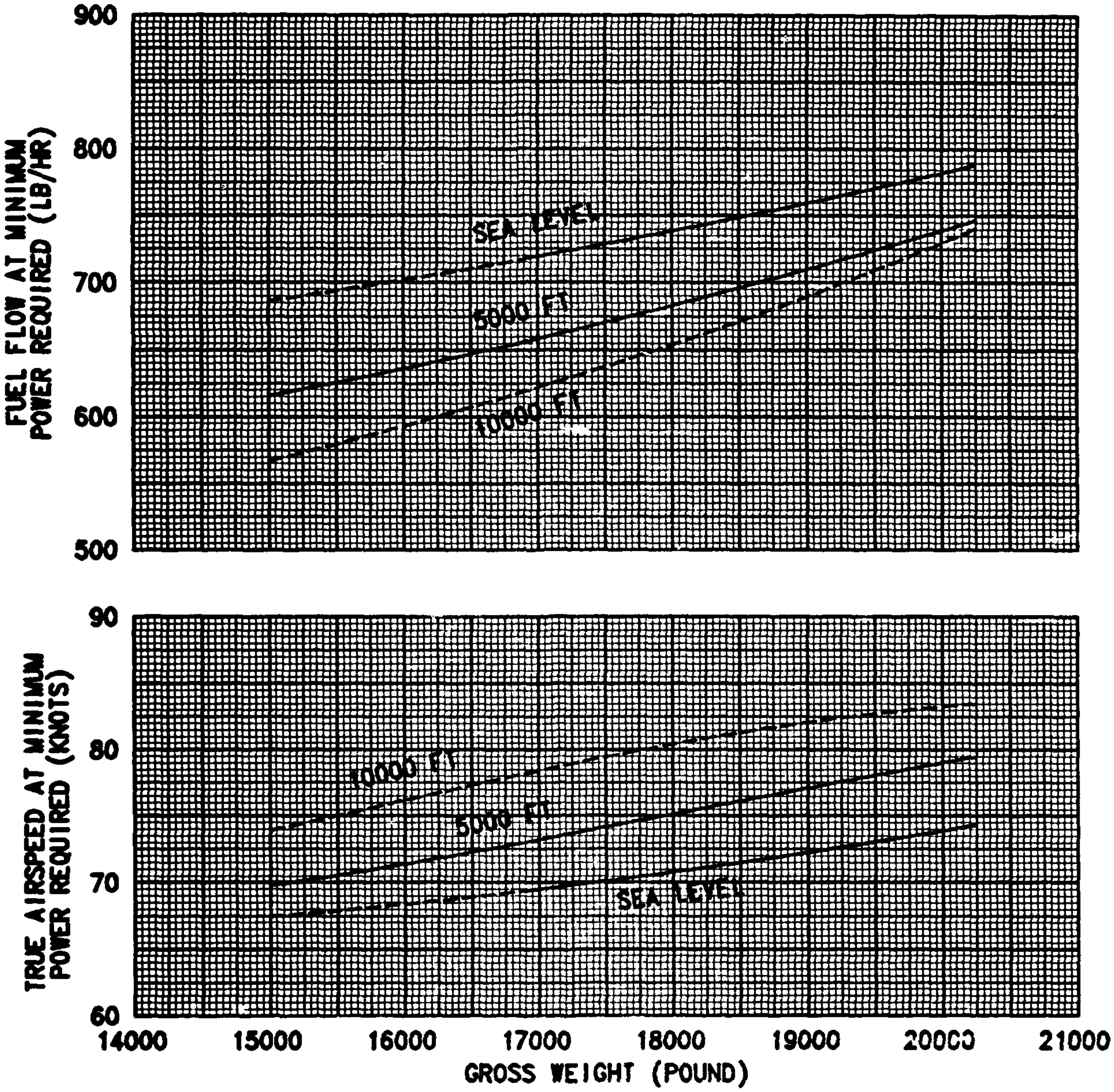


FIGURE E-16
NONDIMENSIONAL MAXIMUM ENDURANCE SUMMARY
EH-60A USA S/N 86-24569

$N/\sqrt{\theta}$ = 258.0 RPM
CG LOCATION = 361.2 FS
QUICK FIX CONFIGURATION
ECM ANTENNA EXTENDED

NOTE: DATA DERIVED FROM FIGS. E-2 THRU E-4

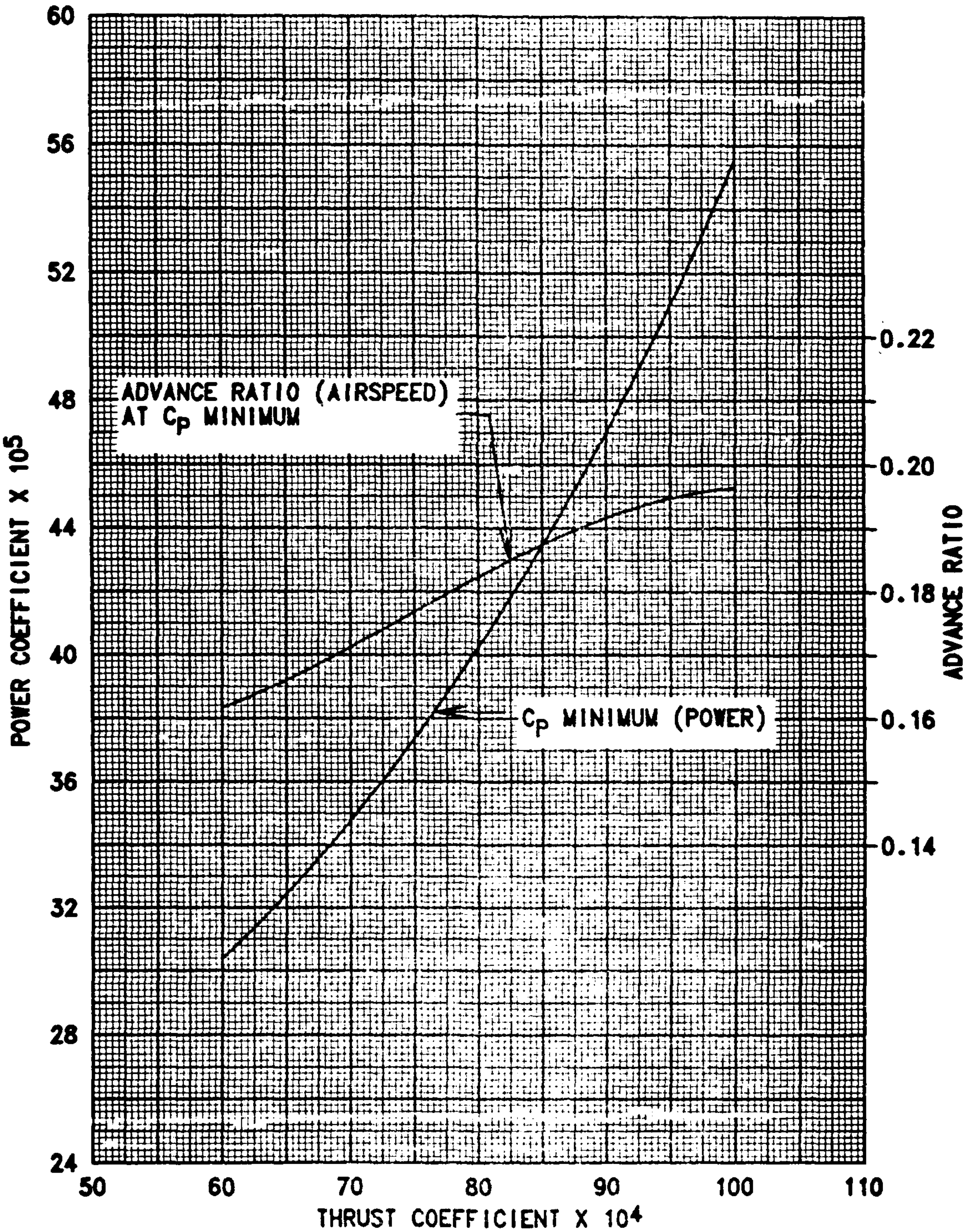


FIGURE E-19
ENGINE CHARACTERISTICS
EH-60A USA S/N 86-24569
S/N GE-E-207861

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
◇	12170	-2.0	250
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
★	8120	3.0	253
♤	9570	1.5	259
♡	9610	-6.0	255
♧	8960	-5.0	256
▲	4350	14.5	258
⊡	10610	1.5	259
♗	9050	3.0	253

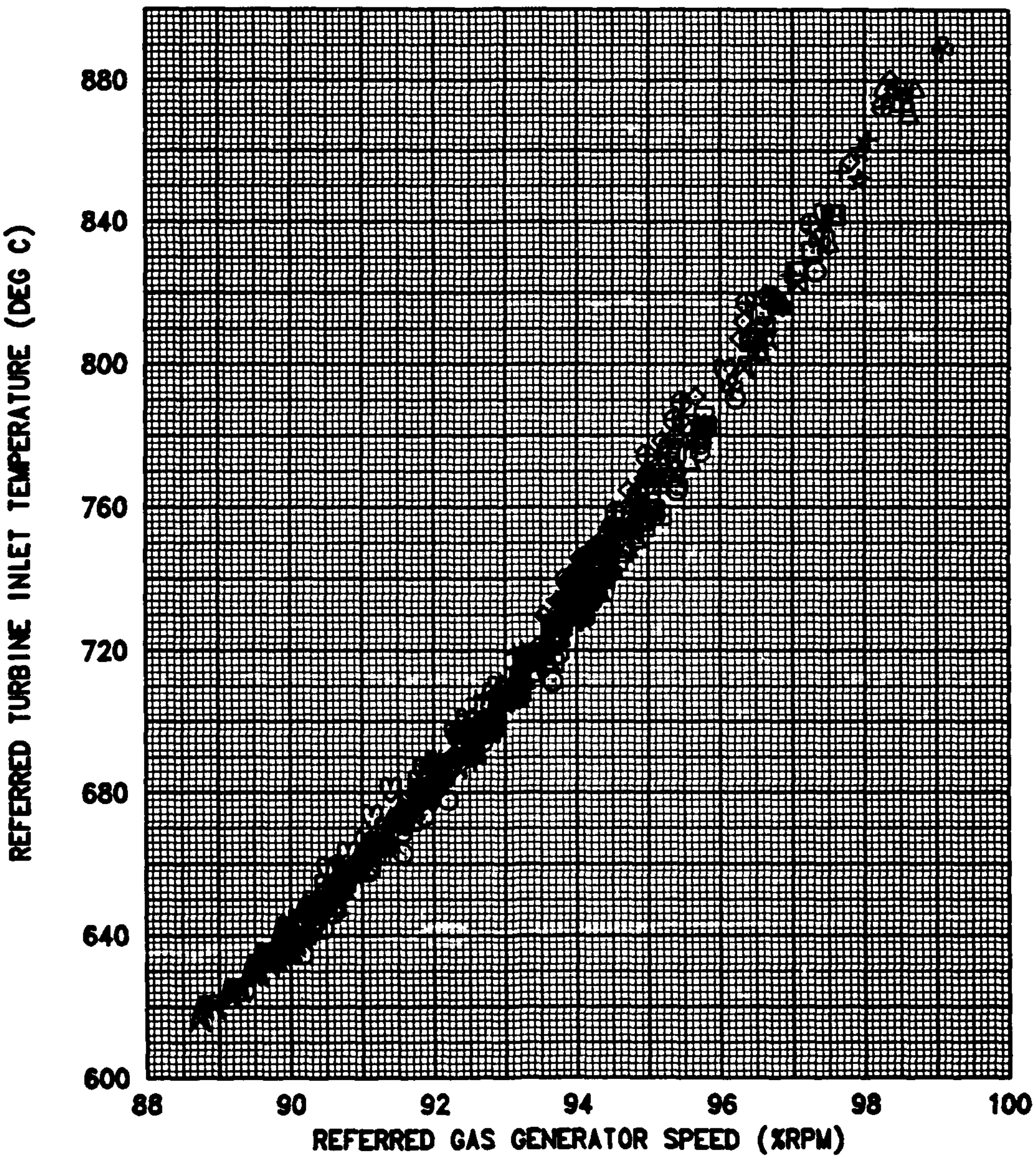


FIGURE E-20

ENGINE CHARACTERISTICS

EH-60A USA S/N 86-24569
S/N GE-E-207888

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
◇	12170	-2.0	250
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
☆	8120	3.0	253
♤	9570	1.5	259
♡	9610	-6.0	255
♧	8960	-5.0	256
⍋	4350	14.5	258
⊡	10610	1.5	259
⍝	9050	3.0	253

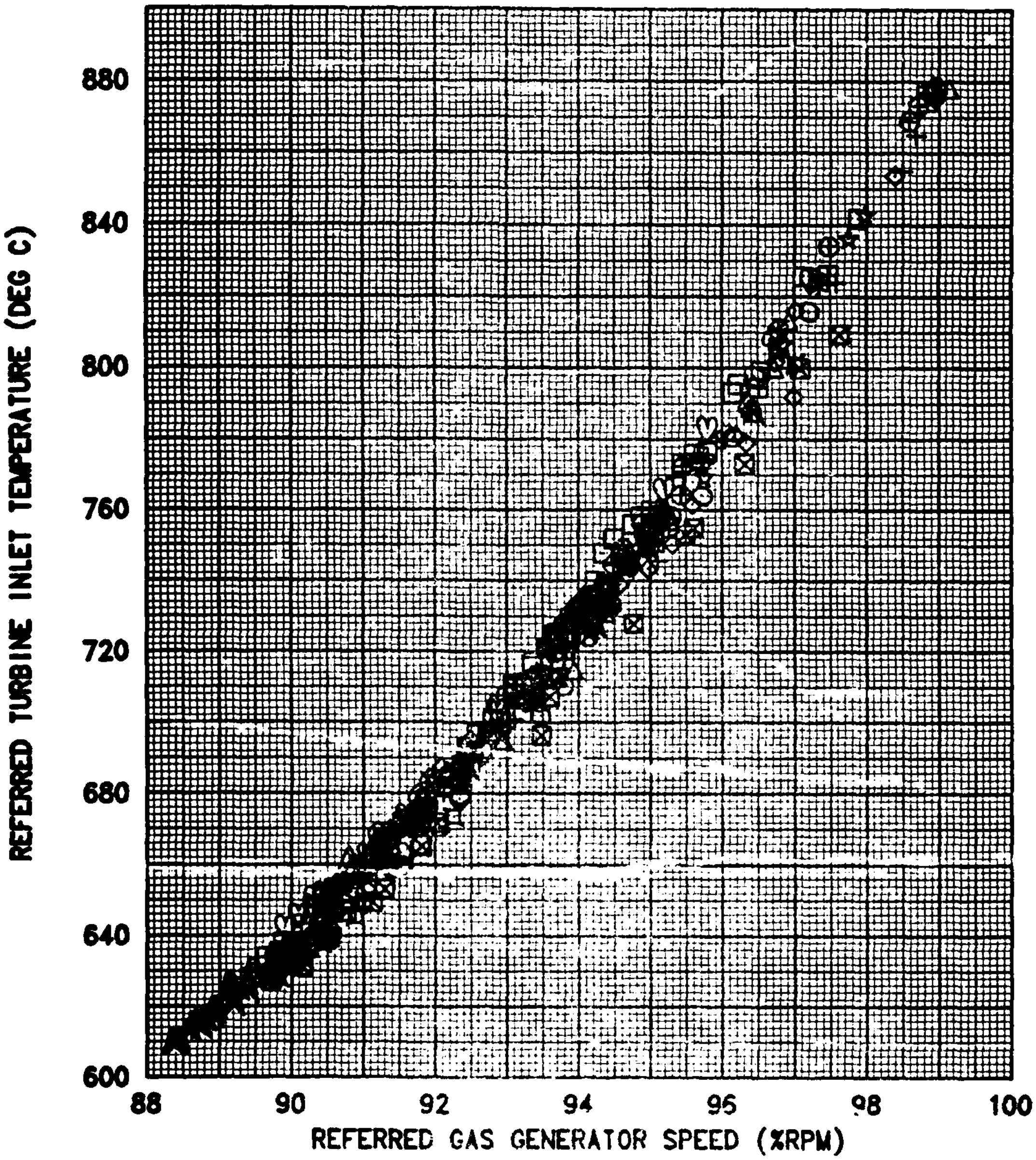


FIGURE E-21
ENGINE CHARACTERISTICS
EH-60A USA S/N 86-24569
S/N GE-E-207861

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
◇	12170	-2.0	250
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
☆	8120	3.0	253
♤	9570	1.5	259
♡	9610	-6.0	255
♧	8960	-5.0	256
⍋	4350	14.5	258
⊡	10610	1.5	259
⍙	9050	3.0	253

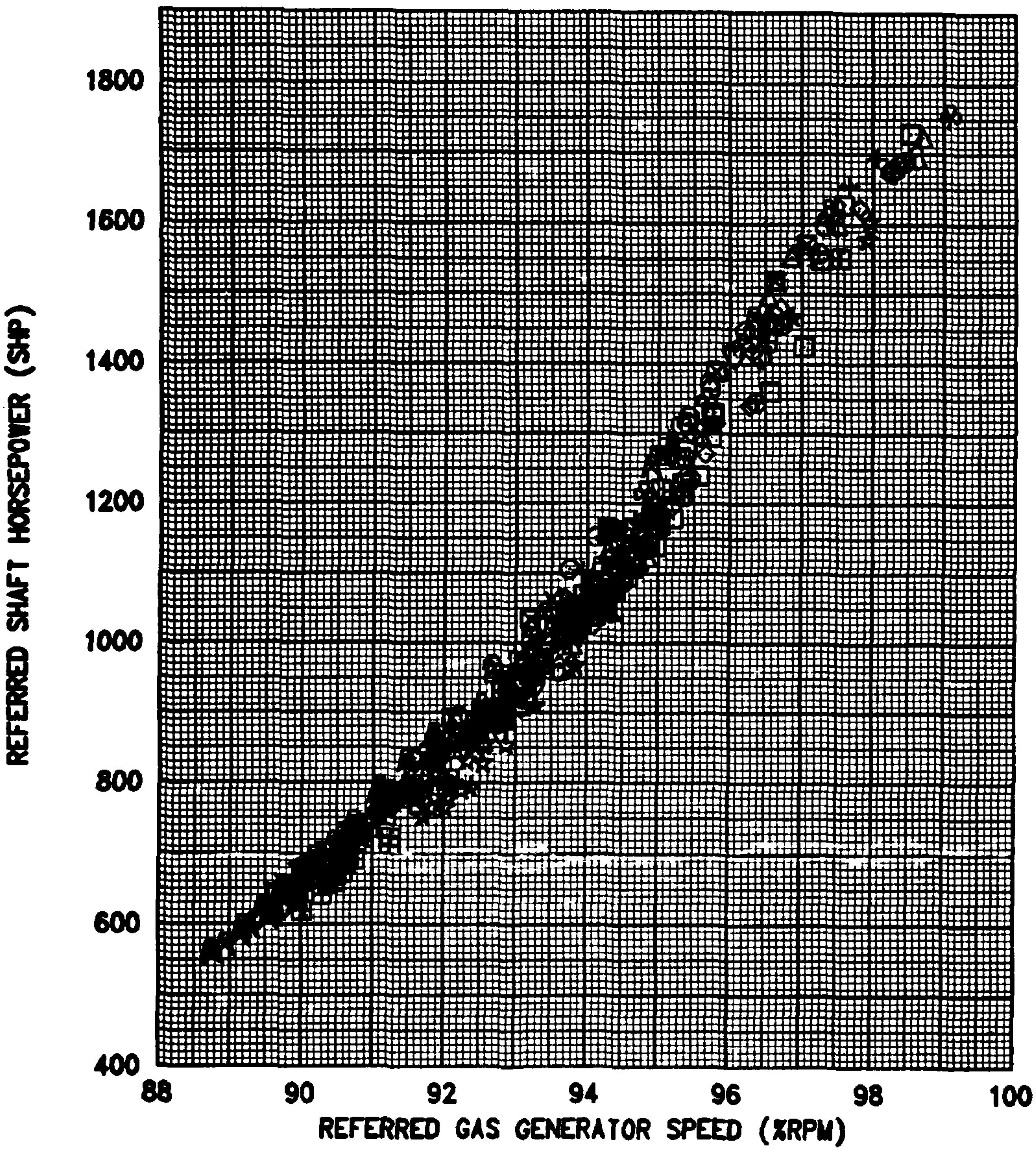


FIGURE E-22

ENGINE CHARACTERISTICS

EH-60A USA S/N 86-24569
S/N GE-E-207888

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
◇	12170	-2.0	250
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
☆	8120	3.0	253
♤	9570	1.5	259
♡	9610	-6.0	255
♧	8960	-5.0	256
▲	4350	14.5	258
⊡	10610	1.5	259
♙	9050	3.0	253

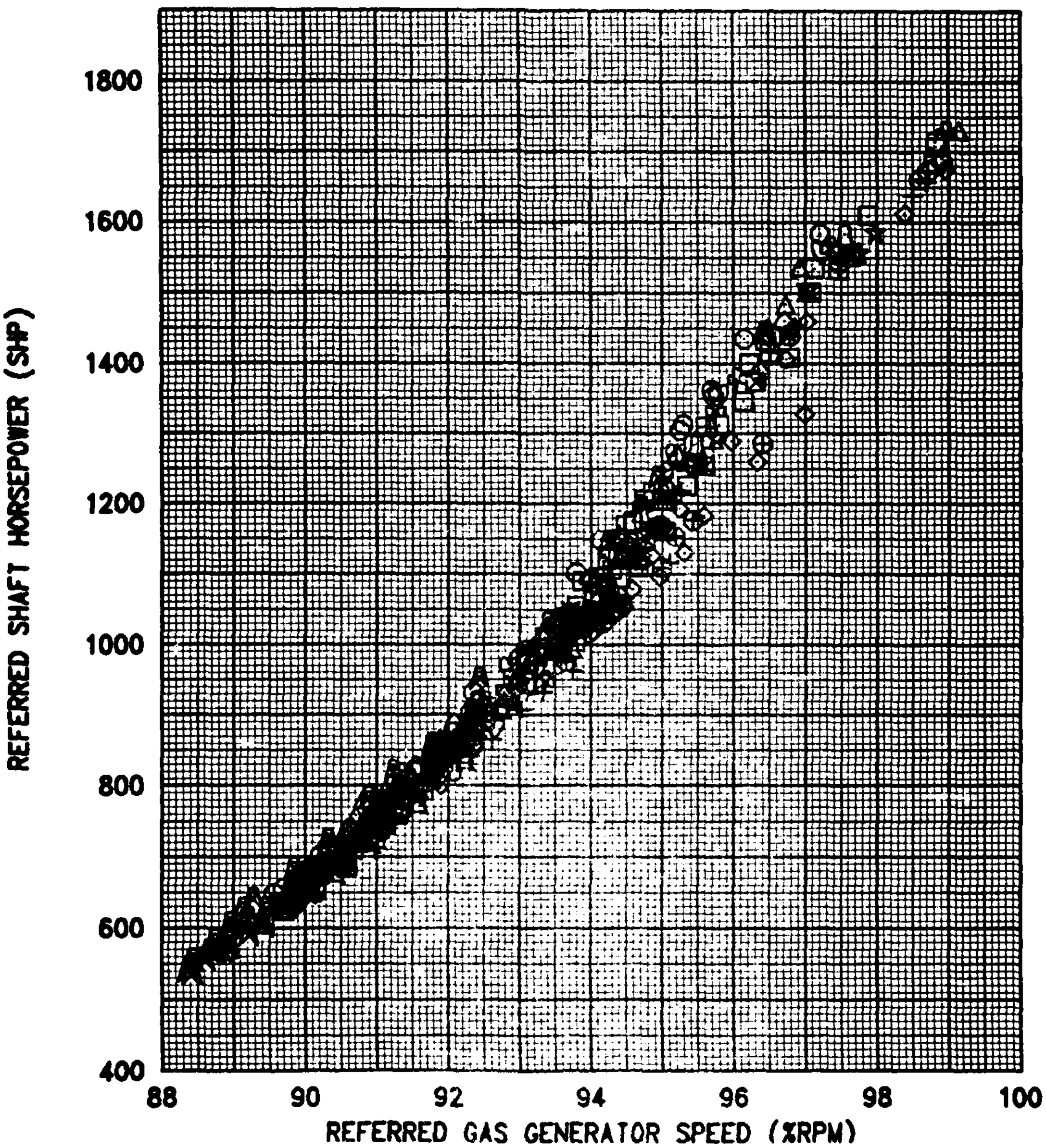


FIGURE E-23

ENGINE CHARACTERISTICS

EH-60A USA S/N 86-24569
S/N GE-E-207861

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
◇	12170	-2.0	250
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
★	8120	3.0	253
♤	9570	1.5	259
♡	9610	-6.0	255
♧	8960	-5.0	256
▲	4350	14.5	258
⊡	10610	1.5	259
♙	9050	3.0	253

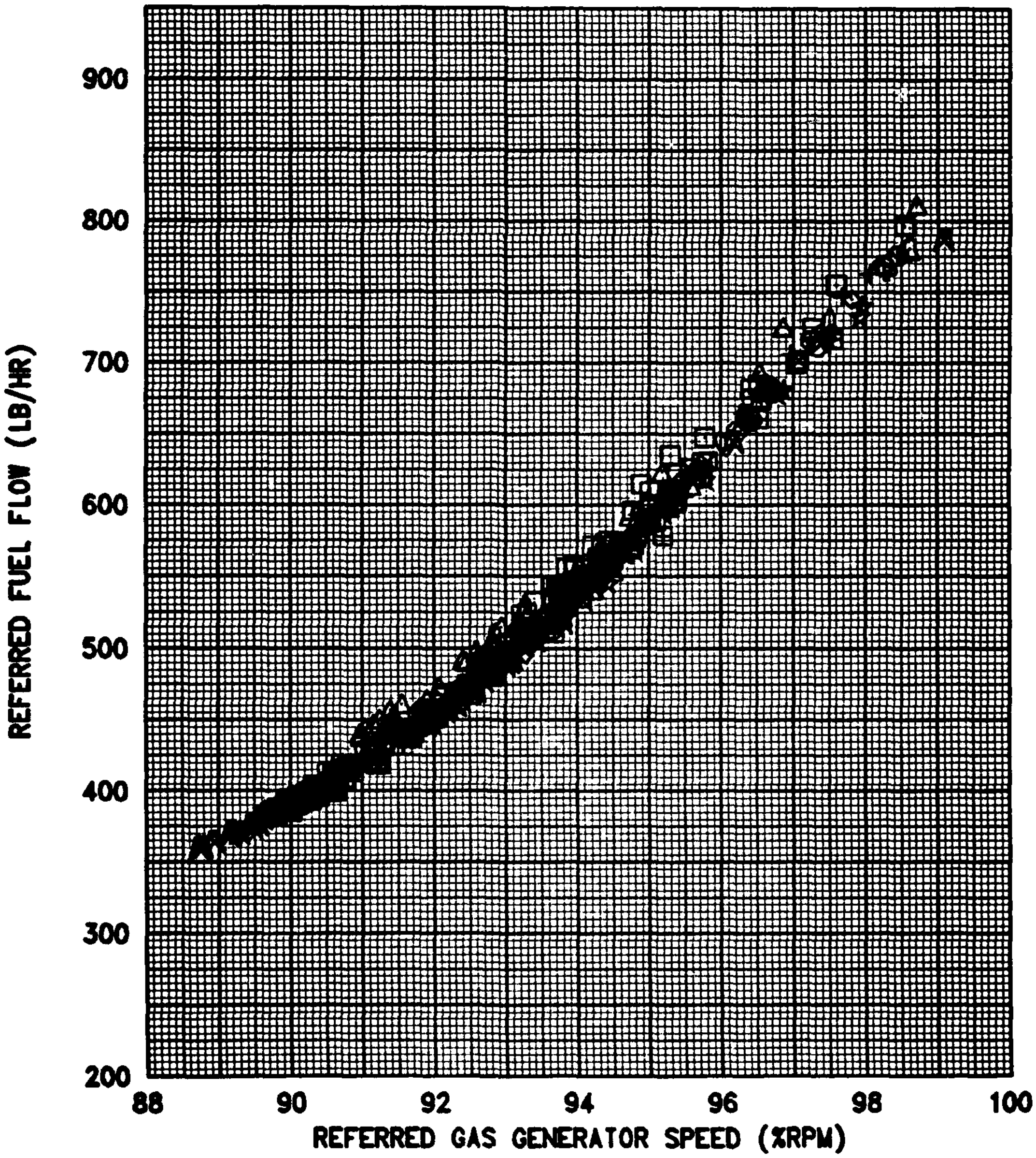


FIGURE E-24

ENGINE CHARACTERISTICS

EH-60A USA S/N 86-24569
S/N GE-E-207888

SYMBOL	AVG PRESSURE ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)
⊙	11690	-2.0	250
△	7620	0.5	251
+	9540	3.0	253
⊠	4010	4.0	253
⌑	3890	7.5	255
⊕	12170	2.0	252
⊞	4360	6.5	254
☆	8120	3.0	253
◇	9570	1.5	259
▽	9610	-6.0	255
♣	8960	-5.0	256
A	4350	14.5	258
⊡	10610	1.5	259
△	9050	3.0	253

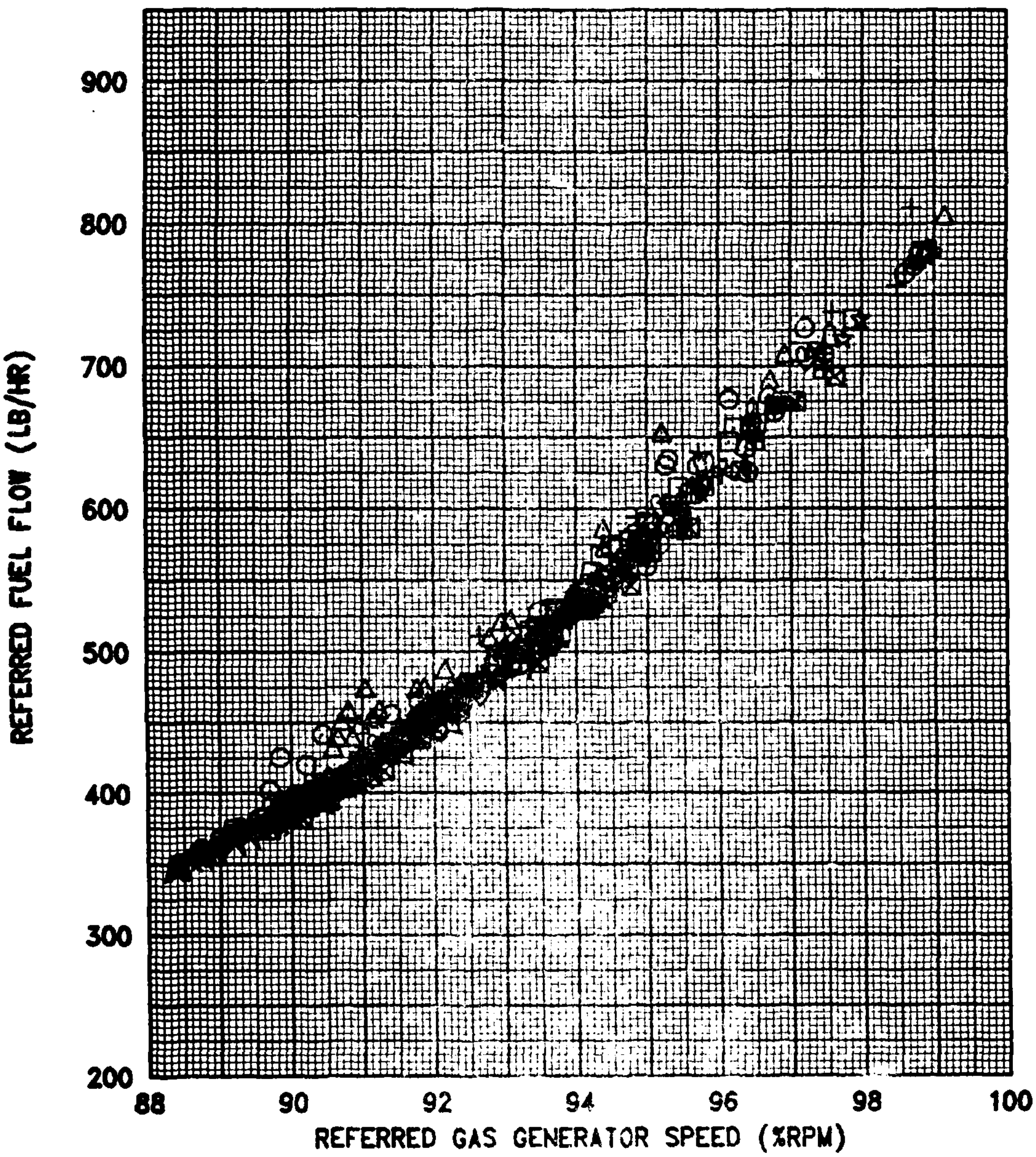


FIGURE E-25

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
14460	361.5	0.0	5280	14.5	258	.005999	QUICK FIX

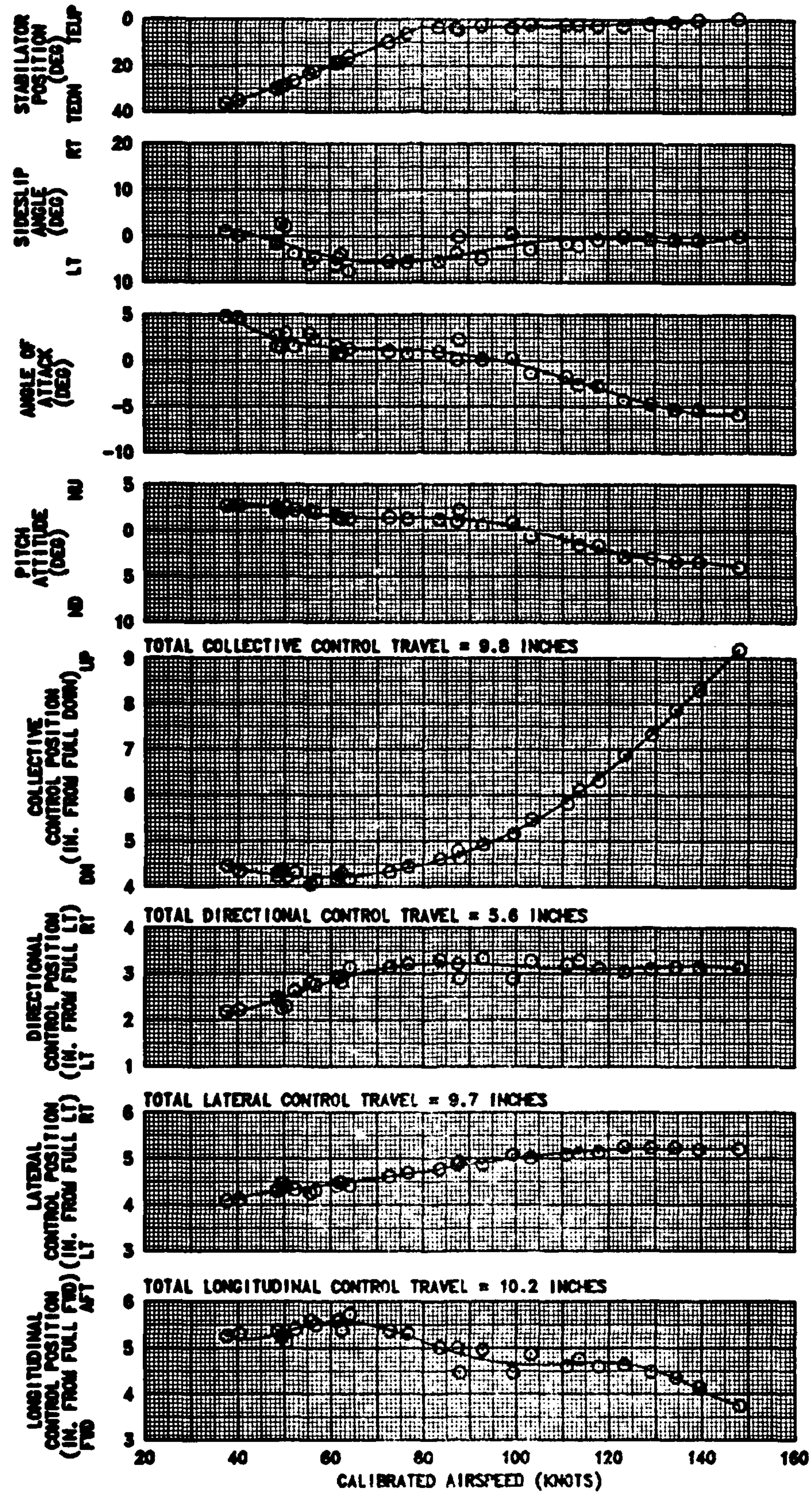


FIGURE E-28

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
16830	360.8	0.0	4400	8.5	254	.007010	QUICK FIX

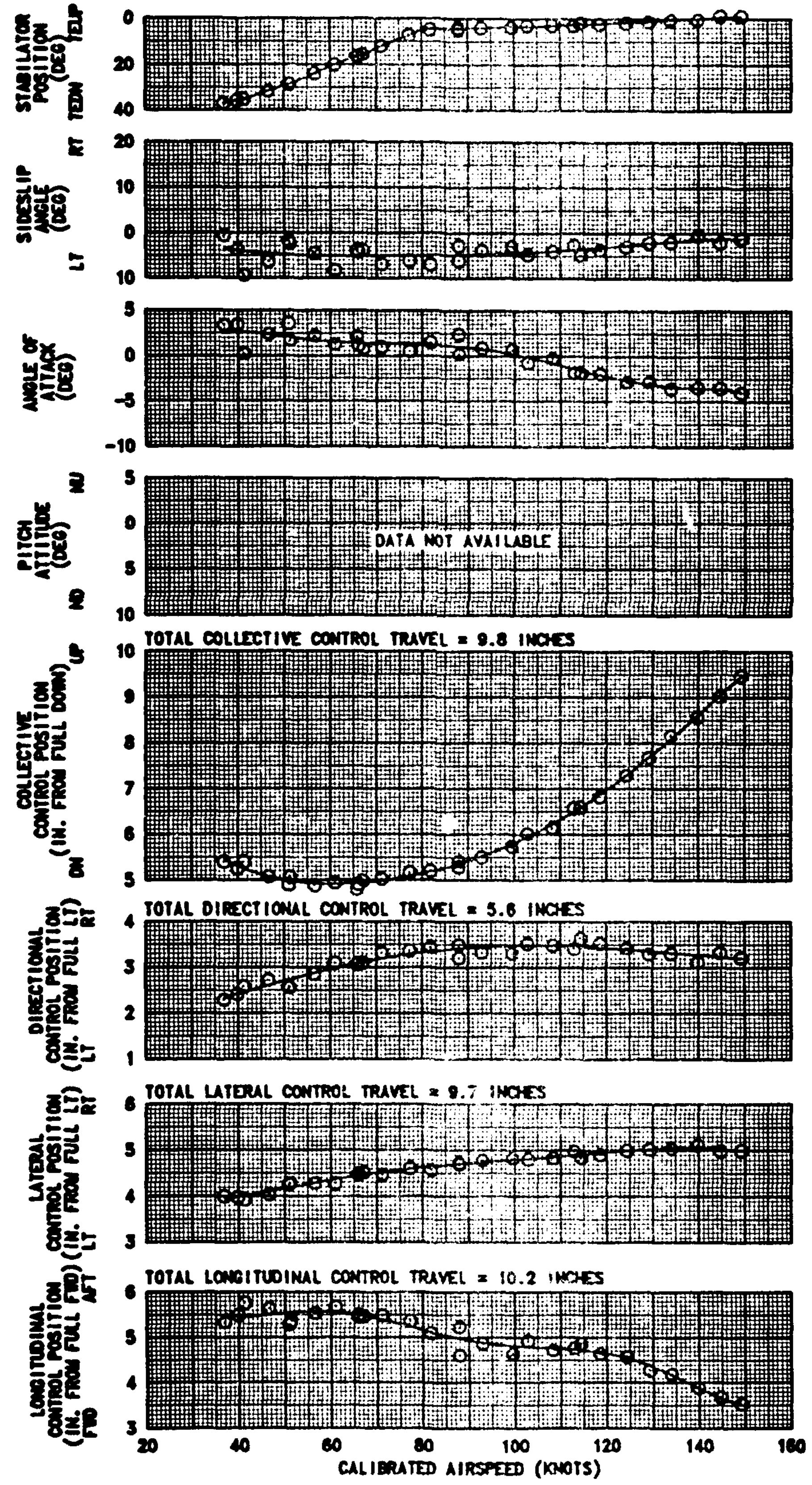


FIGURE E-27

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
16730	360.9	0.0	8620	3.5	253	.007997	QUICK FIX

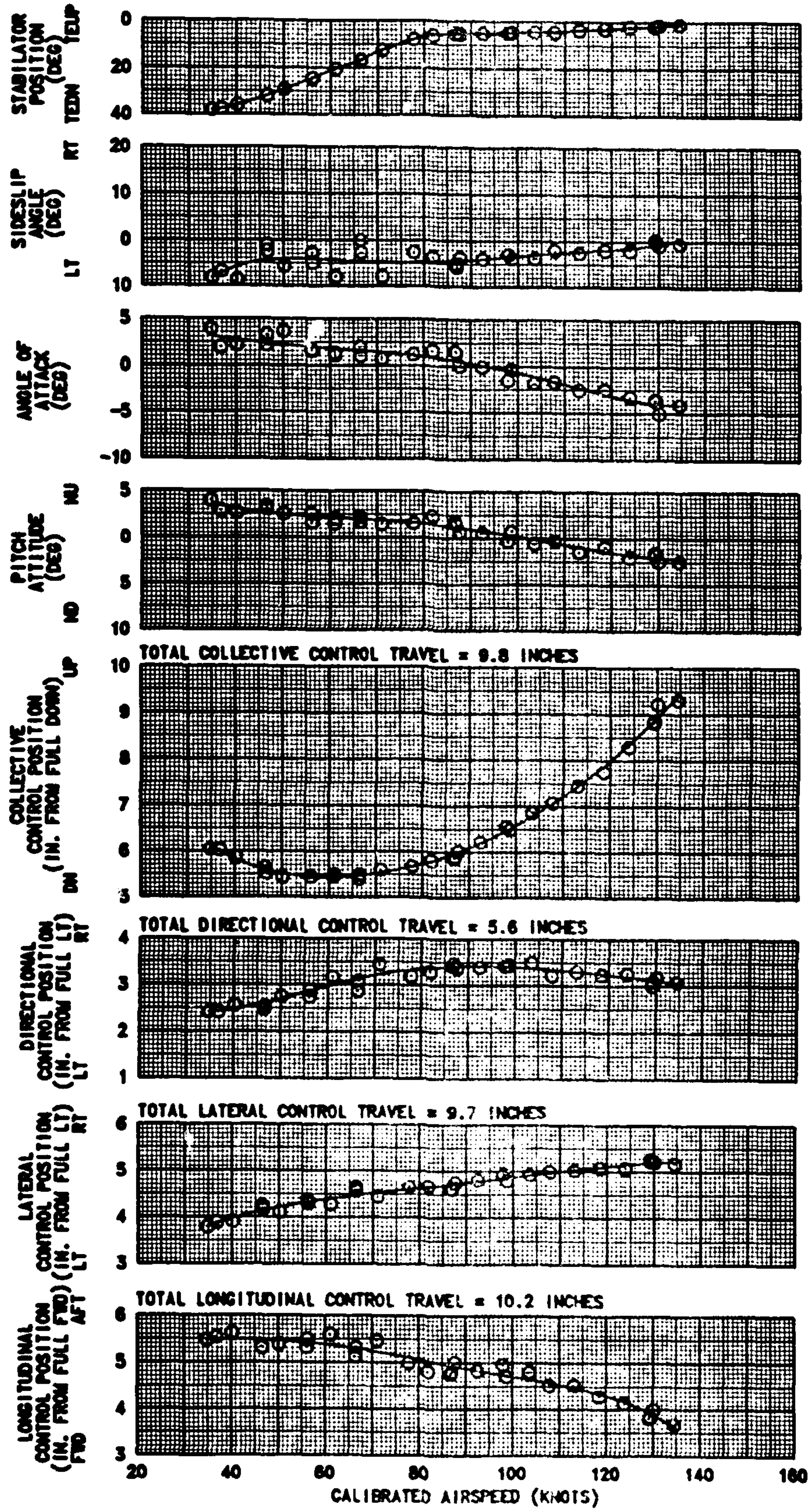


FIGURE E-28

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
18150	361.6	0.0	9740	3.0	255	.005994	QUICK FIX

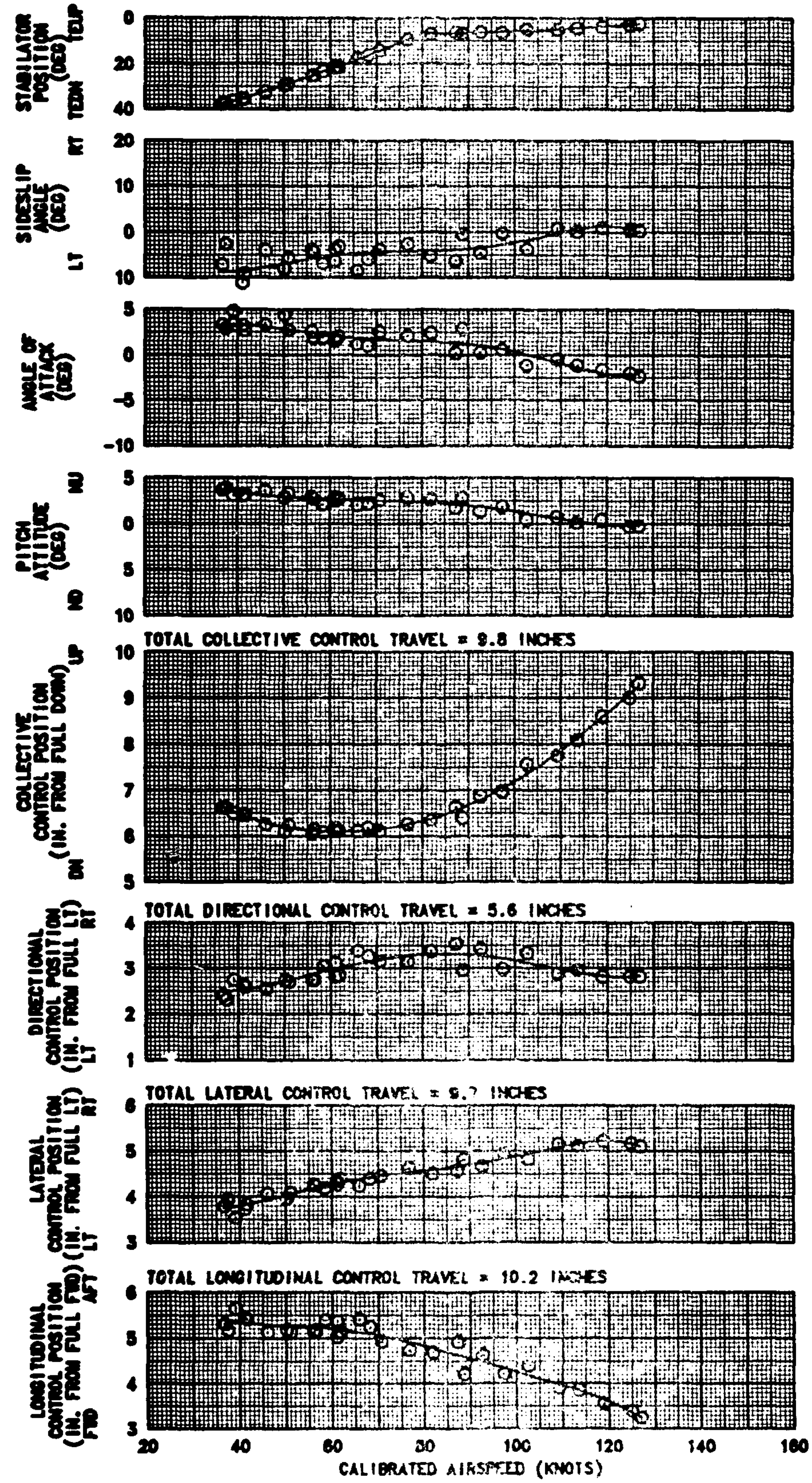


FIGURE E-29

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
18160	361.9	0.0	12690	0.0	250	.009998	QUICK FIX

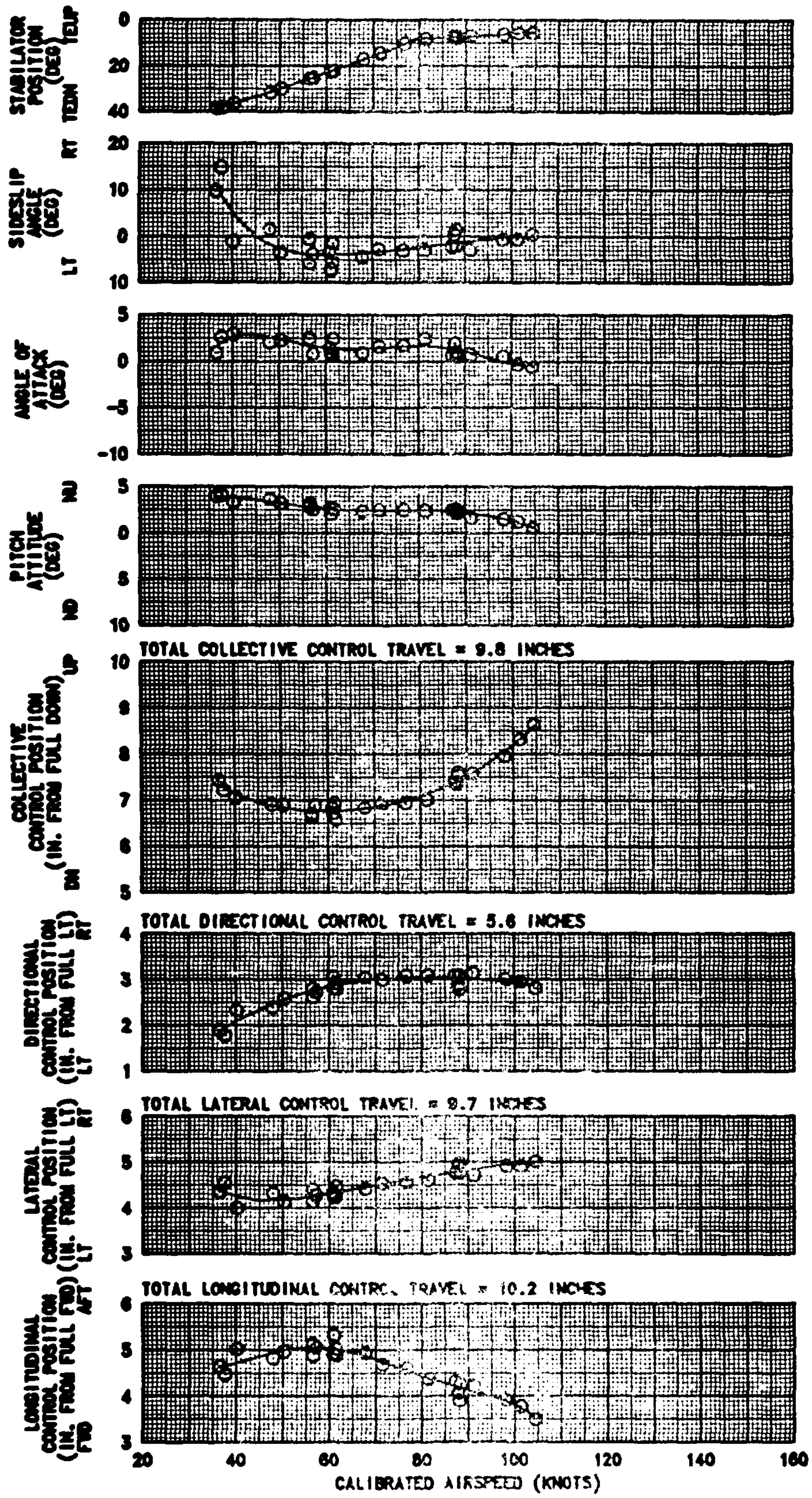


FIGURE E-30

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 83-24589

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
14570	362.1	0.0	9720	-3.0	257	.007002	QUICK FIX

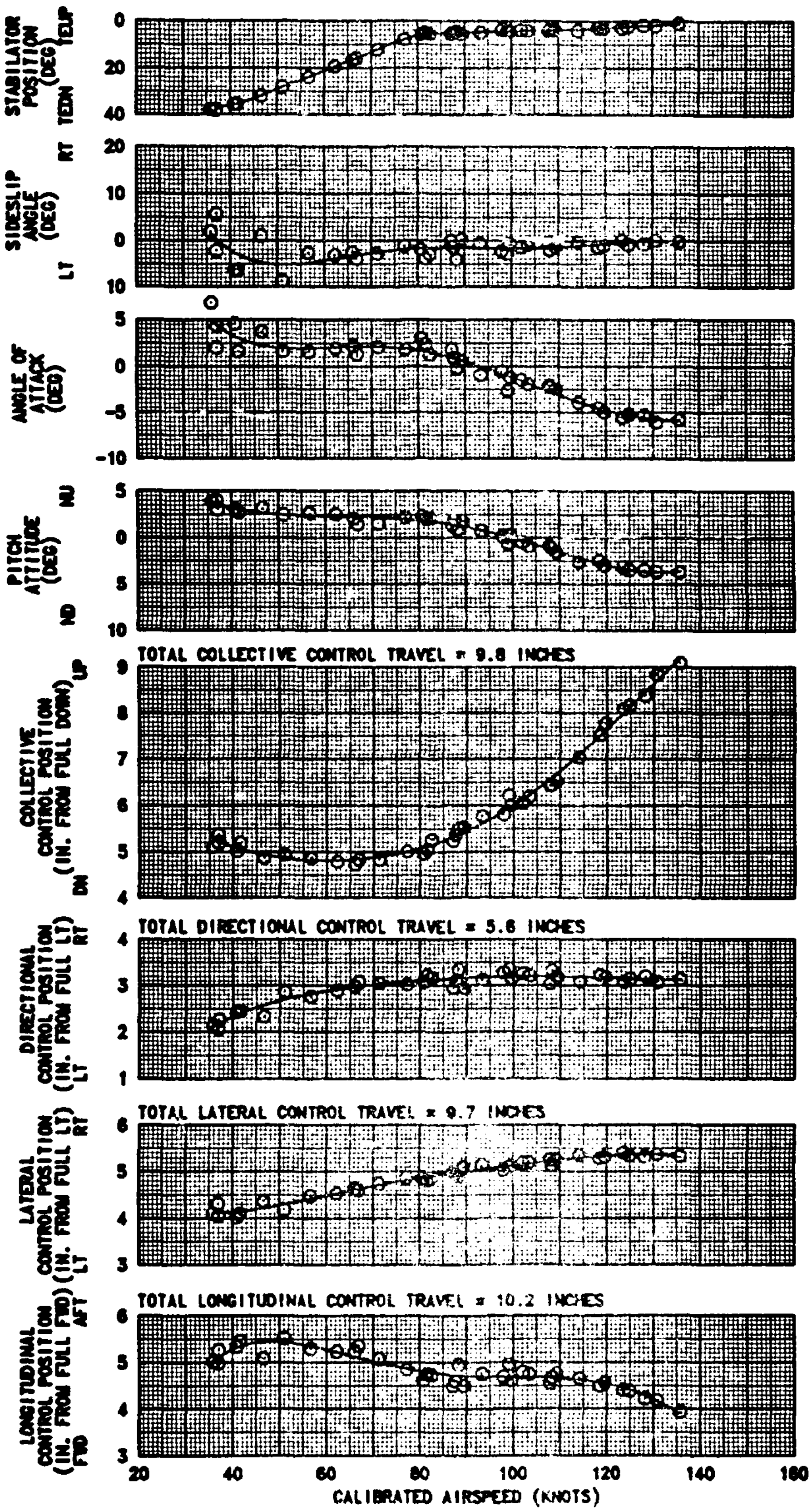


FIGURE E-31

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
17080	362.1	0.0	8690	-5.0	256	.008002	QUICK FIX

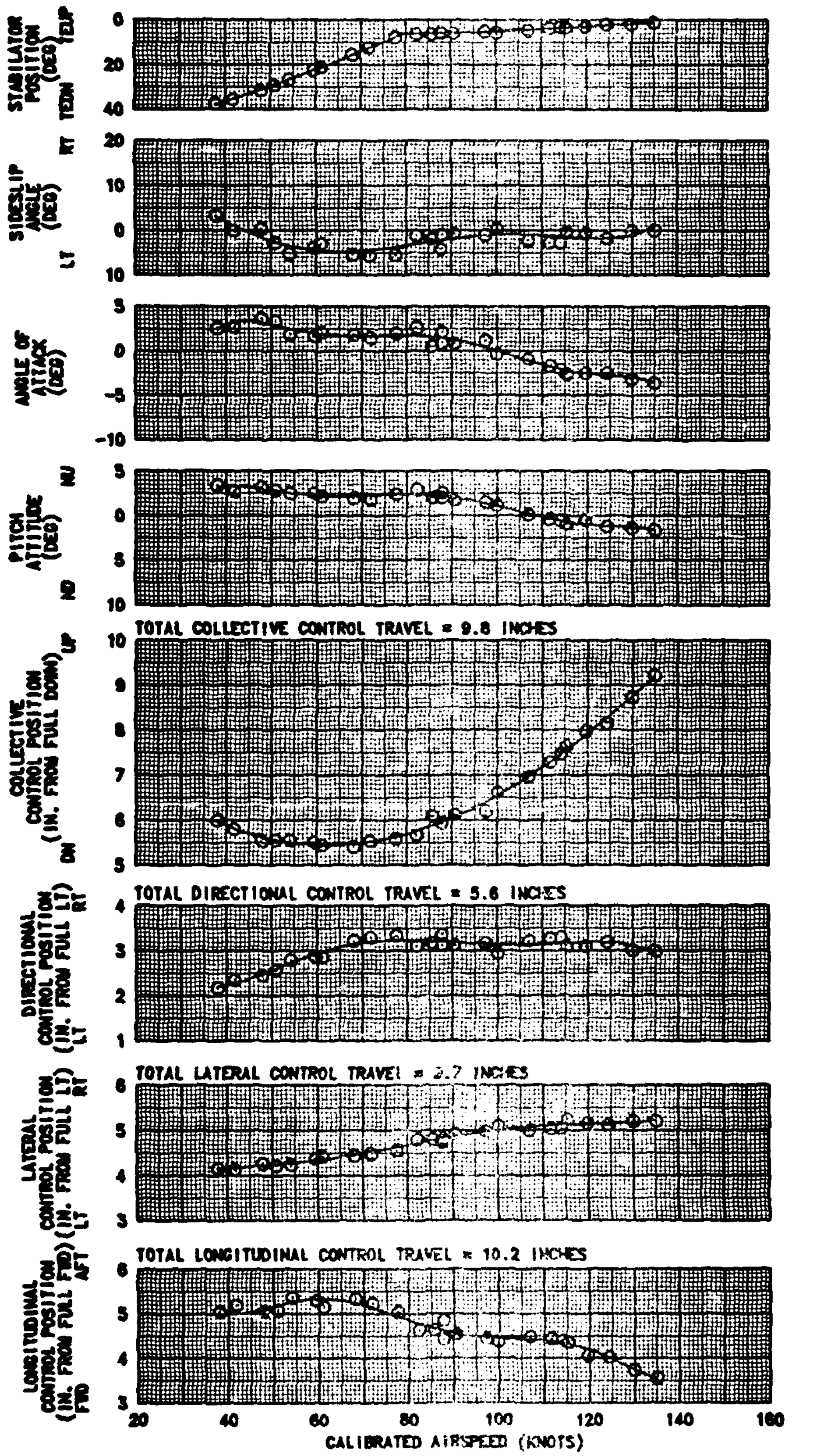


FIGURE E-32

CONTROL POSITIONS IN TRIMMED FORWARD FLIGHT

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFF.	AIRCRAFT CONFIGURATION
18040	361.2	0.0	11450	1.5	259	.009006	QUICK FIX

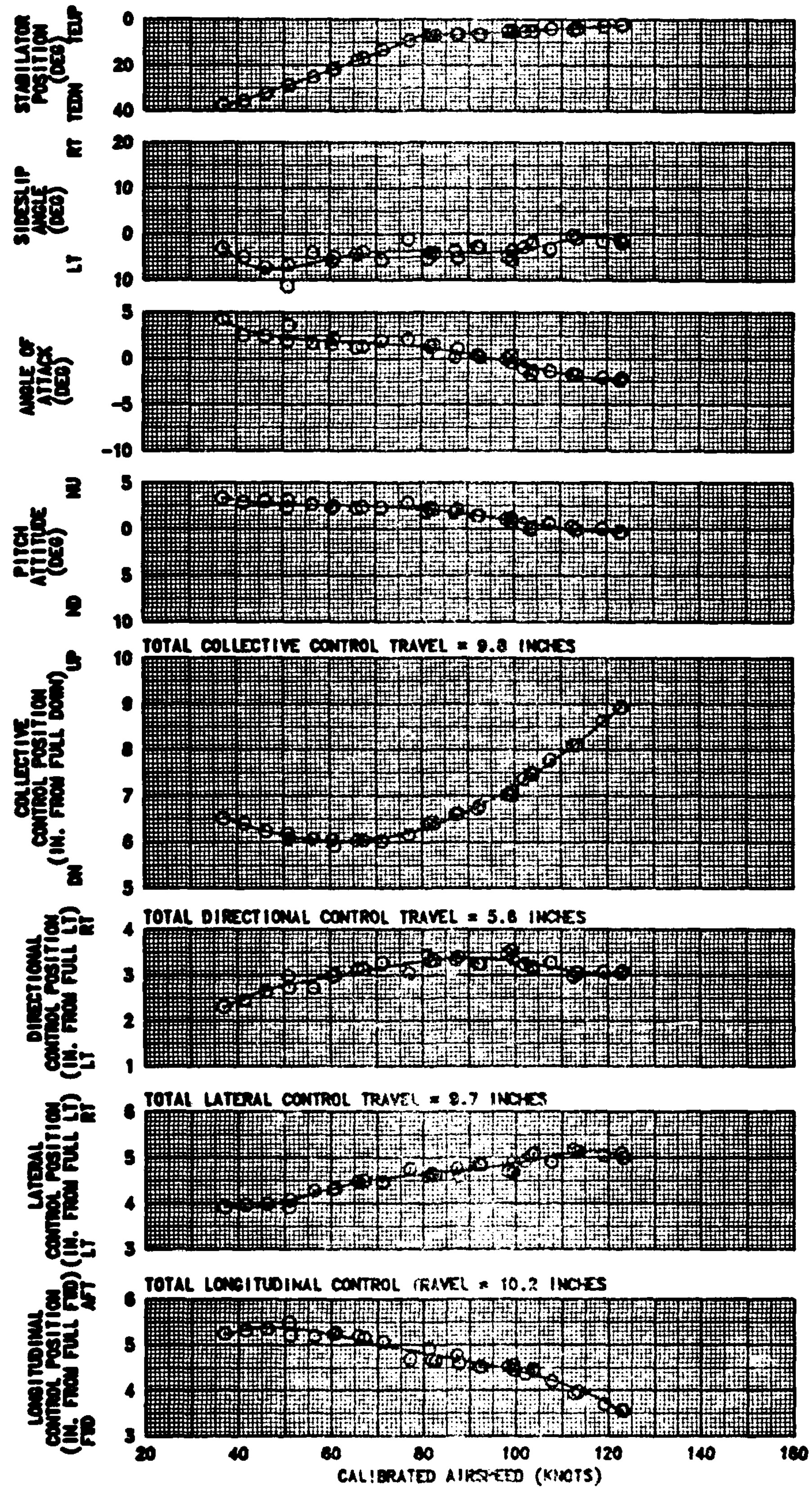


FIGURE E-33

COLLECTIVE-FIXED STATIC LONGITUDINAL STABILITY

EH-60A USA S/N 86-24569

SYMBOL	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)
⊡	17250	362.5	0.0	6500	19.0	258	72
⊙	16890	361.2	0.0	6700	19.5	258	114

NOTE:
1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL-CENTERED TRIM CONDITION
4. SHADED SYMBOLS DENOTE TRIM POINTS

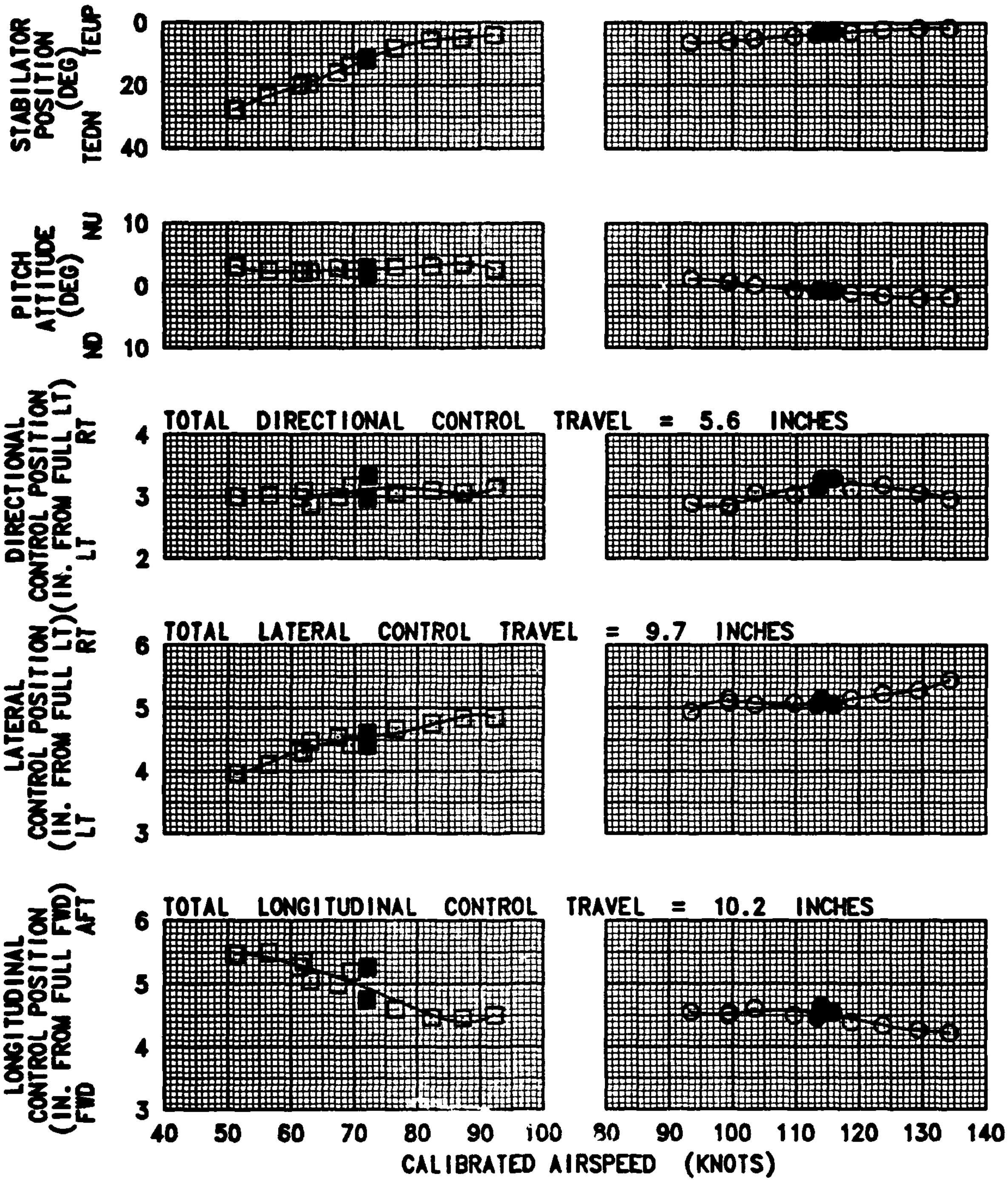


FIGURE E-34

STATIC LATERAL-DIRECTIONAL STABILITY

EH-60A USA S/N 86-24569

SYMBOL	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)
□	16430	359.6	0.0	6640	18.0	258	72
⊙	16650	360.4	0.0	6600	20.0	258	114

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. BALL-CENTERED TRIM CONDITION
4. SHADED SYMBOLS DENOTE TRIM POINTS

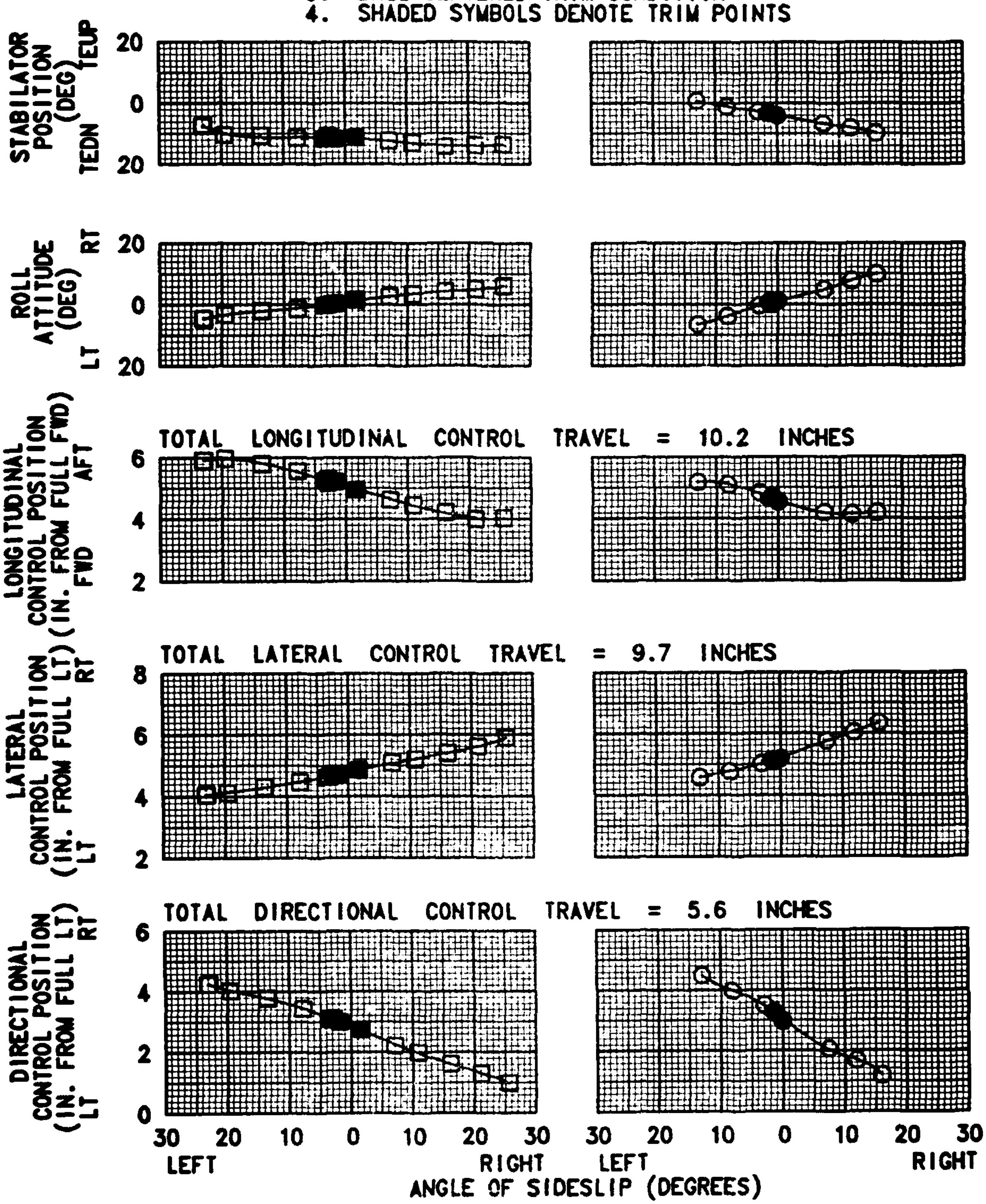


FIGURE E-35
MANEUVERING STABILITY
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	FLIGHT CONDITION	SAS CONDITION
⊡	17160	362.3	0.0	7500	18.0	258	71	RIGHT TURN	ON
⊙	16890	361.4	0.0	7370	18.0	258	71	LEFT TURN	ON

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. TRIM POINT IN LEVEL FLIGHT
4. SHADED SYMBOLS DENOTE TRIM POINT

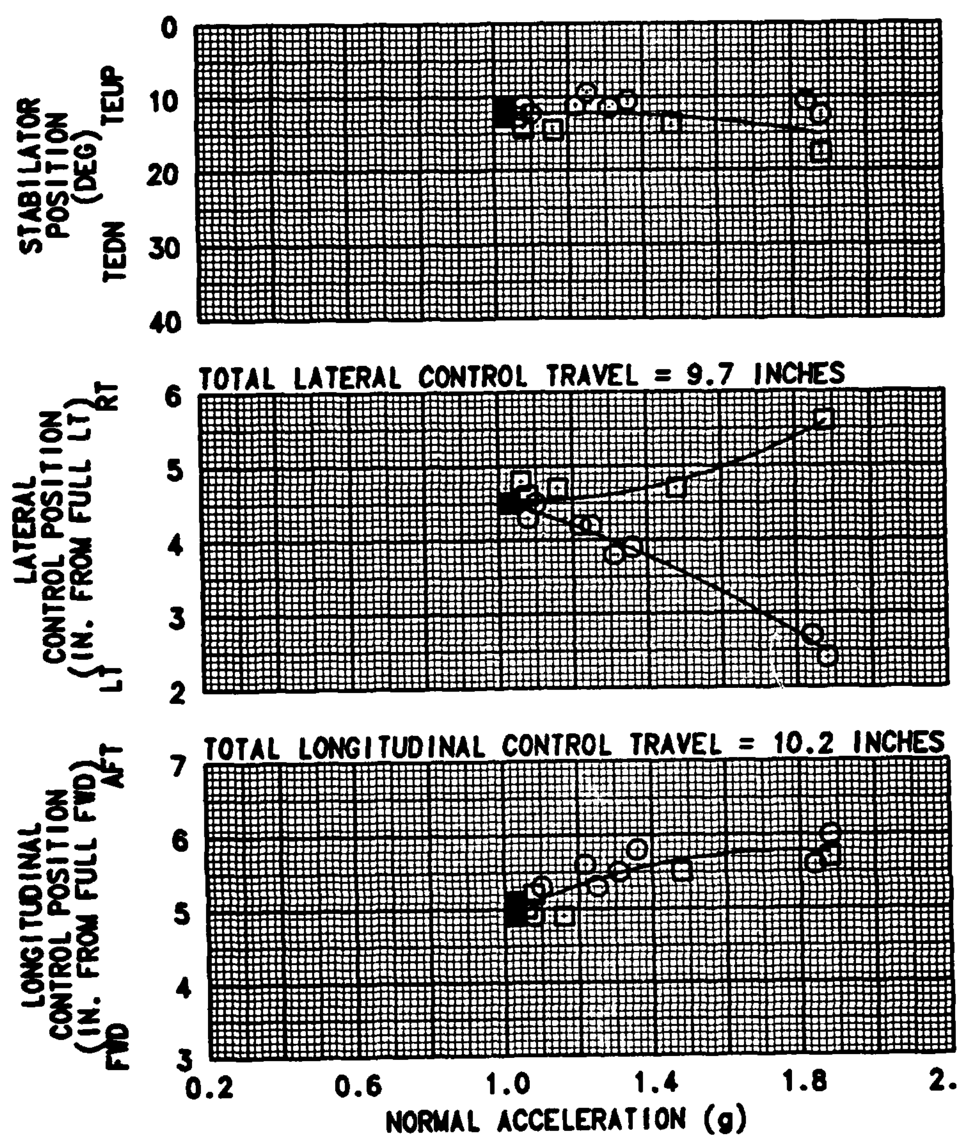


FIGURE E-36
MANEUVERING STABILITY
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	FLIGHT CONDITION	SAS CONDITION
⊡	16440	359.7	0.0	7840	17.0	257	117	RIGHT TURN	ON
⊙	16170	358.7	0.0	7660	17.0	257	117	LEFT TURN	ON

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED
3. TRIM POINT IN LEVEL FLIGHT
4. SHADED SYMBOLS DENOTE TRIM POINT

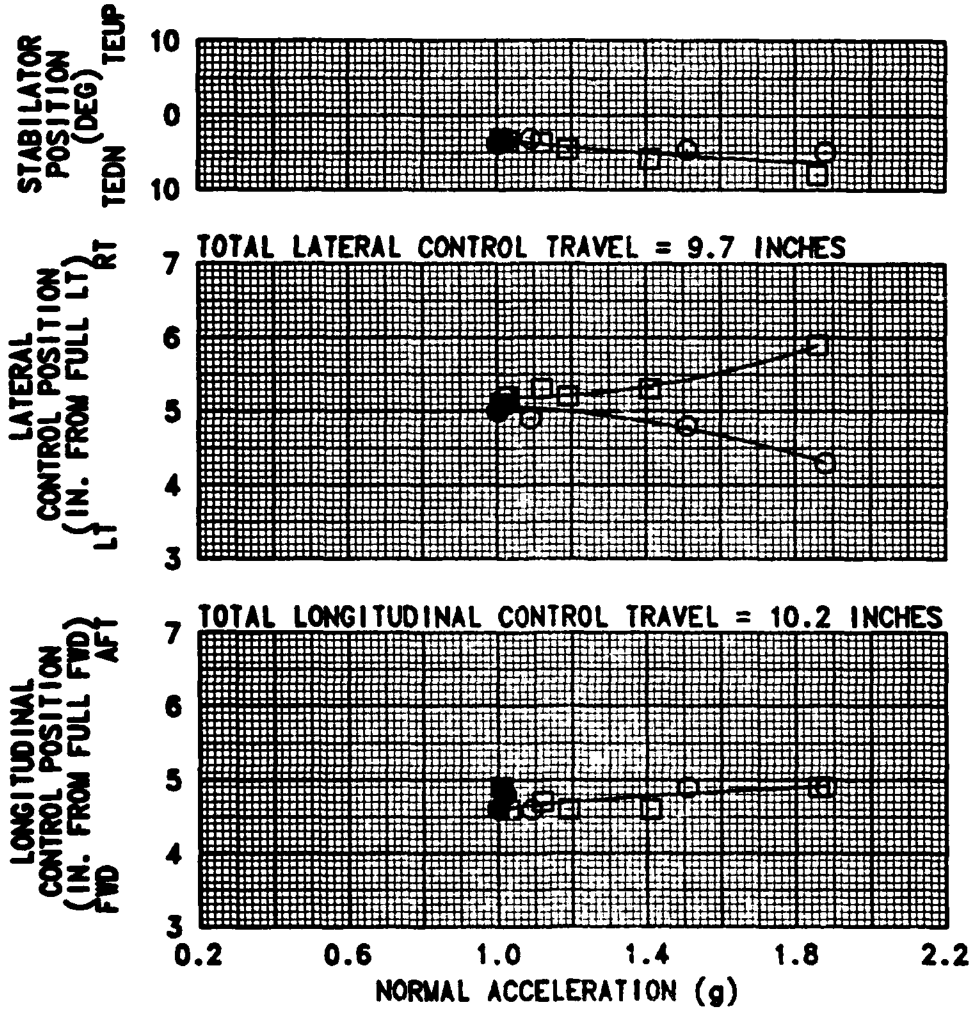


FIGURE E-37
LONGITUDINAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17410	362.8	0.0	7490	10.5	257	72	QUICK FIX

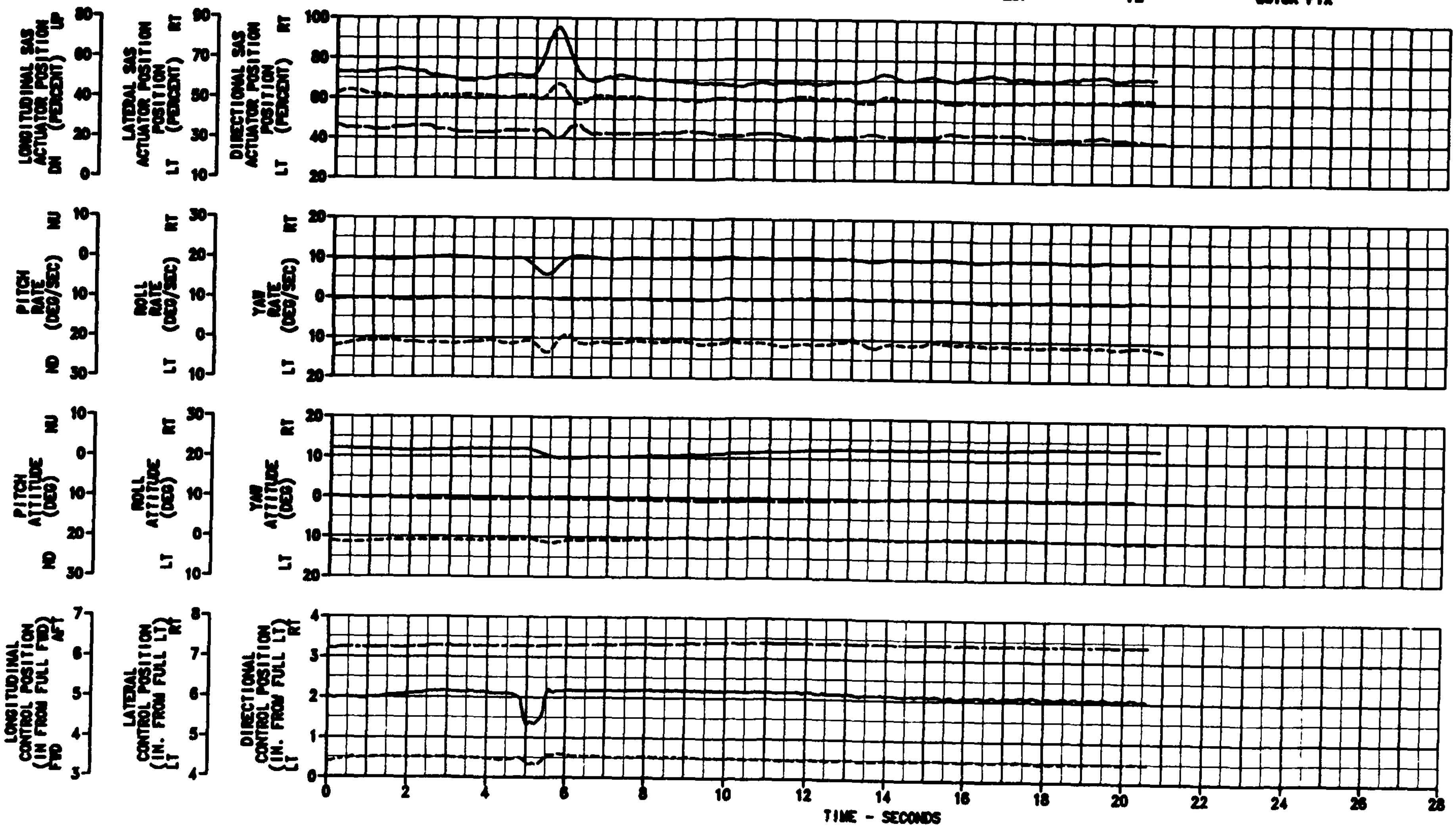


FIGURE E-38
LONGITUDINAL PULSE INPUT
EH-60A USA S/N 86-24600

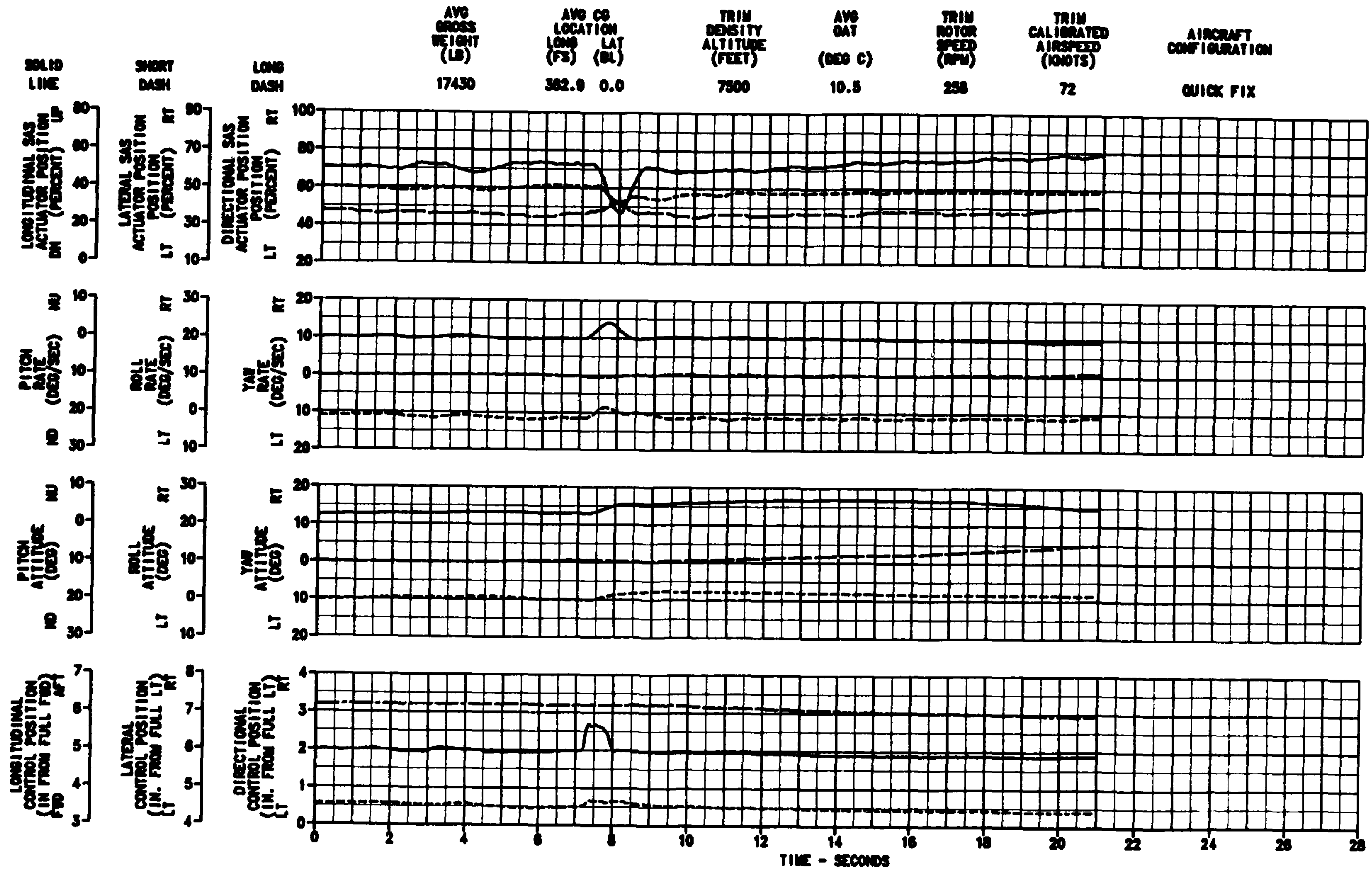


FIGURE E-30
LONGITUDINAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17160	362.0	0.0	7700	10.5	257	100	QUICK FIX

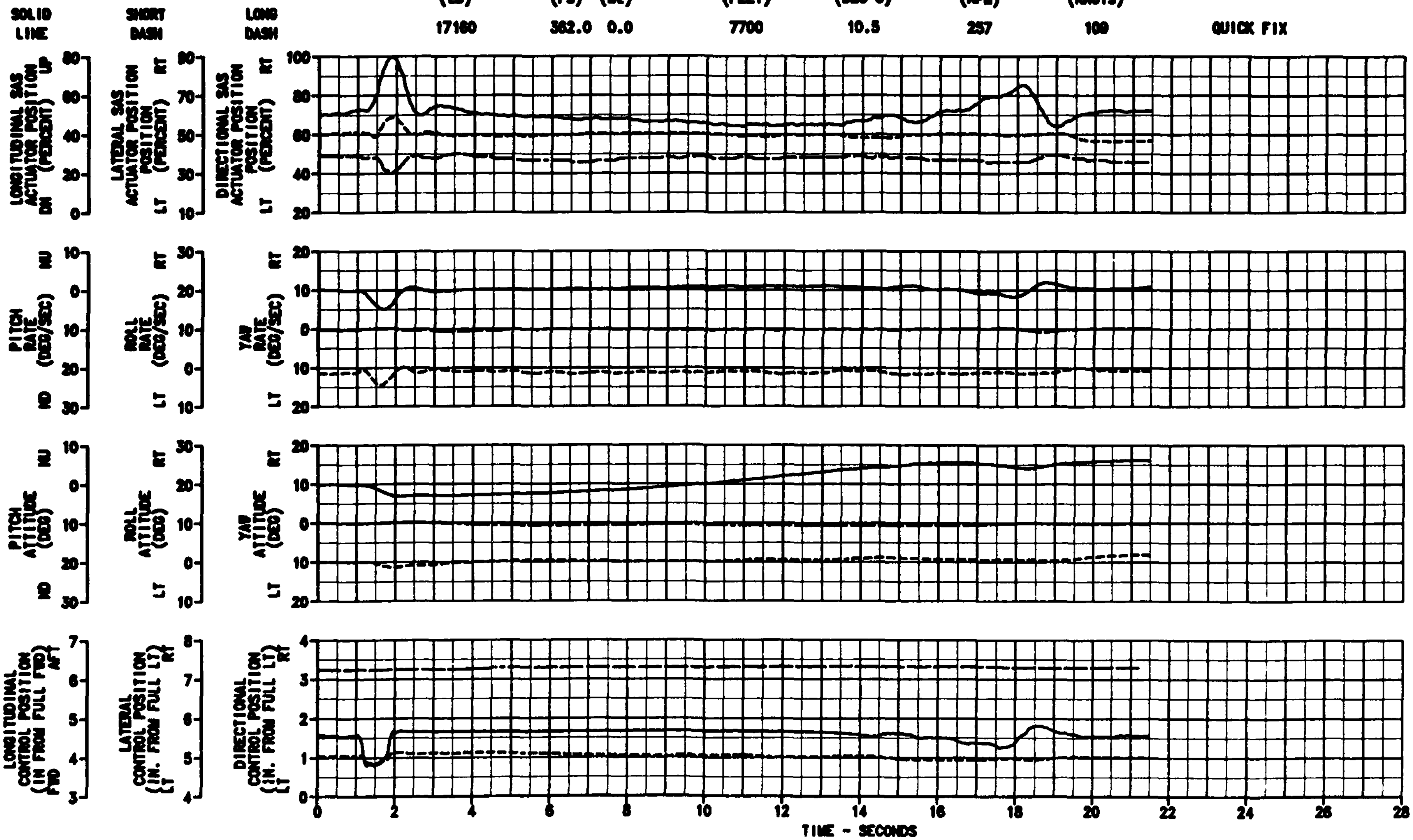


FIGURE E-40
LONGITUDINAL PULSE INPUT
EH-60A USA S/N 86-24500

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17180	362.0	0.0	7580	10.5	257	100	QUICK FIX

SOLID LINE — SHORT DASH — LONG DASH

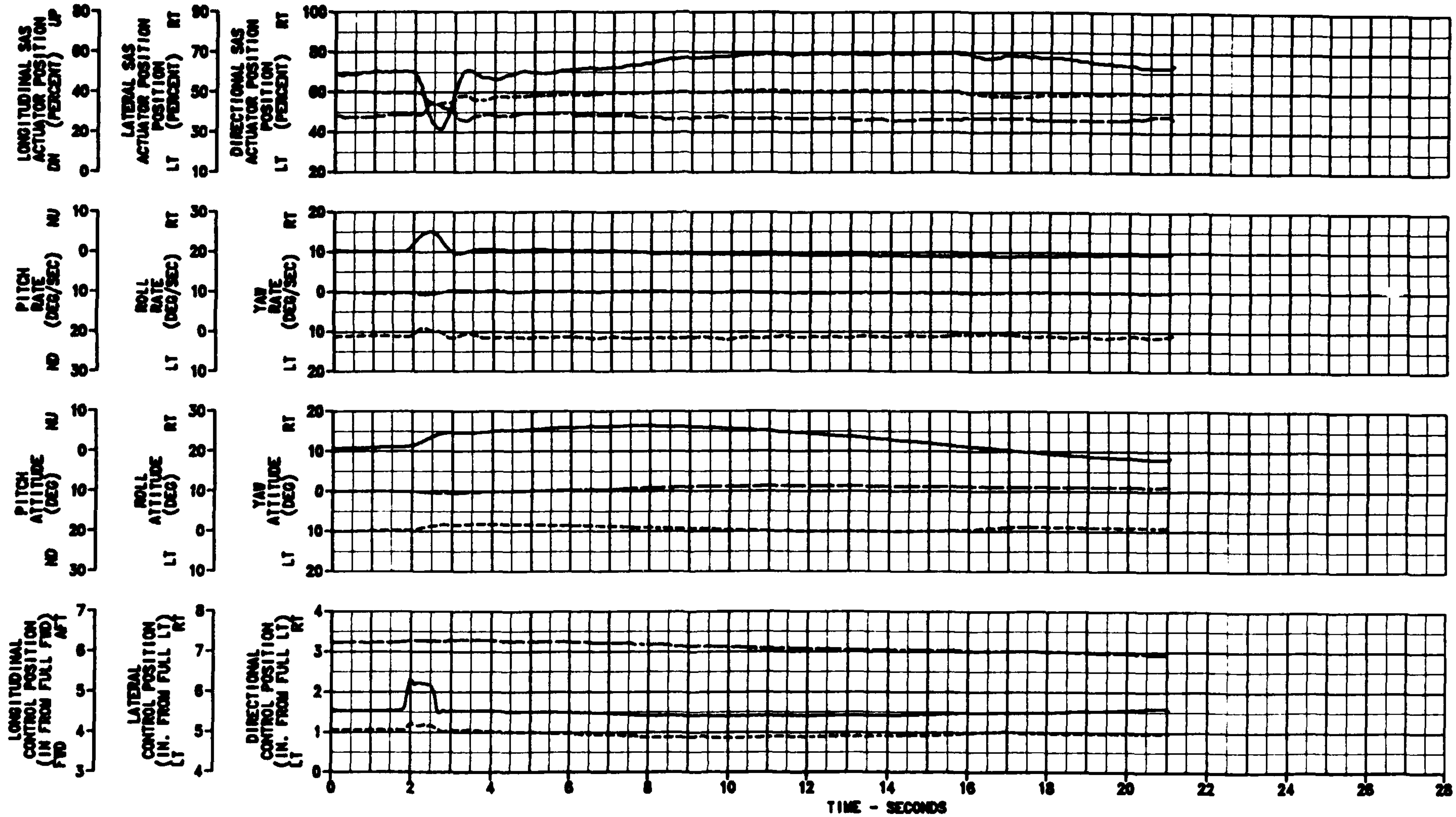


FIGURE E-41
LATERAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17380	362.7	0.0	7470	10.5	257	71	QUICK FIX

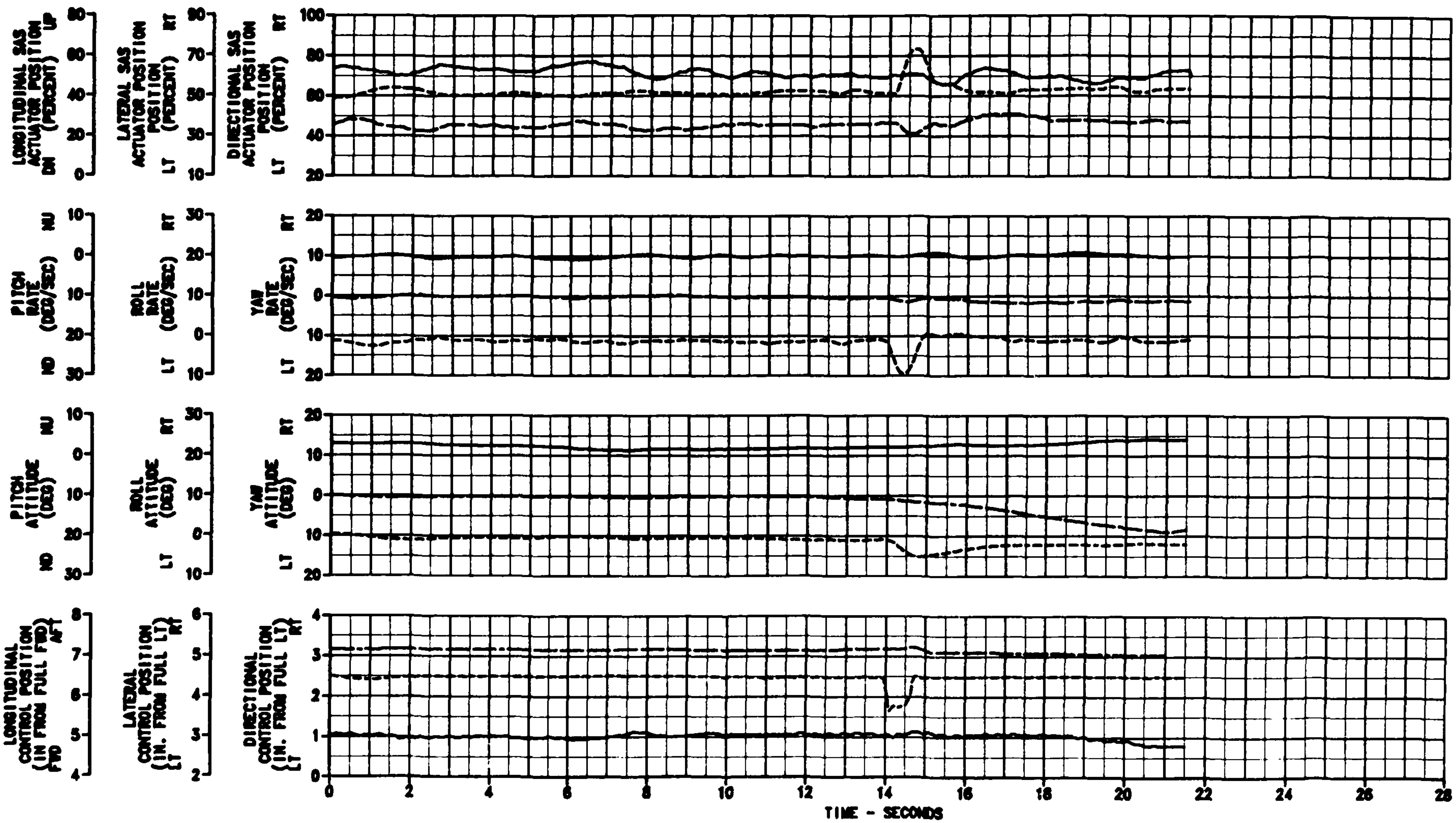


FIGURE E-42

LATERAL PULSE INPUT

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17370	362.7	0.0	7520	10.5	257	72	QUICK FIX

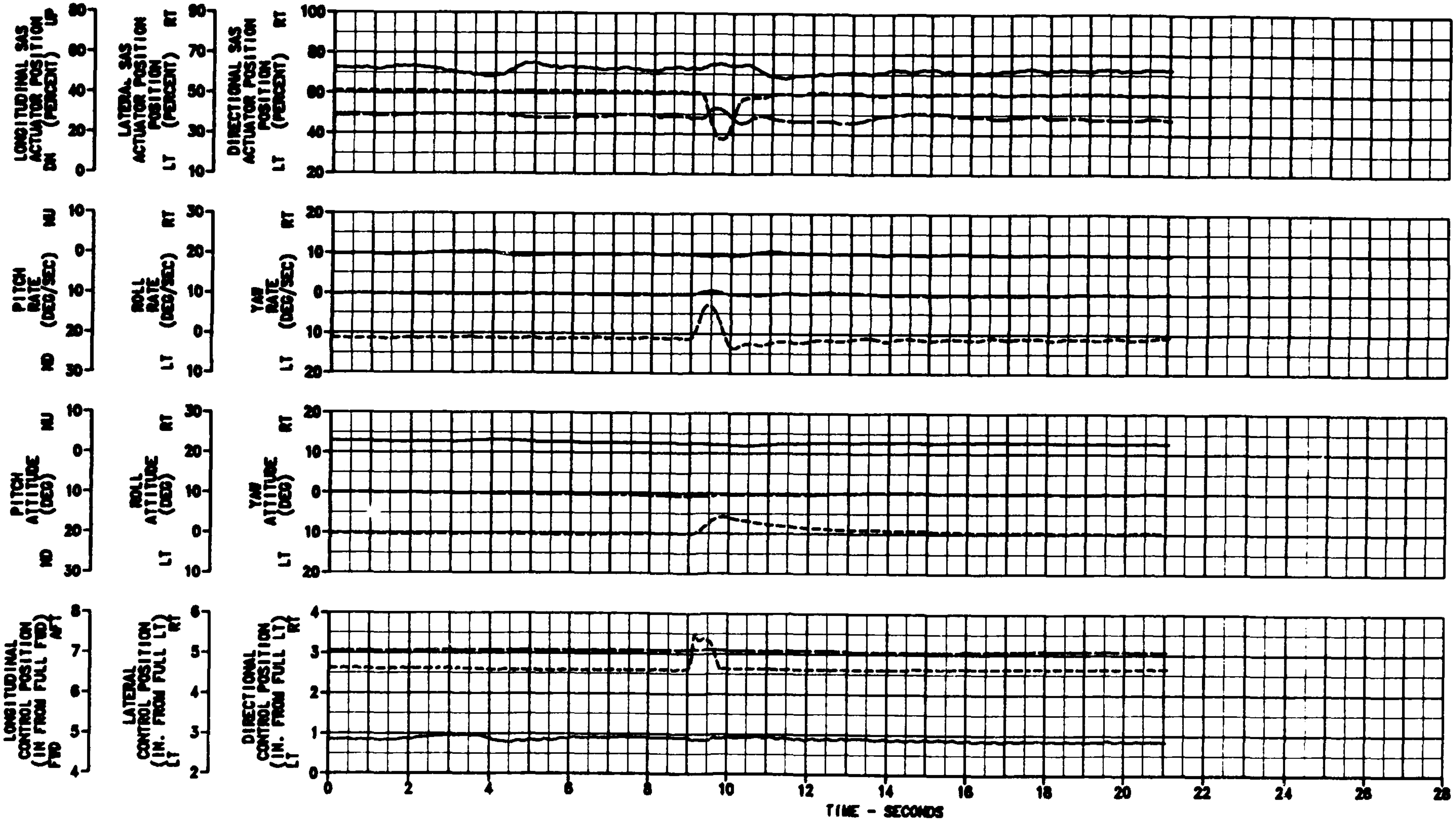


FIGURE E-43
LATERAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17120	361.8	0.0	7540	10.5	257	107	QUICK FIX

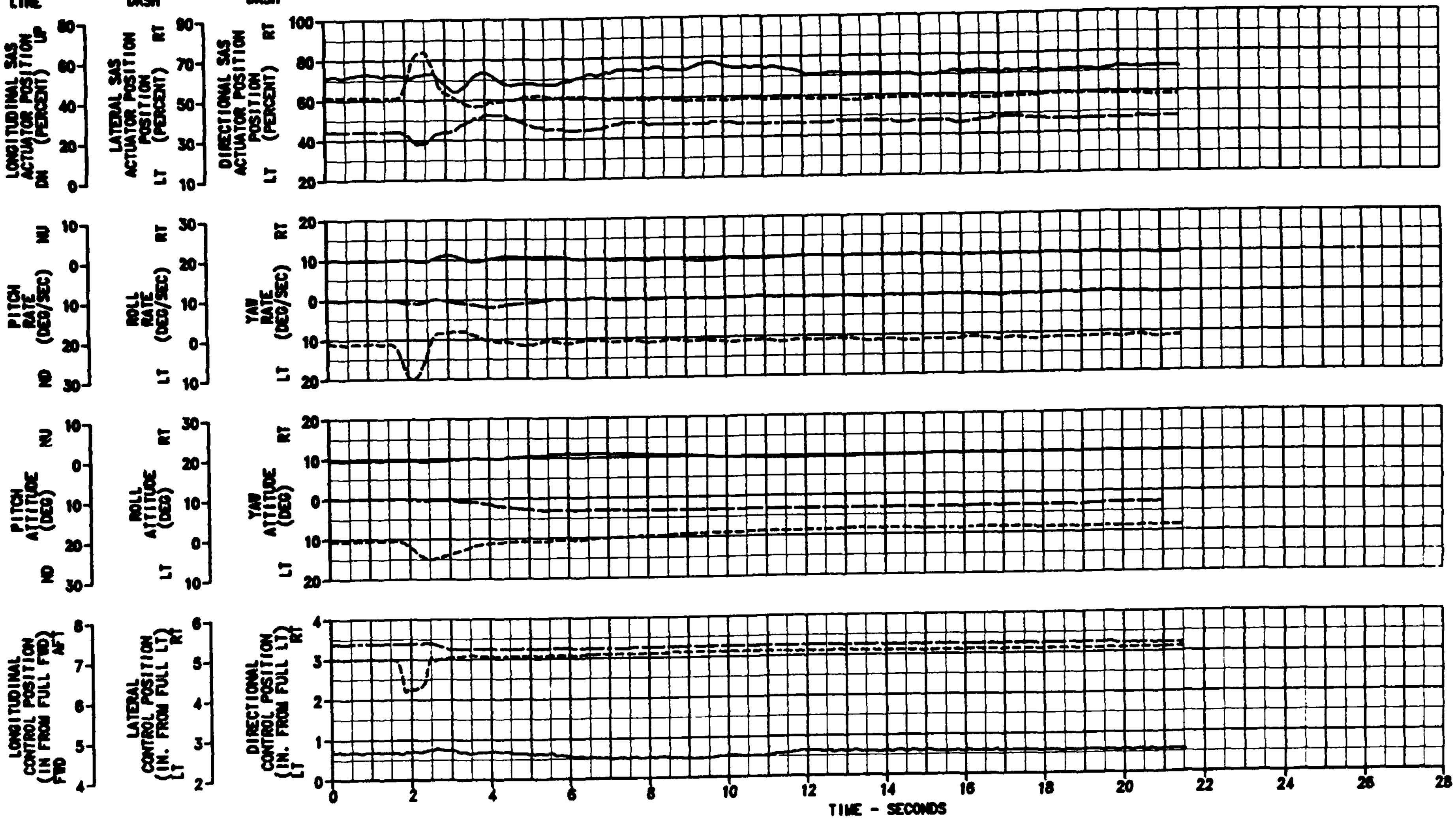


FIGURE E-44
LATERAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17100	361.8	0.0	7500	10.5	258	107	QUICK FIX

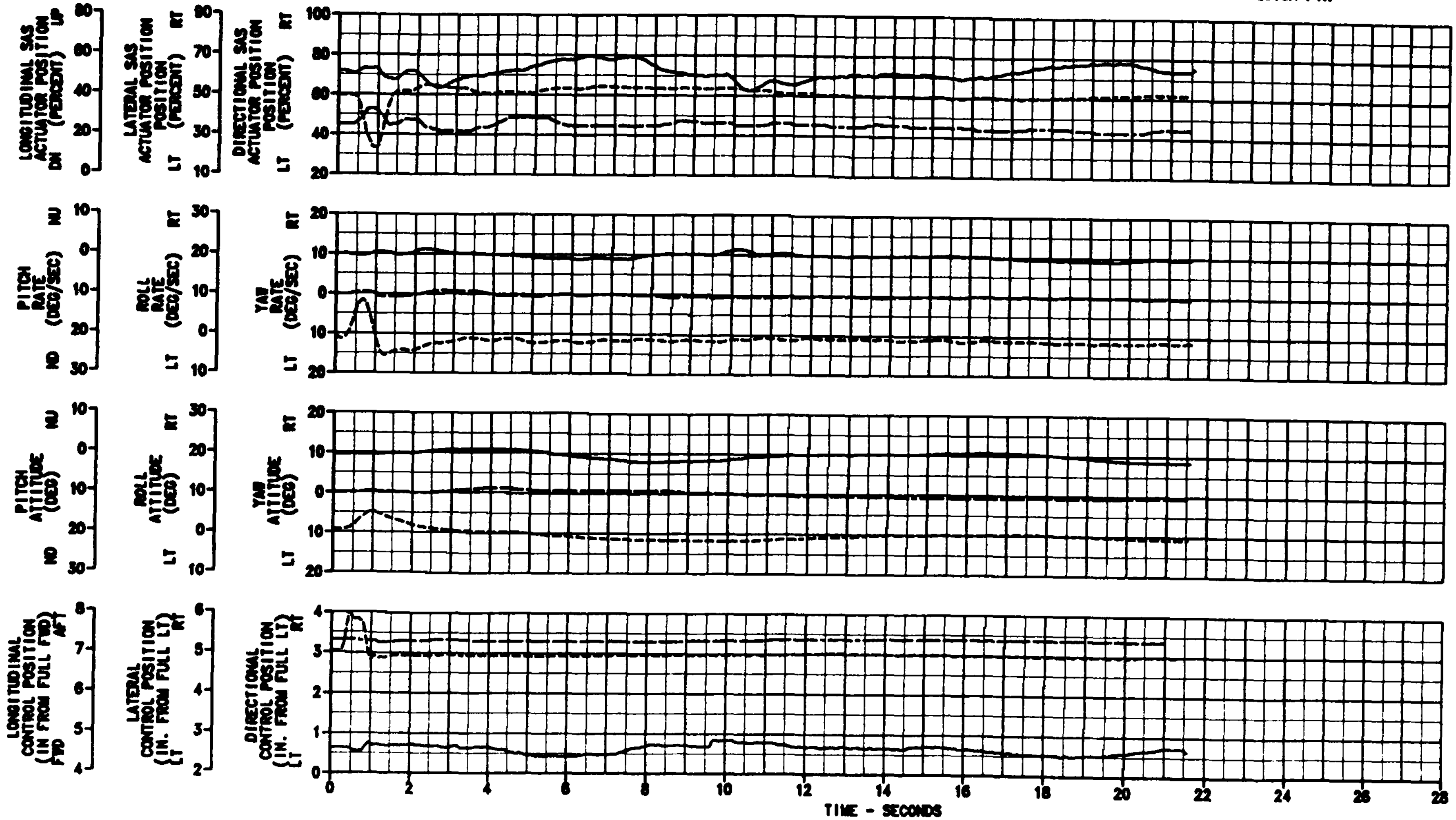


FIGURE E-46
DIRECTIONAL PULSE INPUT
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17320	362.5	0.0	7450	10.5	257	70	QUICK FIX

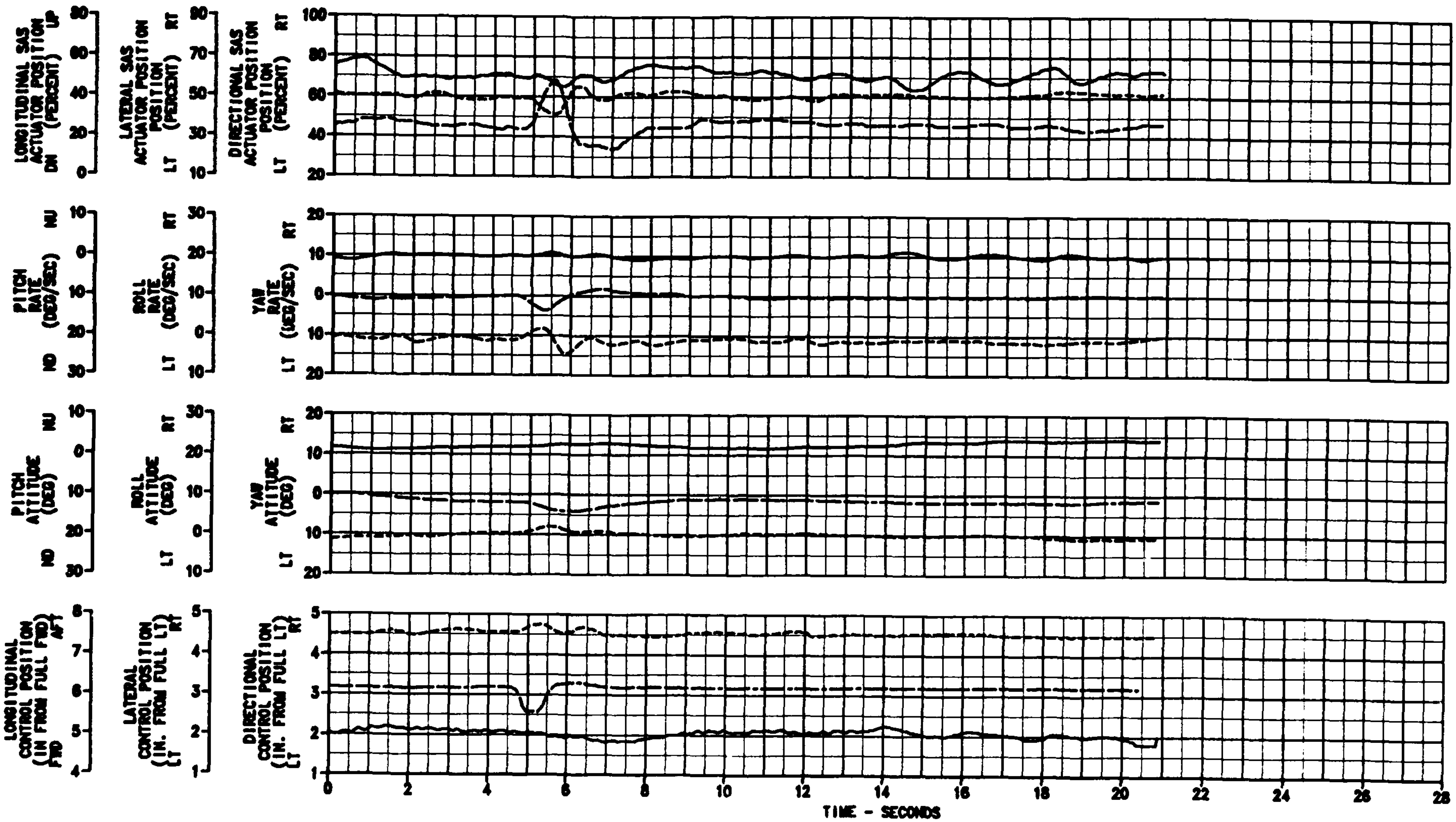


FIGURE E-46
DIRECTIONAL PULSE INPUT
EH-60A USA S/N 86-24580

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17290	362.4	0.0	7480	10.5	257	72	QUICK FIX

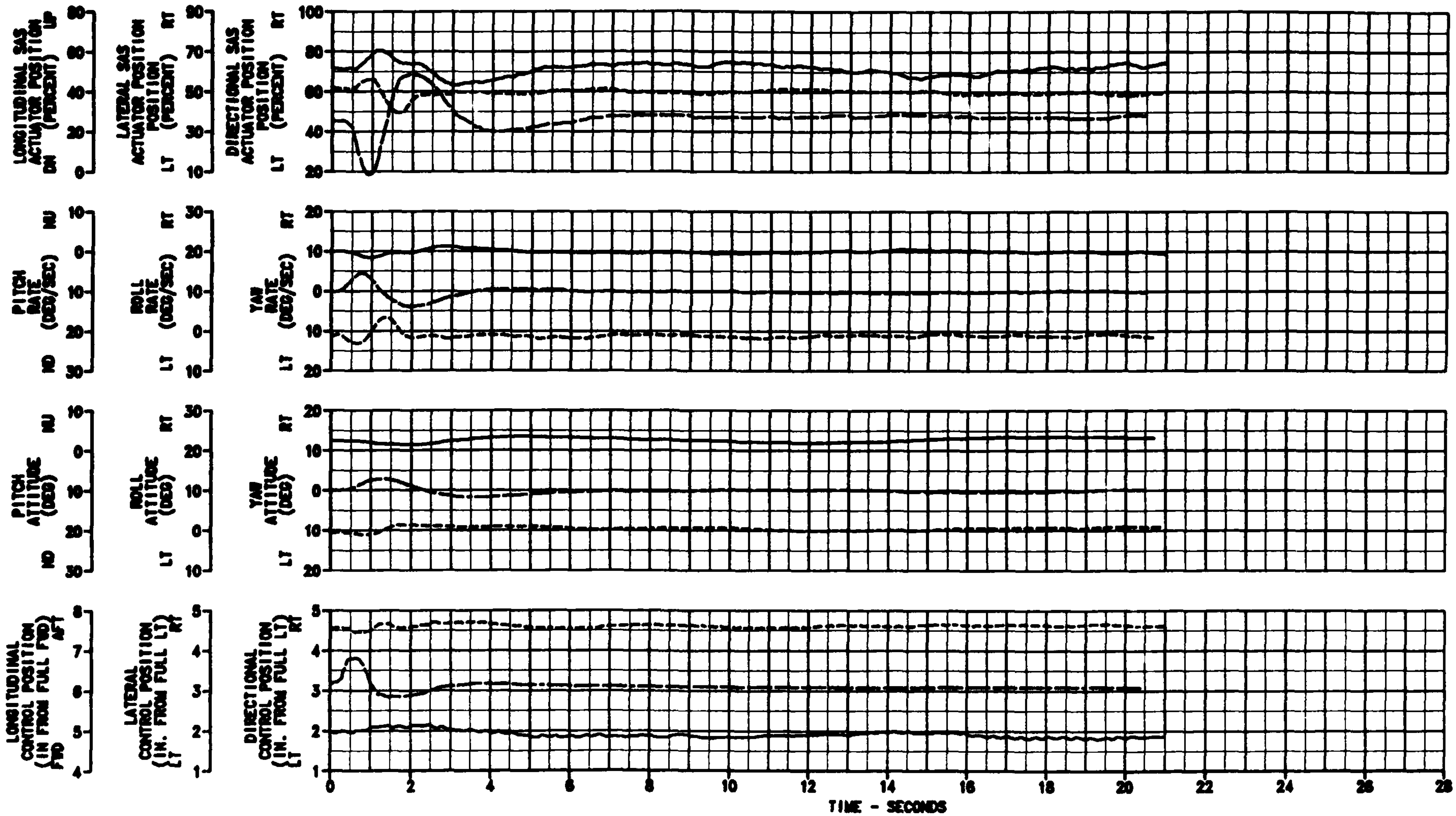


FIGURE E-47
DIRECTIONAL PULSE INPUT
EH-60A USA S/N 86-24580

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17090	361.7	0.0	7570	10.5	257	108	QUICK FIX

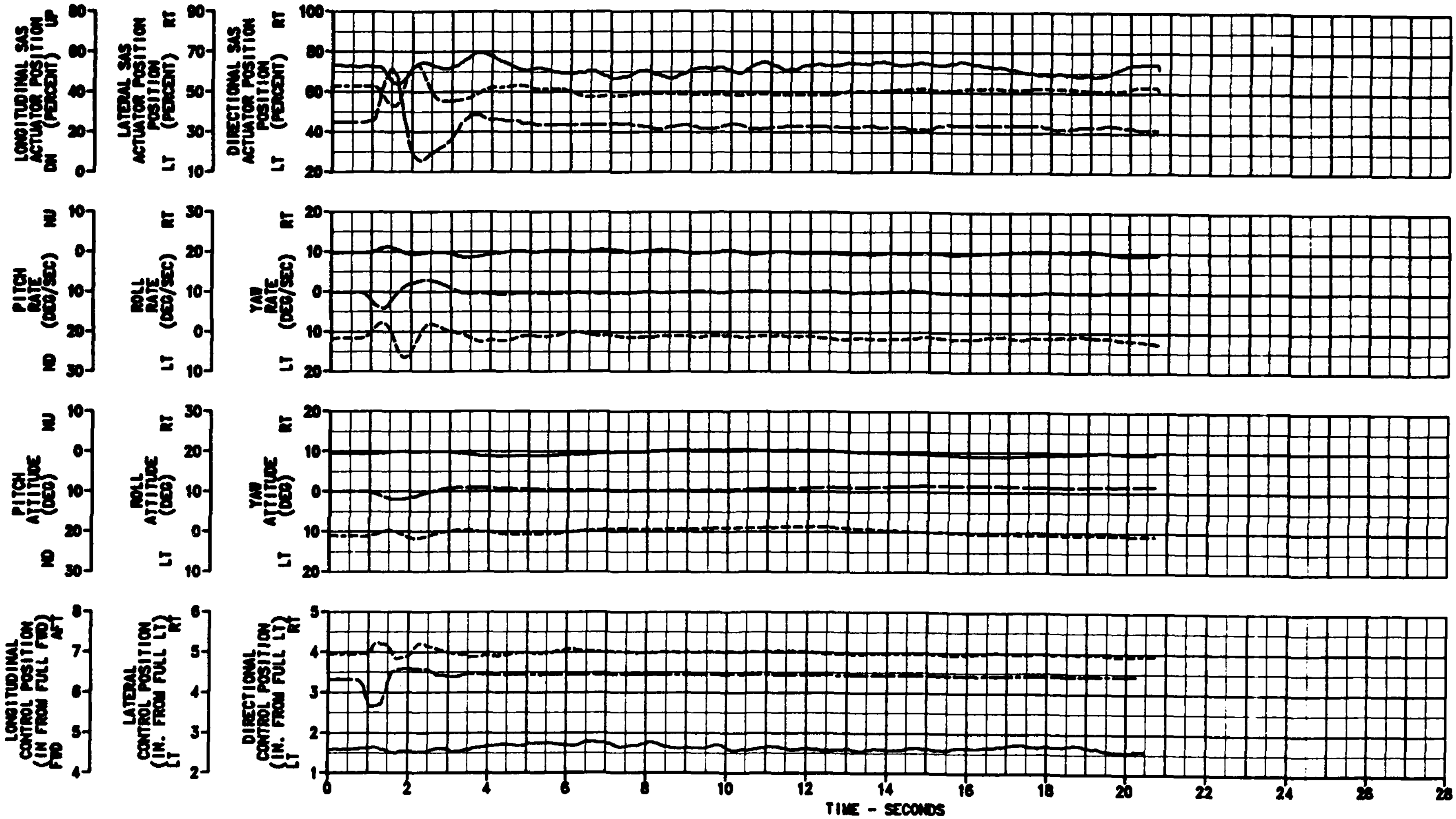


FIGURE E-48

DIRECTIONAL PULSE INPUT

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	TRIM ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KNOTS)	AIRCRAFT CONFIGURATION
17050	361.6	0.0	7550	10.5	257	107	QUICK FIX

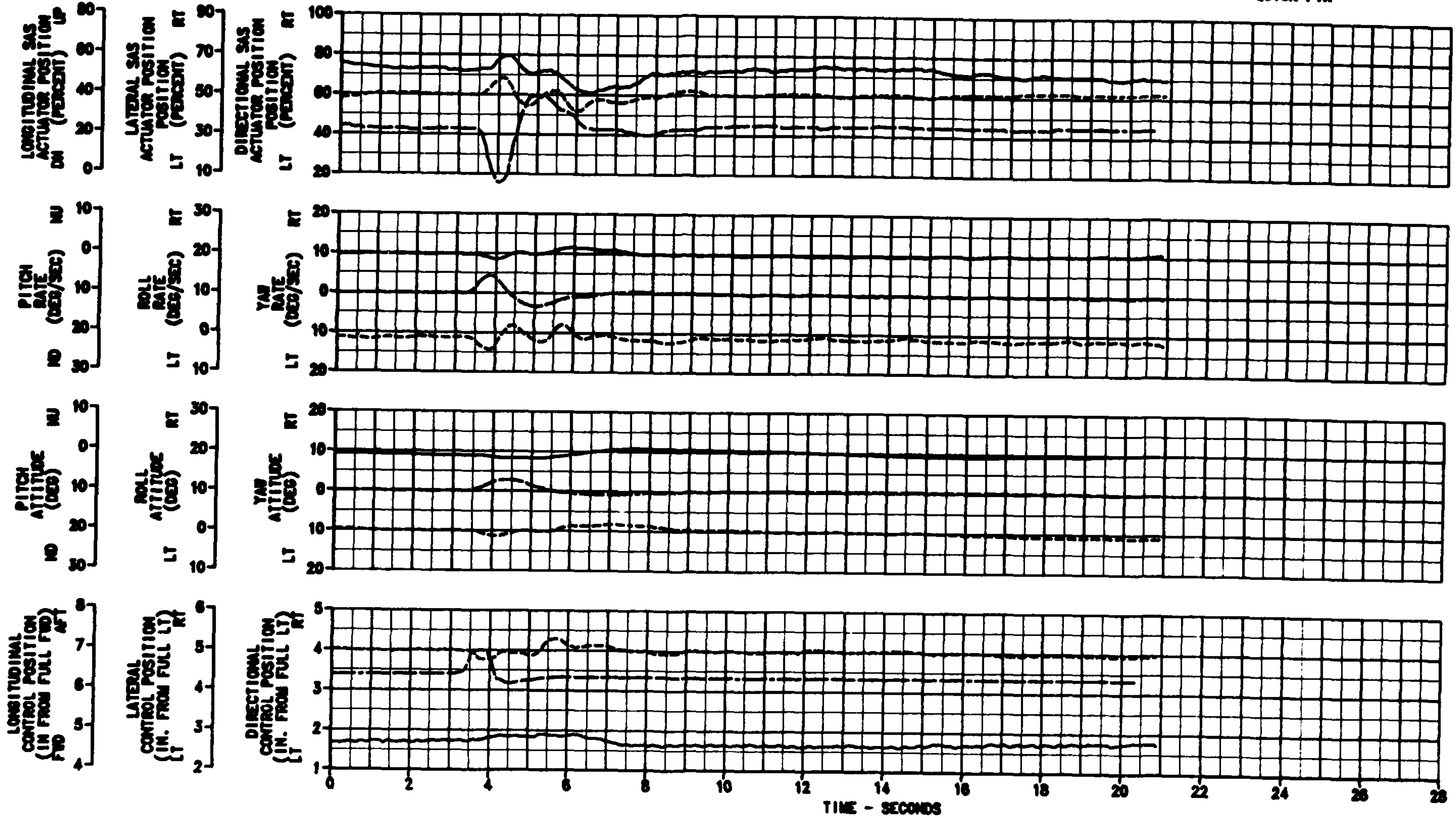


FIGURE E-49
LONGITUDINAL CONTROLLABILITY
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	SAS CONDITION
□	17440	362.9	0.0	7360	10.0	257	72	ON
⊙	17460	362.9	0.0	7580	10.5	258	108	ON

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED

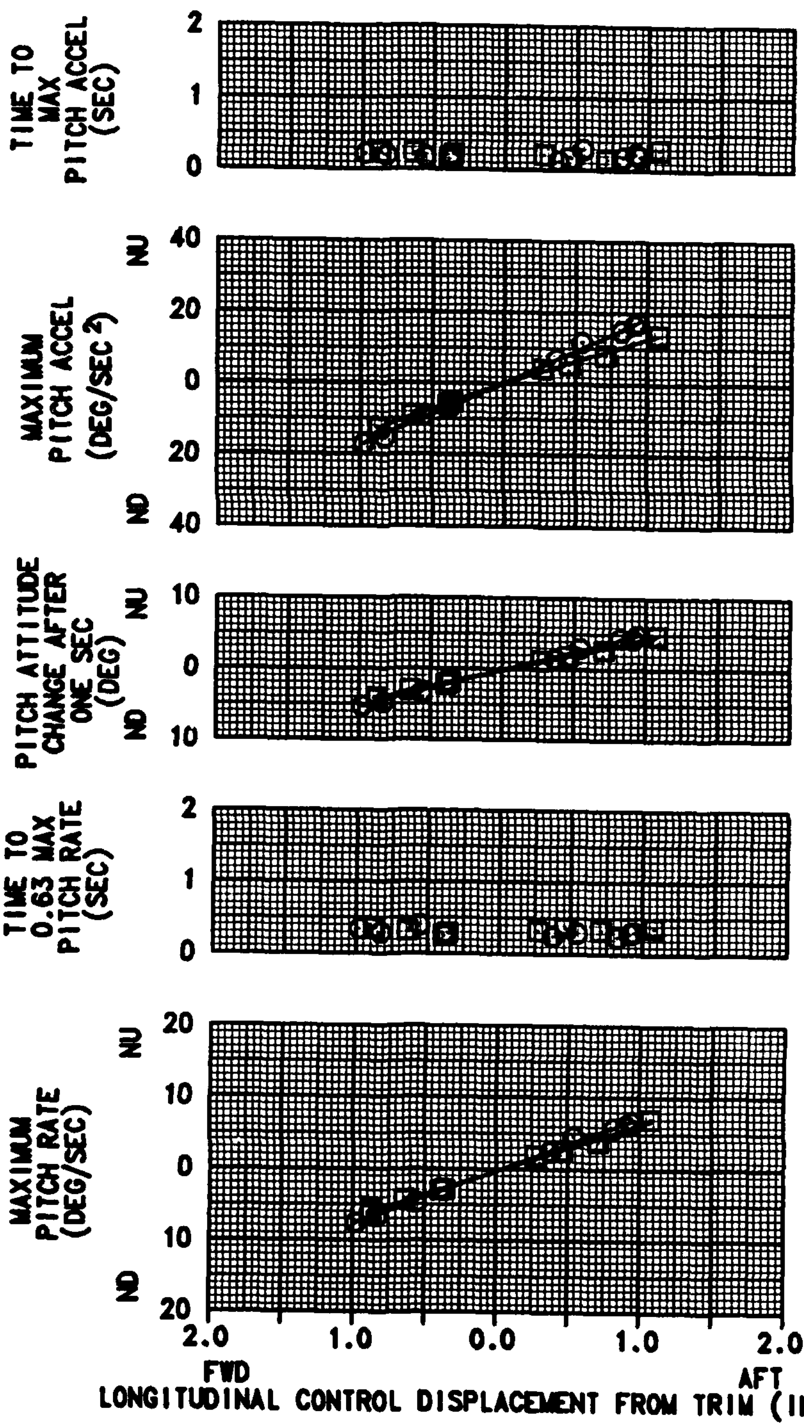


FIGURE E-50
LATERAL CONTROLLABILITY
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	SAS CONDITION
⊡	17300	362.4	0.0	7480	10.0	257	72	ON
⊙	17300	362.4	0.0	7540	10.5	258	108	ON

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED

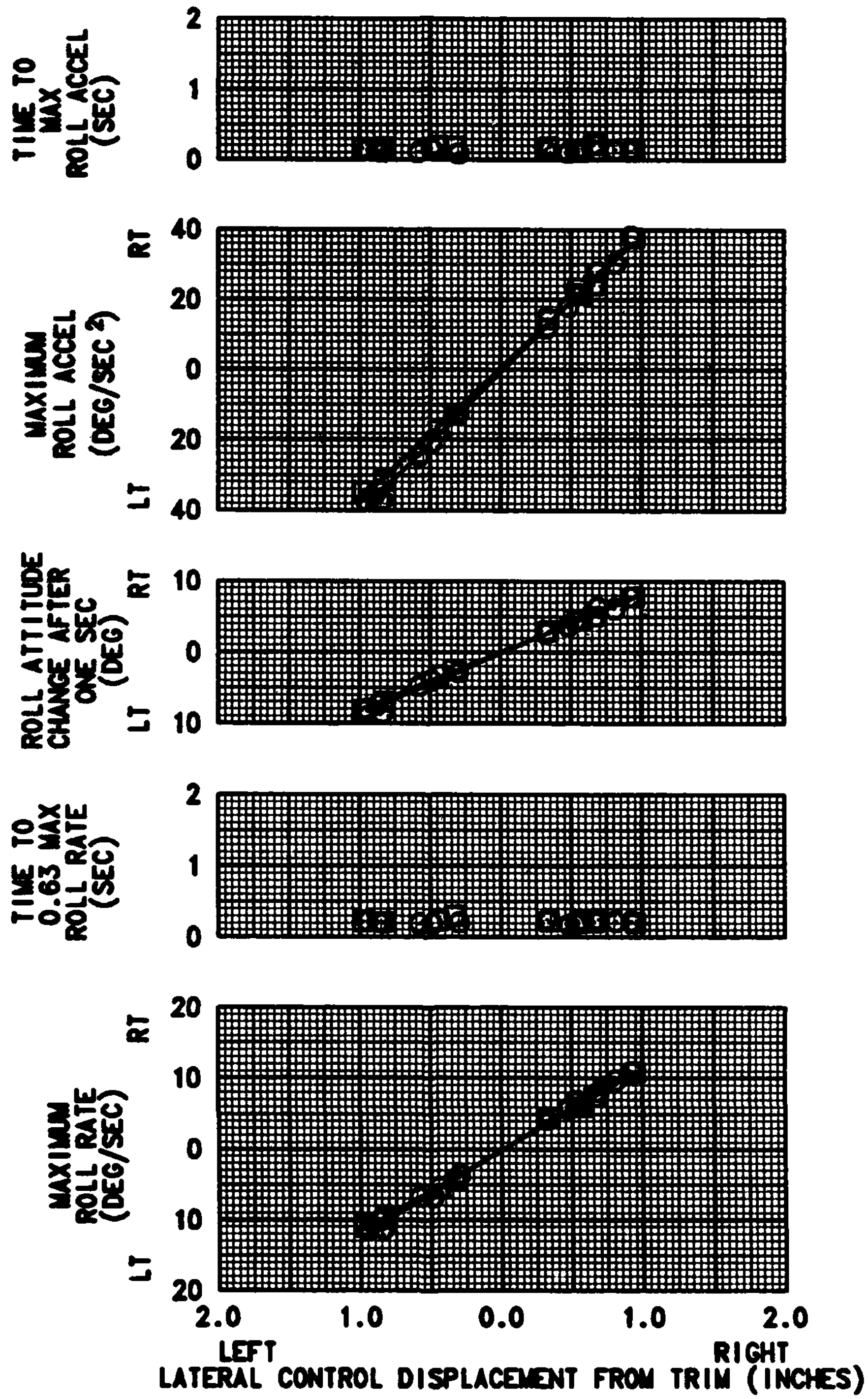


FIGURE E-51
DIRECTIONAL CONTROLLABILITY
EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	TRIM CALIBRATED AIRSPEED (KTS)	SAS CONDITION
⊡	17140	362.9	0.0	7420	10.0	257	72	ON
⊙	17110	362.9	0.0	7590	11.0	258	108	ON

NOTE: 1. QUICK FIX CONFIGURATION
2. ECM ANTENNA EXTENDED

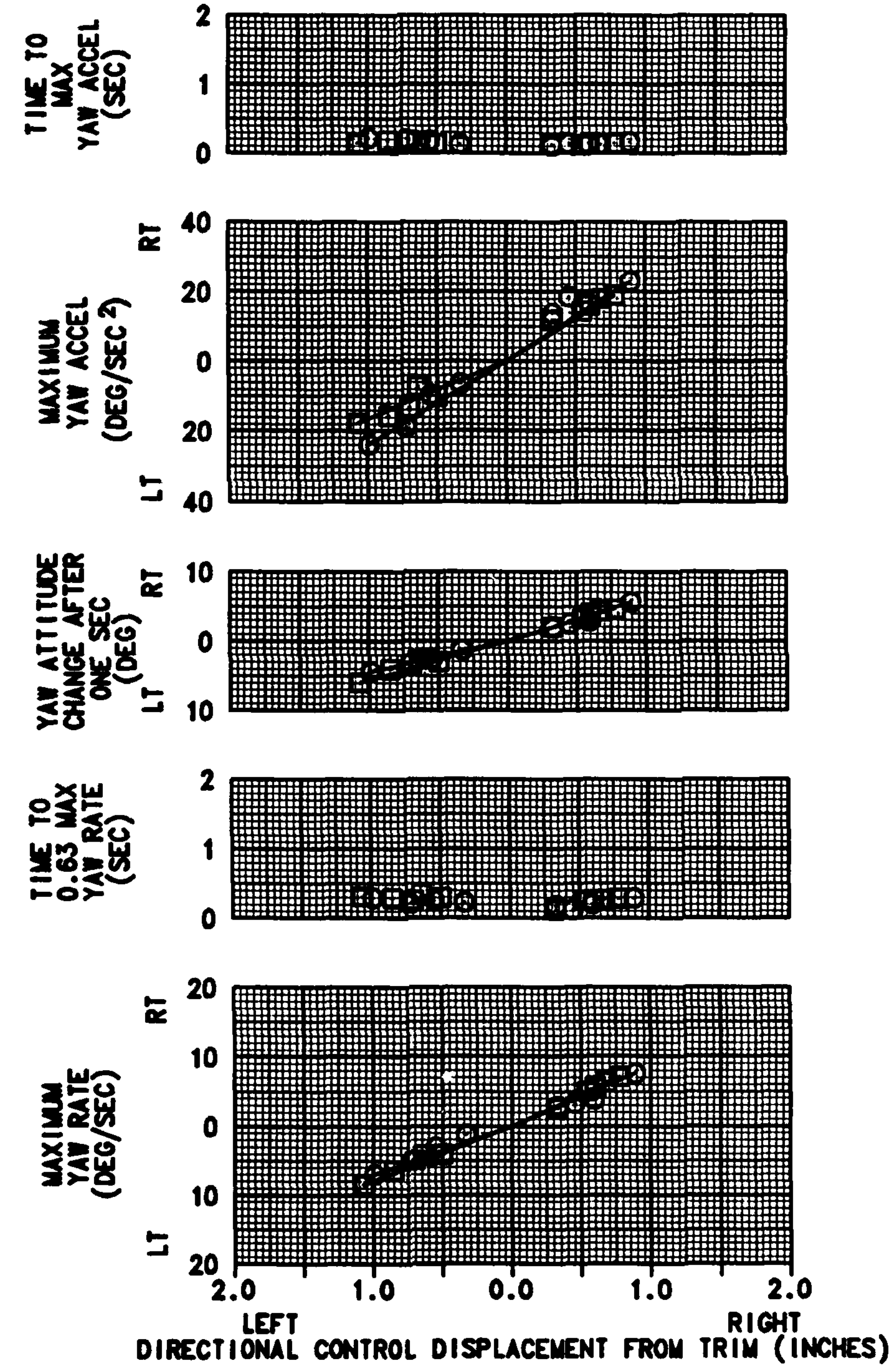


FIGURE E-52

LOW SPEED FORWARD AND REARWARD FLIGHT CHARACTERISTICS

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG WHEEL HEIGHT (FT)	AIRCRAFT CONFIGURATION	SAS CONDITION
16620	351.1	0.1 LT	2180	8.5	258	30	QUICK FIX	ON

NOTE: 1. VERTICAL LINES DENOTE CONTROL EXCURSIONS
2. ECM ANTENNA EXTENDED

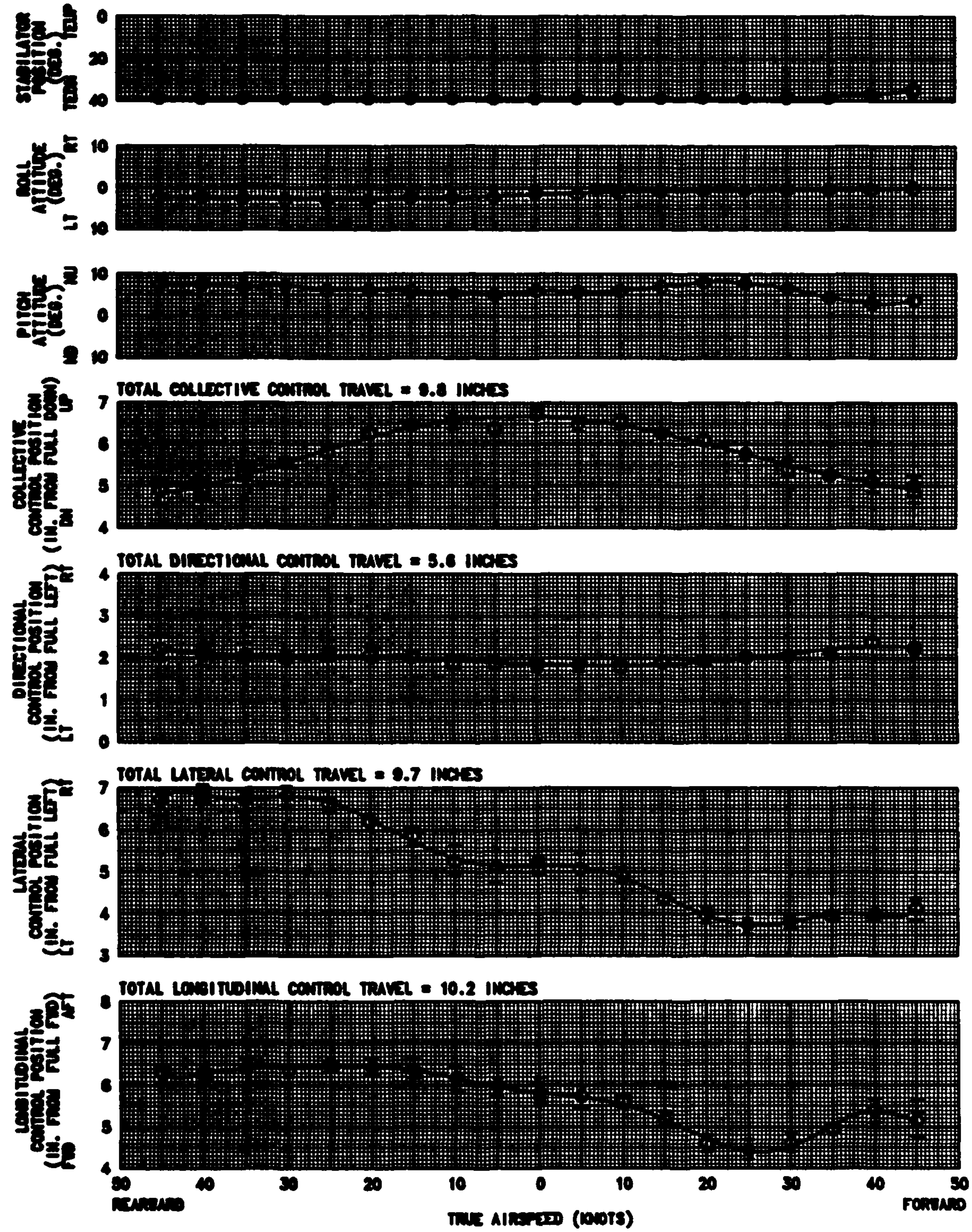


FIGURE E-53

LOW SPEED RIGHT AND LEFT SIDEWARD FLIGHT CHARACTERISTICS

EH-60A USA S/N 86-24569

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG WHEEL HEIGHT (FT)	AIRCRAFT CONFIGURATION	SAS CONDITION
16900	361.1	0.1 LT	2180	8.5	258	30	QUICK FIX	ON

NOTE: 1. VERTICAL LINES DENOTE CONTROL EXCURSIONS
2. ECM ANTENNA EXTENDED

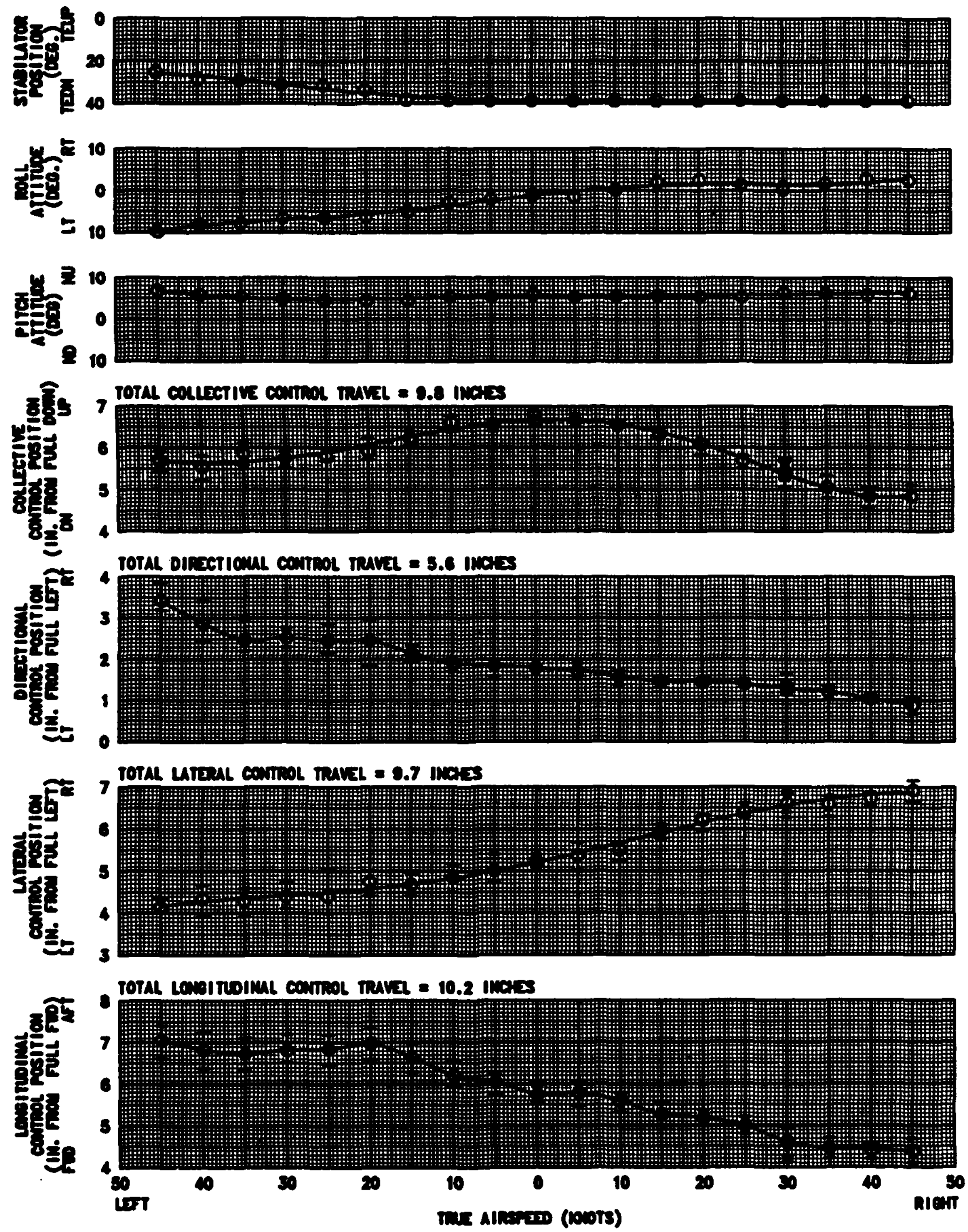


FIGURE E-54
INSTRUMENT TAKEOFF
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AIRFIELD DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17430	360.0	0.0	3040	20.0	258	QUICK FIX

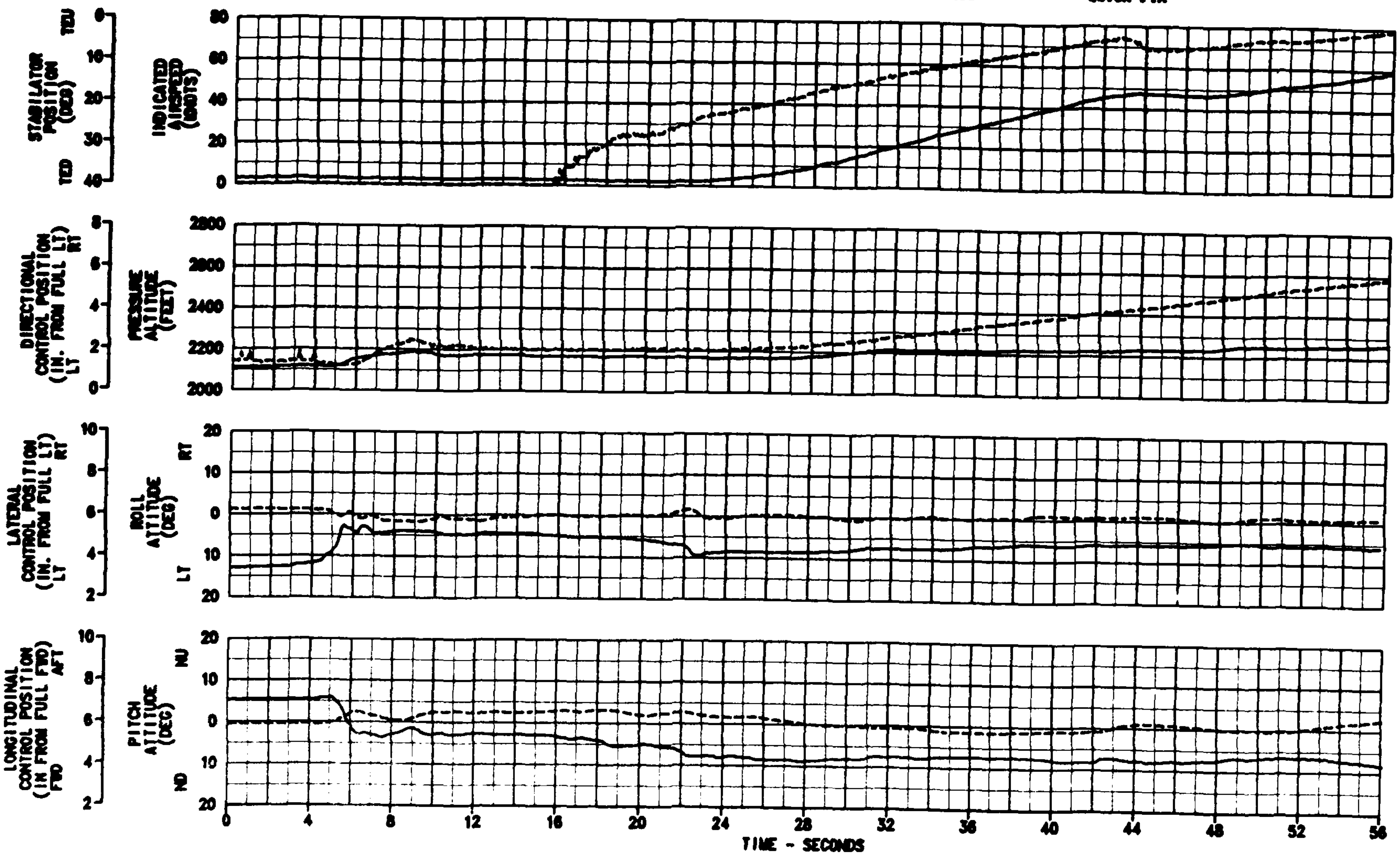


FIGURE E-86
15° RIGHT BANK AT 74 KCAS
EH-60A USA S/N 88-24580

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17320	365.7	0.0	7020	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

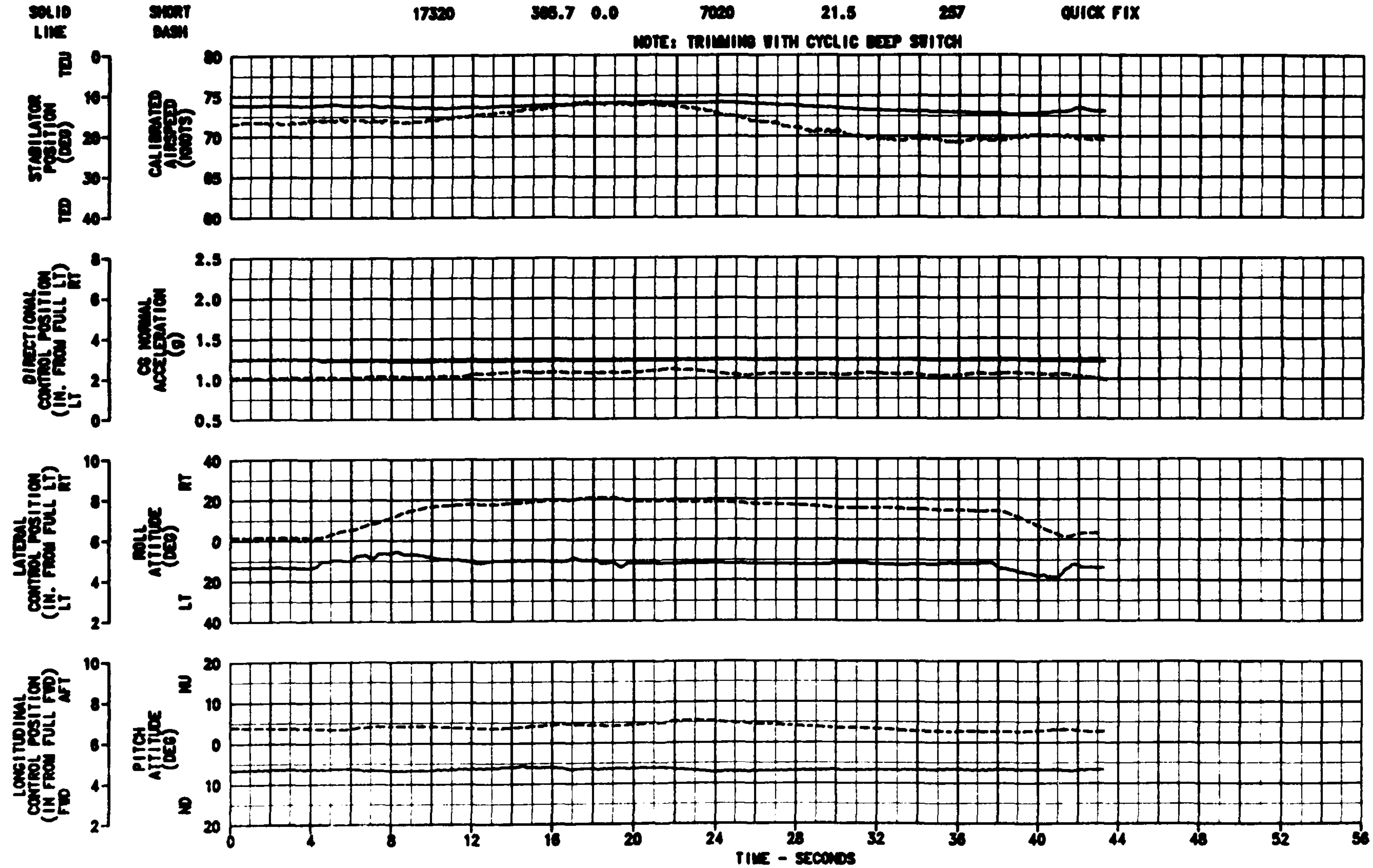


FIGURE E-55
15° LEFT BANK AT 74 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17330	365.7	0.0	7010	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

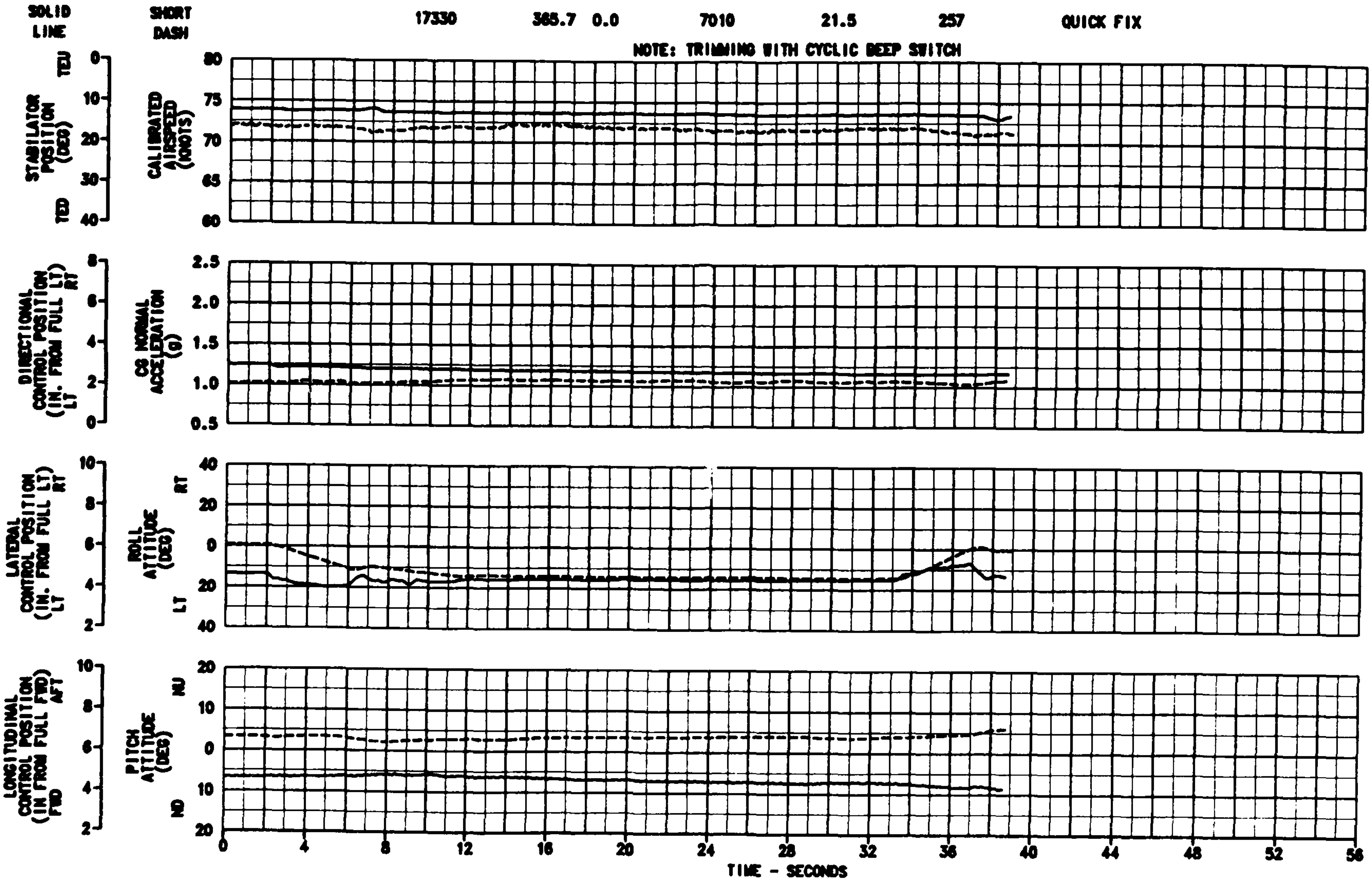


FIGURE E-57
15° LEFT BANK AT 74 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17300	365.6	0.0	7050	22.0	257	QUICK FIX

SOLID LINE

SHORT DASH

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

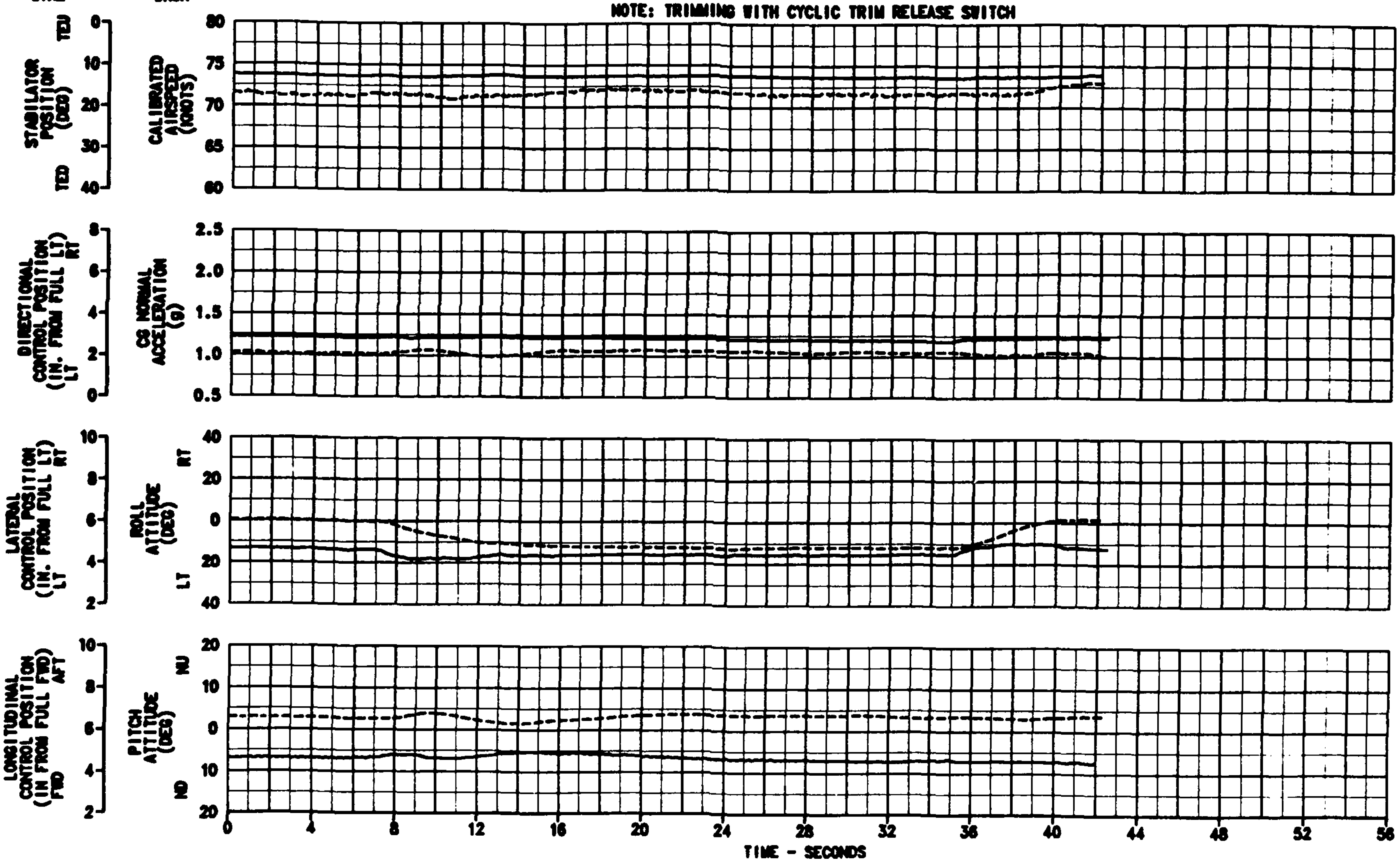


FIGURE E-58

15° RIGHT BANK AT 74 KCAS

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17290	365.6	0.0	7020	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

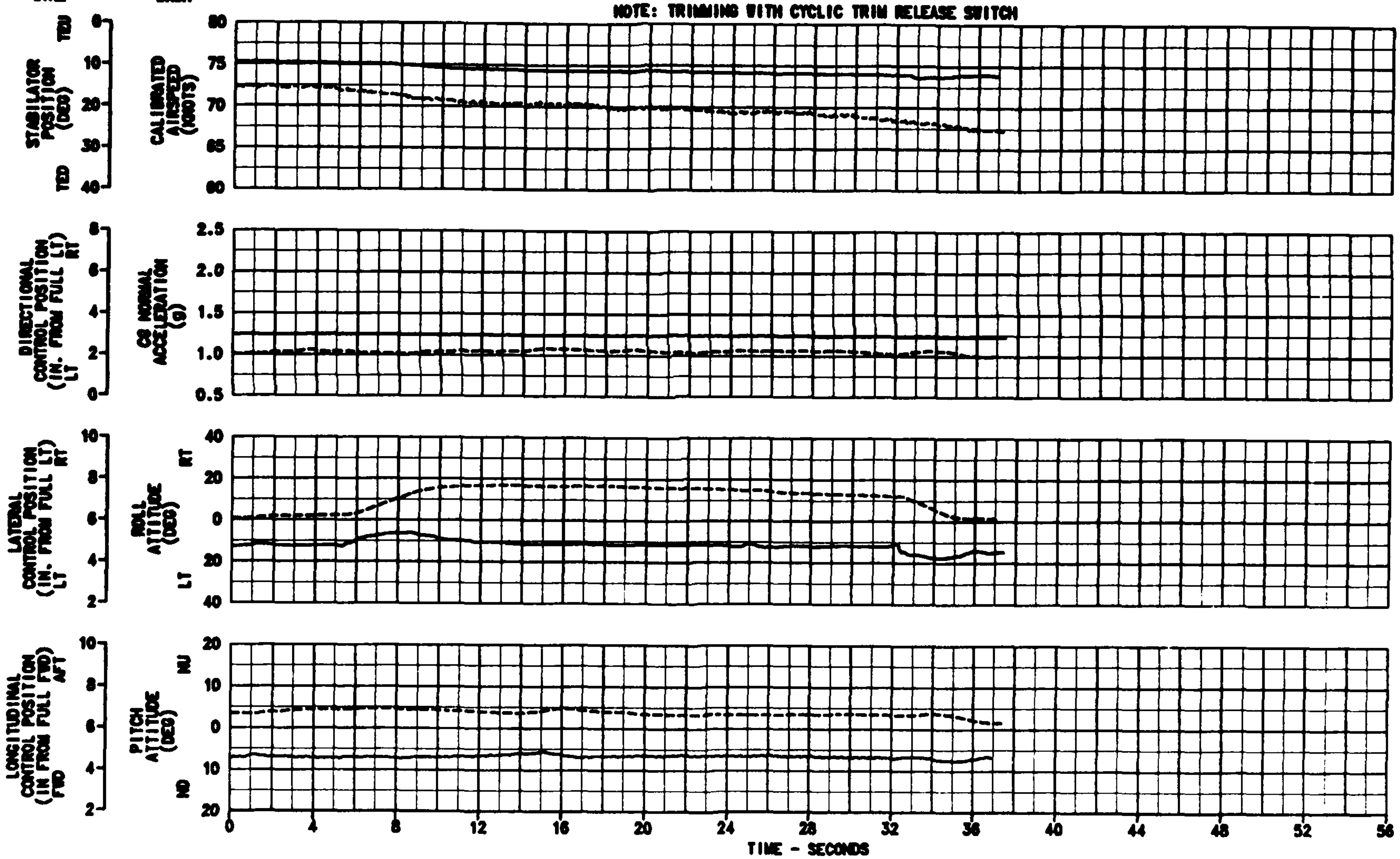


FIGURE E-60
25° LEFT BANK AT 74 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17240	365.4	0.0	6960	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

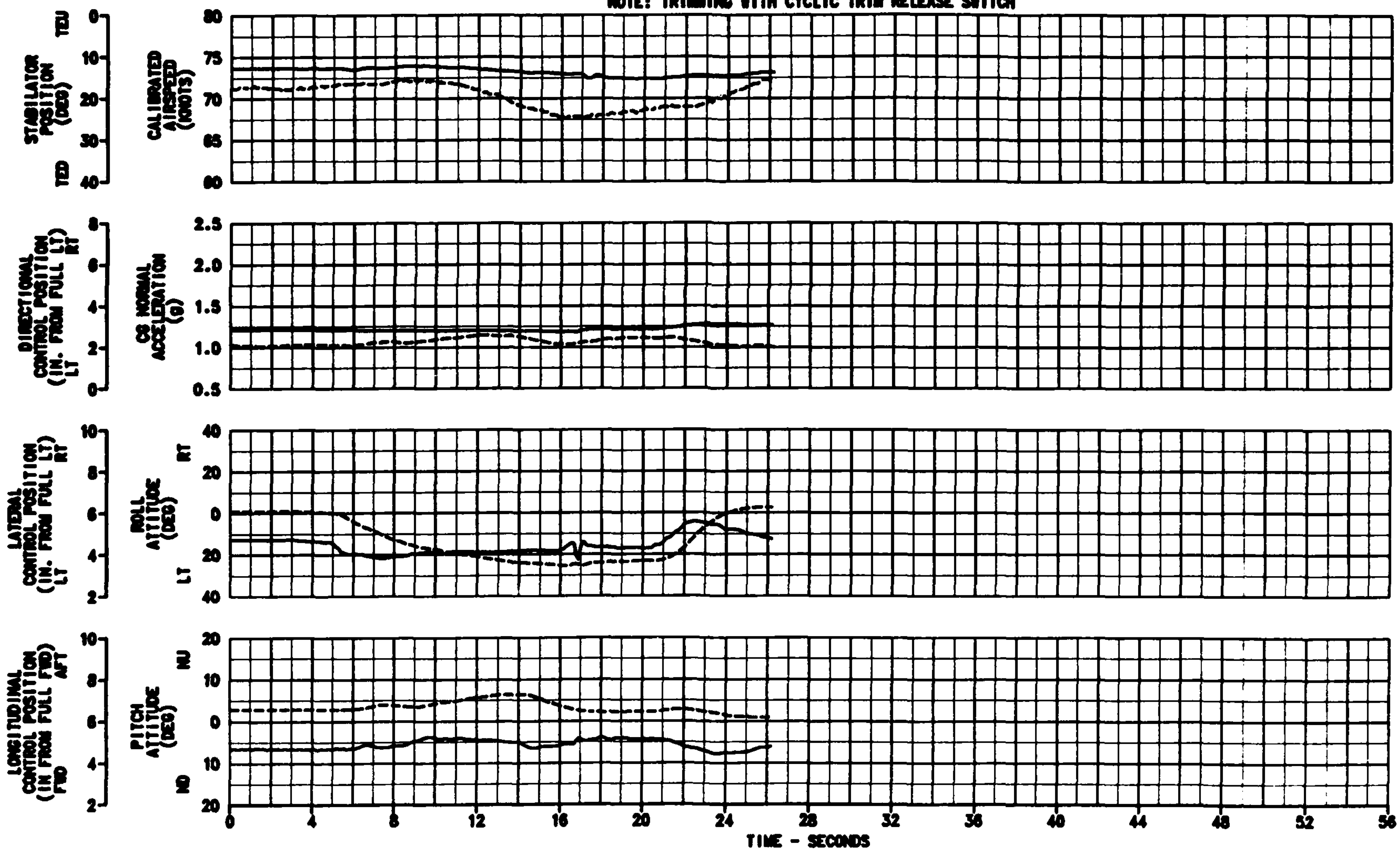


FIGURE E-60
25° RIGHT BANK AT 74 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17230	385.4	0.0	6010	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

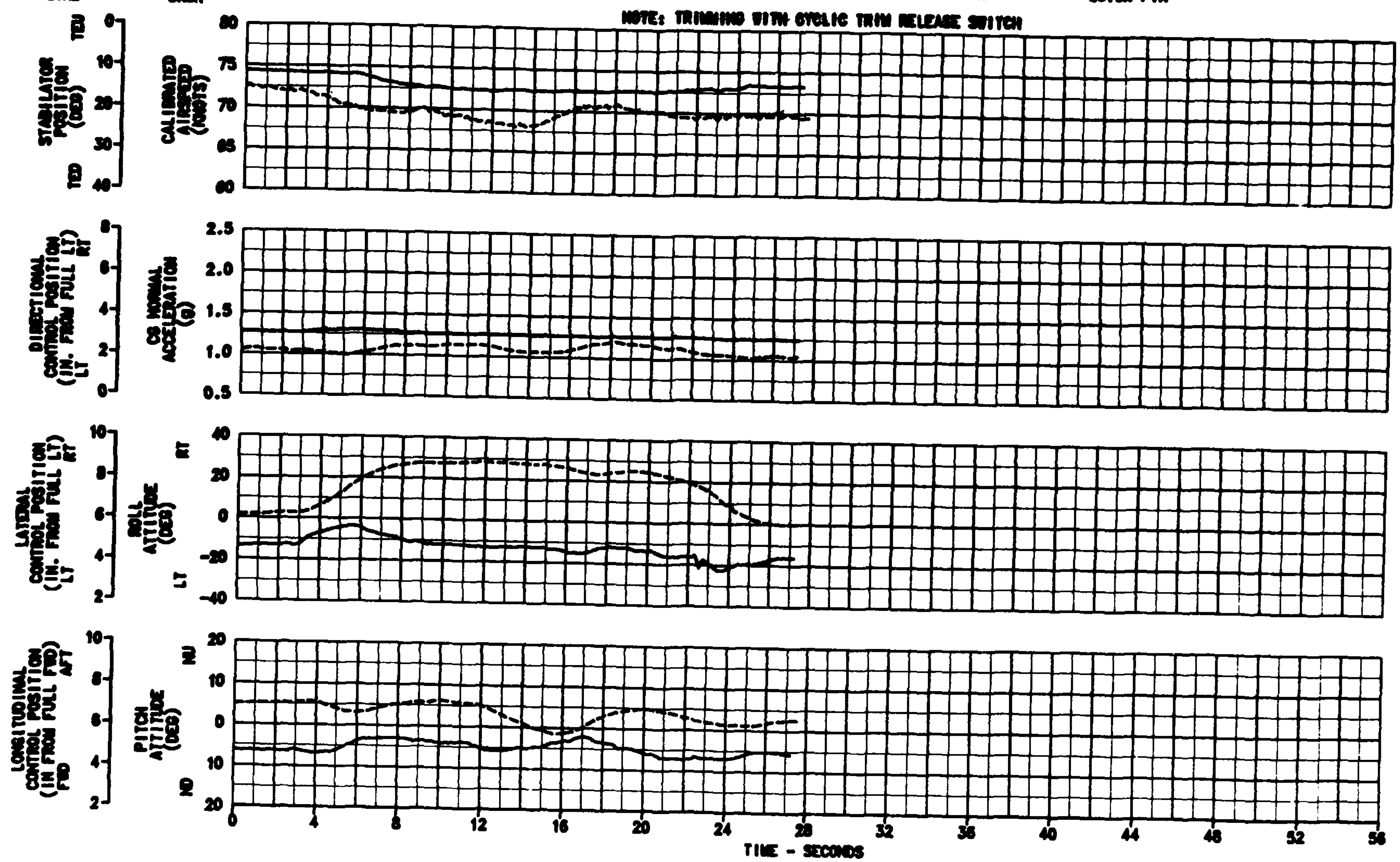


FIGURE E-61
30° LEFT BANK AT 74 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17280	365.6	0.0	6930	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

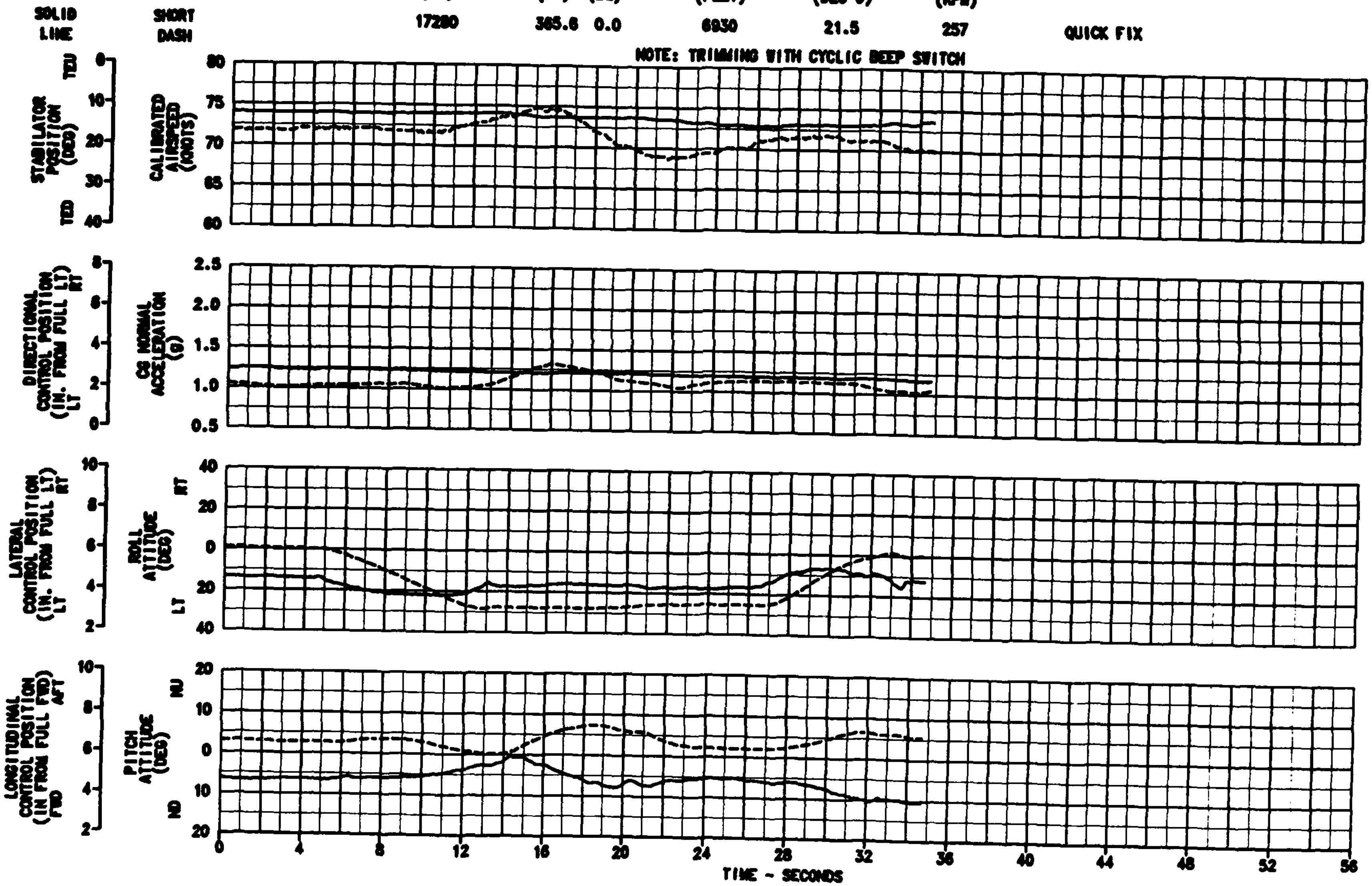


FIGURE E-62
30° RIGHT BANK AT 74 KCAS
EH-60A USA S/N 80-24580

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17270	365.5	0.0	6780	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

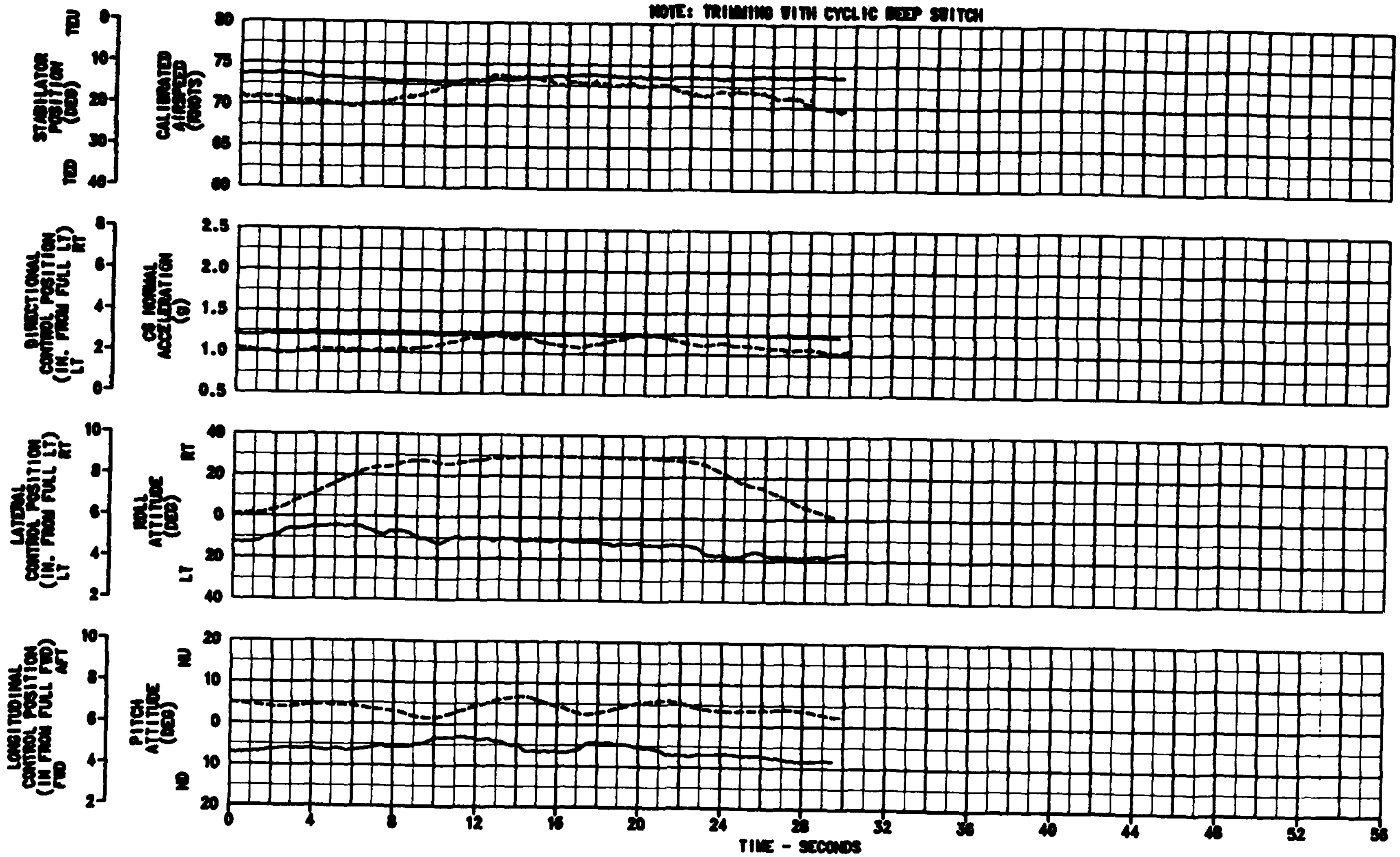


FIGURE E-63

15° LEFT BANK AT 107 KCAS

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17190	365.3	0.0	7030	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

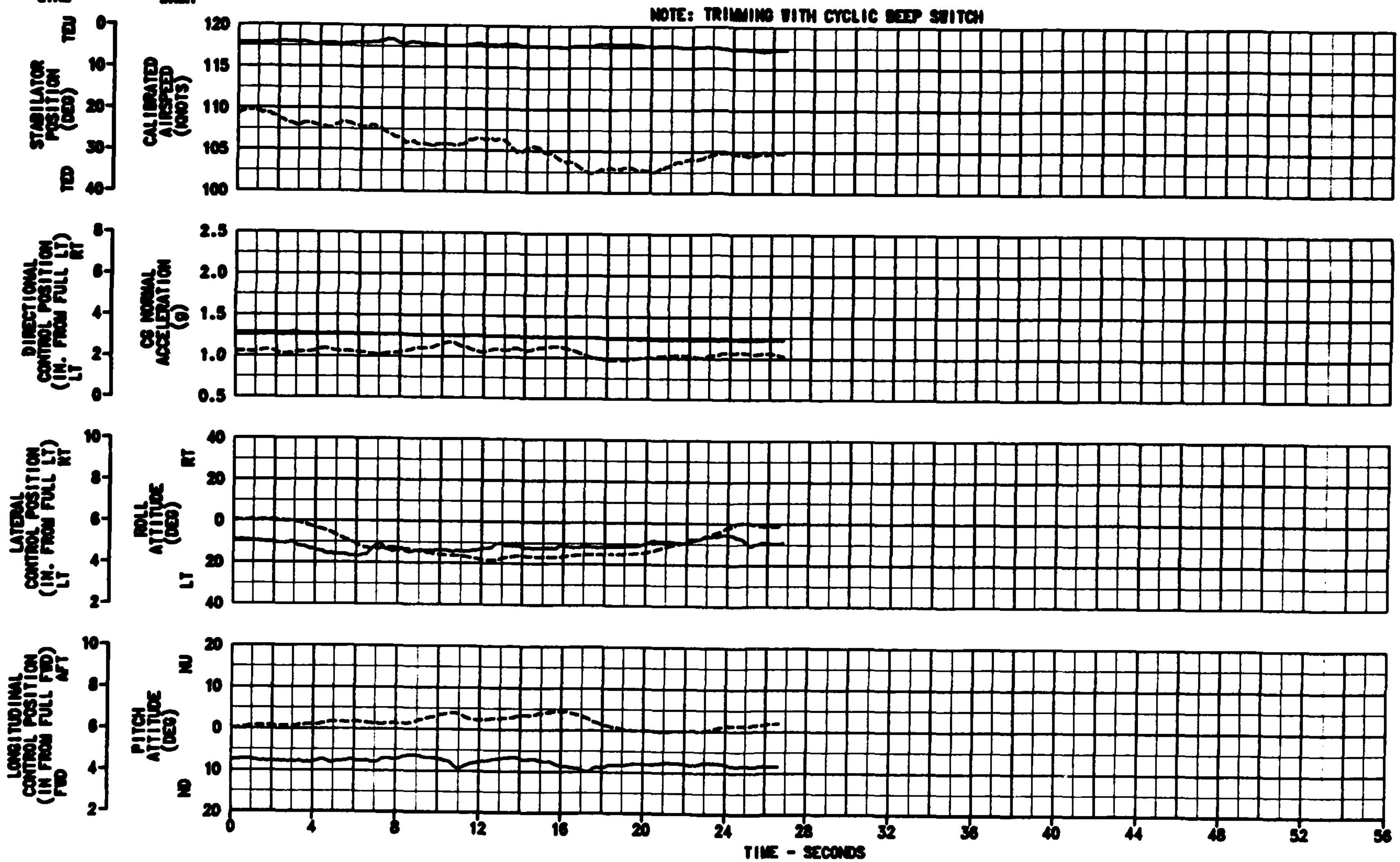


FIGURE E-64
15° RIGHT BANK AT 107 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17160	365.2	0.0	7650	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

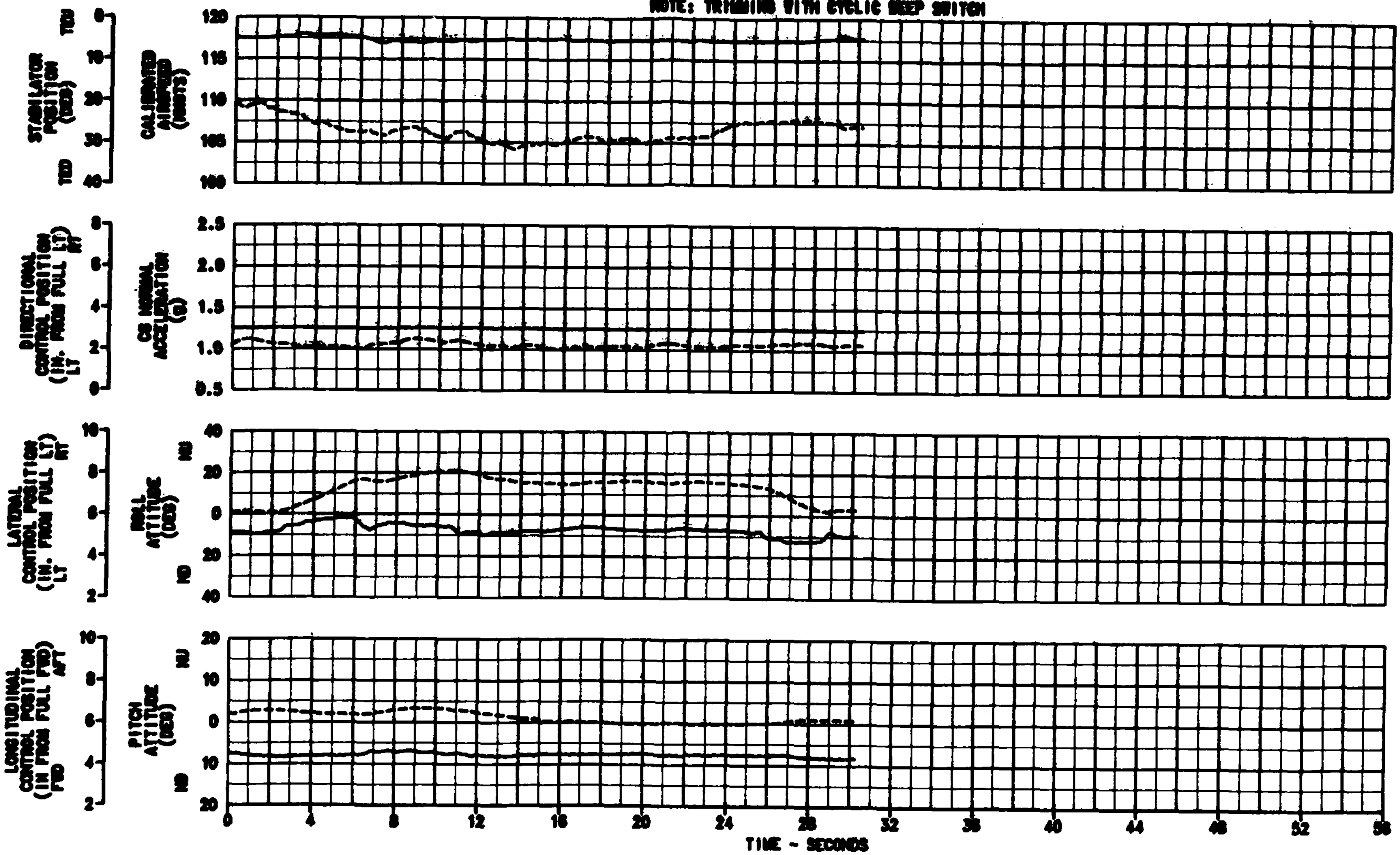


FIGURE E-65

15° LEFT BANK AT 107 KCAS

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17120	365.1	0.0	7130	21.5	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

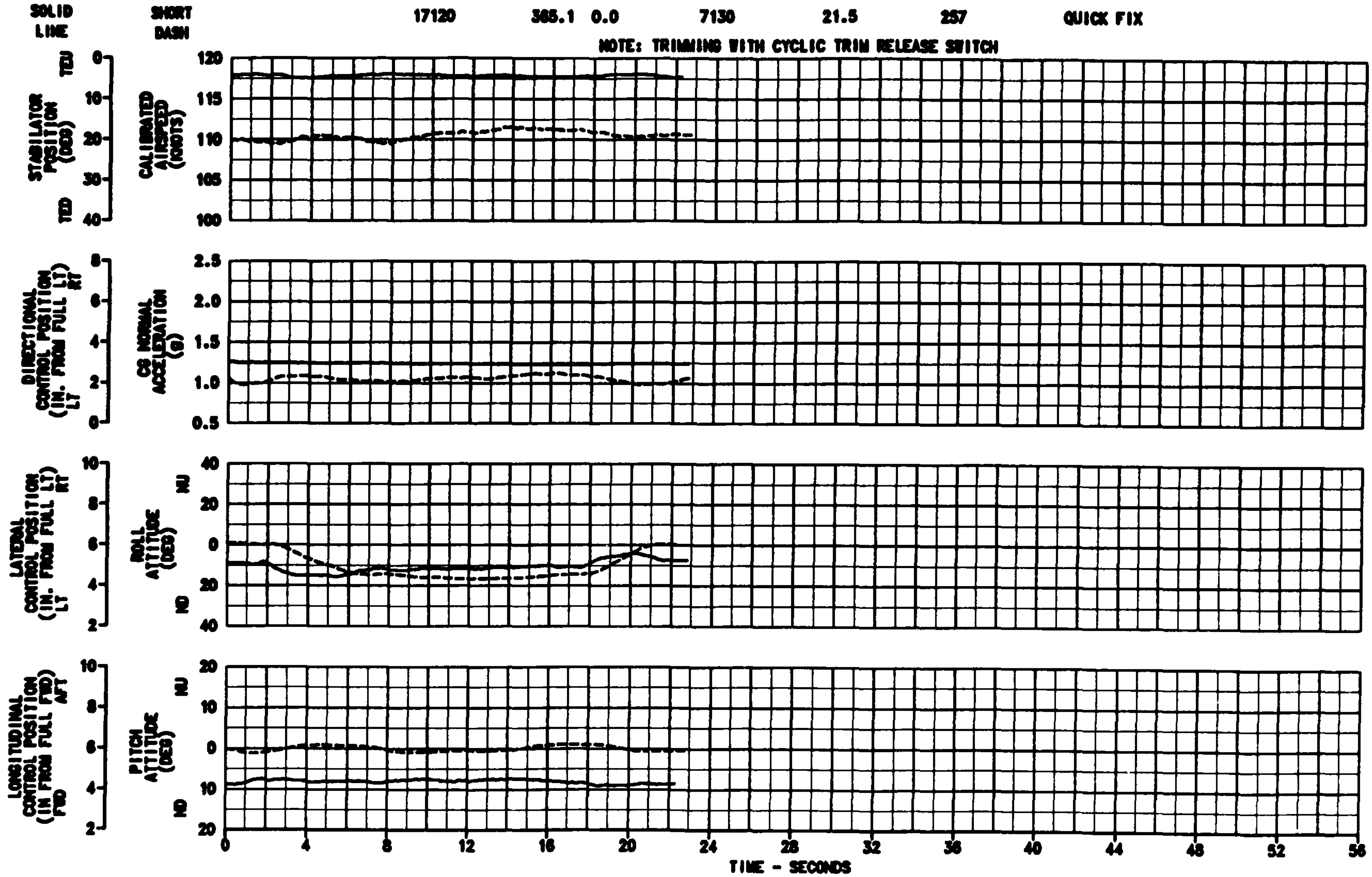


FIGURE E-68
15° RIGHT BANK AT 107 KCAS
EH-60A USA S/N 80-24500

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17130	365.1	0.0	7120	21.5	257	QUICK FIX

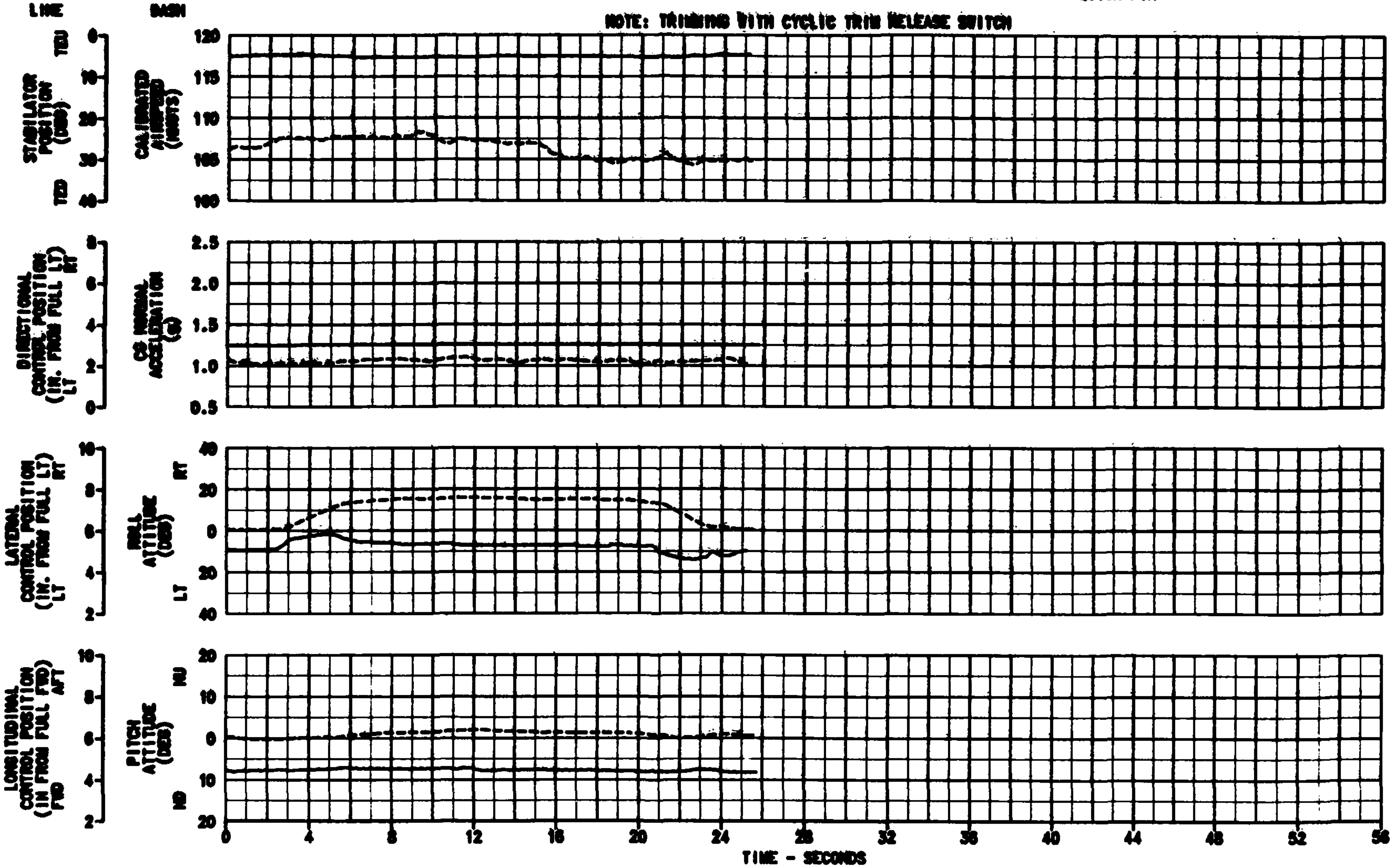


FIGURE E-67
30° LEFT BANK AT 107 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17100	365.0	0.0	7040	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

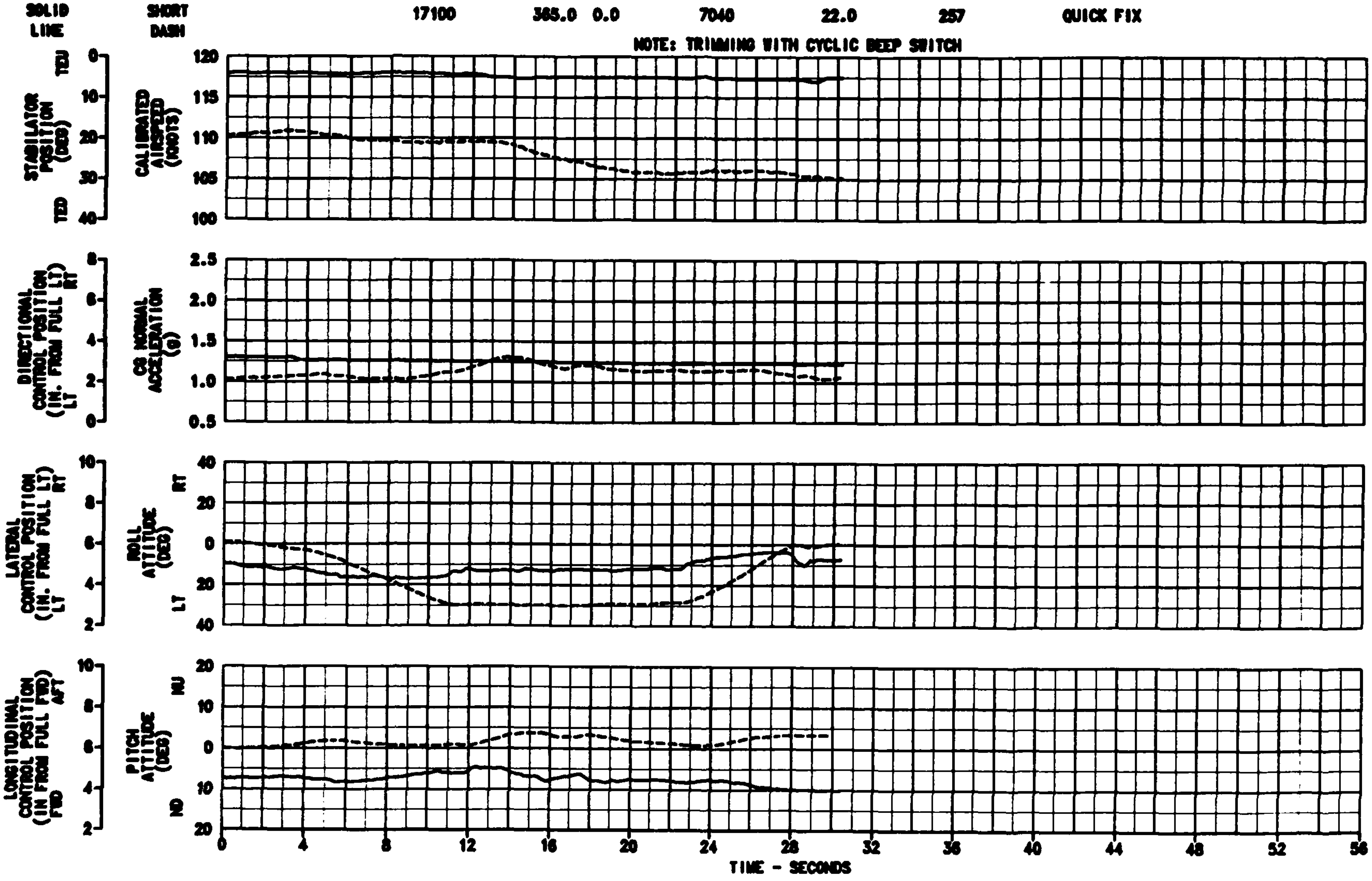


FIGURE E-66
30° RIGHT BANK AT 107 KCAS
EH-60A USA S/N 88-24588

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17080	365.0	0.0	7080	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC BEEP SWITCH

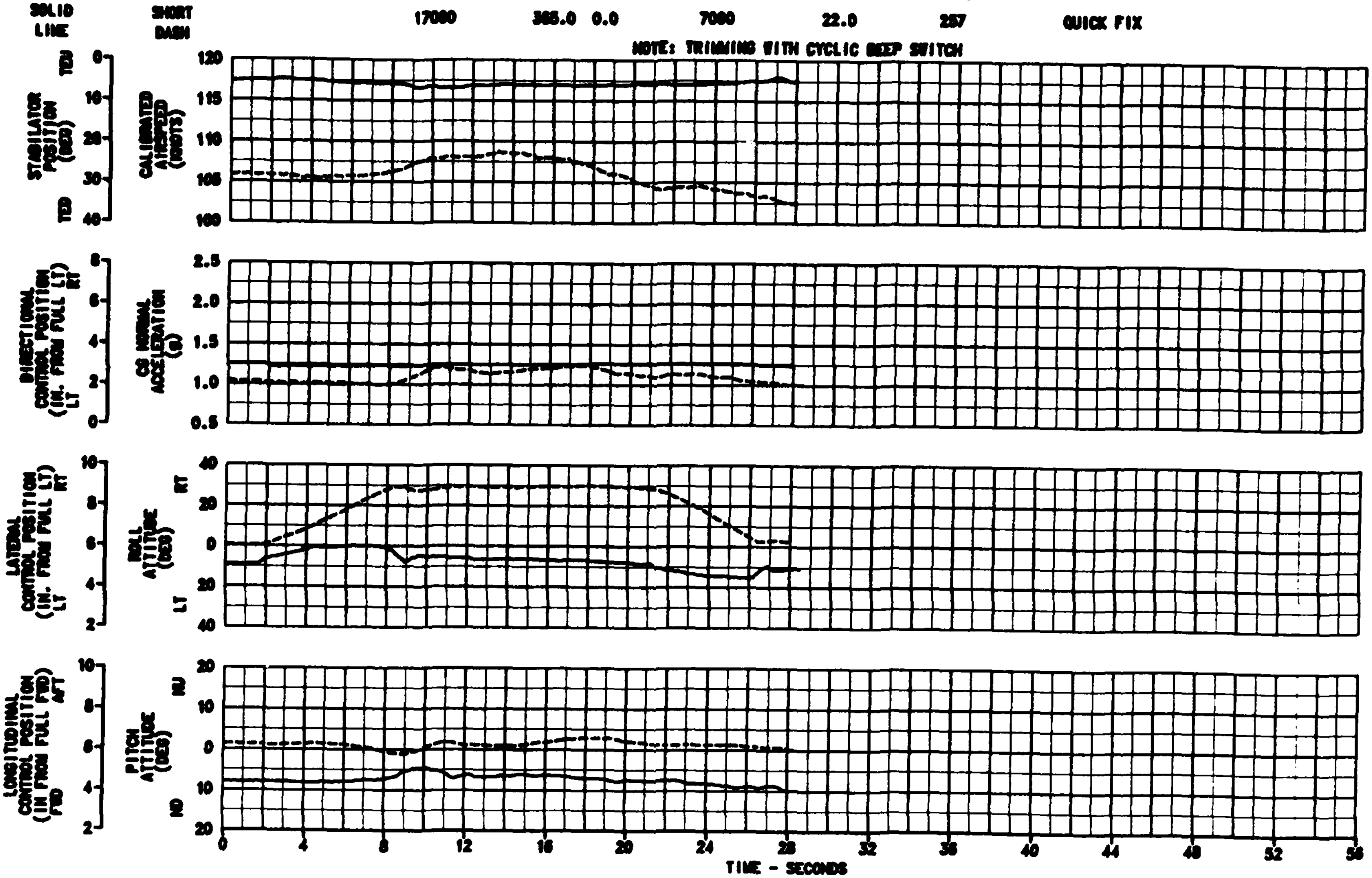


FIGURE E-80
30° LEFT BANK AT 107 KCAS
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17150	365.1	0.0	7050	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

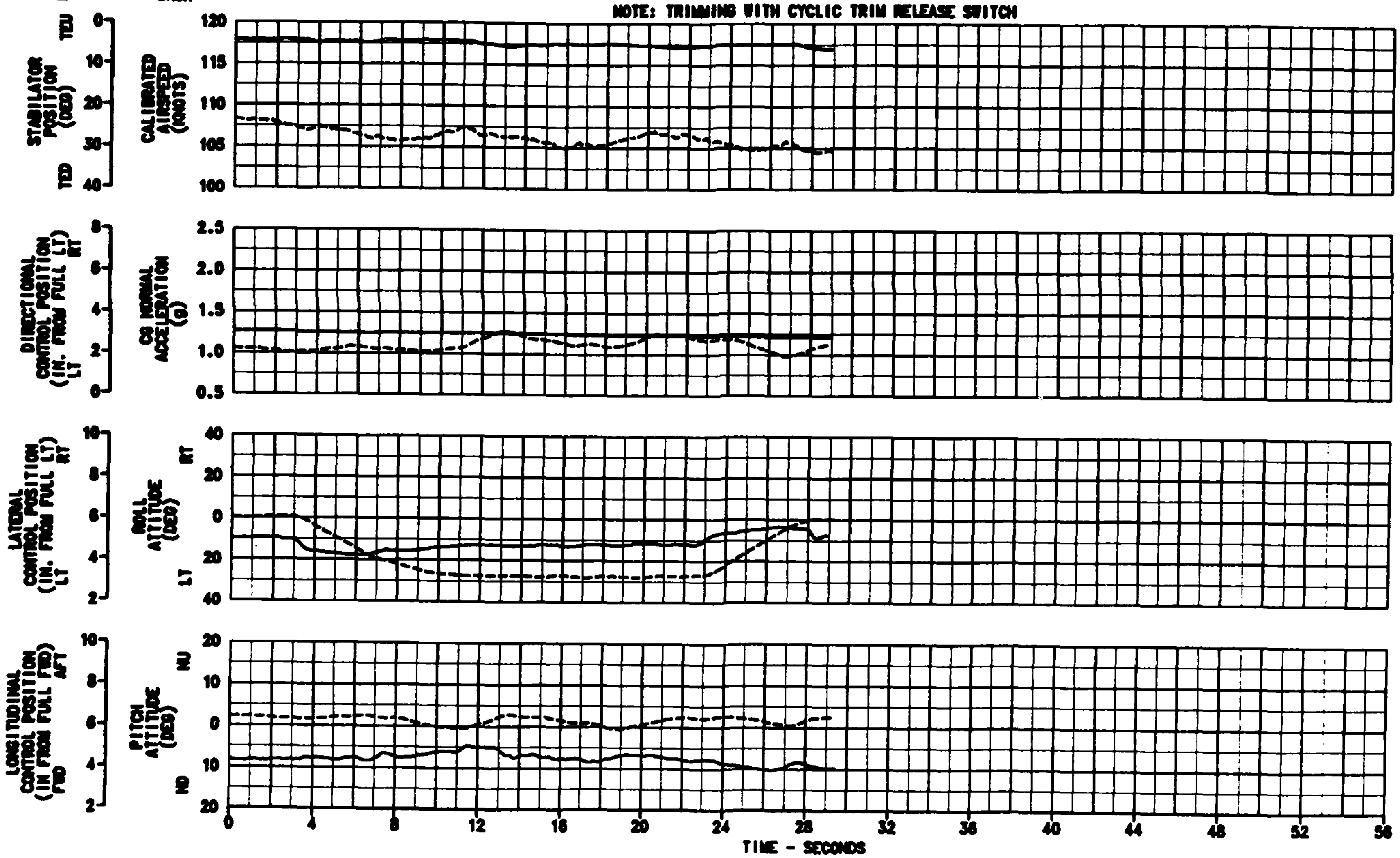


FIGURE E-70

30° RIGHT BANK AT 107 KCAS

EH-60A USA S/N 86-24[illegible]

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17070	364.9	0.0	7100	22.0	257	QUICK FIX

NOTE: TRIMMING WITH CYCLIC TRIM RELEASE SWITCH

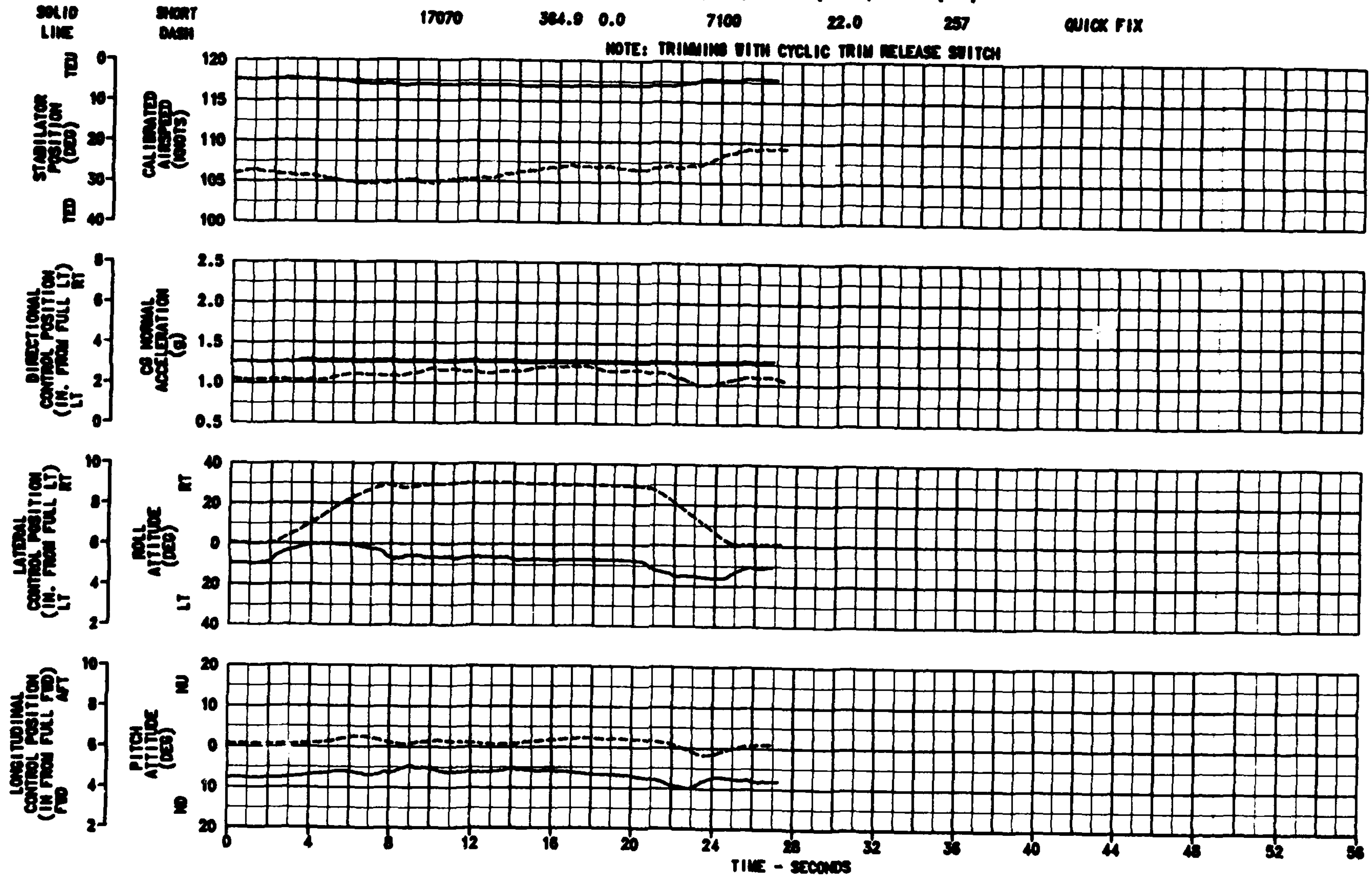


FIGURE E-71
HIGH SPEED DIVE WITH 60° LEFT BANK, 180° HEADING CHANGE
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
17000	364.7	0.0	10100	18.5	258	QUICK FIX

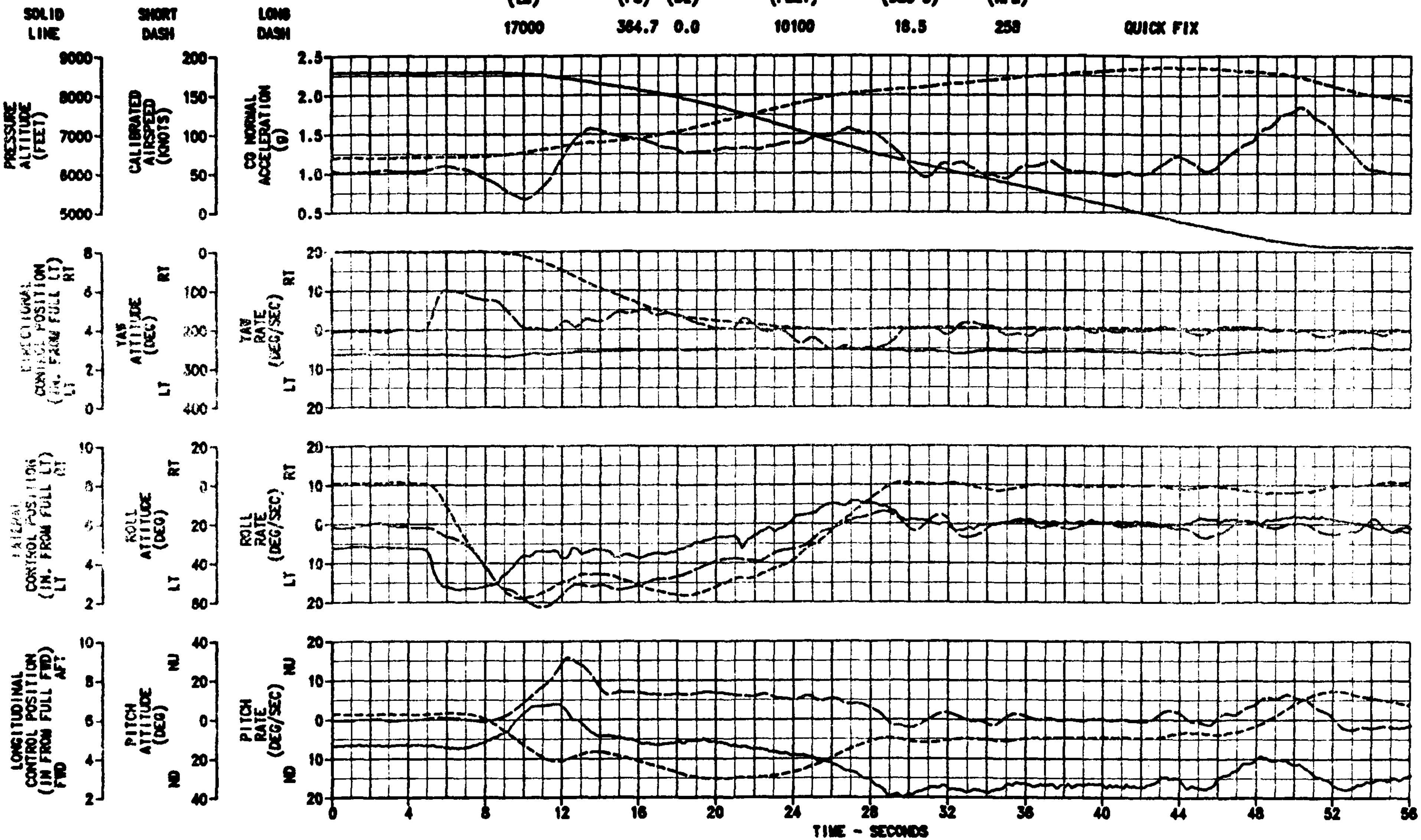


FIGURE E-72
HIGH SPEED DIVE WITH 60° RIGHT BANK, 180° HEADING CHANGE
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
16870	364.2	0.0	10090	15.0	258	QUICK FIX

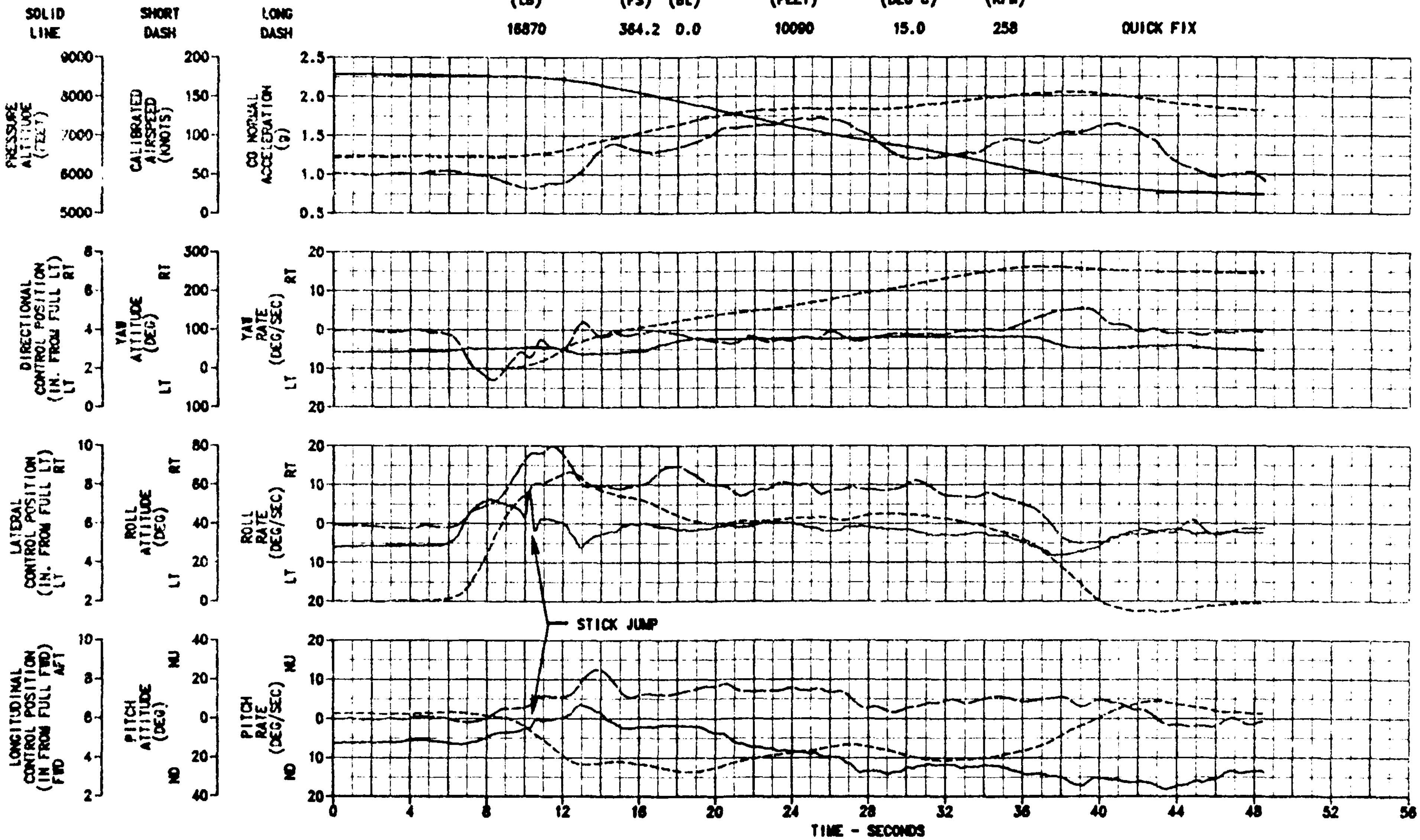


FIGURE E-73
DIVING LEFT SPIRAL
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
16730	363.8	0.0	10430	14.5	262	QUICK FIX

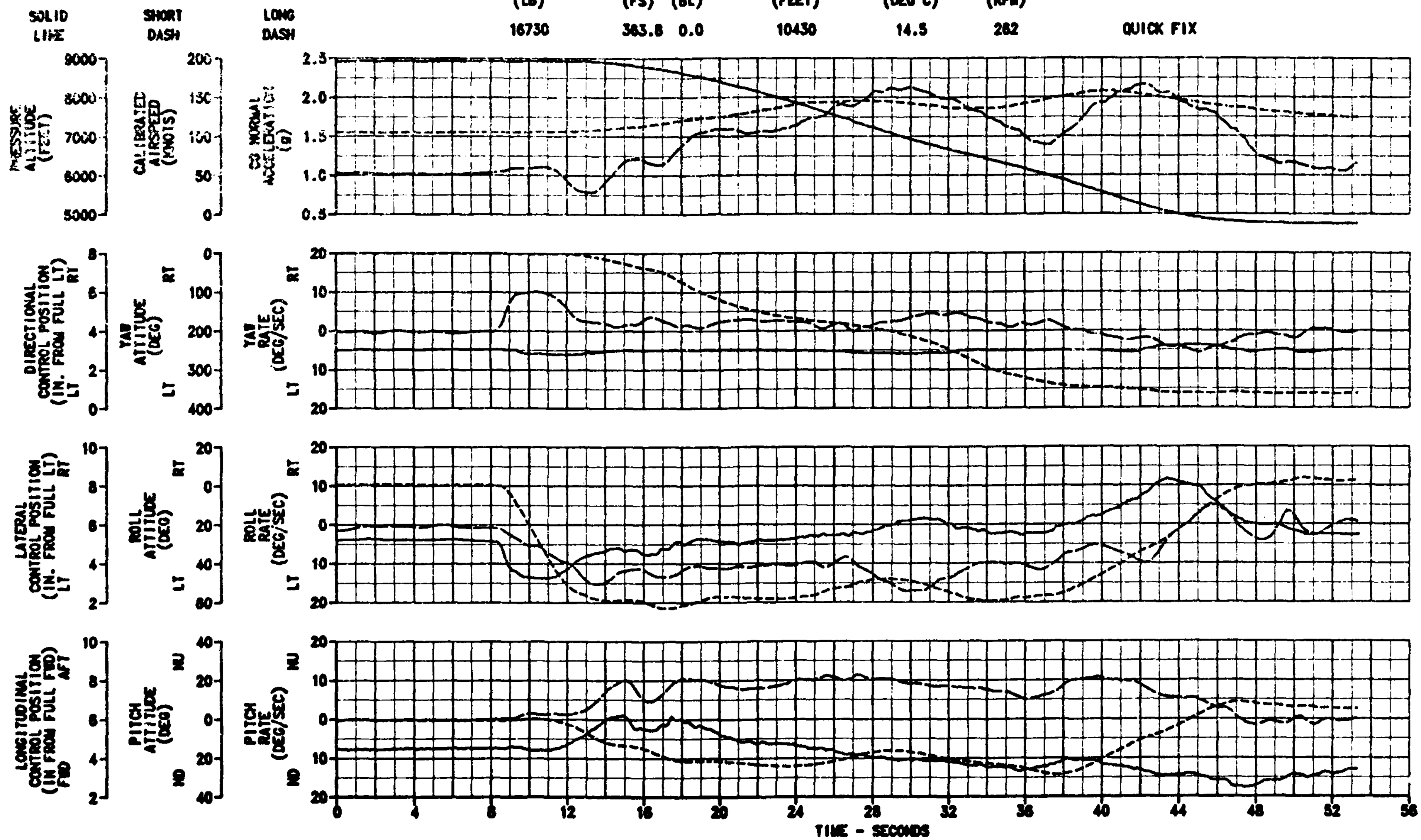


FIGURE E-74
DIVING RIGHT SPIRAL
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
16820	364.1	0.0	10140	16.0	258	QUICK FIX

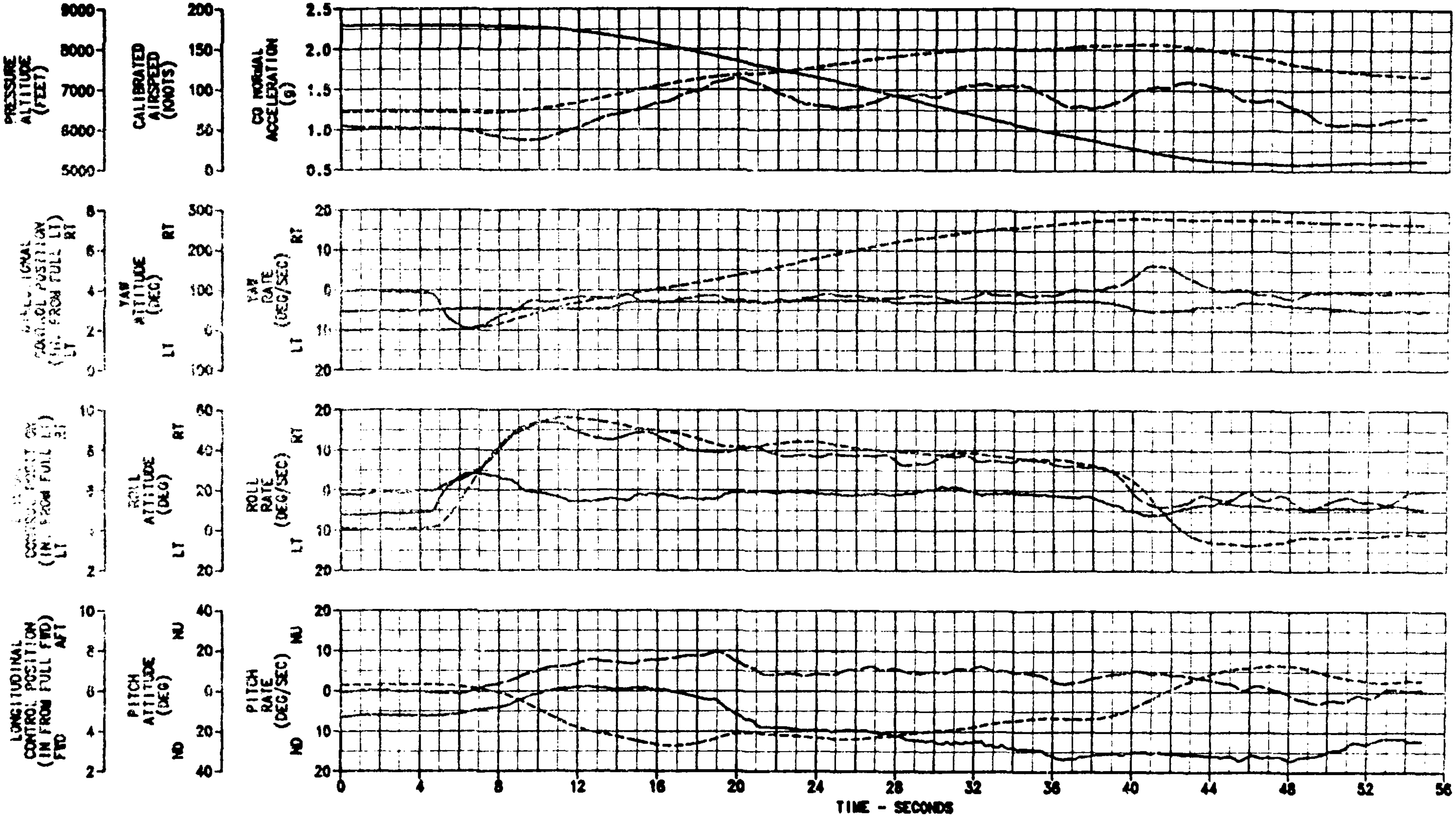


FIGURE E-75
AUTOROTATION WITH LEFT 180° HEADING CHANGE
EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
16610	363.3	0.0	10060	15.0	260	QUICK FIX

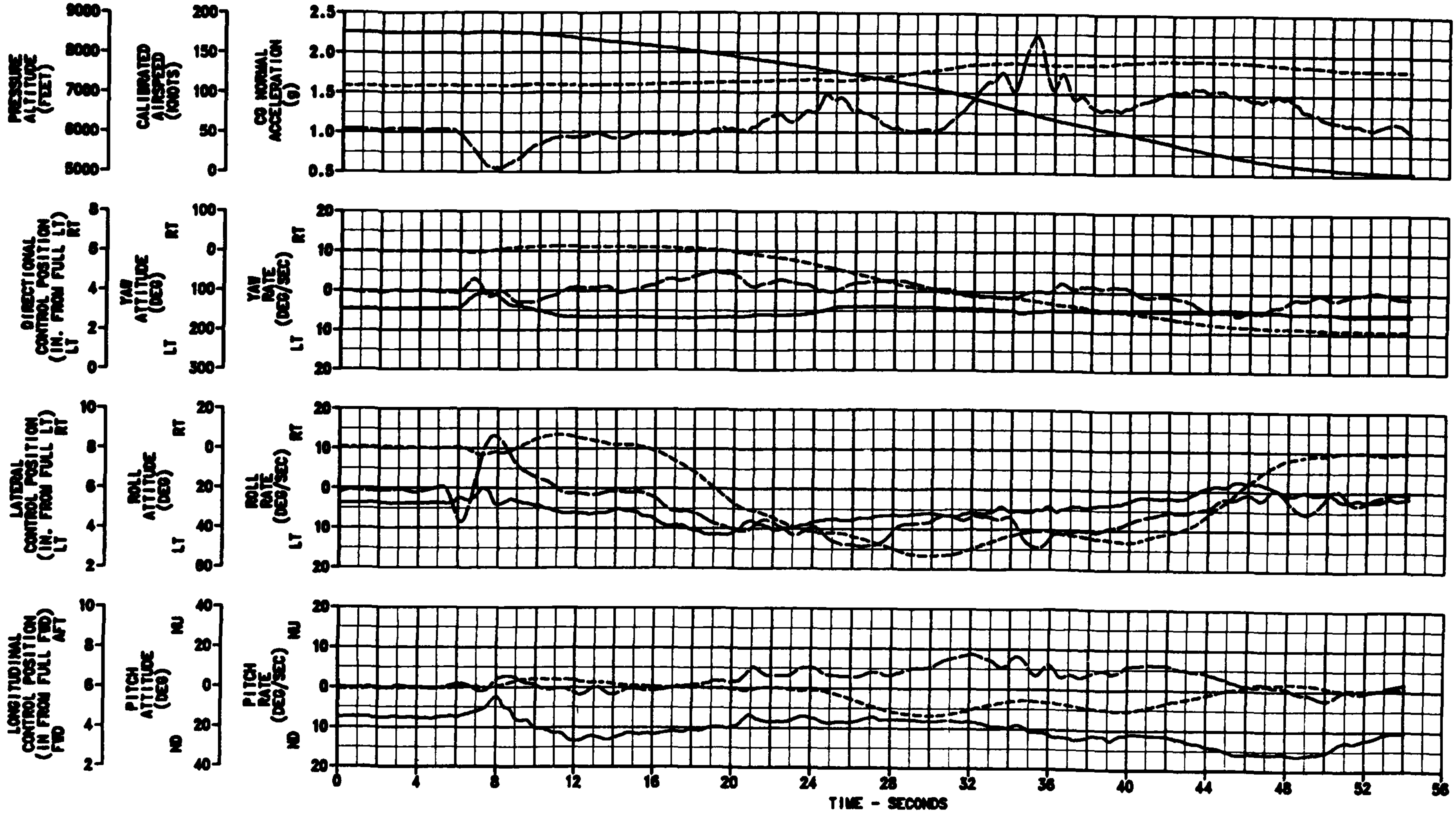


FIGURE E-78
AUTOROTATION WITH RIGHT 180° HEADING CHANGE
EH-60A USA S/N 86-24560

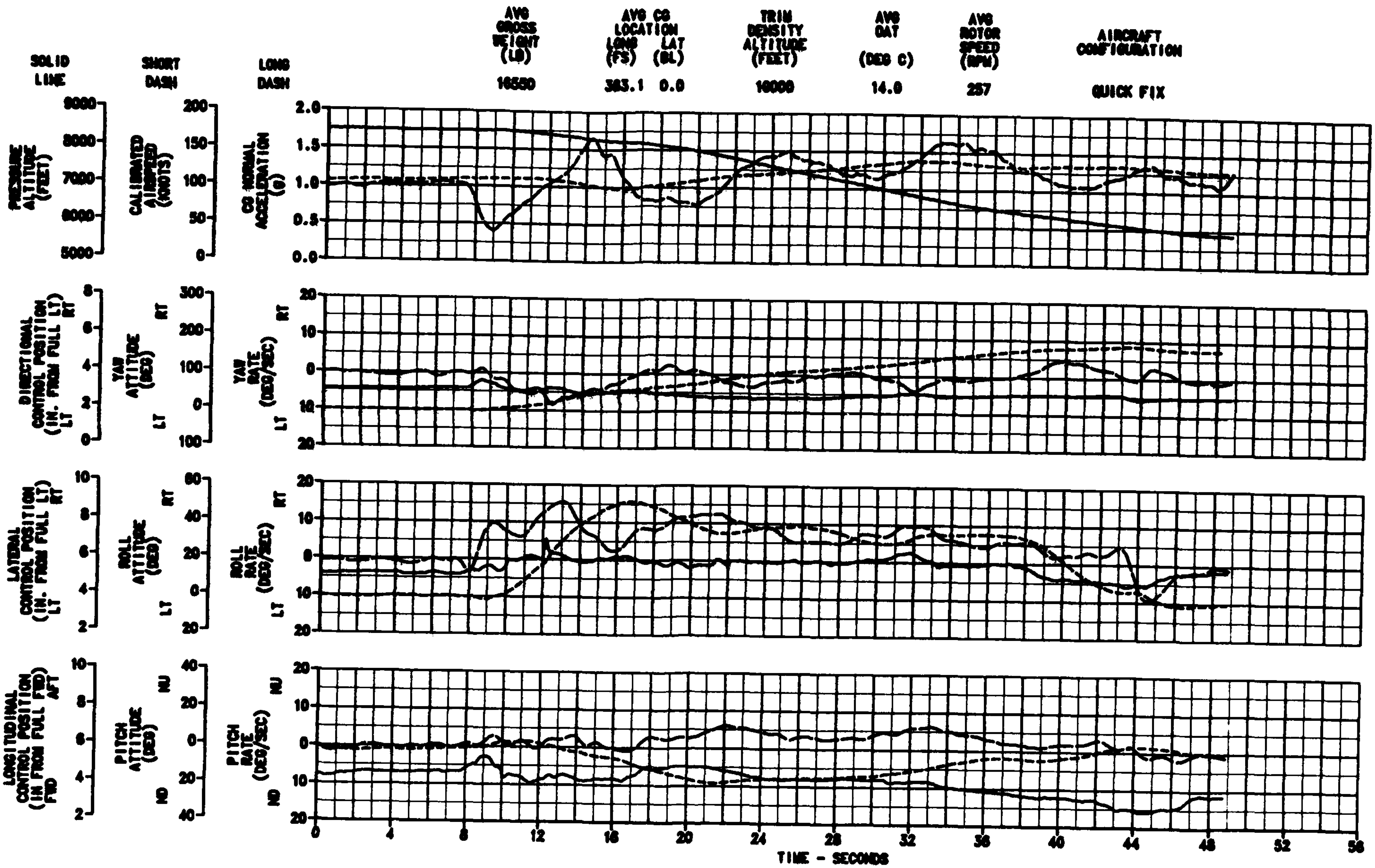


FIGURE E-77

STANDARD AUTOROTATION

EH-60A USA S/N 86-24560

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	TRIM DENSITY ALTITUDE (FEET)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AIRCRAFT CONFIGURATION
16500	362.9	0.0	10140	17.0	258	QUICK FIX

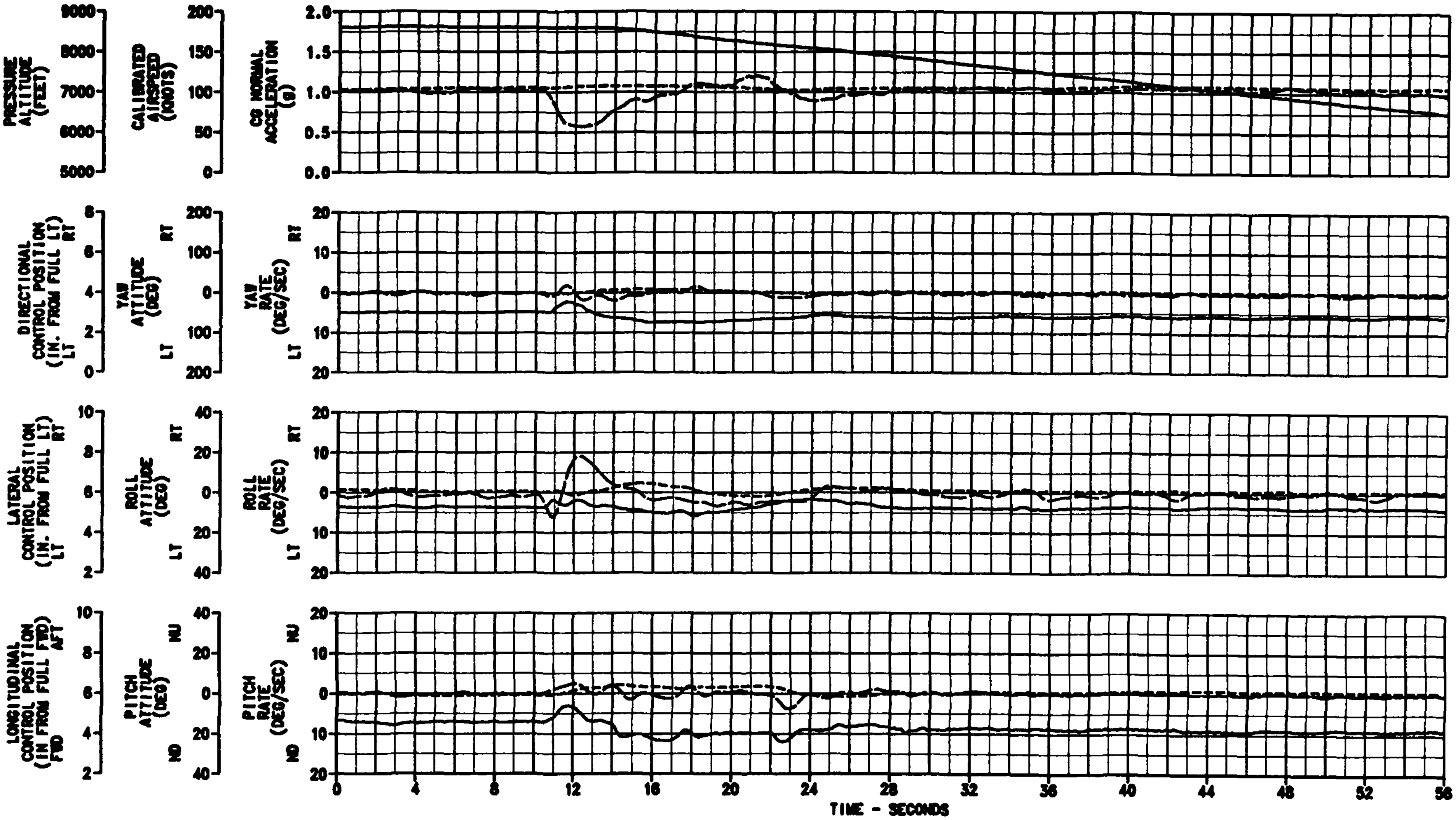


FIGURE E-78
VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)
EH-60A USA S/N 86-24569
CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = LEVEL, ⊕ = DIVE

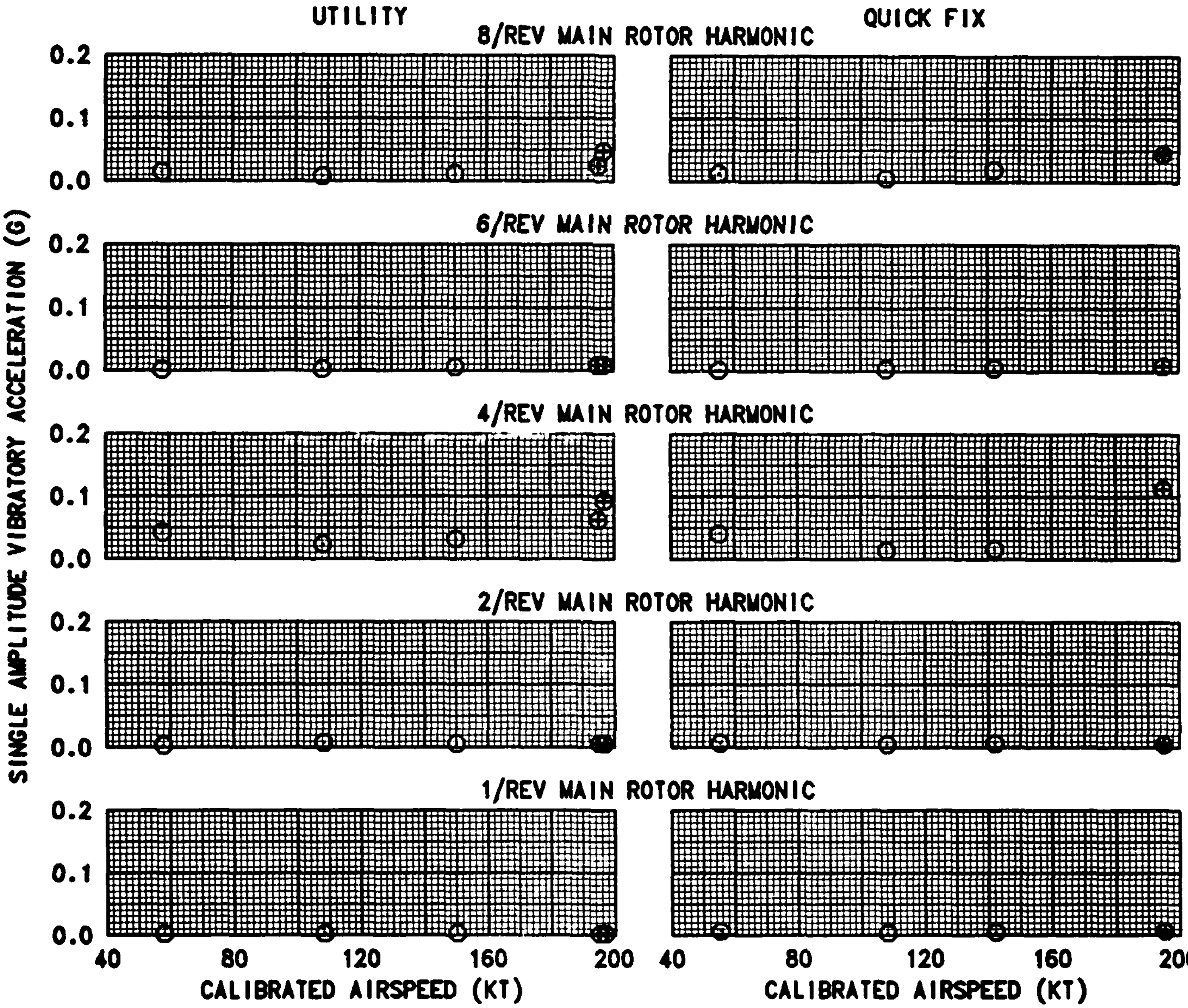


FIGURE E-79

VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS

EH-60A USA S/N 86-24569

CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

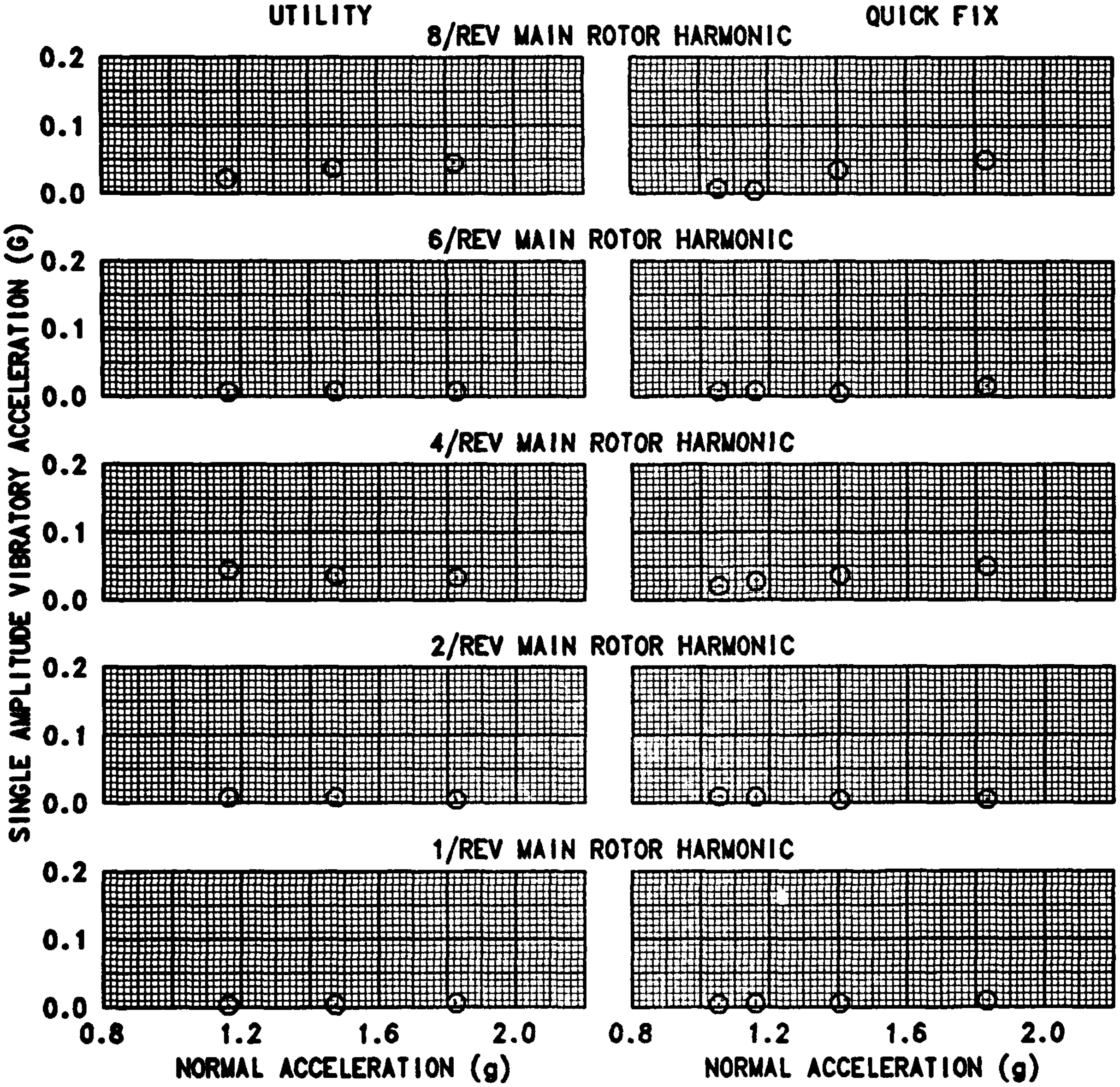


FIGURE E-80
VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

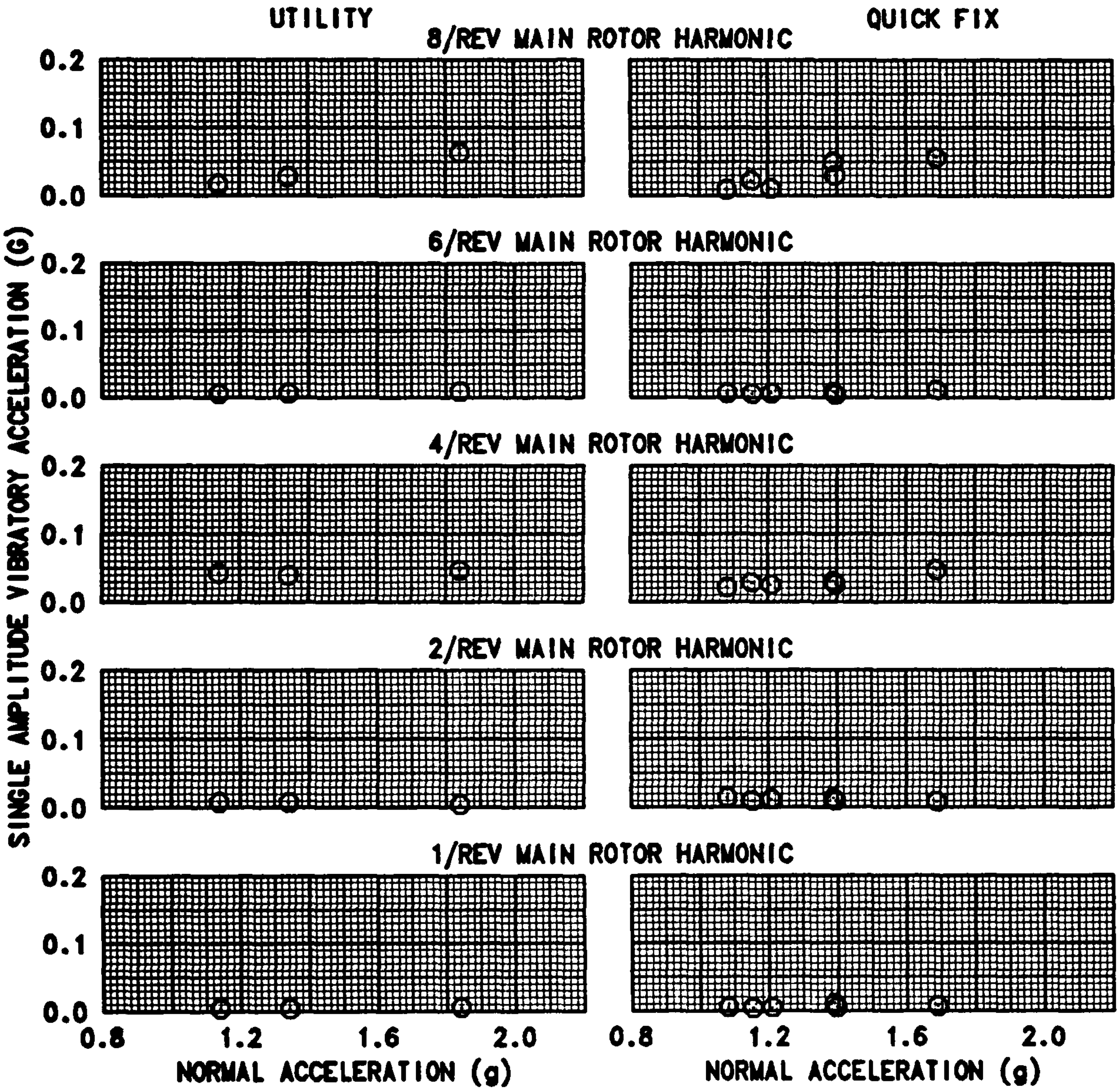


FIGURE E-81

VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT

EH-60A USA S/N 86-24569

CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

NOTE:
1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = SIDEWARD, ⊕ = OGE, ⊠ = IGE

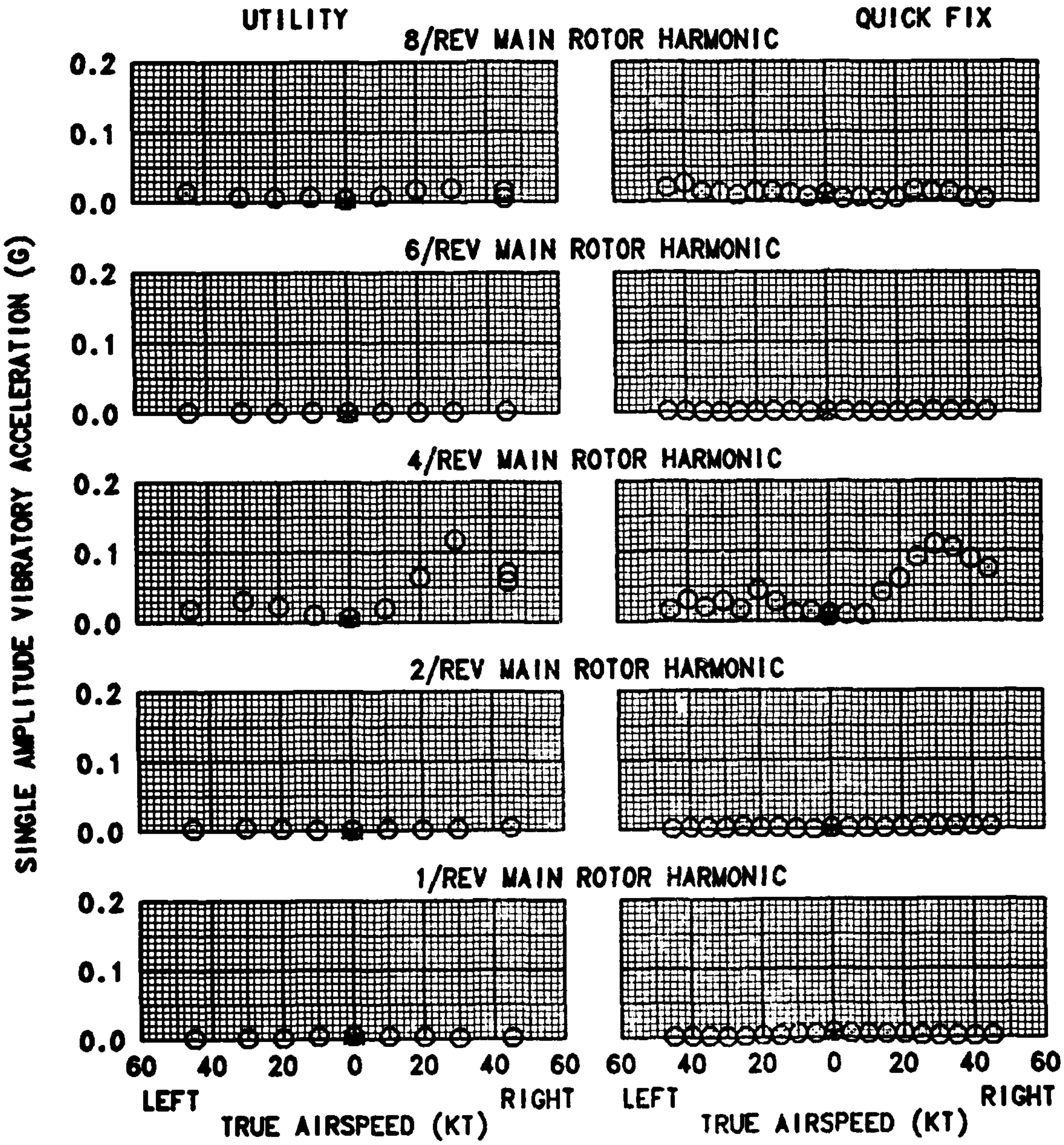


FIGURE E-82
VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT
EH-60A USA S/N 86-24569
CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

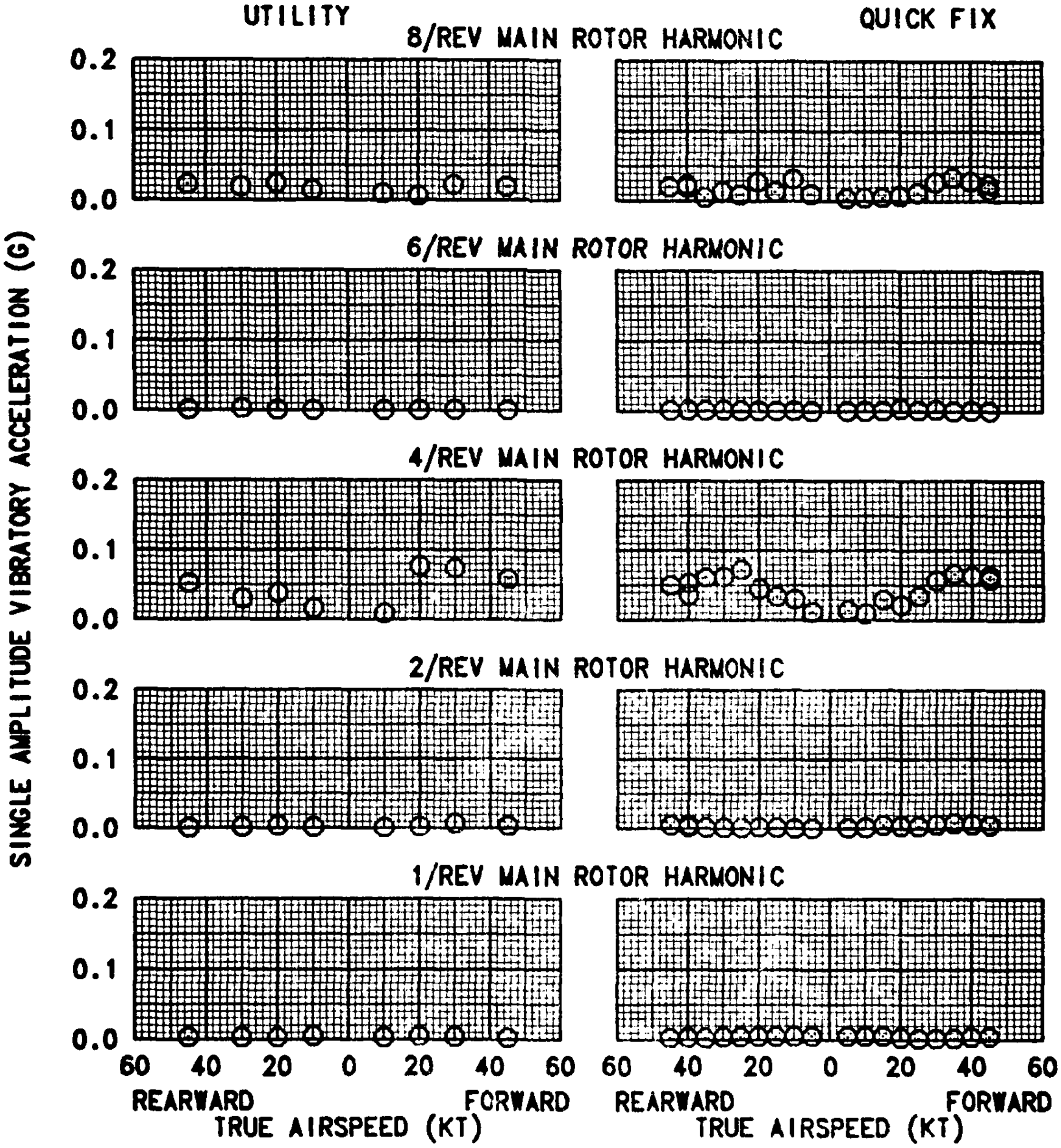


FIGURE E-83

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = CLIMB, ⊕ = DESCENT, ⊗ = APPROACH

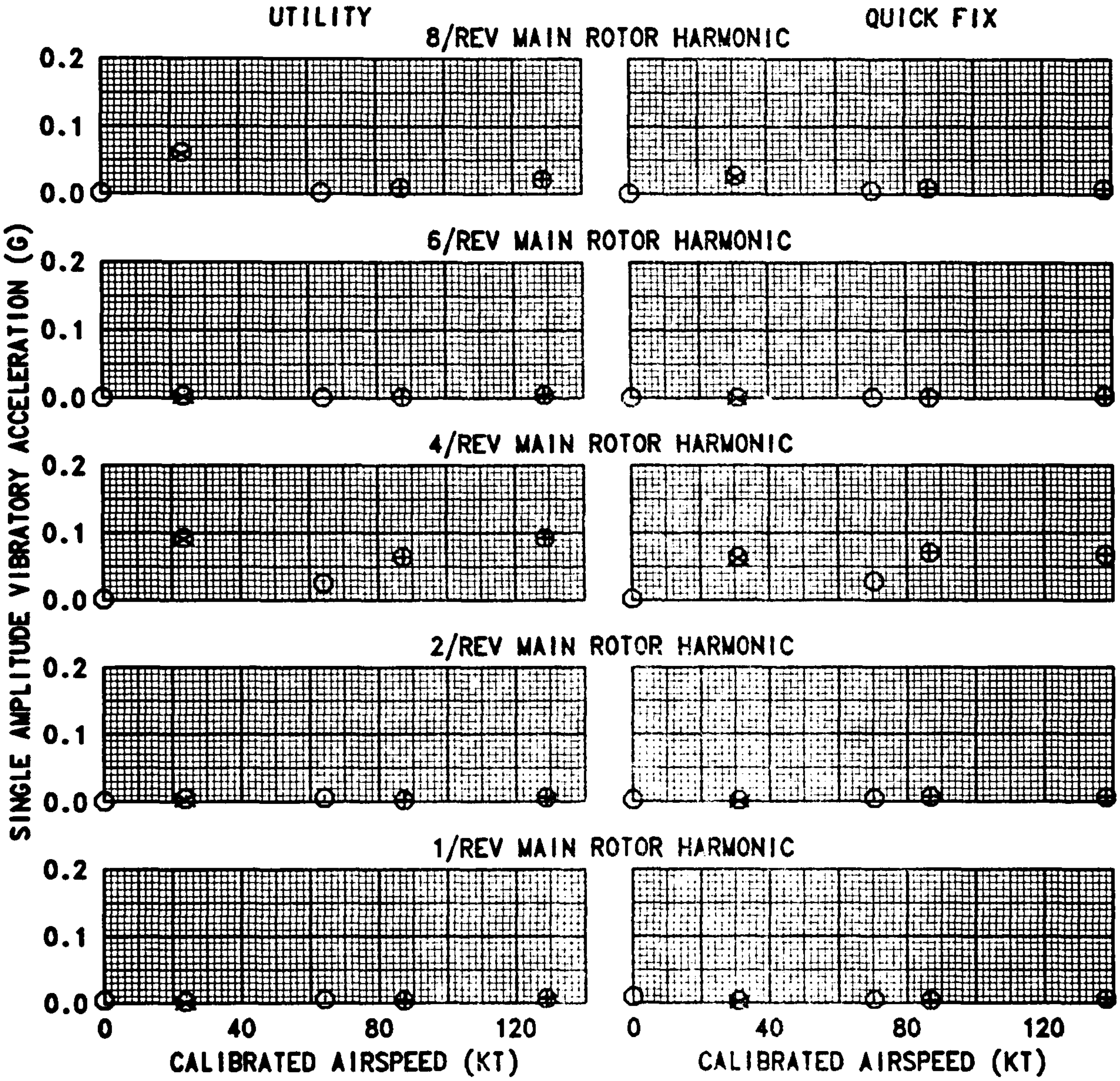


FIGURE E-84

VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP

EH-60A USA S/N 86-24569

CG LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = RIGHT, ⊕ = LEFT

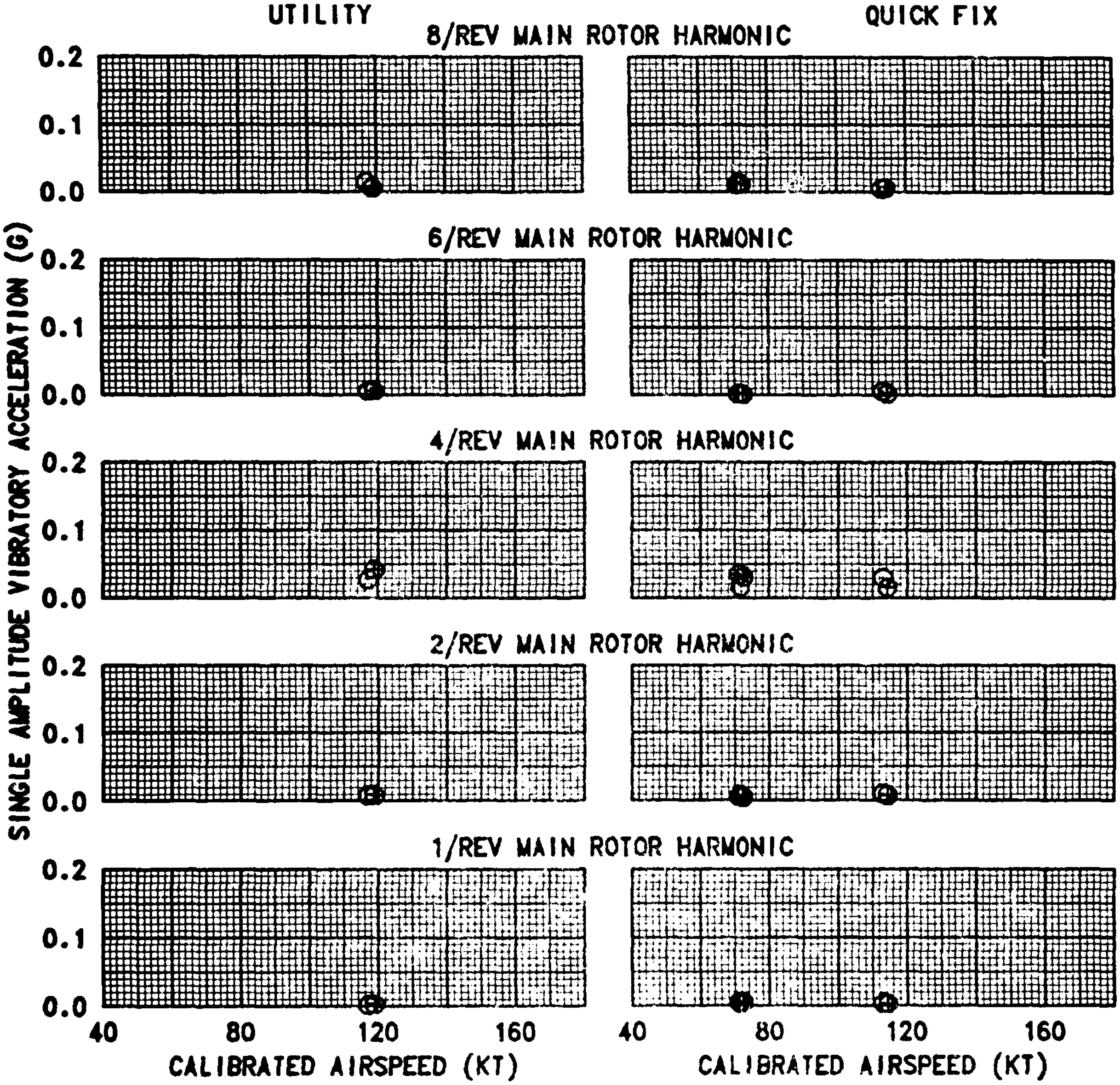


FIGURE E-85

VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)

EH-60A USA S/N 86-24569

CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

NOTE:
1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = LEVEL, ⊕ = DIVE

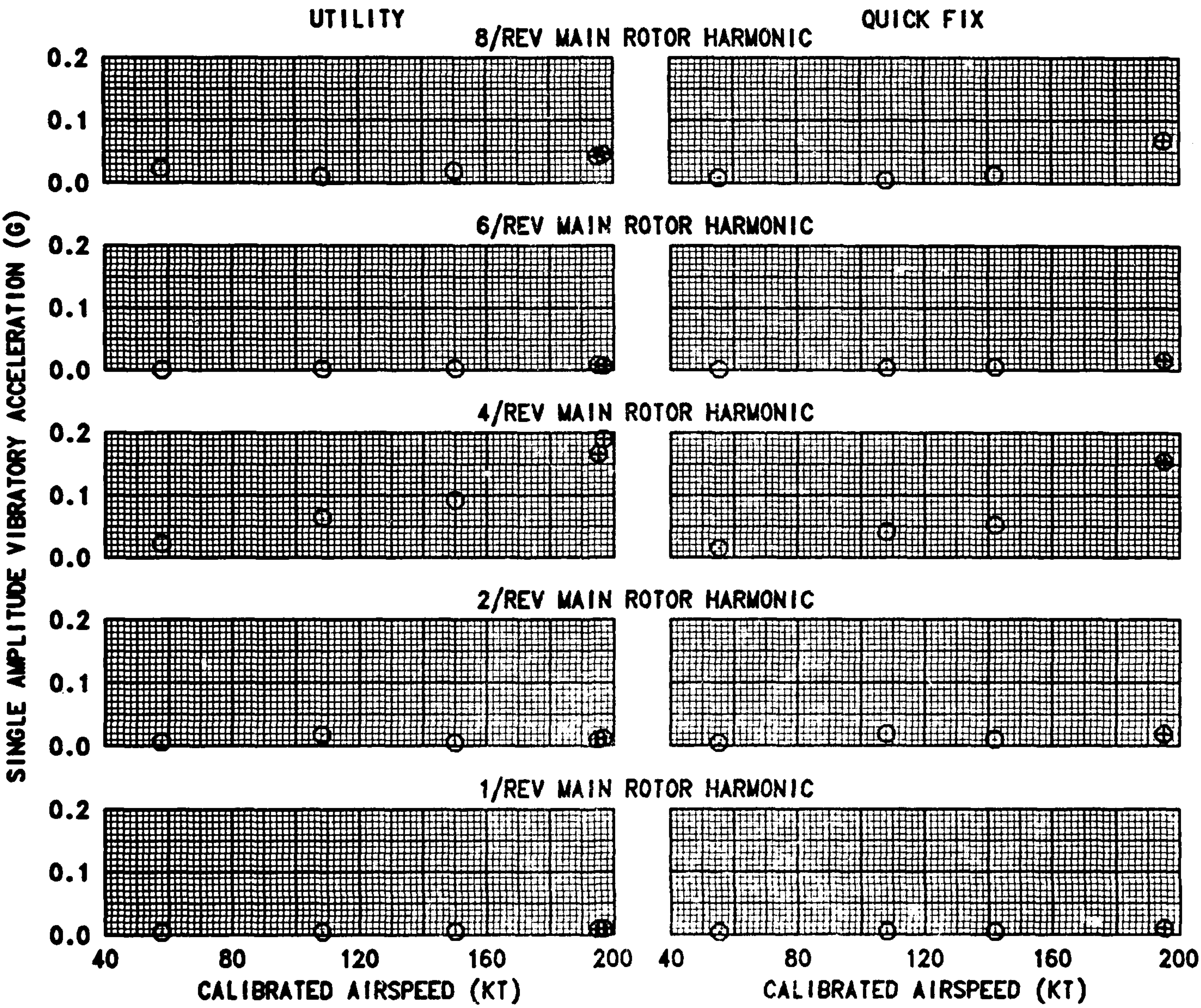


FIGURE E-86

VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS

EH-60A USA S/N 86-24569

CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

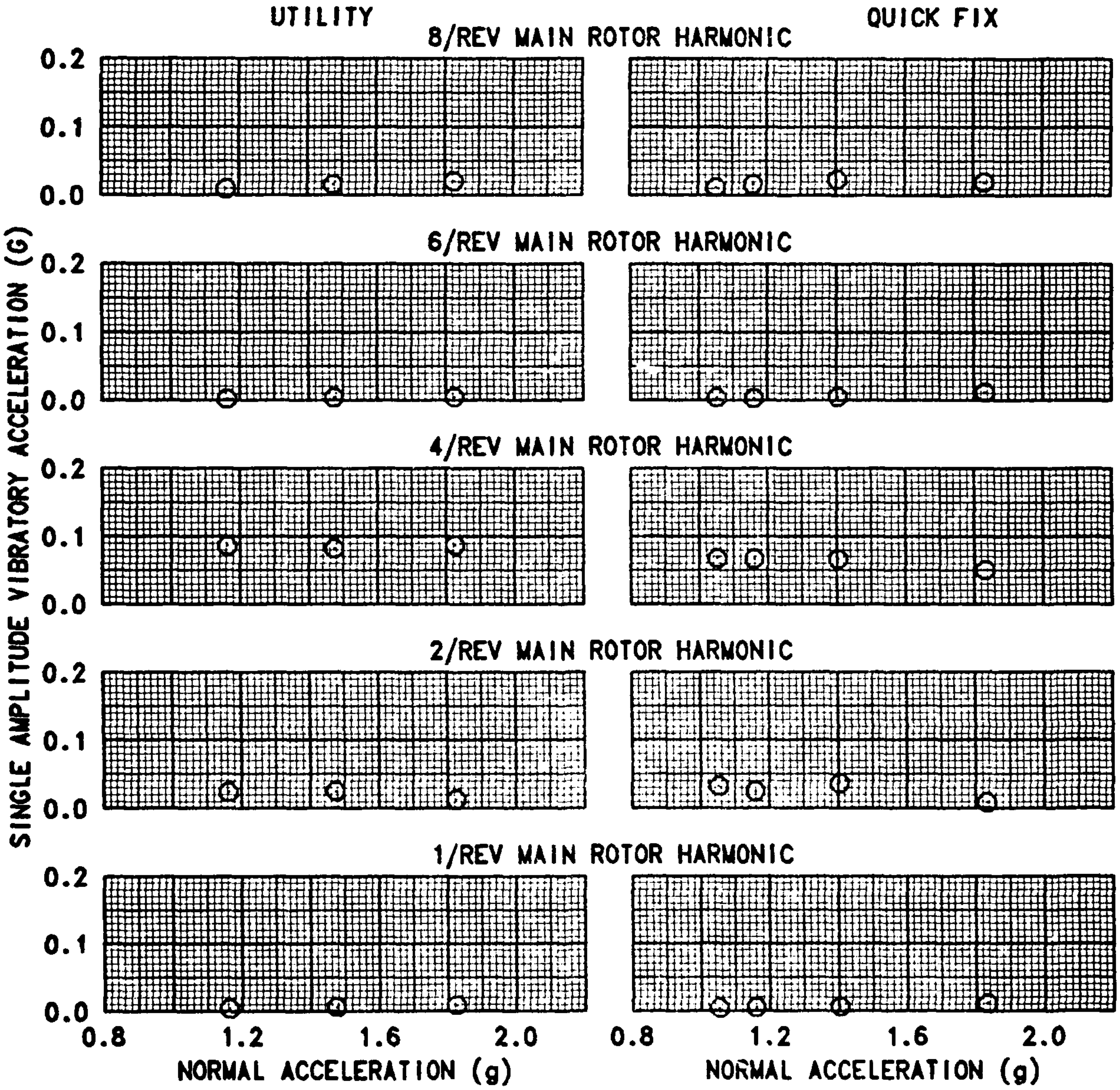


FIGURE E-87

VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS

EH-60A USA S/N 86-24569
CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

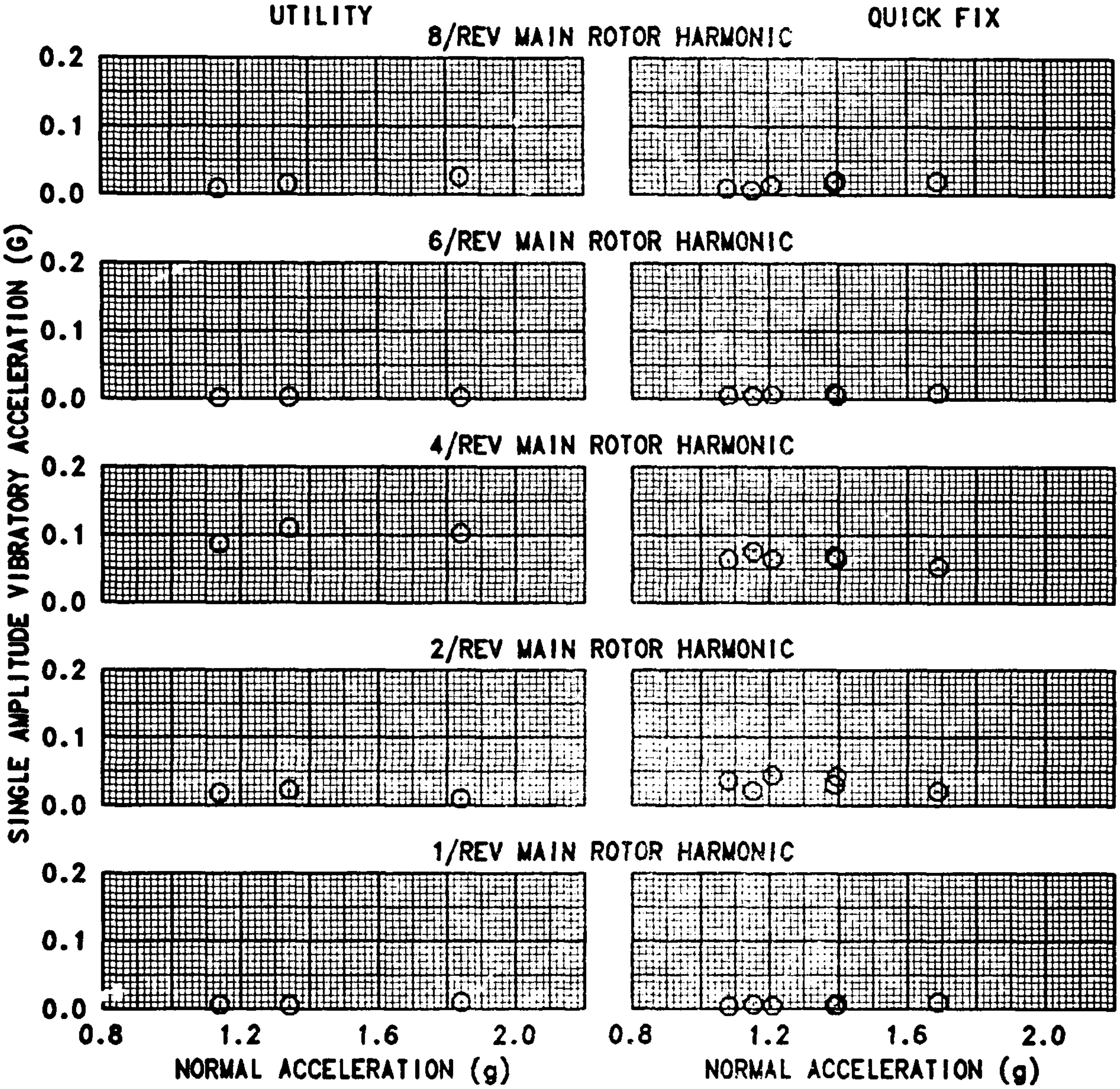


FIGURE E-88
VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT
EH-60A USA S/N 86-24569
CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = SIDEWARD, ⊕ = OGE, ⊗ = IGE

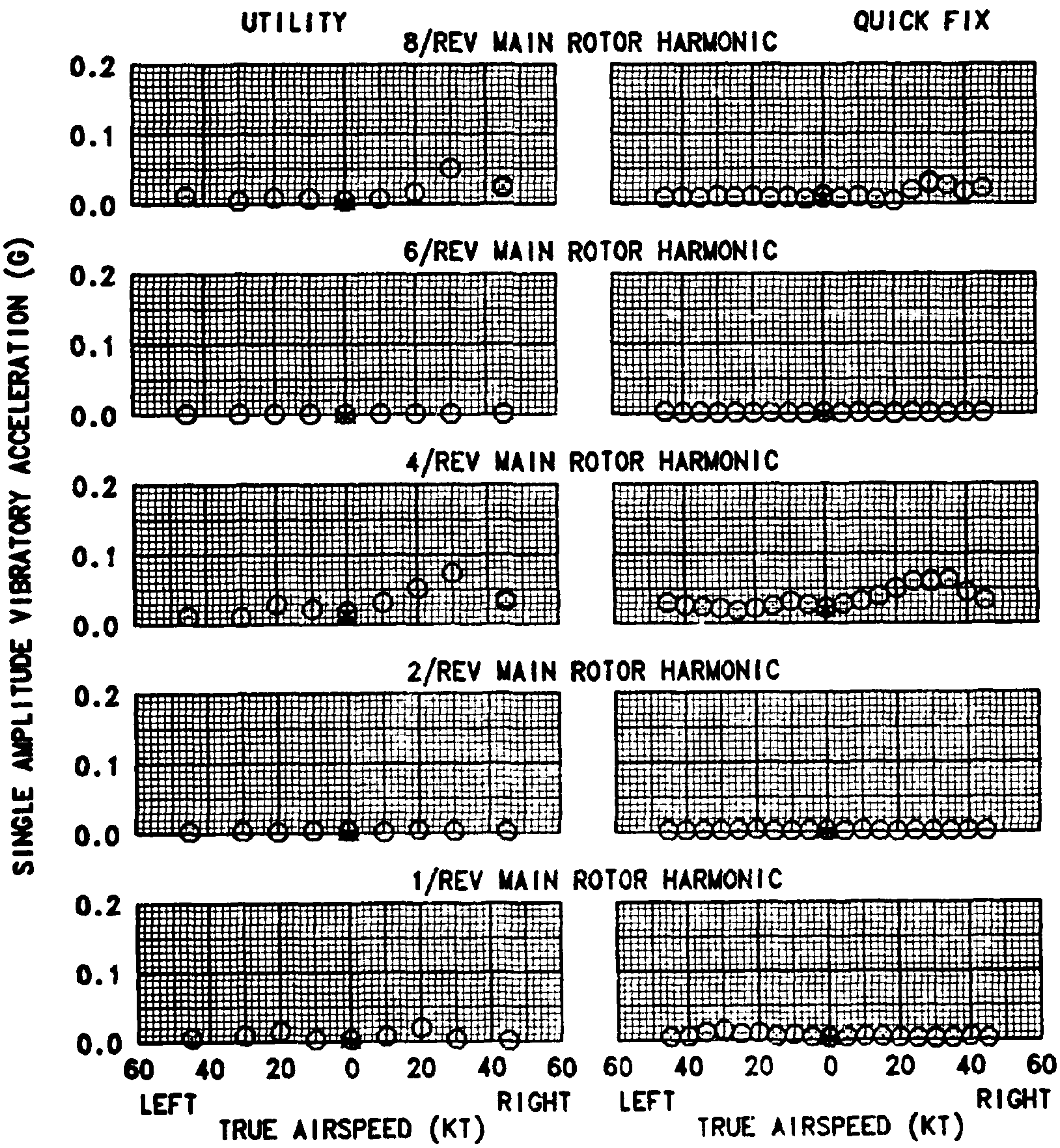


FIGURE E-89
VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT
EH-60A USA S/N 86-24569
CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

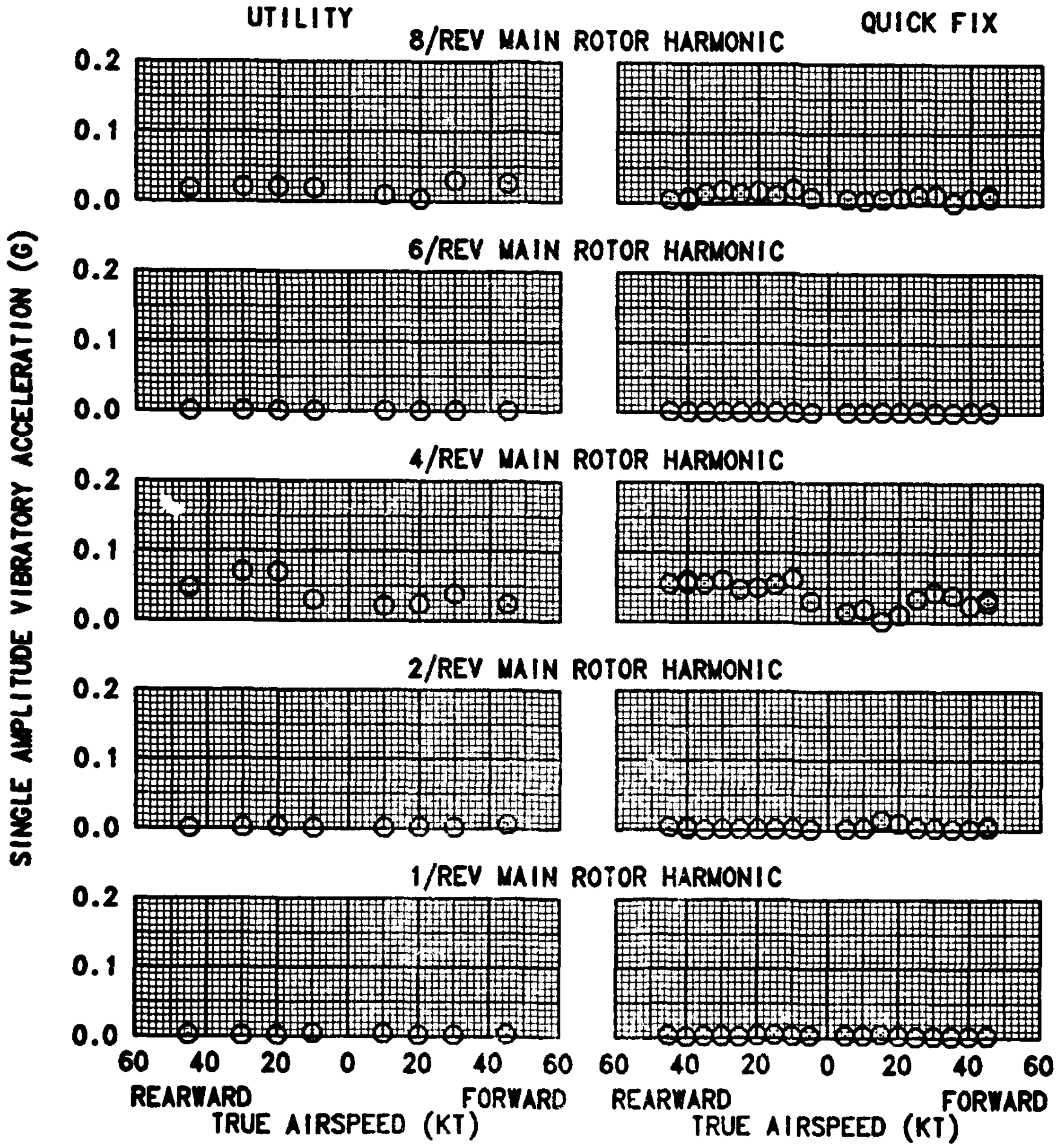


FIGURE E-90

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = CLIMB, ⊕ = DESCENT, ⊗ = APPROACH

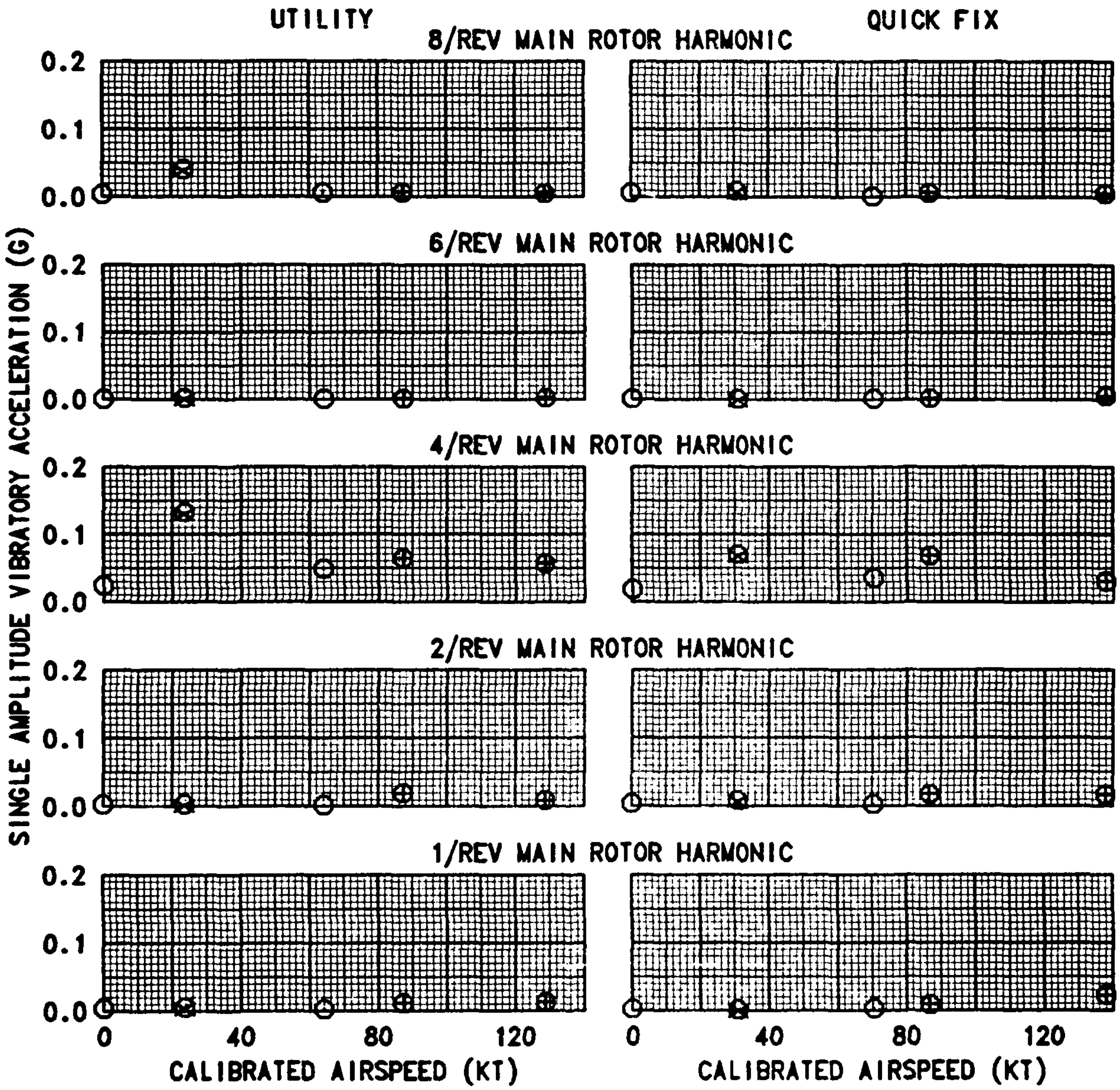


FIGURE E-91
VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP
EH-60A USA S/N 86-24569
CG LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = RIGHT, ⊕ = LEFT

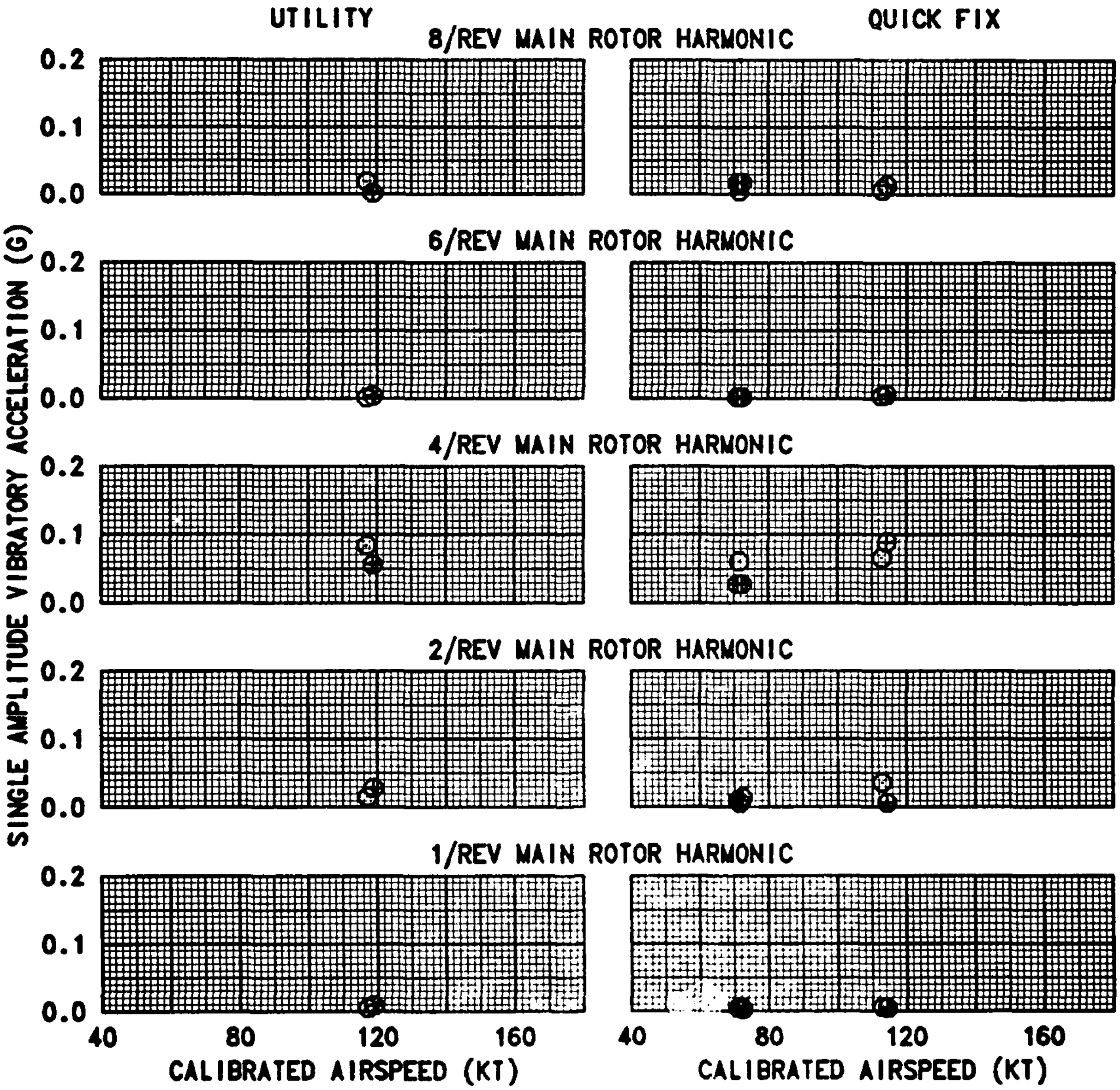


FIGURE E-92

VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)

EH-60A USA S/N 86-24569

CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

NOTE:
1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = LEVEL, ⊕ = DIVE

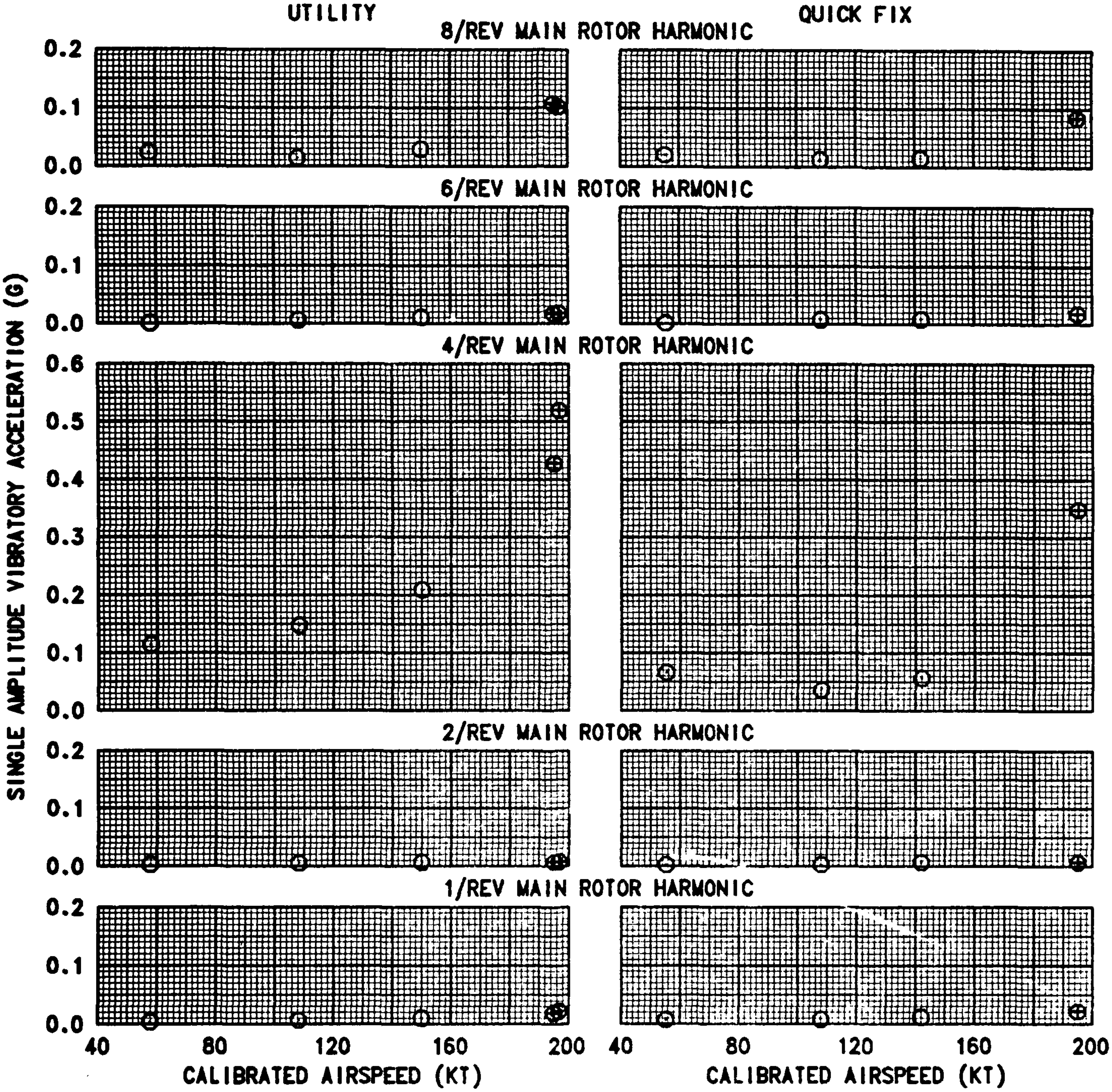


FIGURE E-93

VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS

EH-60A USA S/N 86-24569
CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

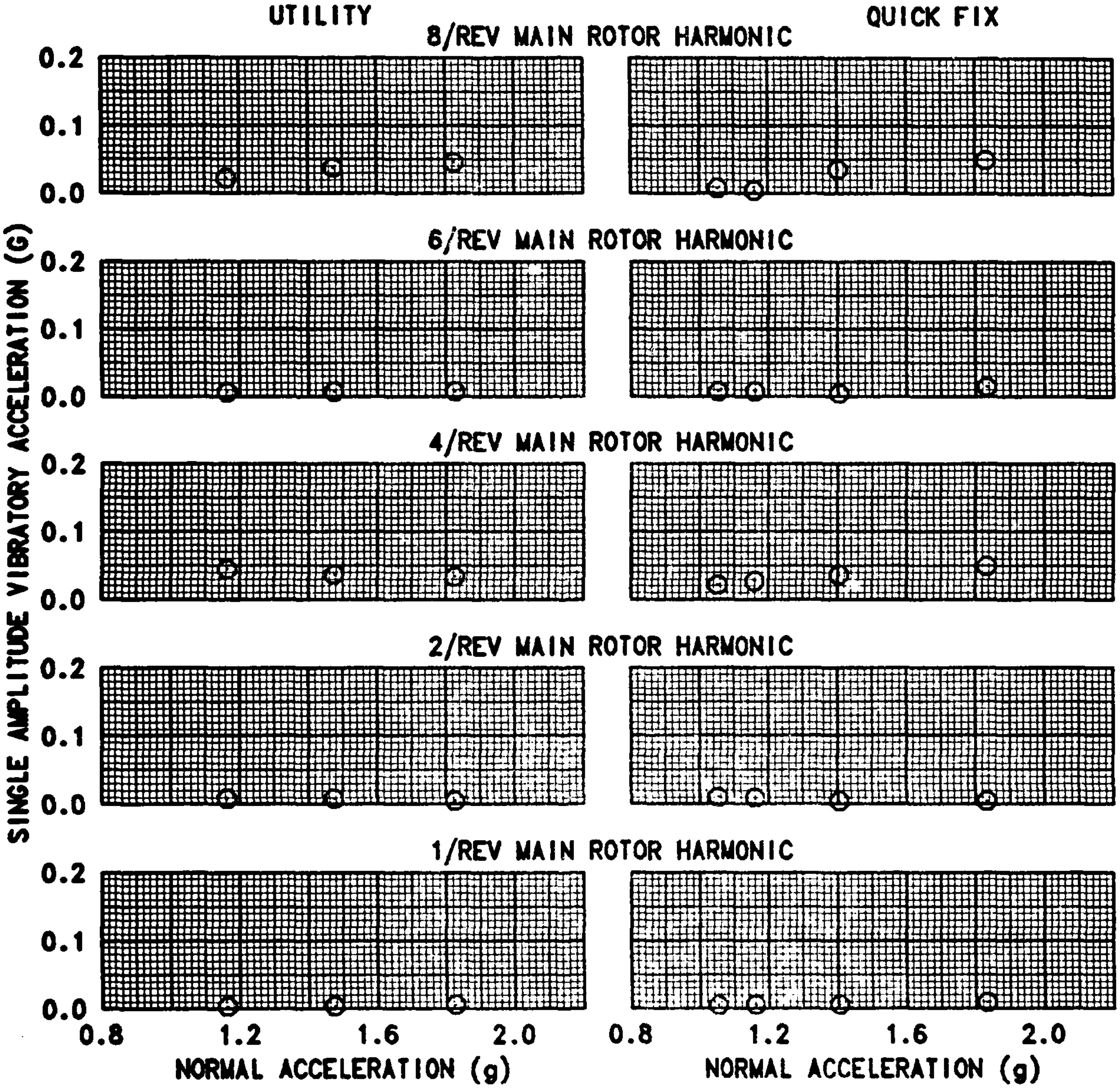


FIGURE E-94
VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

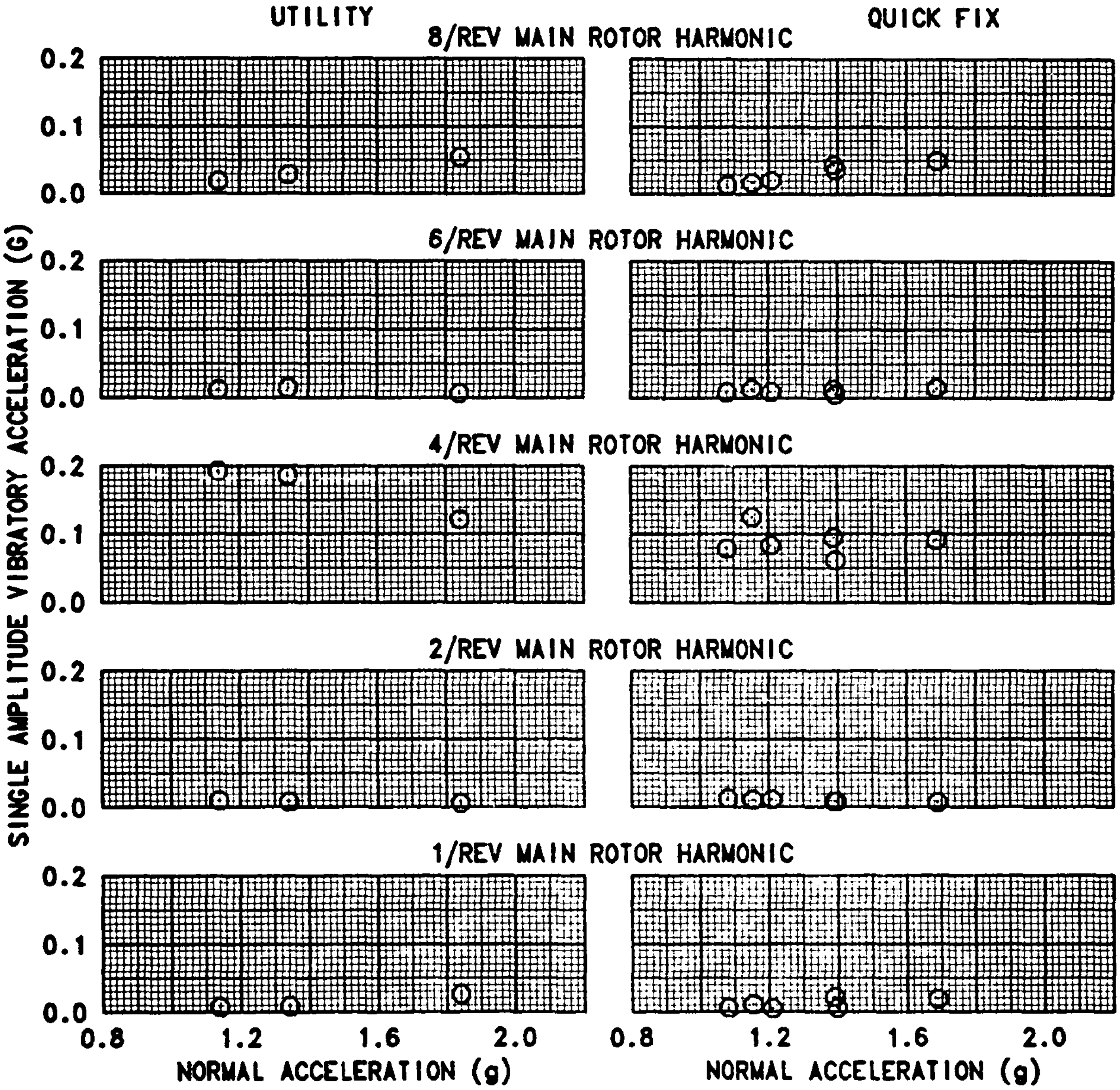


FIGURE E-95

VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT

EH-60A USA S/N 86-24569

CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

NOTE:
1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = SIDEWARD, ⊕ = OGE, ⊠ = IGE

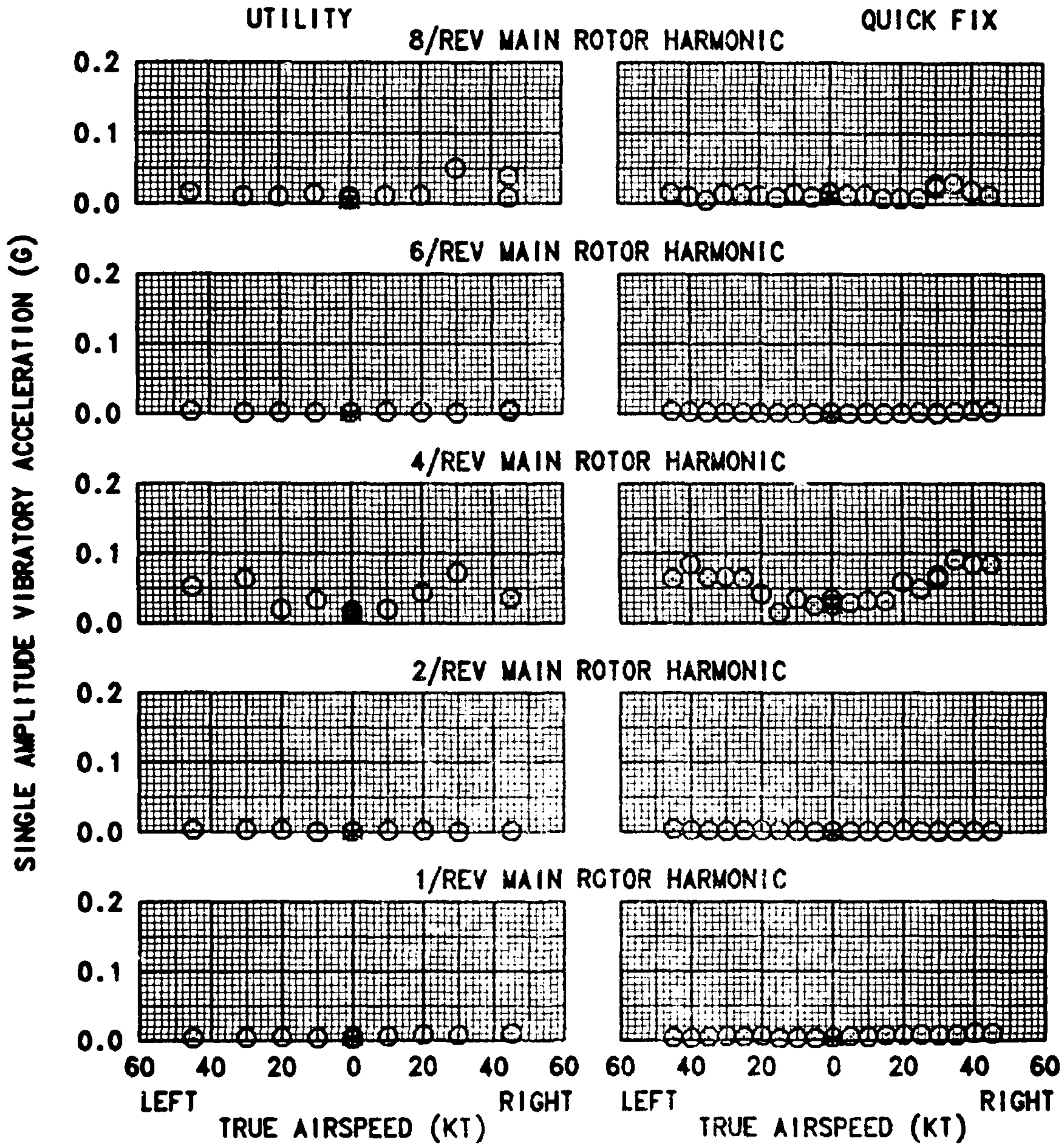


FIGURE E-96

VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT

EH-60A USA S/N 86-24569

CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0

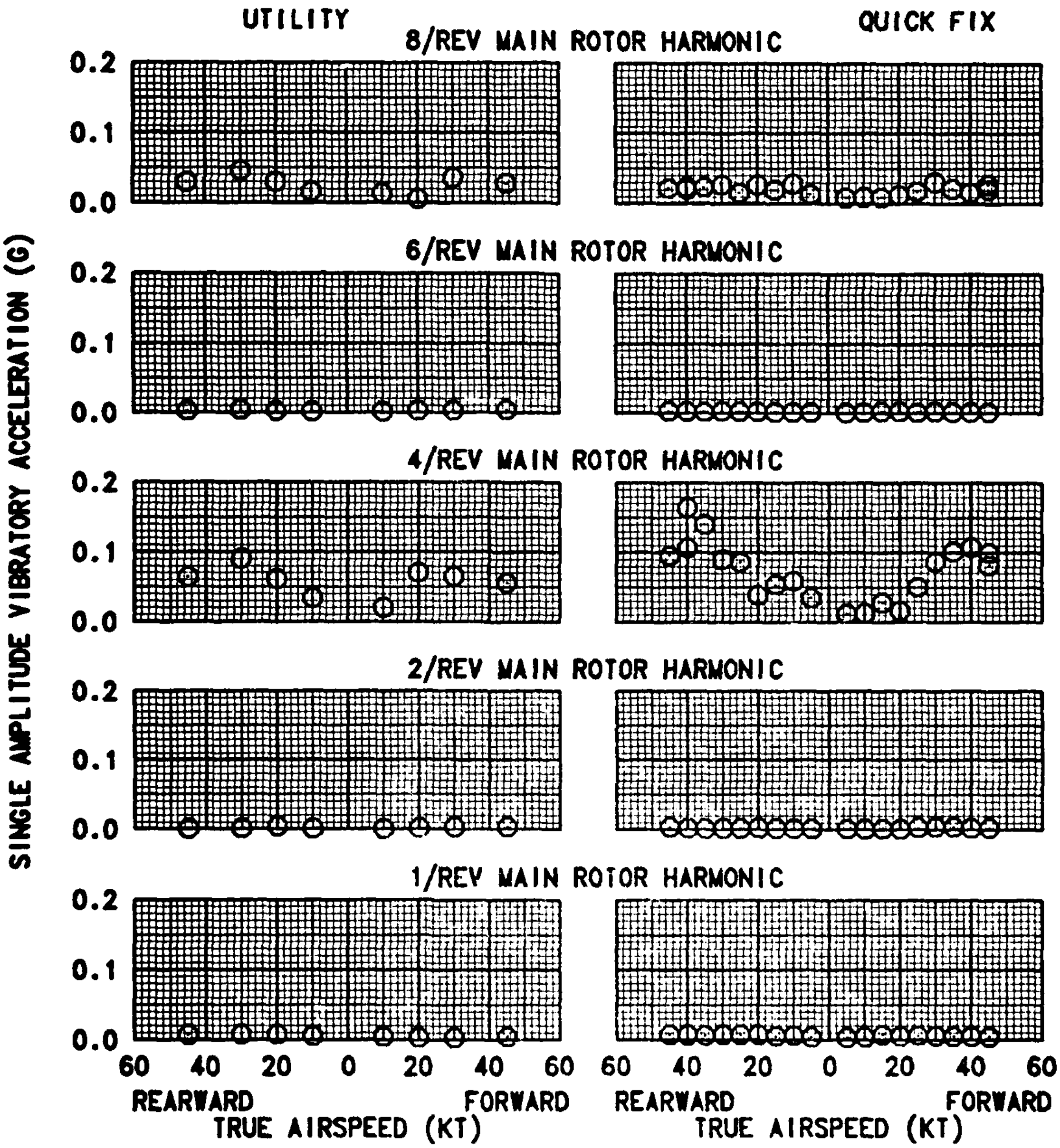


FIGURE E-97

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

NOTE:
1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = CLIMB, ⊕ = DESCENT, ⊠ = APPROACH

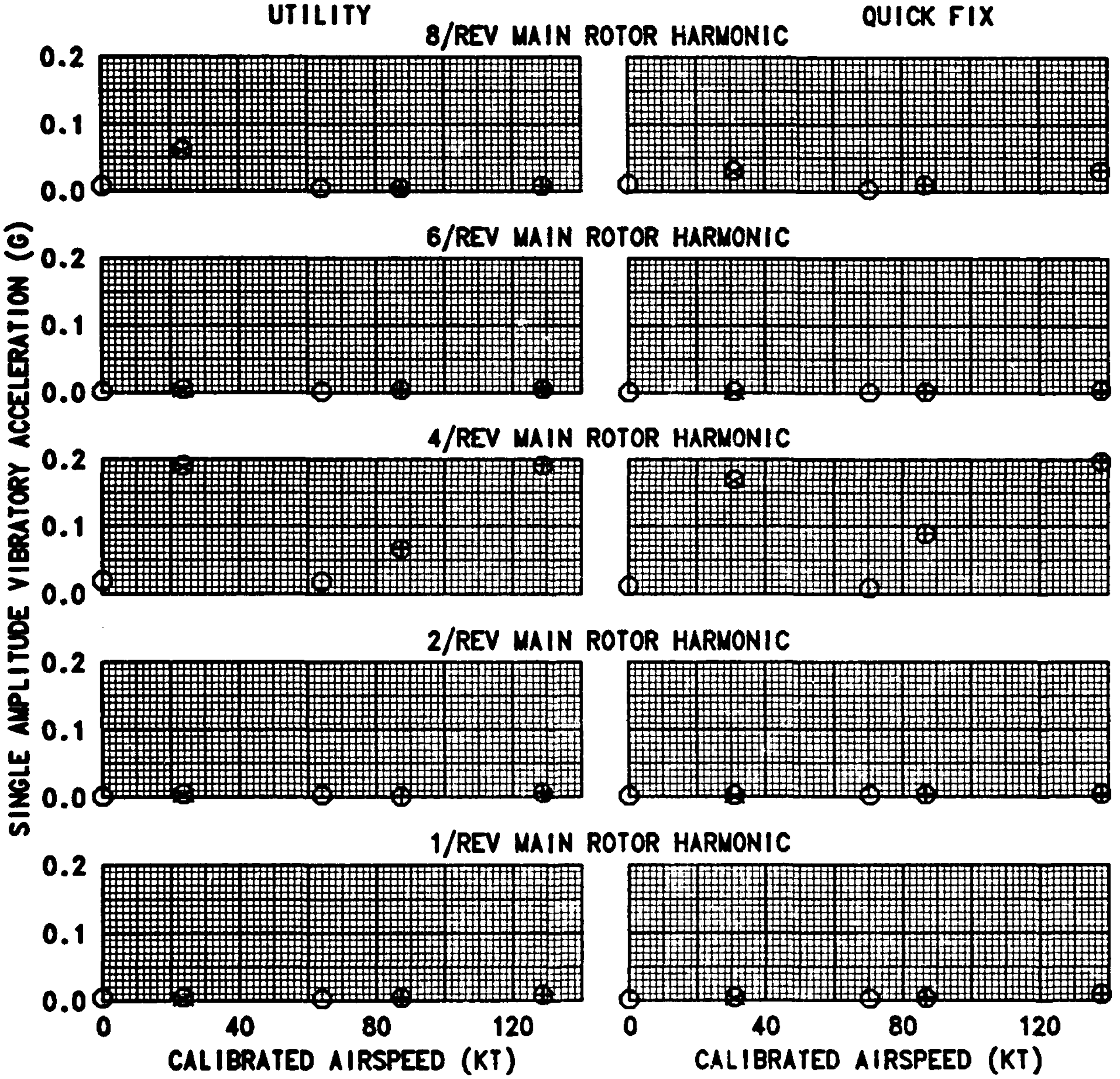


FIGURE E-98

VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP

EH-60A USA S/N 86-24569
CG VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

NOTE: 1. MAIN ROTOR FUNDAMENTAL FREQUENCY = 4.3 Hz
2. ECM ANTENNA EXTENDED
3. VIBRATION PICKUP AT FS 398.0 BL 0.0 WL 235.0
4. ⊙ = RIGHT, ⊕ = LEFT

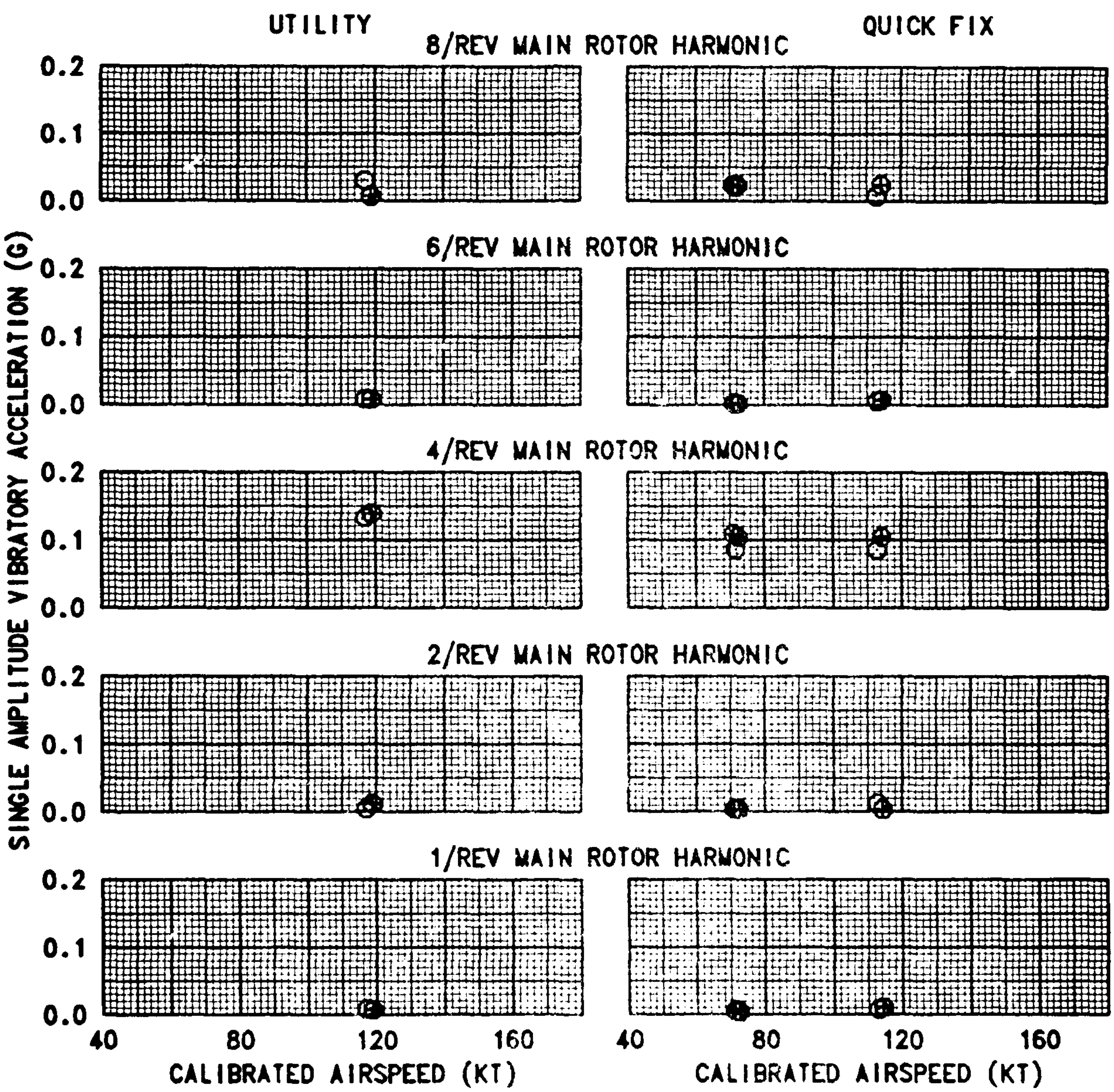


FIGURE E-99
VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)
EH-60A USA S/N 86-24569
STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

MANEUVER DIVE	MANEUVER LEVEL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. EMC ANTENNA EXTENDED

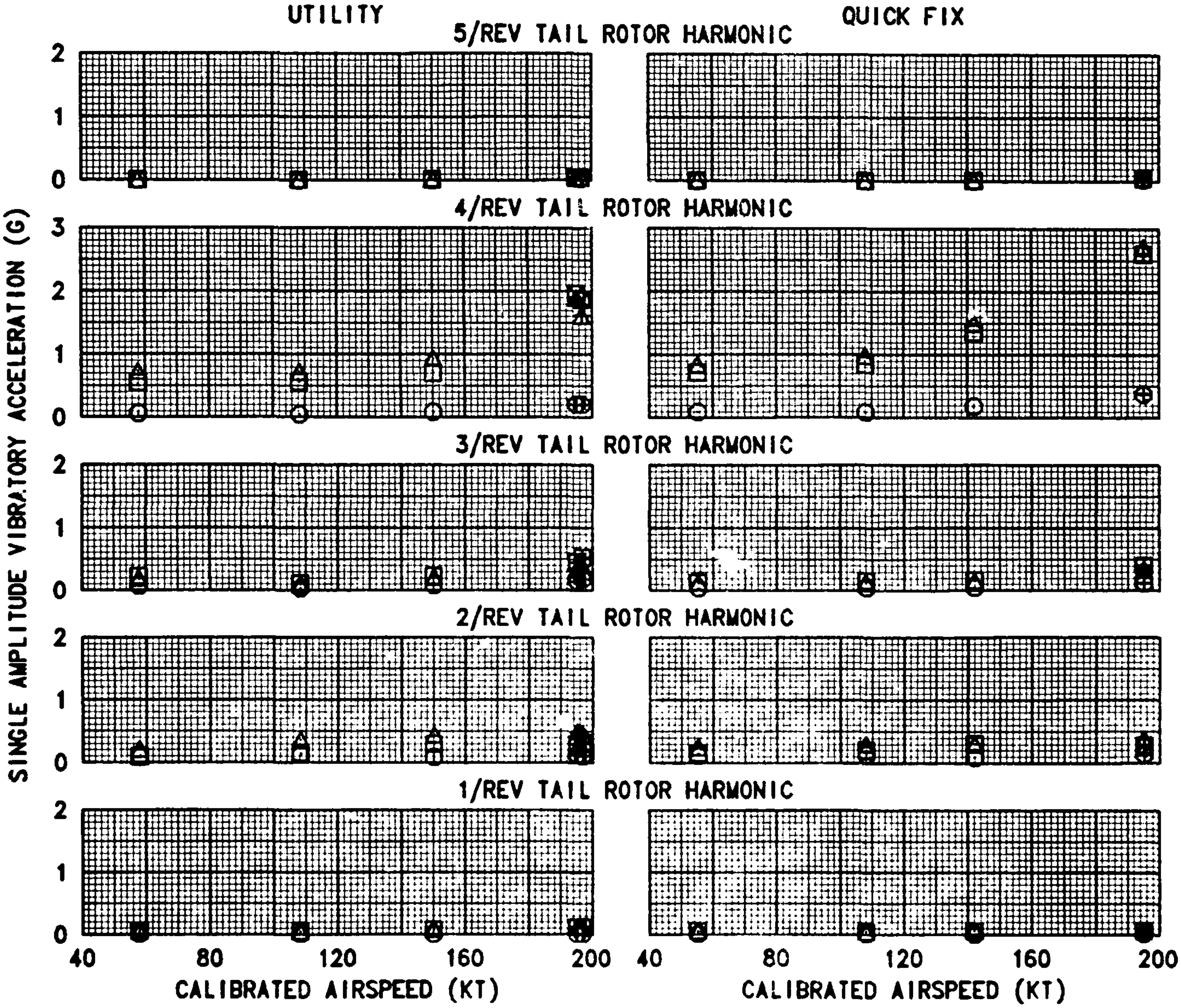


FIGURE E-100
VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

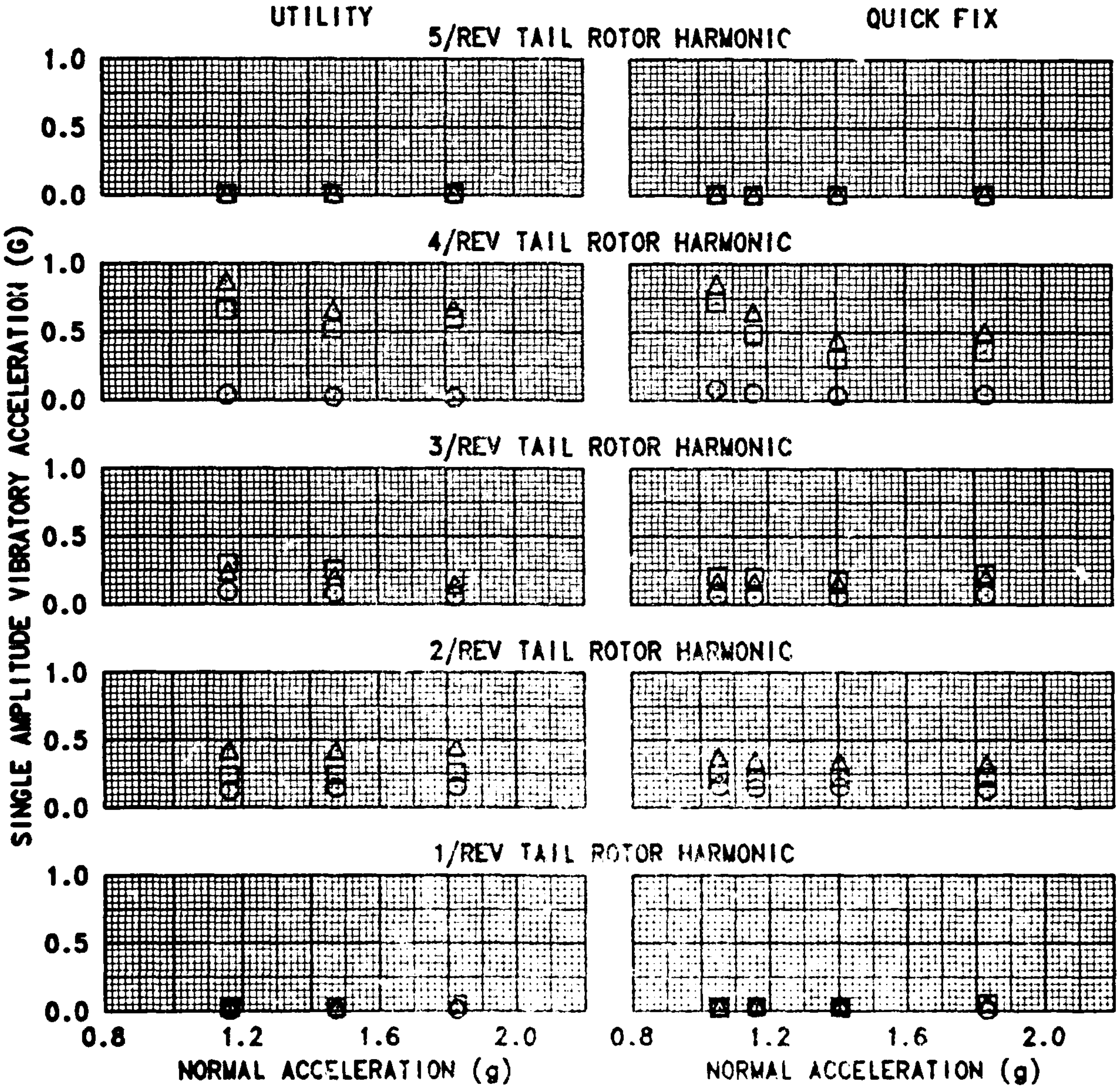


FIGURE E-101

VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS

EH-60A USA S/N 86-24569

STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

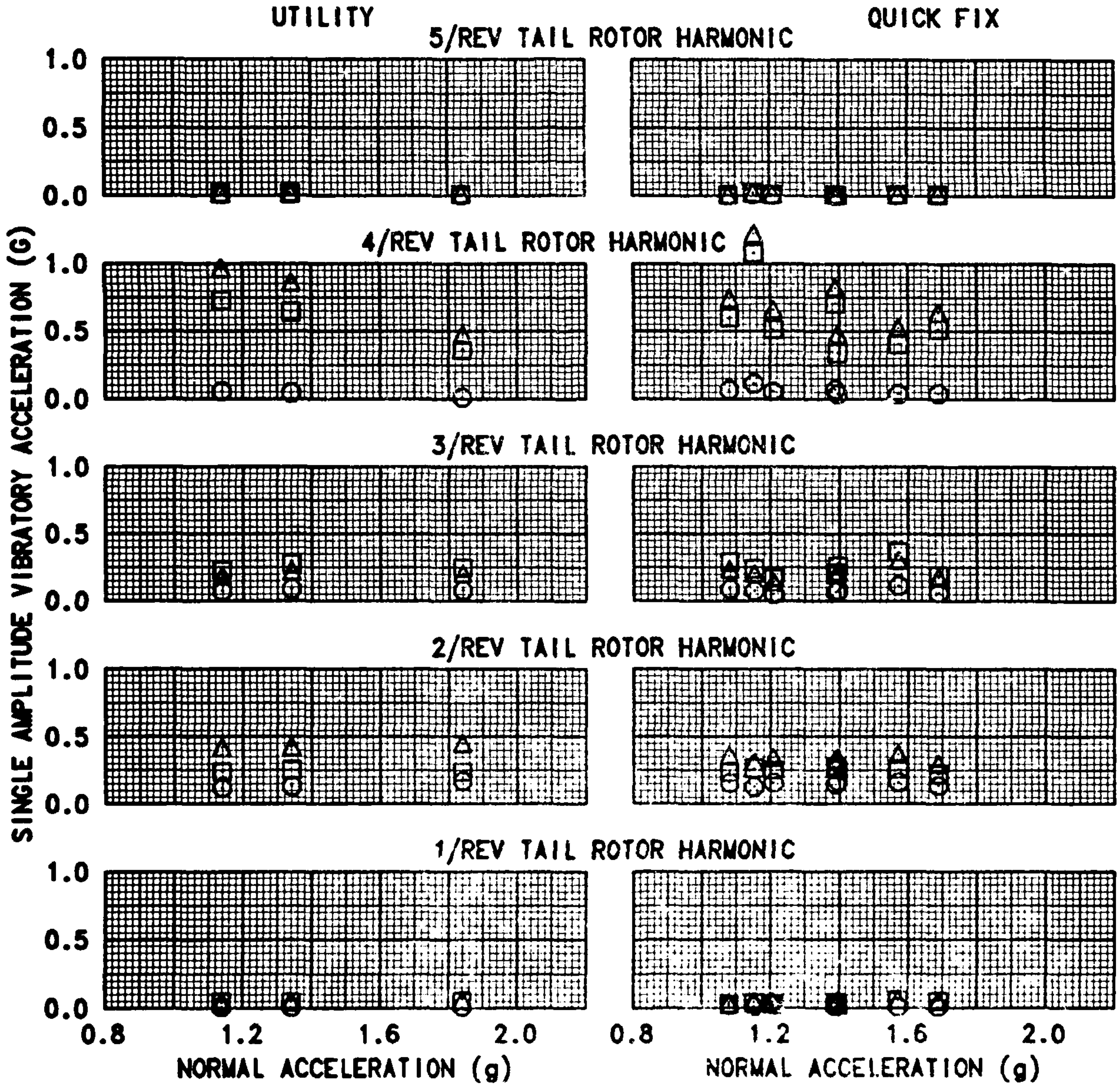


FIGURE E-102

VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

MANEUVER				LOCATION		
IGE	OGE	SIDEWARD	PARAMETER	FS	BL	WL
⊠	⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊗	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

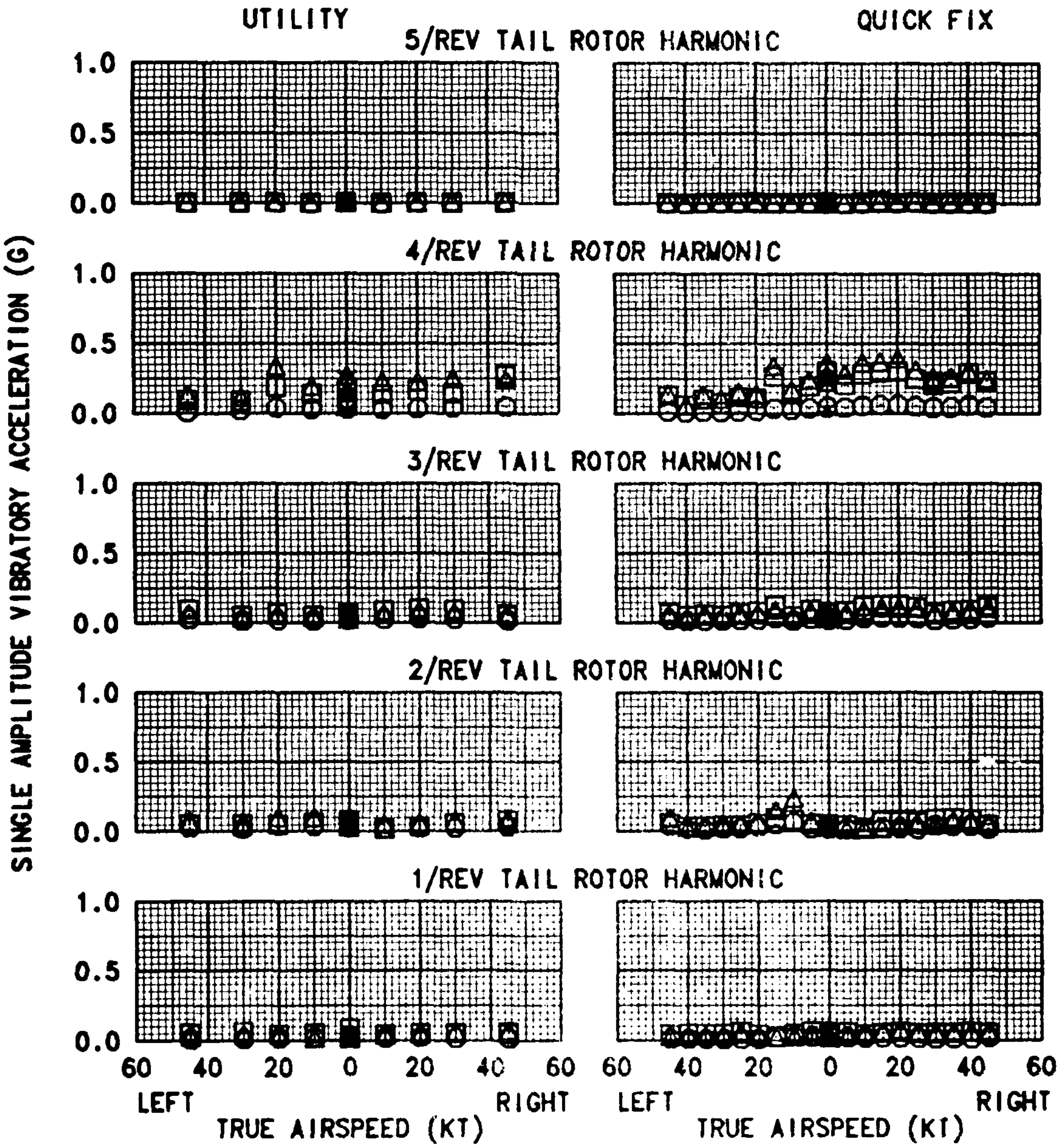


FIGURE E-103

VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
□	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

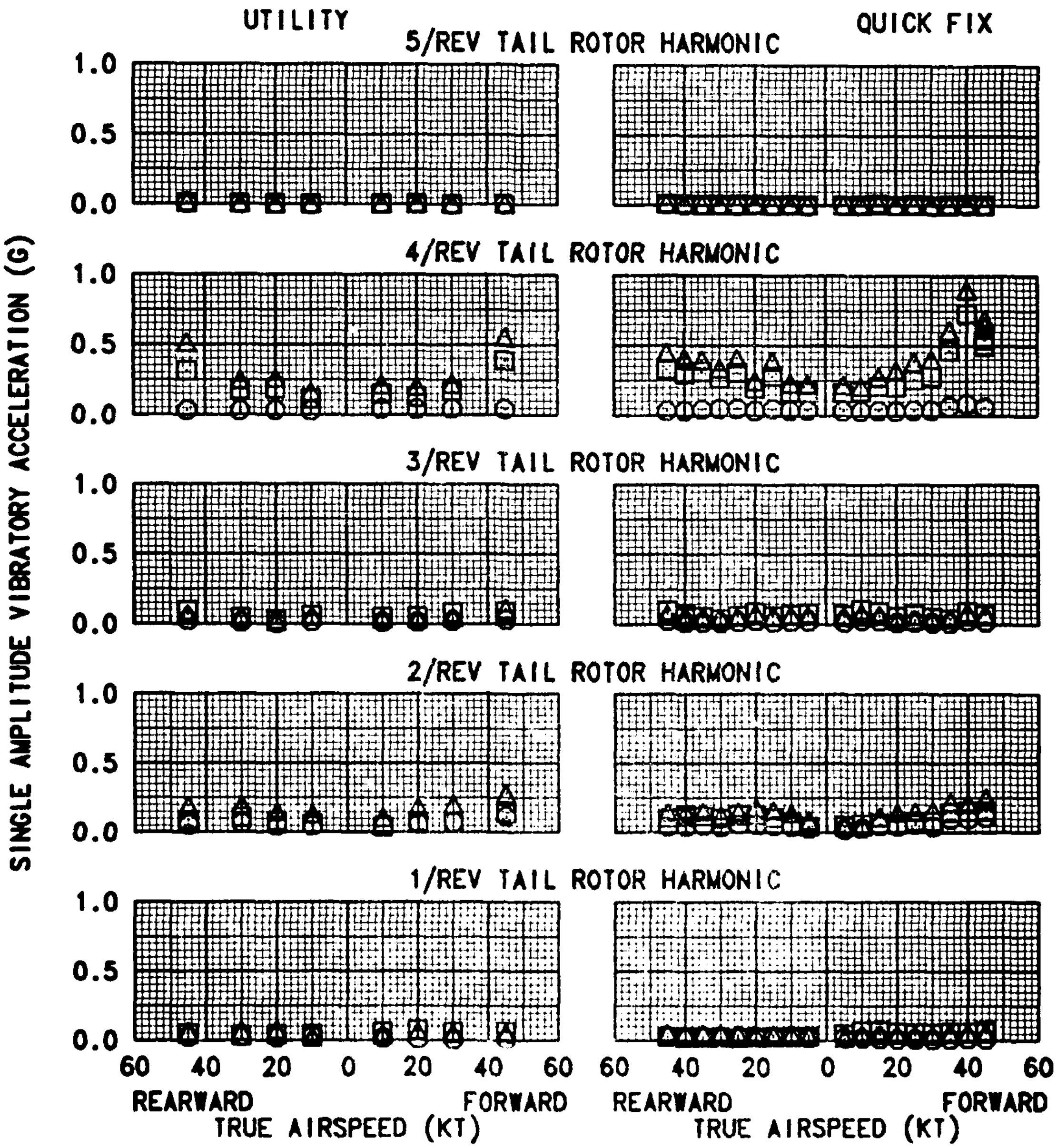


FIGURE E-104

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

MANEUVER				LOCATION		
APPROACH	DESCENT	CLIMB	PARAMETER	FS	BL	WL
⊠	⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
●	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

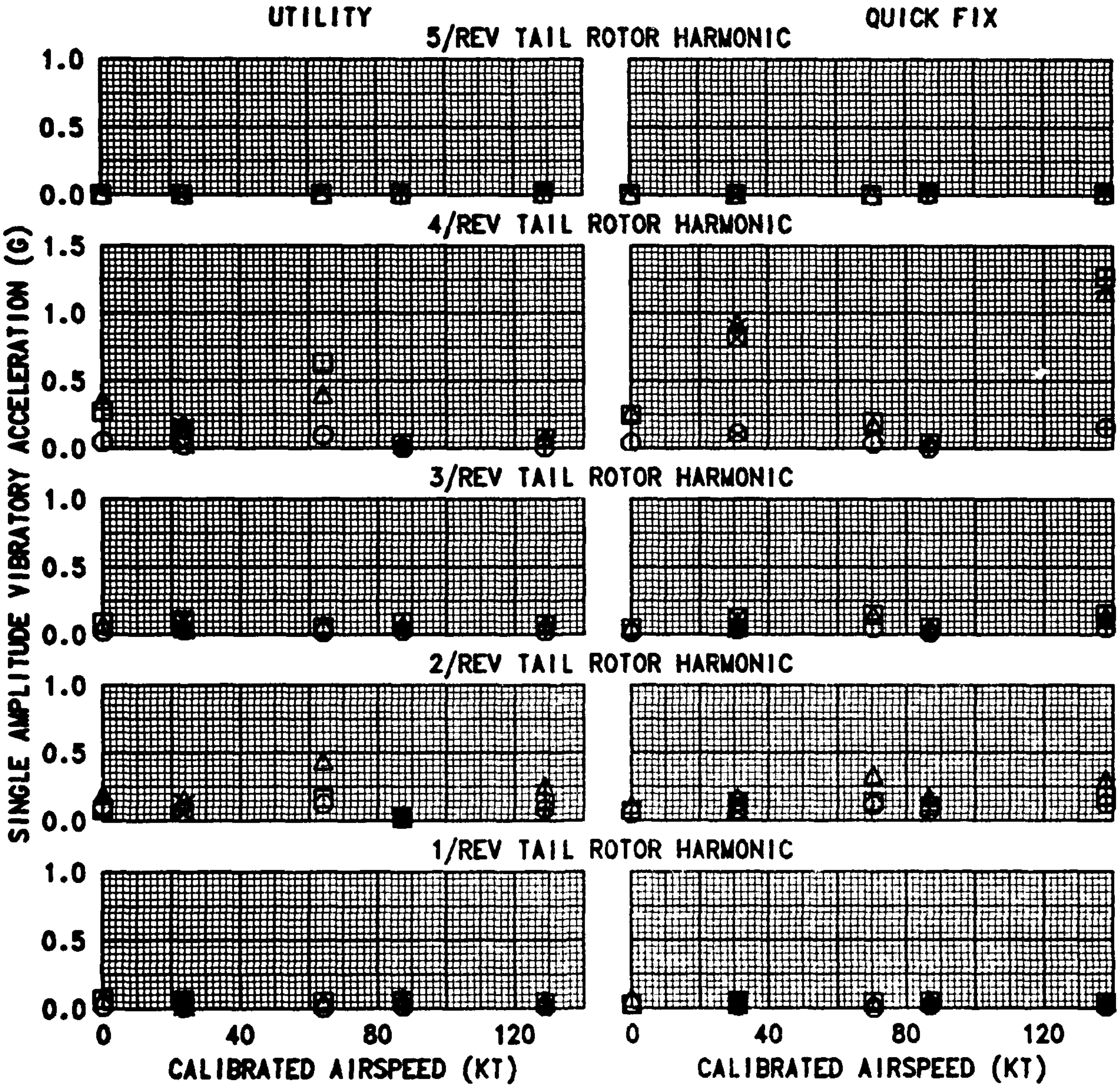


FIGURE E-105

VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP

EH-60A USA S/N 86-24569

STABILATOR LONGITUDINAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

MANEUVER LEFT	MANEUVER RIGHT	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

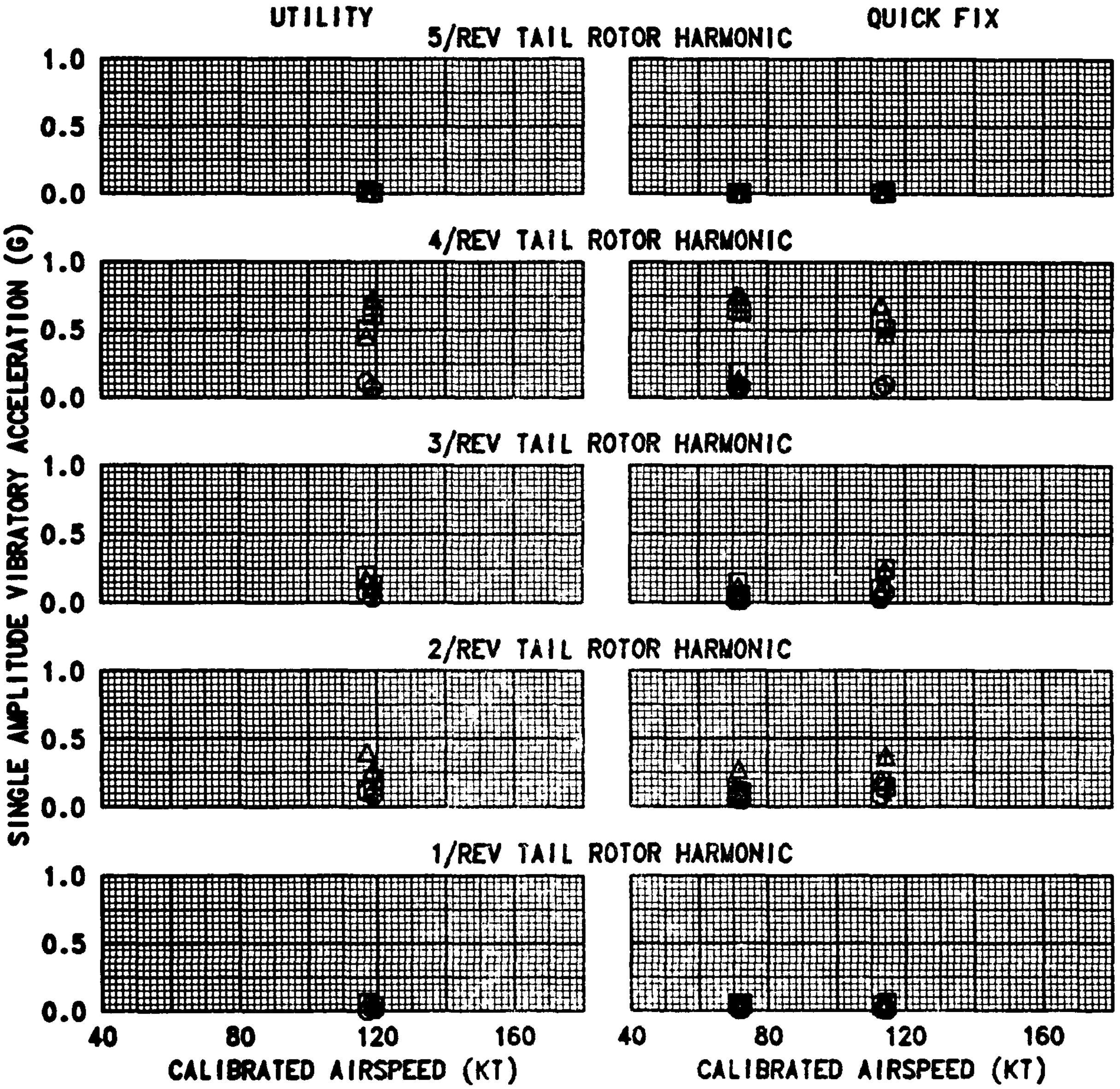


FIGURE E-106

VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)

EH-60A USA S/N 86-24569

STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

MANEUVER DIVE	MANEUVER LEVEL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
⊼	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. EMC ANTENNA EXTENDED

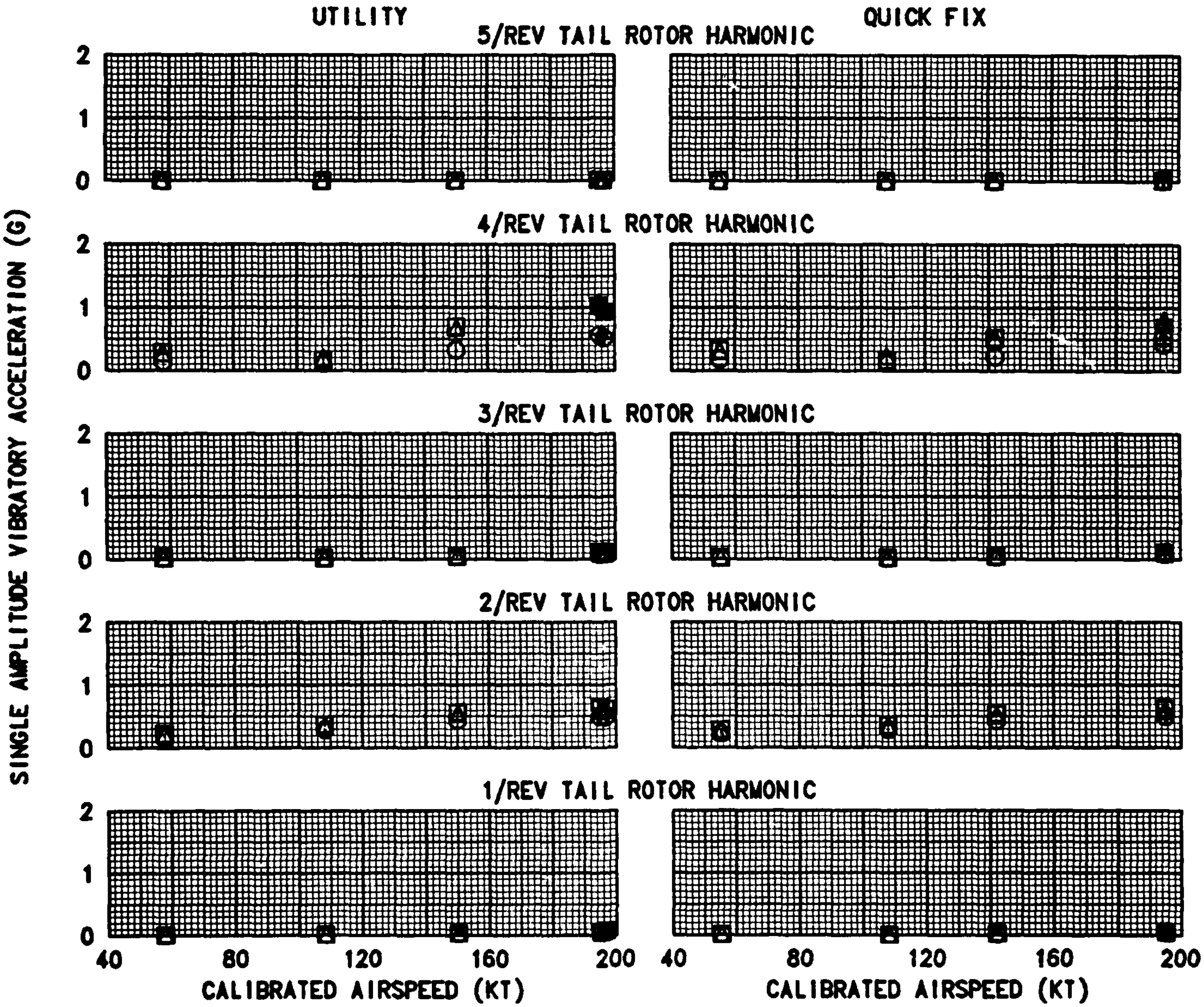


FIGURE E-107
VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
□	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

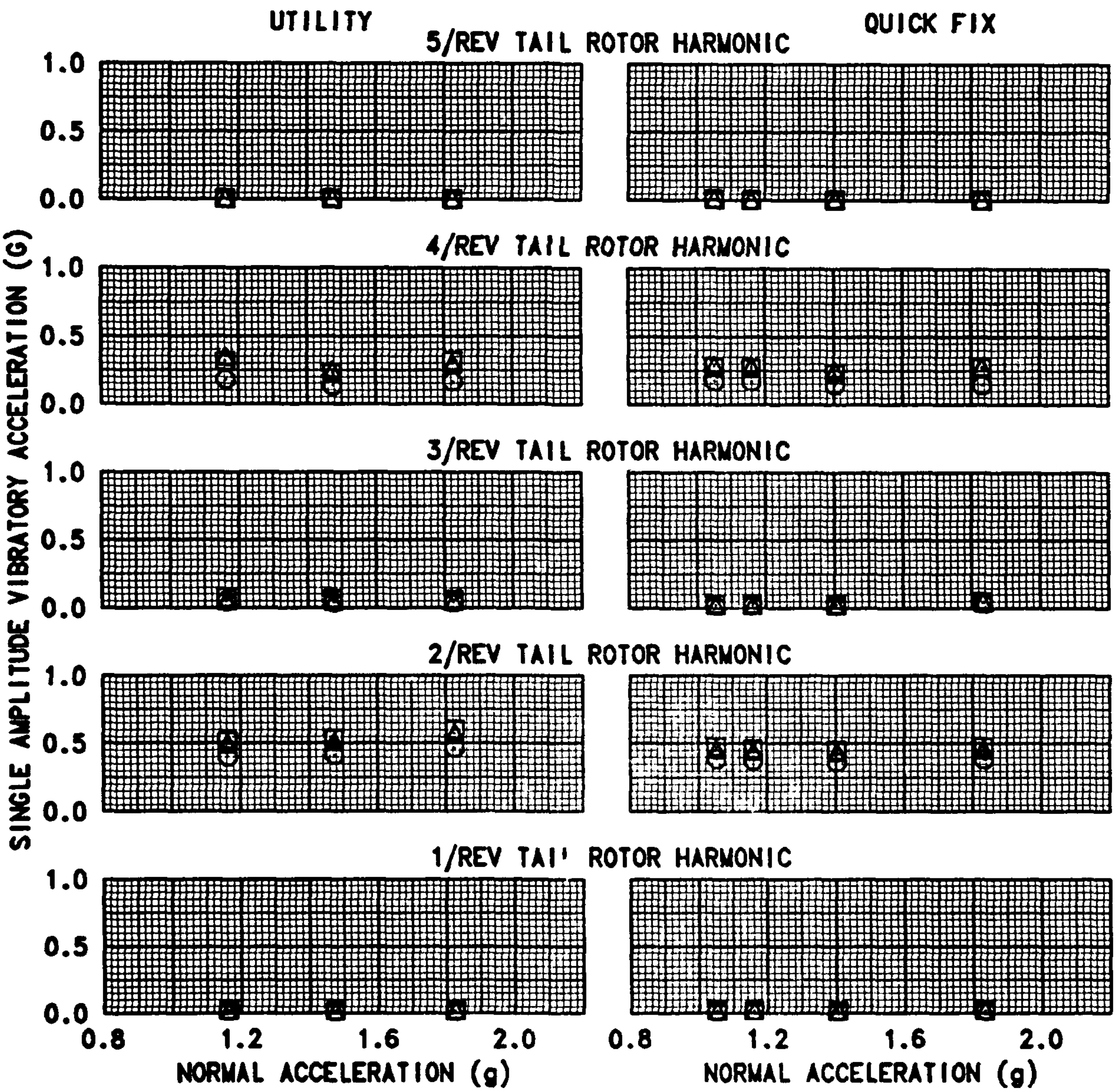


FIGURE E-108
VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

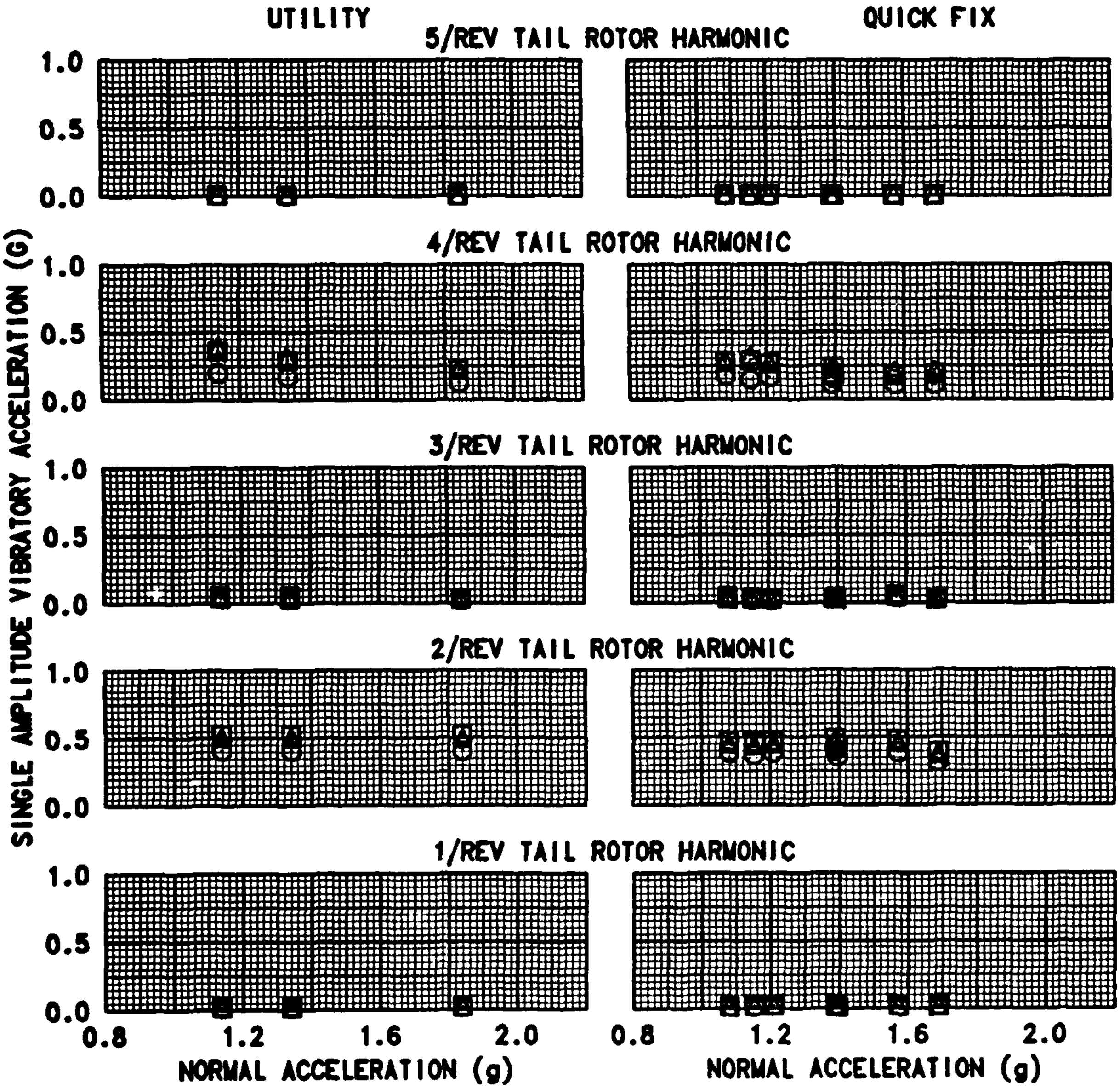


FIGURE E-109

VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

MANEUVER IGE	MANEUVER OGE	MANEUVER SIDEWARD	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊠	⊞	□	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊗	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

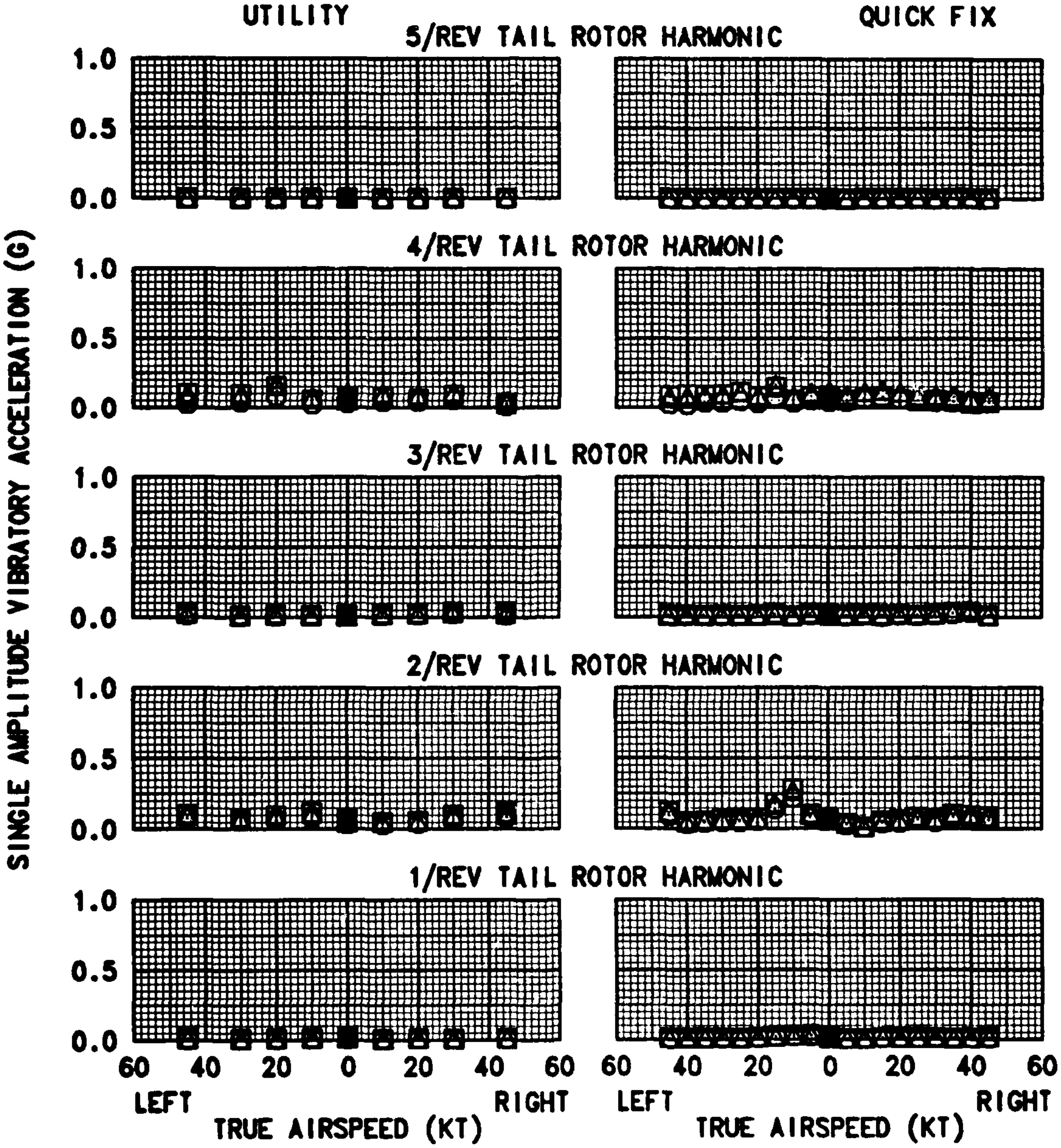


FIGURE E-110

VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

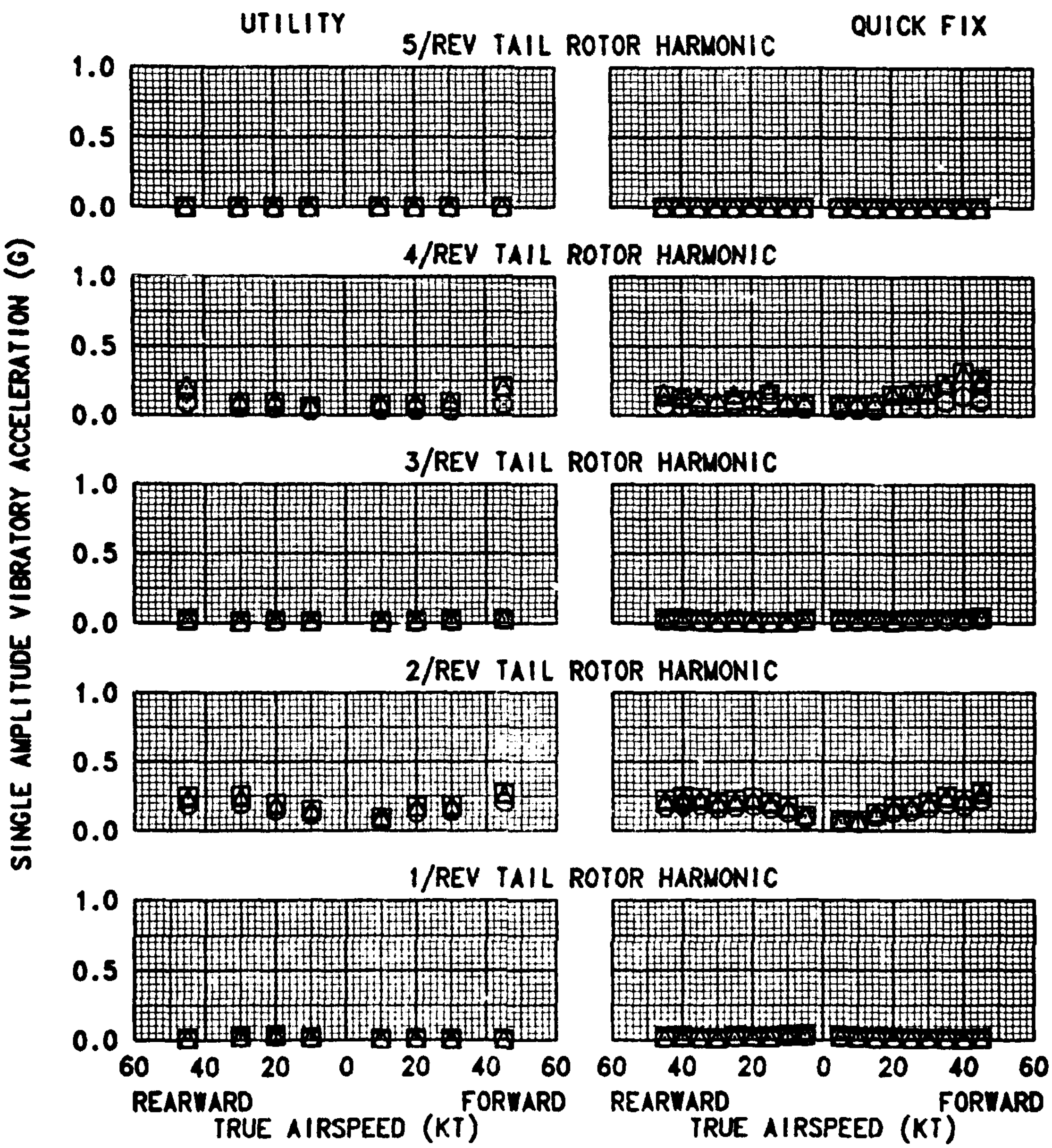


FIGURE E-111

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

MANEUVER: APPROACH	DESCENT	CLIMB	PARAMETER	LOCATION: FS	BL	WL
⊠	⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
		△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

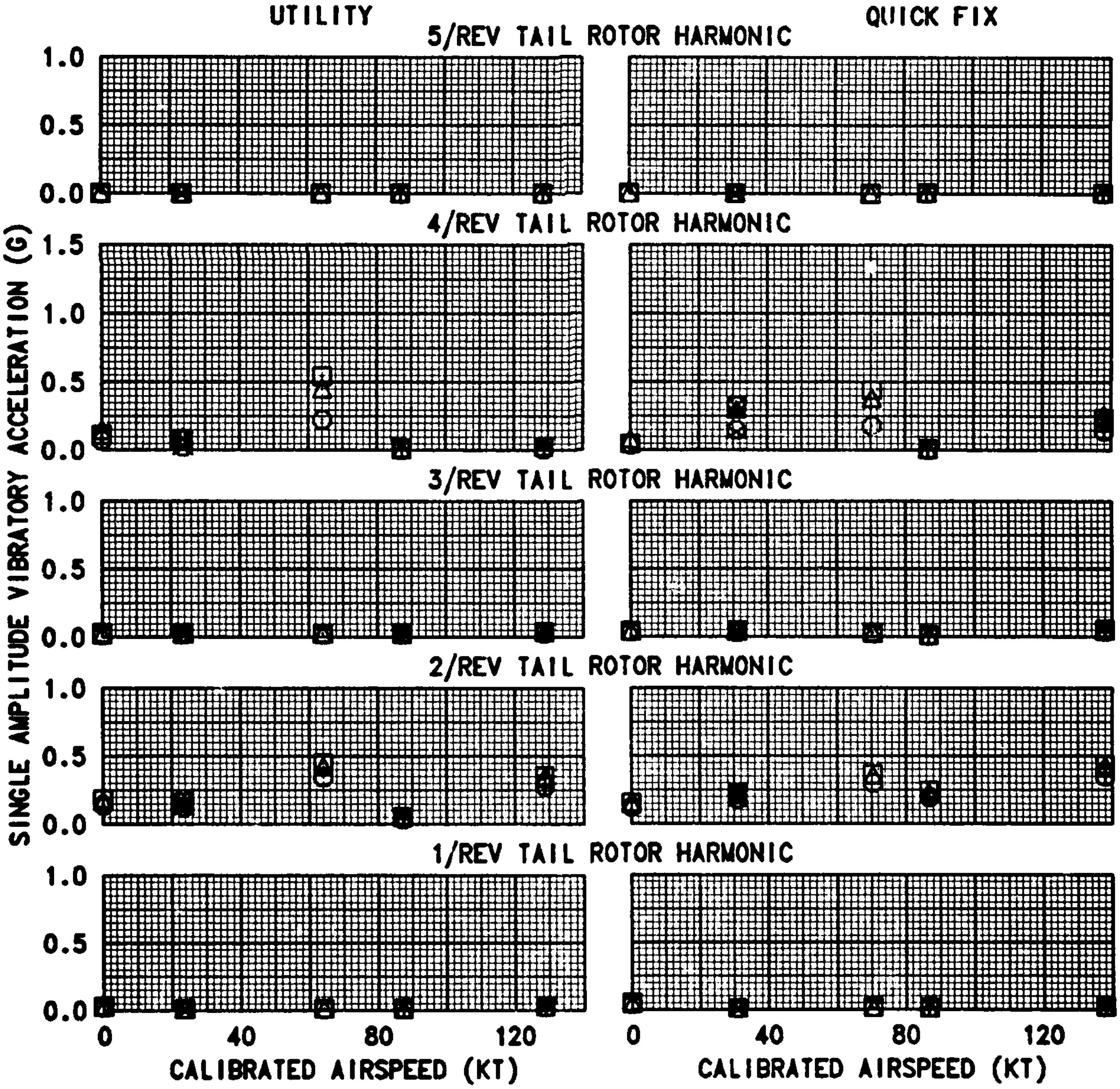


FIGURE E-112

VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP

EH-60A USA S/N 86-24569

STABILATOR LATERAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

MANEUVER LEFT	MANEUVER RIGHT	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
⟁	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

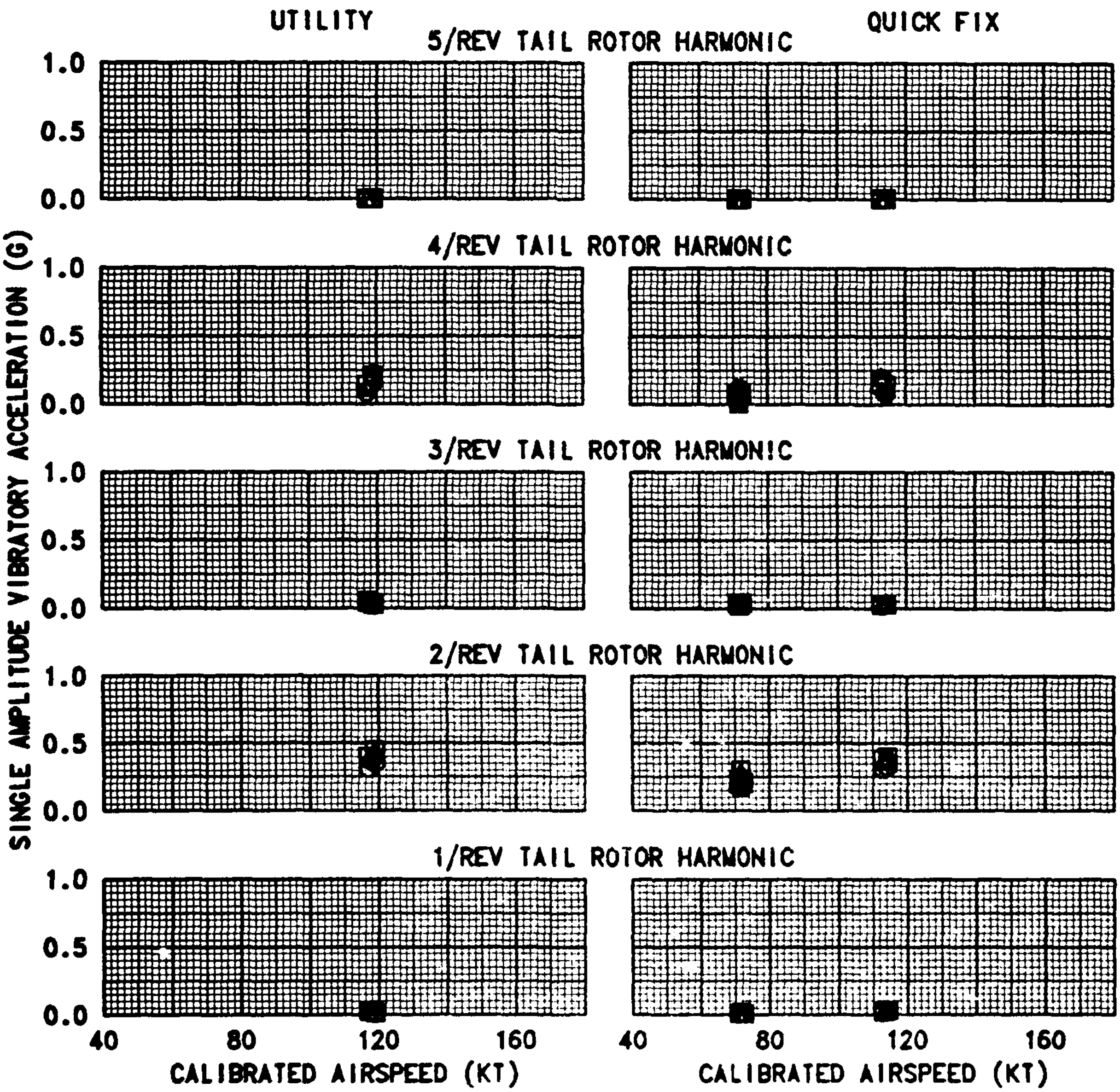


FIGURE E-113

VIBRATION CHARACTERISTICS IN LEVEL FLIGHT AND DIVE (Vne)

EH-60A USA S/N 86-24569
STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
16860	359.8	4810	0.0	258	0.006884	LEVEL	UTILITY
16760	359.4	3330	2.0	258	0.006545	DIVE	UTILITY
17290	362.4	6680	19.5	258	0.007474	LEVEL	QUICK FIX
17160	361.9	4880	20.0	258	0.007022	DIVE	QUICK FIX

MANEUVER		PARAMETER	LOCATION		
DIVE	LEVEL		FS	BL	WL
⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. EMC ANTENNA EXTENDED

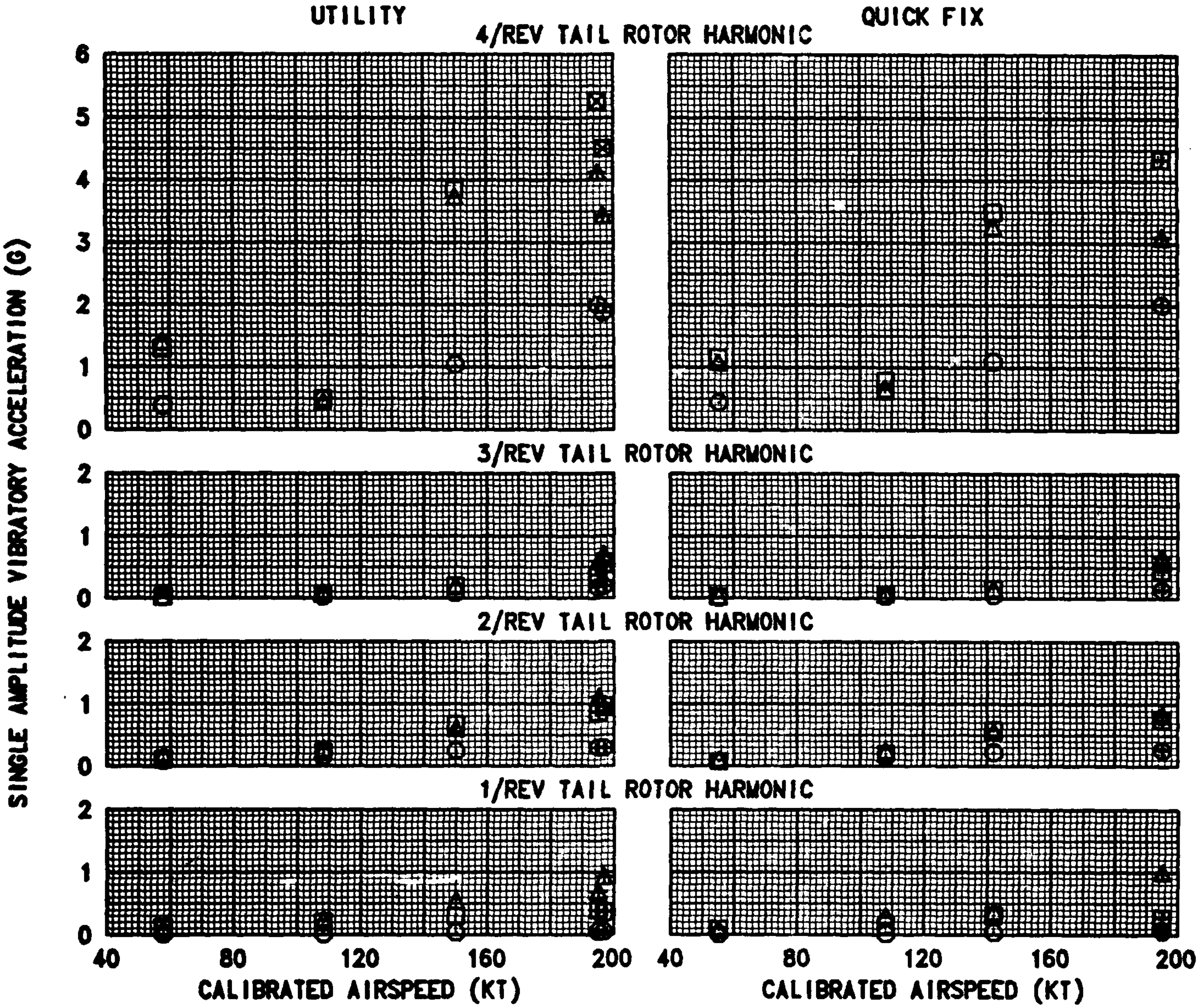


FIGURE E-114
VIBRATION CHARACTERISTICS IN LEFT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16650	359.1	5190	-1.0	258	0.006877	UTILITY
16530	359.8	7000	19.5	257	0.007272	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

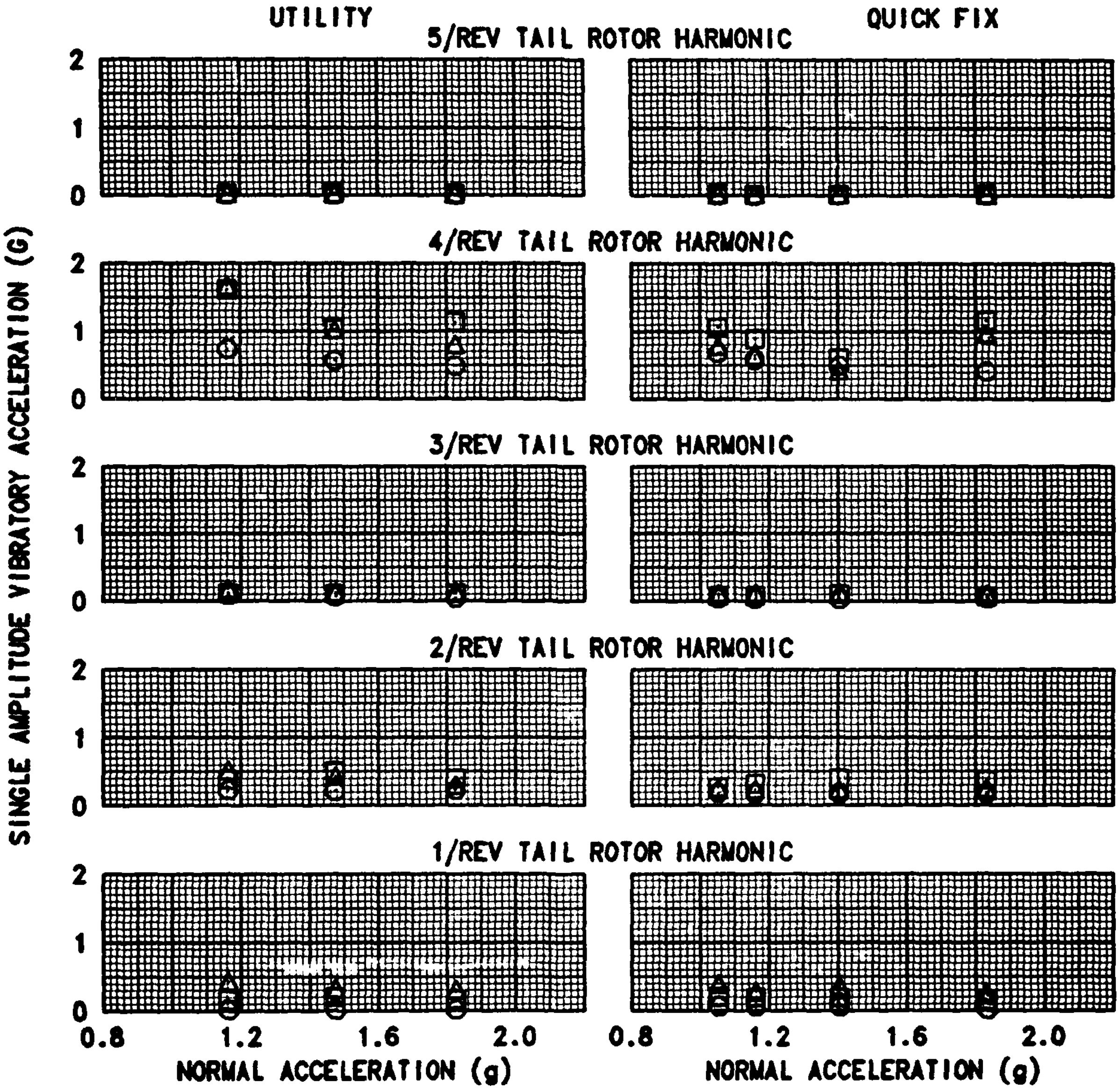


FIGURE E-115
VIBRATION CHARACTERISTICS IN RIGHT TURNS AT 125 KCAS
EH-60A USA S/N 86-24569
STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
16560	358.7	5270	-1.0	258	0.006857	UTILITY
16770	360.8	8070	16.0	258	0.007566	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
□	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
○	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

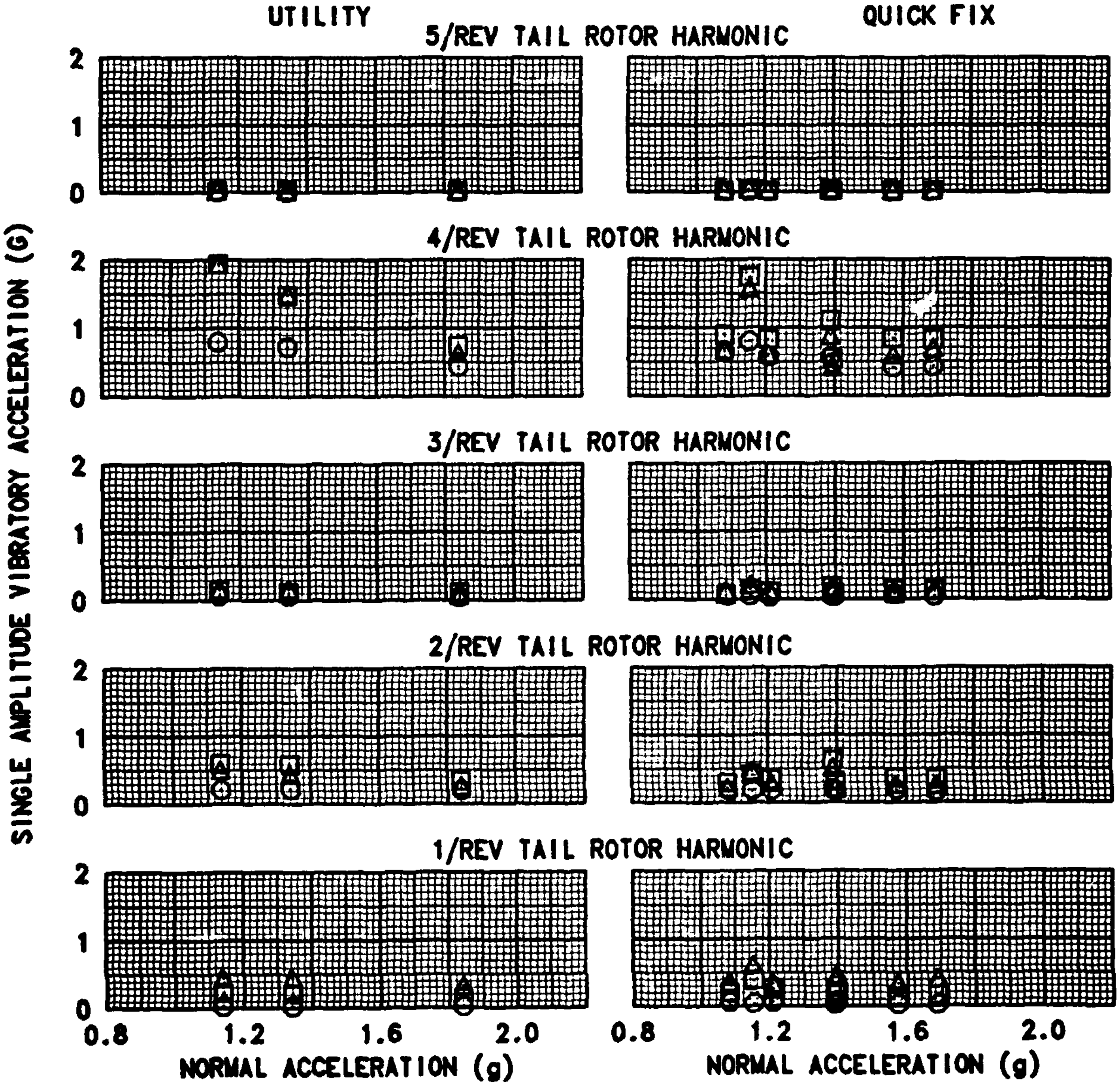


FIGURE E-116

VIBRATION CHARACTERISTICS IN HOVER AND SIDEWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17410	361.8	780	0.0	258	0.006304	HOVER	UTILITY
17590	362.4	1040	1.5	258	0.006418	SIDEWARD	UTILITY
16900	361.0	1730	8.5	258	0.006293	HOVER	QUICK FIX
17490	363.1	3130	19.5	258	0.006790	SIDEWARD	QUICK FIX

MANEUVER IGE	OGE	SIDEWARD	PARAMETER	LOCATION FS	BL	WL
⊠	⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
●	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

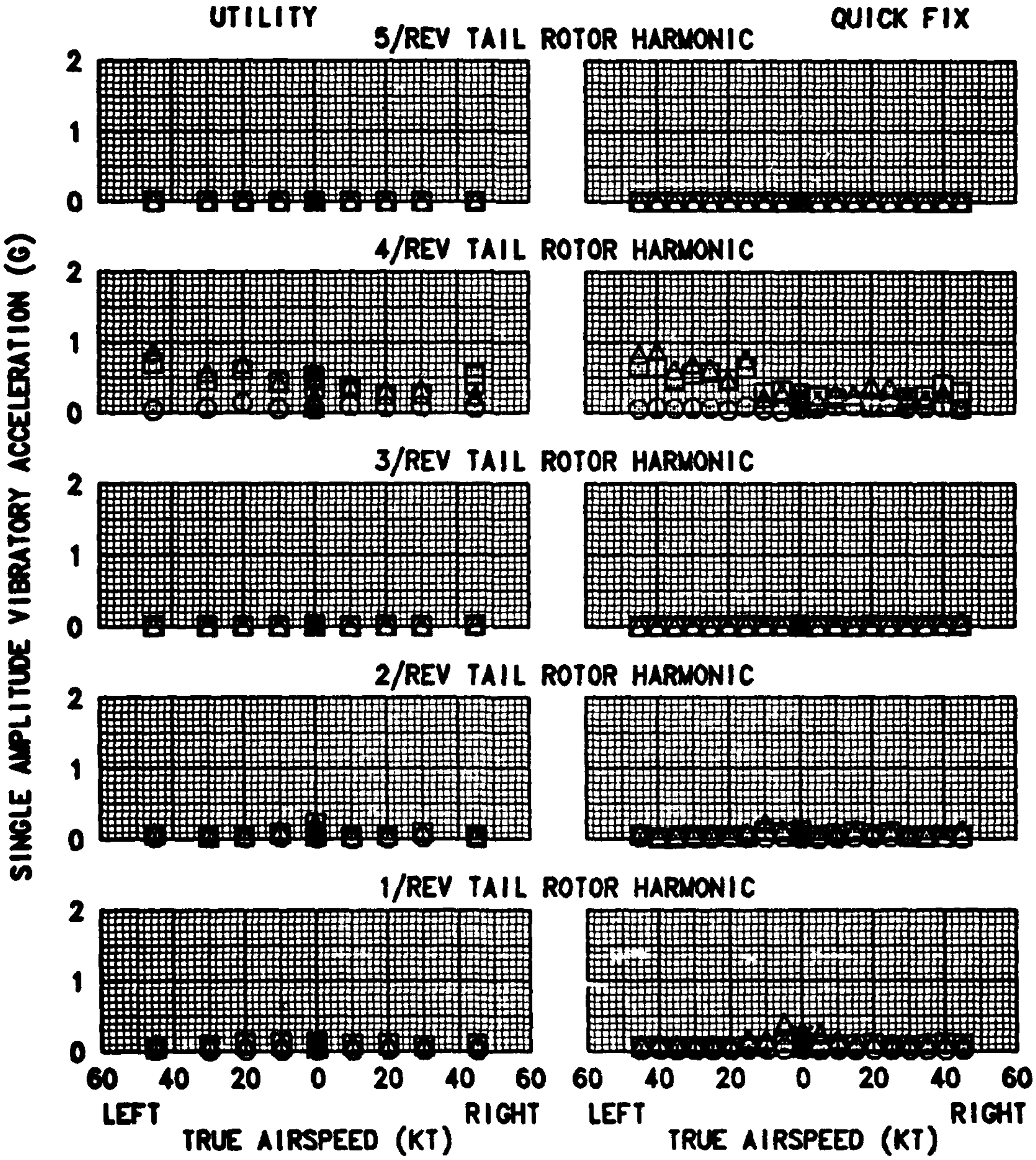


FIGURE E-117

VIBRATION CHARACTERISTICS IN FORWARD AND REARWARD FLIGHT

EH-60A USA S/N 86-24569

STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17400	361.7	870	0.0	258	0.006317	UTILITY
16850	360.8	2040	12.0	258	0.006332	QUICK FIX

SYMBOL	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. AIRSPEED OBTAINED FROM PACE VEHICLE
3. ECM ANTENNA EXTENDED

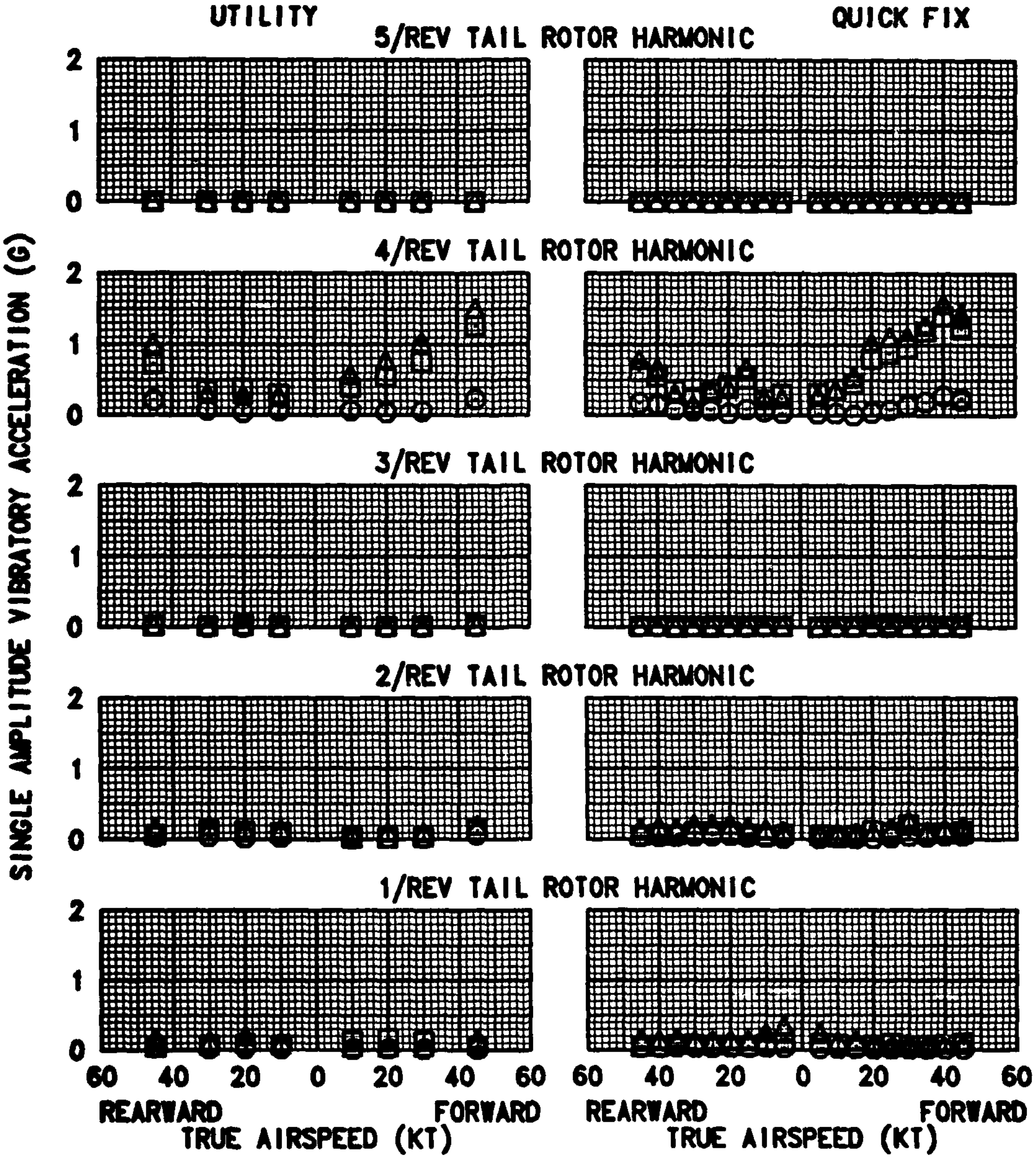


FIGURE E-118

VIBRATION CHARACTERISTICS IN CLIMB, DESCENT, AND APPROACH TO LANDING

EH-60A USA S/N 86-24569

STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT MANEUVER	AIRCRAFT CONFIGURATION
17170	360.8	4390	0.0	258	0.006923	CLIMB	UTILITY
16470	358.5	4140	1.0	267	0.006154	DESCENT	UTILITY
16360	358.0	1620	4.5	258	0.006072	APPROACH	UTILITY
17440	362.9	5620	20.0	258	0.007298	CLIMB	QUICK FIX
16740	360.5	6840	20.0	262	0.007051	DESCENT	QUICK FIX
16640	360.2	4010	22.0	258	0.006632	APPROACH	QUICK FIX

MANEUVER APPROACH	MANEUVER DESCENT	MANEUVER CLIMB	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊠	⊞	⊡	STABILATOR, LEFT TIP	702.0	-79.0	247.0
⚠	⚠	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊗	⊕	⊙	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

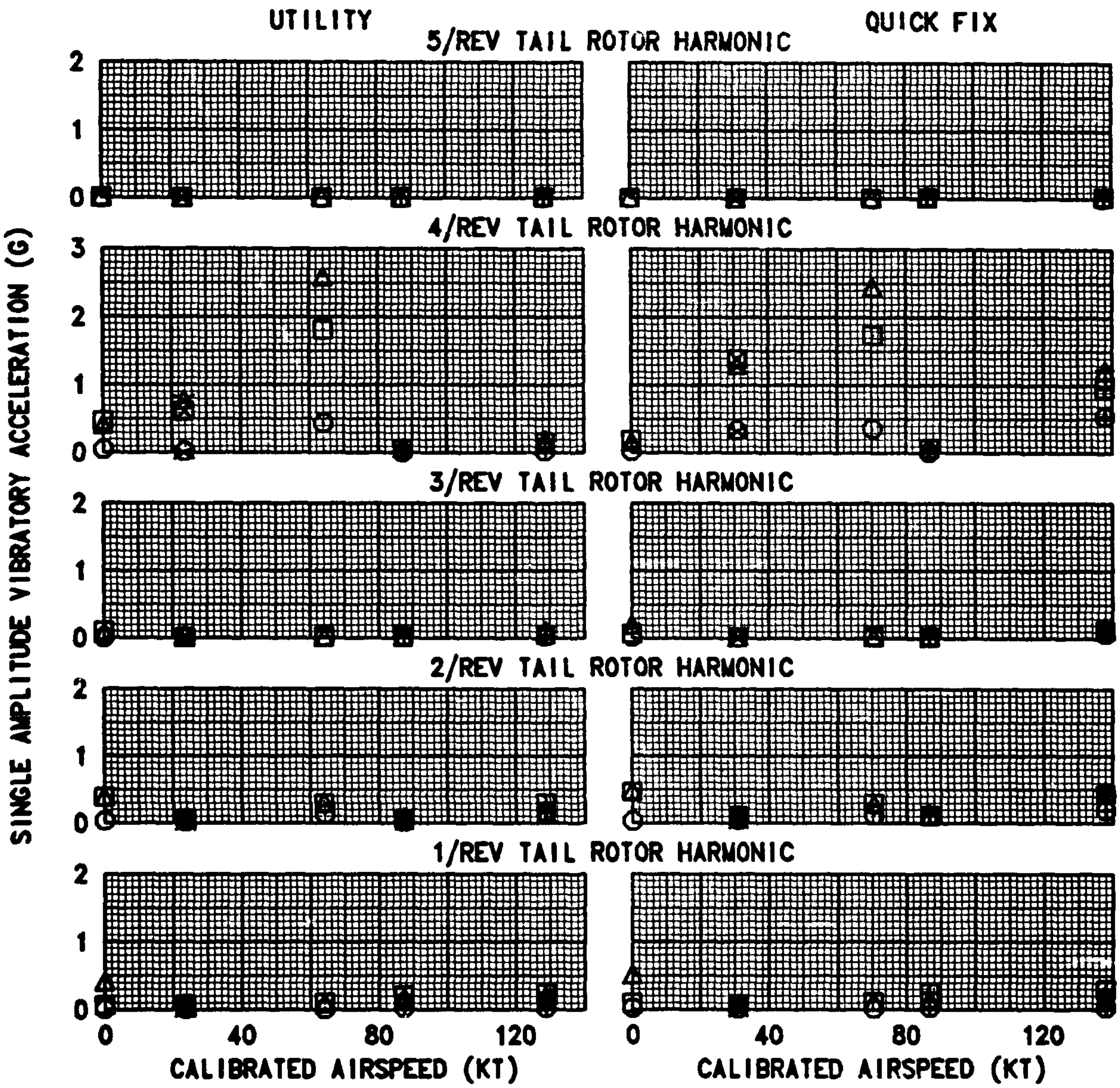


FIGURE E-119
VIBRATION CHARACTERISTICS IN LEFT AND RIGHT SIDESLIP
EH-60A USA S/N 86-24569
STABILATOR VERTICAL ACCELERATION

AVG GROSS WEIGHT (LB)	AVG LONGITUDINAL CG (FS)	AVG DENSITY ALTITUDE (FT)	AVG OAT (DEG C)	AVG ROTOR SPEED (RPM)	AVG THRUST COEFFICIENT	AIRCRAFT CONFIGURATION
17000	360.3	4440	1.0	258	0.006864	UTILITY
16500	359.8	6570	20.0	258	0.007108	QUICK FIX

MANEUVER LEFT	MANEUVER RIGHT	PARAMETER	LOCATION FS	LOCATION BL	LOCATION WL
⊞	□	STABILATOR, LEFT TIP	702.0	-79.0	247.0
▲	△	STABILATOR, RIGHT TIP	702.0	79.0	247.0
⊕	○	STABILATOR, CENTER	702.0	0.0	247.0

NOTE: 1. TAIL ROTOR FUNDAMENTAL FREQUENCY = 19.8 Hz
2. ECM ANTENNA EXTENDED

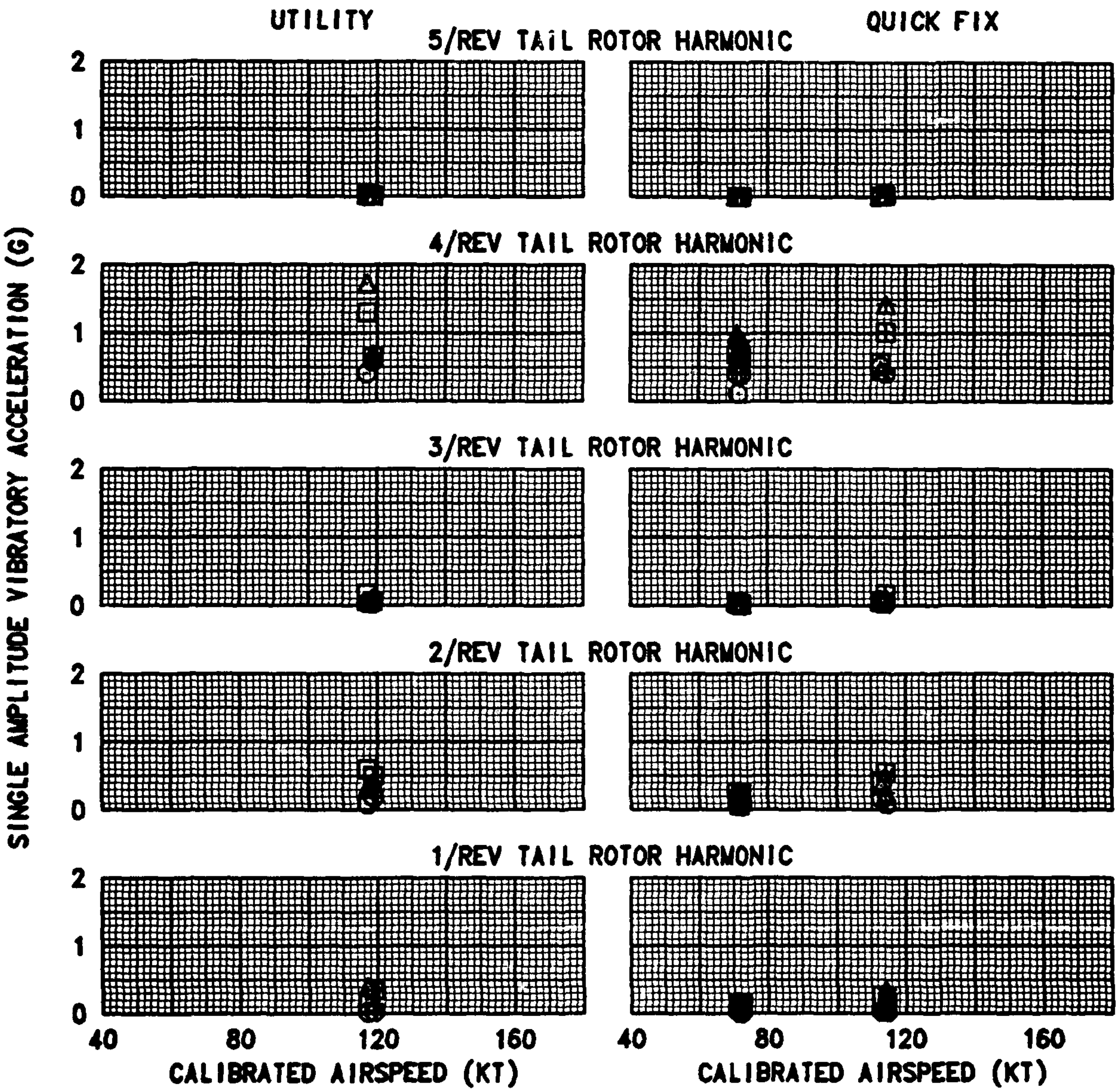
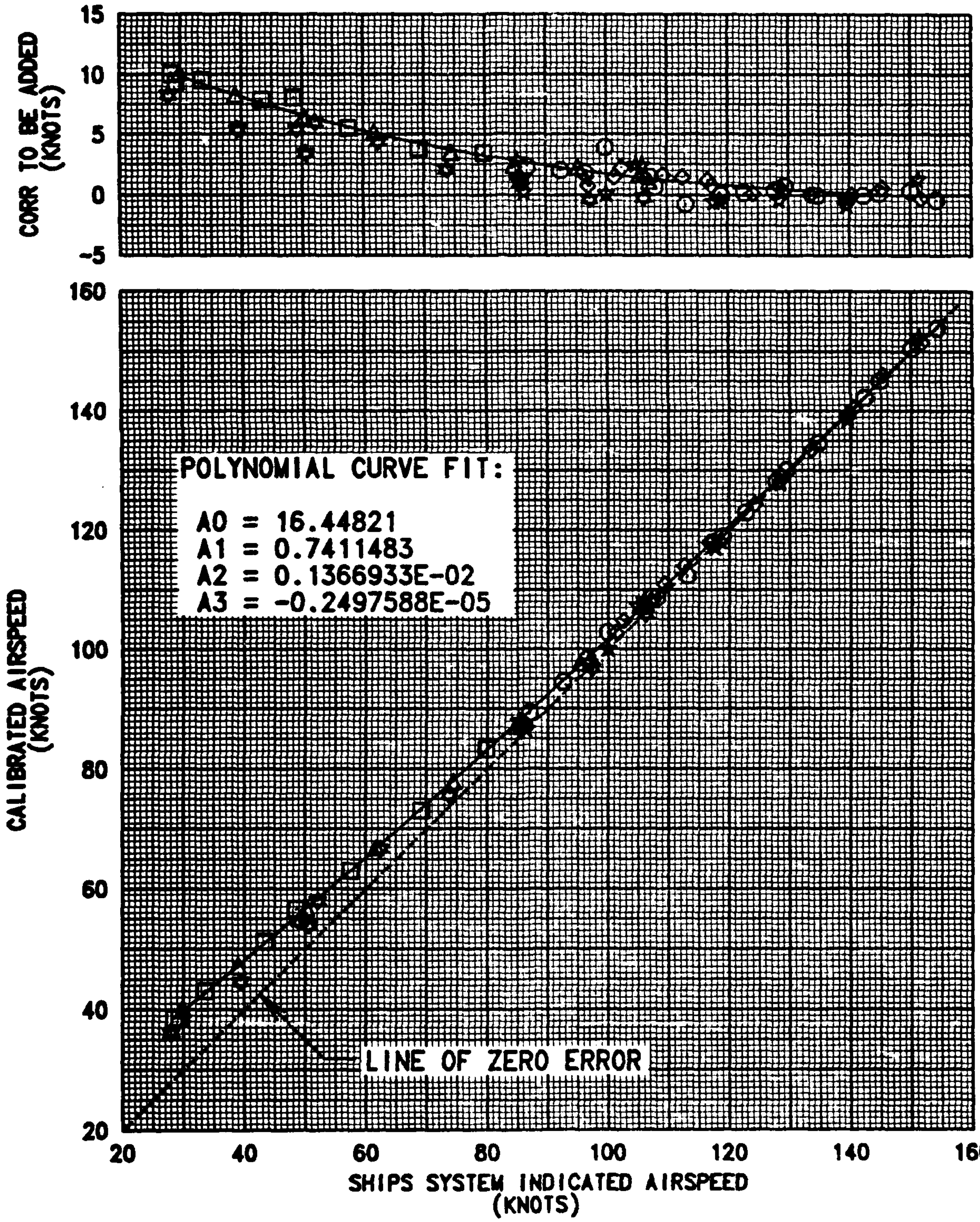


FIGURE E-120

SHIPS SYSTEM AIRSPEED CALIBRATION IN LEVEL FLIGHT

EH-60A USA S/N 86-24569

SYM	AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG OAT (°C)	AVG ROTOR SPEED (RPM)	TEST METHOD	AIRCRAFT CONFIGURATION
□	17040	360.9	0.1 LT	690	-2.5	259	GRND SPD	UTILITY
△	19060	358.0	0.1 LT	360	-4.5	258	GRND SPD	UTILITY
⊙	16400	359.1	0.1 LT	3020	9.5	257	T34 PACE	UTILITY
◇	19900	360.8	0.1 LT	2520	4.5	258	T34 PACE	UTILITY
★	14720	363.6	0.0	4650	16.0	258	T34 PACE	QUICK FIX
✡	15320	364.8	0.0	3640	13.0	258	TRAIL BOMB	QUICK FIX



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Aeroflightdynamics Directorate (SAVRT-AF-D)	
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