AD NUMBER
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AFFTC ltr 28 Mar 1978

FTC-TR-72-35

AD INEXPLORATA

LIMITED PERFORMANCE AND FLYING QUALITIES EVALUATION OF THE F-4E WITH THE RETROFIT TWO-POSITION MANEUVERING SLAT KIT

AFFTC

BILLY R. BOXWELL
Project Engineer

CECIL W. POWELL
Major, USAF
Project Pilot/Officer

RUSSELL C. HUBENET
Sergeant, USAF
Flying Qualities Engineer

TECHNICAL REPORT No. 72-35

AUGUST 1972

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AIR FORCE FLIGHT TEST CENTER
EDWARDS AIR FORCE BASE, CALIFORNIA
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE

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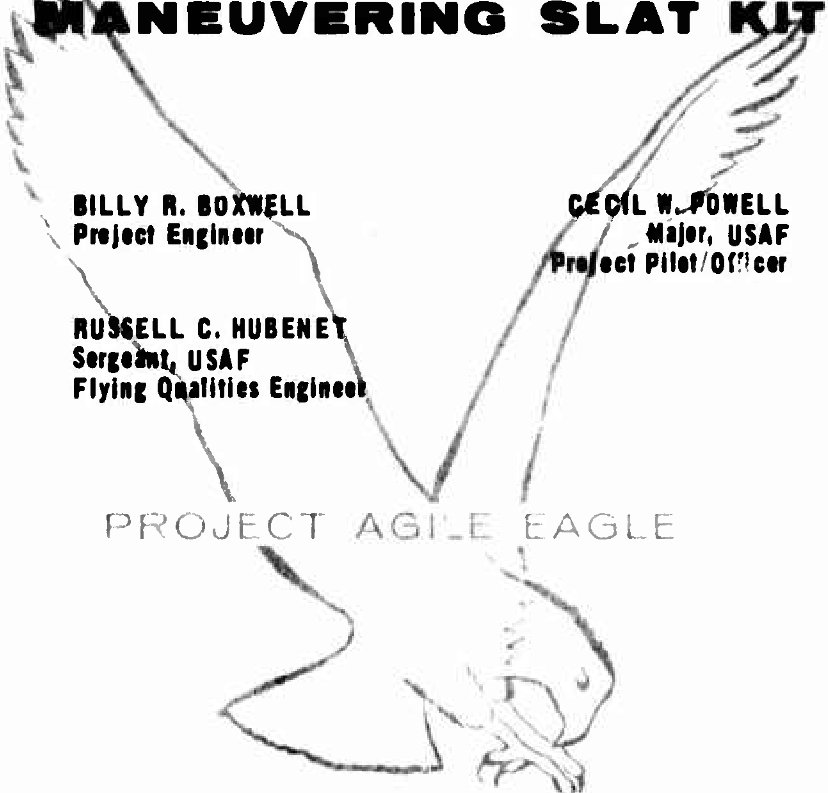

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FOREWORD

This report presents the results of the Air Force/McDonnell Douglas performance and flying qualities evaluation of the F-4E with the production retrofit two-position maneuvering slat kit. These tests were conducted at the McDonnell Douglas flight test facility, St. Louis, Missouri, between 30 March and 25 May 1972, and at the Air Force Flight Test Center, Edwards AFB, California, between 31 May and 22 June 1972. Testing was conducted under the authority of Headquarters Air Force Systems Command as directed by AFFTC Project Directive 72-27 and ASD message R 081410Z March 1972.

This report contains the test techniques, major results, conclusions and recommendations, substantiating data, and data reduction and analysis methods. Findings of the TAC evaluation will be published by TAC under separate cover.

Pilots who participated in the test program were Major Cecil W. Powell, Lieutenant Colonel Richard E. Lawyer, and several pilots from McDonnell Douglas flight test. The two TAC flights were flown by Major M.B. Johnson (Hq TAC) and Major H.W. Dibble (Hq USAFTAWC).

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Prepared by:

Billy R. Boxwell

BILLY R. BOXWELL
Project Engineer

Russell C. Hubenet

RUSSELL C. HUBENET
Sergeant, USAF
Flying Qualities Engineer

Cecil W. Powell

CECIL W. POWELL
Major, USAF
Project Pilot/Officer

Reviewed and approved by:
14 August 1972

James W. Wood

JAMES W. WOOD
Colonel, USAF
Commander, 6510th Test Wing

Robert M. White

ROBERT M. WHITE
Brigadier General, USAF
Commander

ABSTRACT

This report presents the results of the limited performance and flying qualities evaluation of the F-4E with the production retrofit two-position maneuvering slat kit. The objective of the testing was to evaluate the performance and flying qualities of the F-4E aircraft equipped with the two-position leading edge slat and to obtain data necessary to update the F-4 Flight Manual. The two-position slat test results show an increase in turning capability in most of the flight envelope compared with that of the basic F-4E, and were comparable to those obtained with the previous fixed slat configuration, Agile Eagle IV. The normal takeoff rotation technique described in the Flight Manual was considered unsatisfactory for slat-equipped aircraft. The installation of the two-position wing leading edge slat has degraded the maximum speed capability of the F-4 aircraft slightly. Cruise data obtained during the tests show a degradation in cruise performance of approximately four percent for the retracted slat configuration and seven percent for the extended slat. Decreased static stability made precise control of angle of attack (AOA) moderately difficult during landing approaches at 19 units AOA. Rudder rolls performed at high AOA showed improved performance. Lateral-directional flying qualities in the power approach configuration were generally not as good as with the unslatted F-4E, but were satisfactory. Tests performed to evaluate the flying qualities with simulated failures in one or more slat actuators revealed minor, acceptable degradations from the flying qualities observed with the symmetric slat condition.

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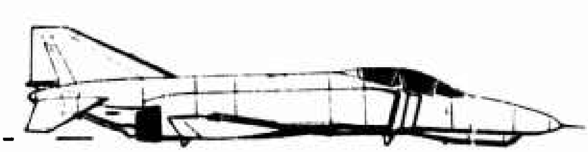


list of illustrations

list of abbreviations and symbols

Item	Definition	Units
A/B	afterburning	- - -
AND	aircraft nose down	- - -
ANL	aircraft nose left	- - -
ANR	aircraft nose right	- - -
AOA	angle of attack	deg or units
C_D	drag coefficient	dimensionless
cg	center of gravity	percent mean aerodynamic chord
C_L	lift coefficient	dimensionless
C_N	normal force coefficient	dimensionless
CO	combat configuration	- - -
CR	cruise configuration	- - -
D	drag	lb
EROS	Eliminate Range Zero System	- - -
EXT	extended	- - -
F_n	engine net thrust	lb
FPA	flightpath acceleration	g
g	acceleration of gravity	32.17405 ft per sec^2

Item	Definition	Units
KIAS	knots indicated airspeed	kt
L	landing configuration	- - -
LWD	left wing down	- - -
M	Mach number	- - -
MAC	mean aerodynamic chord	- - -
MDC	McDonnell Douglas Corporation	- - -
MLG	main landing gear	- - -
n, n_z	normal load factor	g
PA	power approach configuration	- - -
PIO	pilot-induced oscillation	- - -
pps	pulses per second (frequency)	- - -
q	dynamic pressure	lb per ft^2
R/C	rate of climb	ft per min
RET	retracted	- - -
RWD	right wing down	- - -
S	aircraft wing area	530 ft^2
SAS	stability augmentation system	- - -
T	absolute temperature	deg K
TAC	Tactical Air Command	- - -
TAWC	Tactical Air Warfare Center	- - -
TED	trailing edge down	- - -
TEL	trailing edge left	- - -
TER	trailing edge right	- - -
TEU	trailing edge up	- - -
TLF	thrust for level flight	- - -
TO	takeoff configuration	- - -
V	airspeed	kt
W	aircraft gross weight	lb
δ_s	stabilator deflection	deg

INTRODUCTION

The objective of the testing was to evaluate the performance and flying qualities of the F-4E aircraft equipped with the two-position leading edge slat and to obtain data necessary to update the F-4 Flight Manual[1] (reference 1). Fifty-eight flights were flown accumulating 59.7 flight hours, including two qualitative flights by TAC pilots.

In 1969, in an effort to improve the air combat maneuvering capabilities of the F-4 aircraft, the McDonnell Douglas Corporation (MDC) conducted a design and flight test program to investigate increased lift potential using wing leading edge slats. A USAF/USN/USMC flight evaluation was conducted in August 1969 on a YRF-4C equipped with fixed leading edge slats (reference 2). As a result of the improved maneuvering capability, a movable slat system was proposed for production F-4E aircraft which would consist of a hydraulically-actuated, two-position mechanism designed to extend the slats when the angle of attack (AOA) reached some predetermined value.

MDC continued development, corrected the deficiencies noted in reference 2, and installed the refined slats on a production F-4E. In April 1971, October 1971, and again in December 1971, further improved versions of the fixed slat were evaluated by the USAF (references 3, 4, and 5). The optimum fixed slat design, which resulted from the above tests, was mechanized for the two-position configuration and installed on F-4E USAF S/N 66-287A (figures 1 through 6), and an evaluation was conducted by MDC and the USAF. This report presents the results of those tests.

Table I is a summary of the basic configurations flown during the test program and referred to in the text. Table II and figures 7, 8, and 9 present the test loadings that were flown.

The test airplane was a production F-4E instrumented for performance and flying qualities testing. The configuration of the airplane had not been altered except for the removal of production equipment not required in the flight test program and installation of test instrumentation equipment in its place. The radar was replaced by an instrumentation package designed and installed by MDC which contained a magnetic tape airborne data recording system and other major components. The instrumentation package can be seen in figure 10.

A test noseboom was also installed with a pitot-static head for the measurement of airspeed and altitude, and vanes to facilitate the measurement of angle of attack, angle of sideslip, and flightpath acceleration. The noseboom can be seen in figure 11.

The test aircraft required no flight restrictions other than normal Flight Manual limits, with the exception of AOA and normal acceleration which were 32 units and 80 percent of Flight Manual limits, respectively. The normal acceleration limit of 80 percent will be observed on all two-position slat equipped F-4 aircraft until the flight loads testing is completed by MDC. Normal two-position slat operation limits are described in table I.

---

[1]All references to the Flight Manual in this report are to T.O. 1F-4C-1 (Combined Flight Manual USAF Series F-4C, F-4D, and F-4E Aircraft), dated 15 August 1971, Change 2, 15 December 1971.

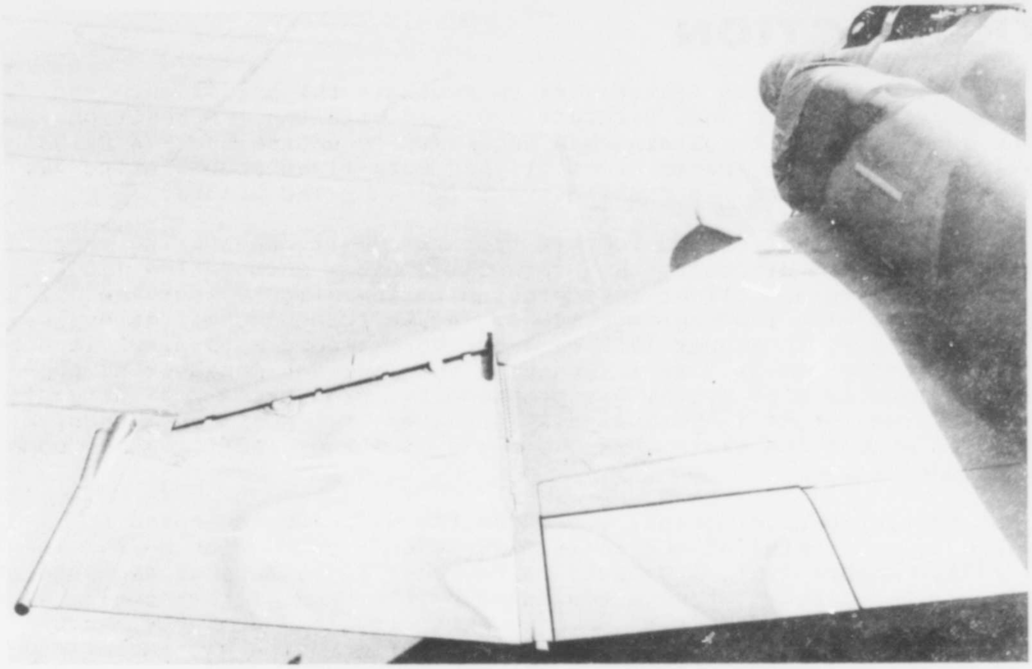


Figure 1 Slat Configuration (Slats Retracted)

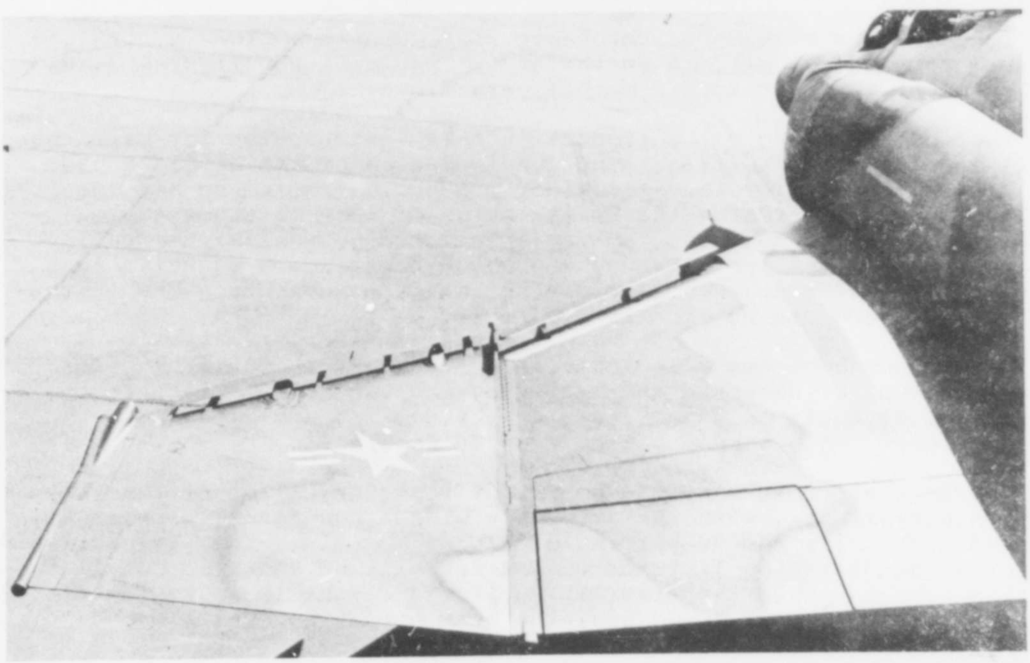


Figure 2 Slat Configuration (Slats Extended)

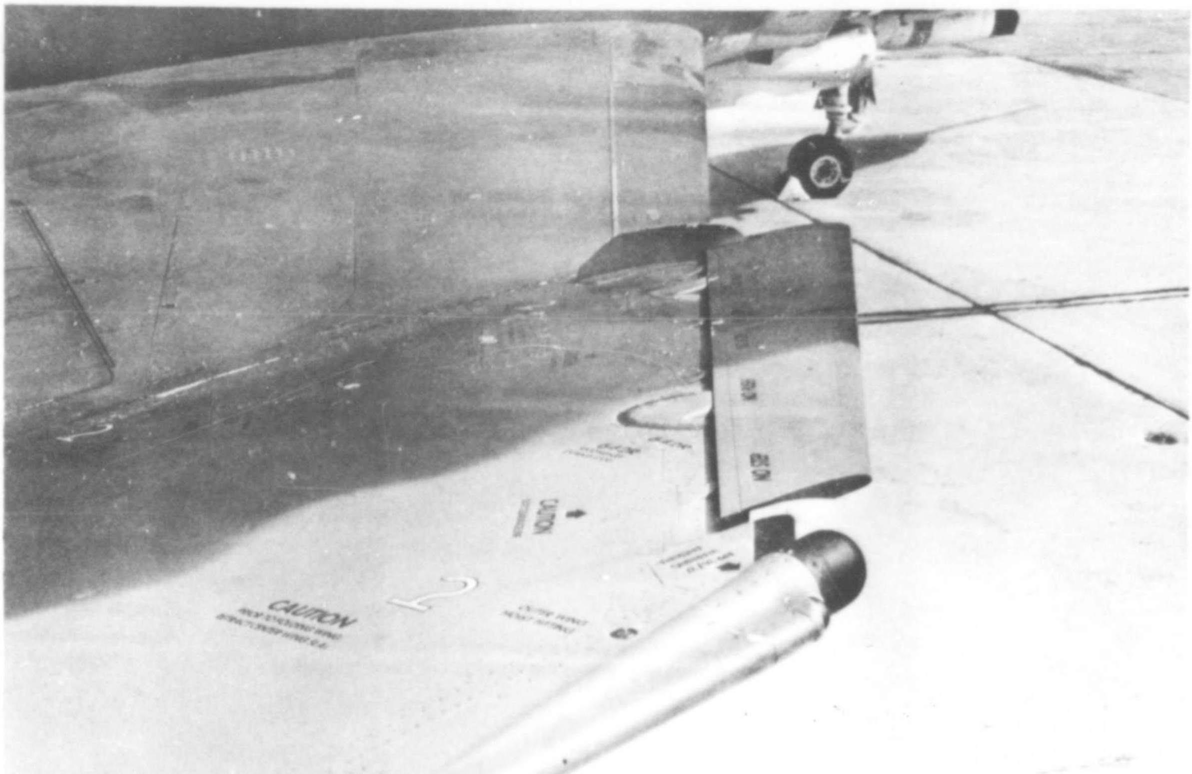


Figure 3 Slat Configuration (Slats Retracted)

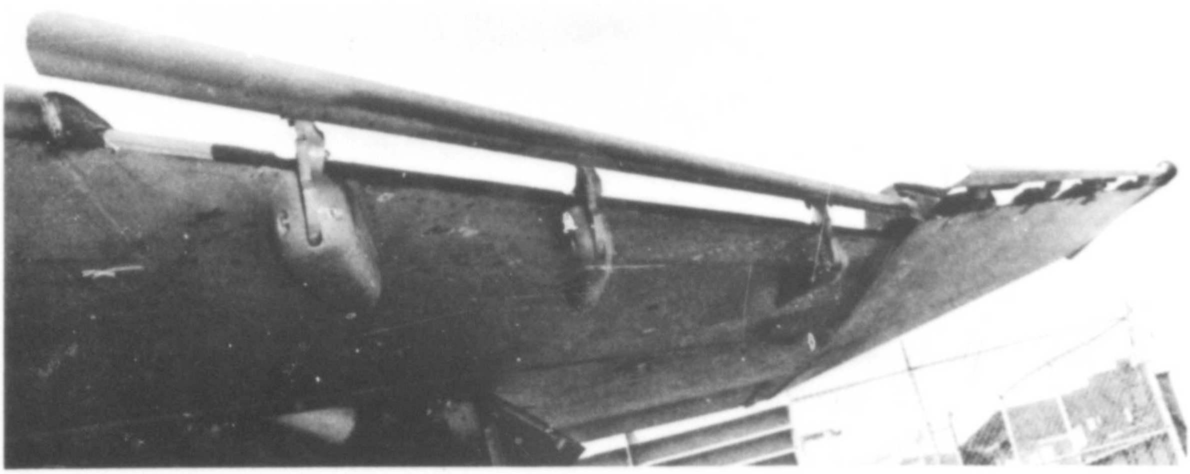


Figure 4 Slat Configuration (Slats Extended)

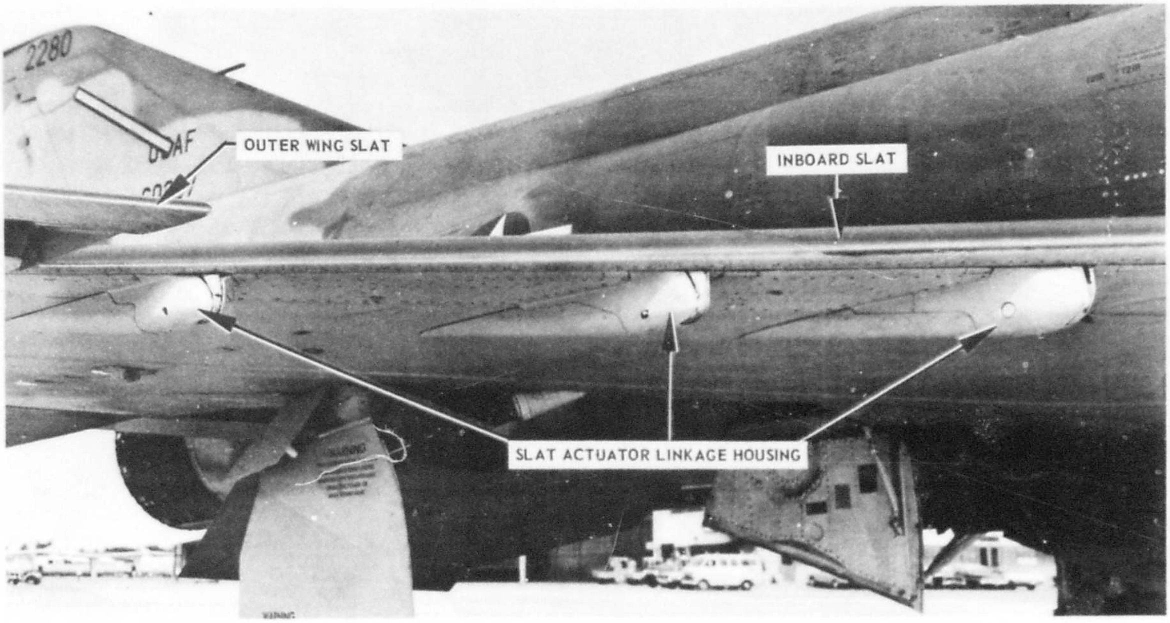


Figure 5 Slat Configuration (Slat Actuator Linkage Housing)

Table I

AIRCRAFT CONFIGURATIONS

Configuration (abbreviation)	Thrust	Gear	Flaps[1]	Slat Position
Takeoff (TO)	MIL or MAX	DOWN	DOWN (30°)	Extended
Cruise (CR)	TLF	UP	UP	Extended or Retracted[2]
Combat (CO)	Augmented	UP	UP	Extended or Retracted
Power Approach (PA)	TLF	DOWN	DOWN (30°)	Extended
Landing (L)	IDLE	DOWN	DOWN (30°)	Extended

Notes:

[1]Trailing edge flaps on two-position slat-equipped aircraft are 30 degrees TED when in the DOWN position. No intermediate position is available.

[2]In the cruise and combat configurations the slats may be extended or retracted depending upon the AOA of the aircraft. The slats automatically extend when the AOA reaches 10 units and retract at 8 units. For a complete description of slat/flap control see the Description of the Two-Position Slat Installation section.

[3]Speed brakes are retracted unless specifically noted otherwise.

F-4E USAF S/N 66-287A
TWO POSITION WING LEADING EDGE SLAT SCHEMATIC

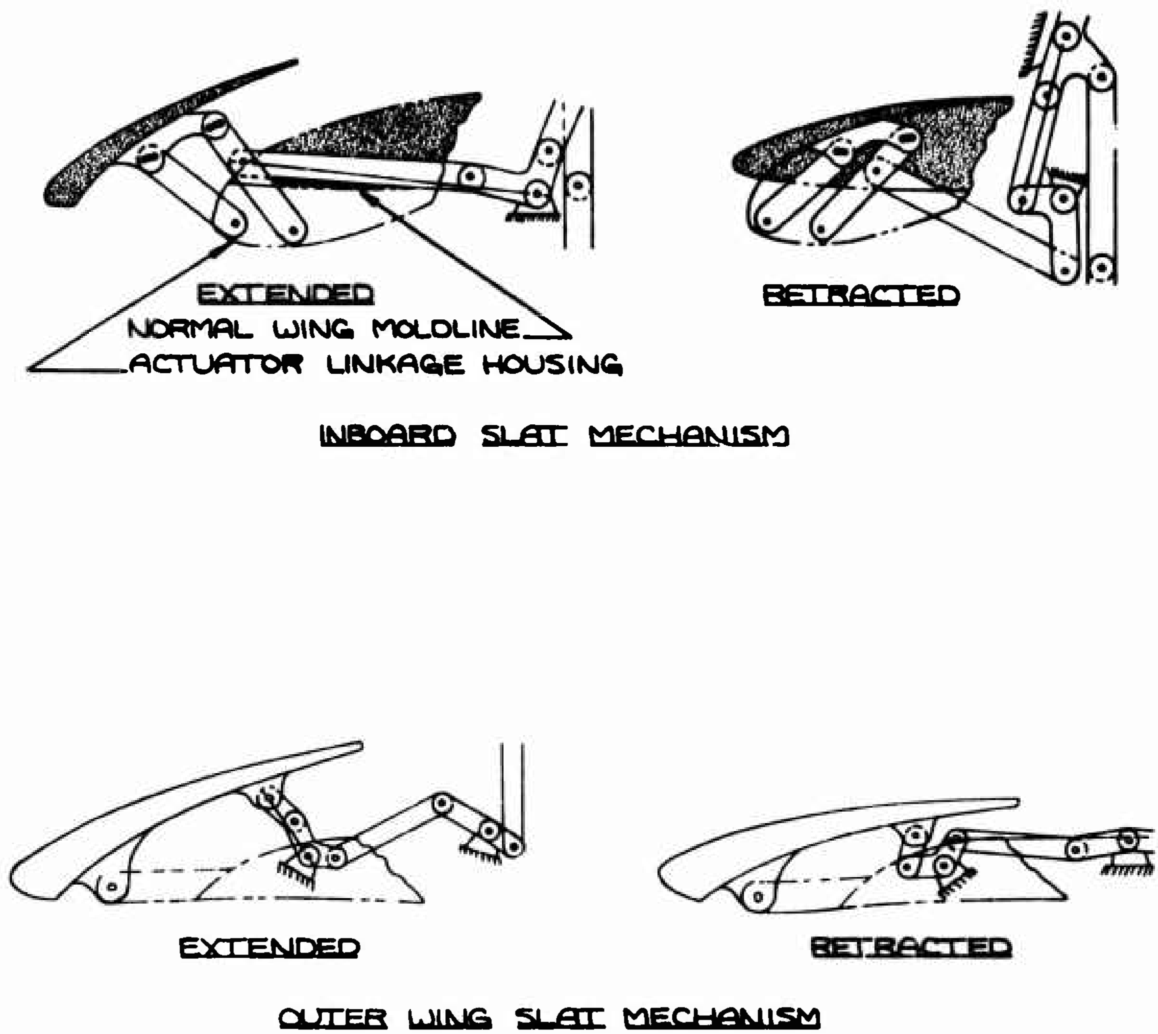
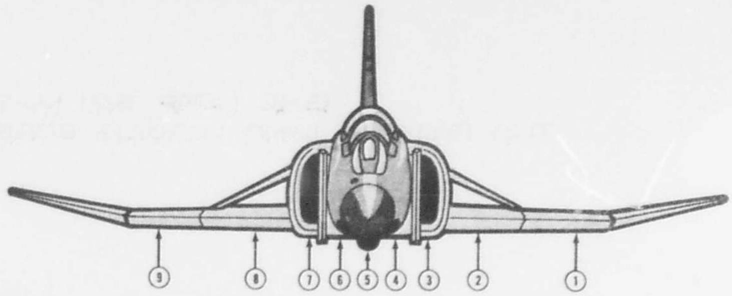


Figure 6 Inboard and Outer Wing Slat Mechanism Schematic

TABLE II
LOADING SUMMARY
F-4E USAF S/N 66-287A
J79-GE-17 ENGINES



Loading[1] No.	Engine Start Gross Weight (lb)	Drag[2] Index No.	Stability Index No.	Fuselage Station								
				9	8	7	6	5	4	3	2	1
1	45,276	3.2	0	-	-	-	-	-	EROS Pod[3]	-	-	-
2	50,702	16.0	40.0	Sgt Fletcher 370-gallon external fuel tank with pylon	-	-	-	-	EROS Pod	-	-	Sgt Fletcher 370-gallon external fuel tank with pylon
3	52,333	41.6	129.0	Sgt Fletcher 370-gallon external fuel tank with pylon	MAU-12 pylon TER-9A rack 2 empty LAU-10 rocket launchers	-	-	-	EROS Pod	-	MAU-12 pylon TER-9A rack 2 empty LAU-10 rocket launchers	Sgt Fletcher 370-gallon external fuel tank with pylon

Notes:

[1] Prefix "A" denotes asymmetric fuel load in the 370-gallon external tanks (right tank half full, left tank empty).
Suffix "a" denotes AIM-7 missile mounted at station 6.
Suffix "b" denotes AIM-7 missiles mounted at stations 3 and 7.

[2] These drag index numbers are valid with the leading edge slat in the retracted position. The drag index for the F-4E with the slat retracted is 3.2; this information was not available for the extended slat configuration at the time of the preparation of this report.

[3] The EROS Pod on station 4 is an AIM-7 shaped container housing an airborne anti-collision system.

Figure 7 Test Airplane Loadings (Loading 1: No External Stores)

Figure 8 Test Airplane Loadings (Loading 2: 2 370-Gallon External Tanks)

Figure 9 Test Airplane Loadings (Loading 3: 2 370-Gallon External Tanks, 2 MER's, 4 Empty LAU-10's)

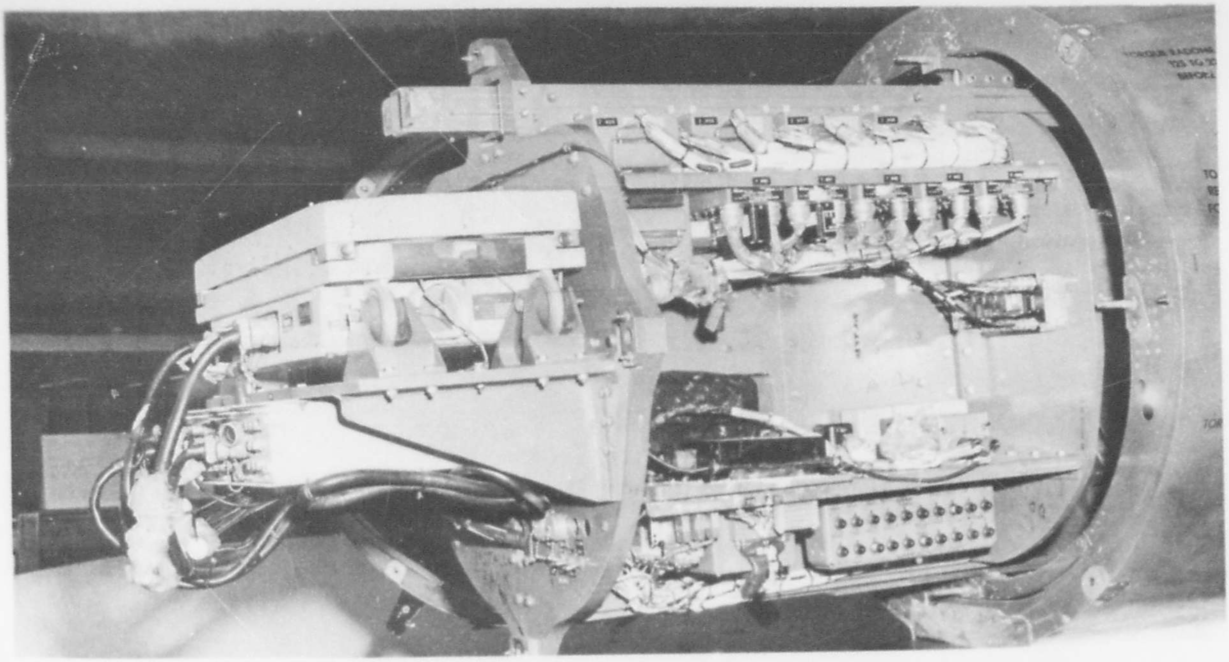


Figure 10 Test Airplane Instrumentation Package

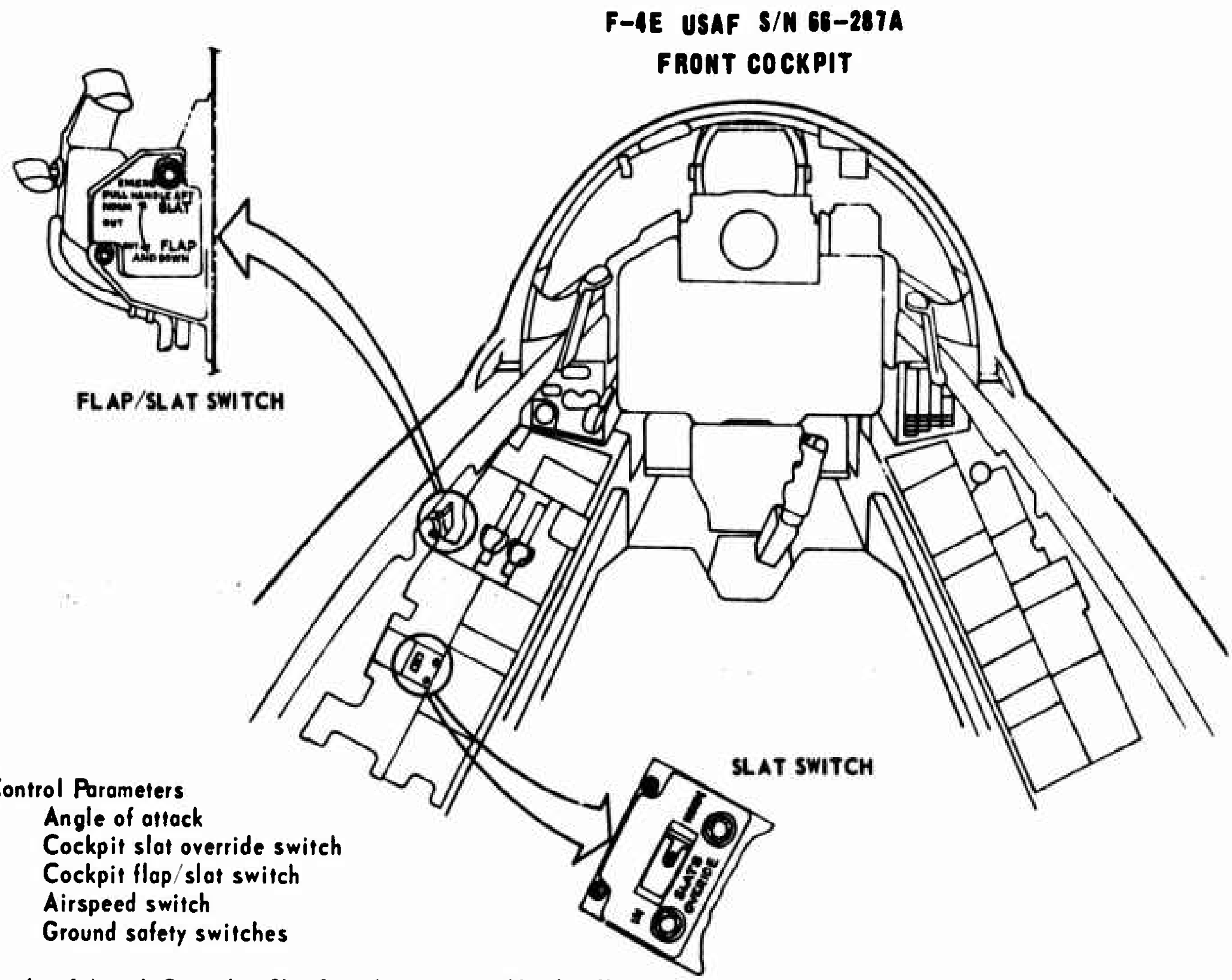
Figure 11 Test Noseboom

DESCRIPTION OF THE TWO-POSITION SLAT INSTALLATION

Flight testing of the F-4 fixed leading edge slat has shown a significant improvement in aircraft maneuvering capability and handling characteristics at high angles of attack. The fixed leading edge slat was mechanized through the utility hydraulic system to be either fully extended or retracted. Production F-4 wing moldlines were altered to contain the inboard slat actuator linkage and structure necessary for slat actuation under high loads. (While the aircraft is maneuvering at high normal load factors and transonic speeds, the slats and associated linkage will be subject to high loads when in operation.) The slat actuator linkage housing and relative slat positions on the inboard and outer wing can be seen in figures 4, 5, and 6.

Rapid slat actuation is required to coordinate the slat extension and retraction with high aircraft pitch rates. Through sizing of hydraulic lines and restrictors, the slat actuation time is controlled to 0.5 seconds and 1.0 seconds extension for the outer wing and inboard wing, respectively, and 0.9 seconds retraction for both. These times are unaffected by wing loads. When not in the extended position, the inboard slat section is completely retractable. The outer wing slat section when retracted rotates slightly aft and down to a low drag position.

The two-position wing leading edge slats are positioned automatically through several slat actuation and control parameters, or they can be controlled manually. A slat position indicator is located on the lower left front panel in the cockpit. Slat and flap control switches are shown in figures 12 and 13 along with a resume of slat actuation and control.



Control Parameters
- Angle of attack
- Cockpit slat override switch
- Cockpit flap/slat switch
- Airspeed switch
- Ground safety switches

Angle of Attack Control – Slat Switch in NORM, Weight off MLG
- Slats extended at 10 units AOA
- Slats retracted at 8 units AOA
- Slats extend when flap/slat switch is positioned to OUT or OUT & DOWN
- Slats retract above 600 KCAS

Manual Control – Slat Switch in SLATS OVERRIDE
- Slats remain retracted at any AOA or any flap selection

Slat Control with Flap/Slat Wsitch in OUT or OUT & DOWN
- Slats extended unless landing gear pin/flag installed, or 600 KIAS is exceeded, or slat override is selected

Slat Control on Ground
- Power removed from flaps and slats when landing gear pin/flap installed in nosewheel well. AOA signal deactivated with weight on wheels.

Figure 12 Leading Edge Slat Control Switches

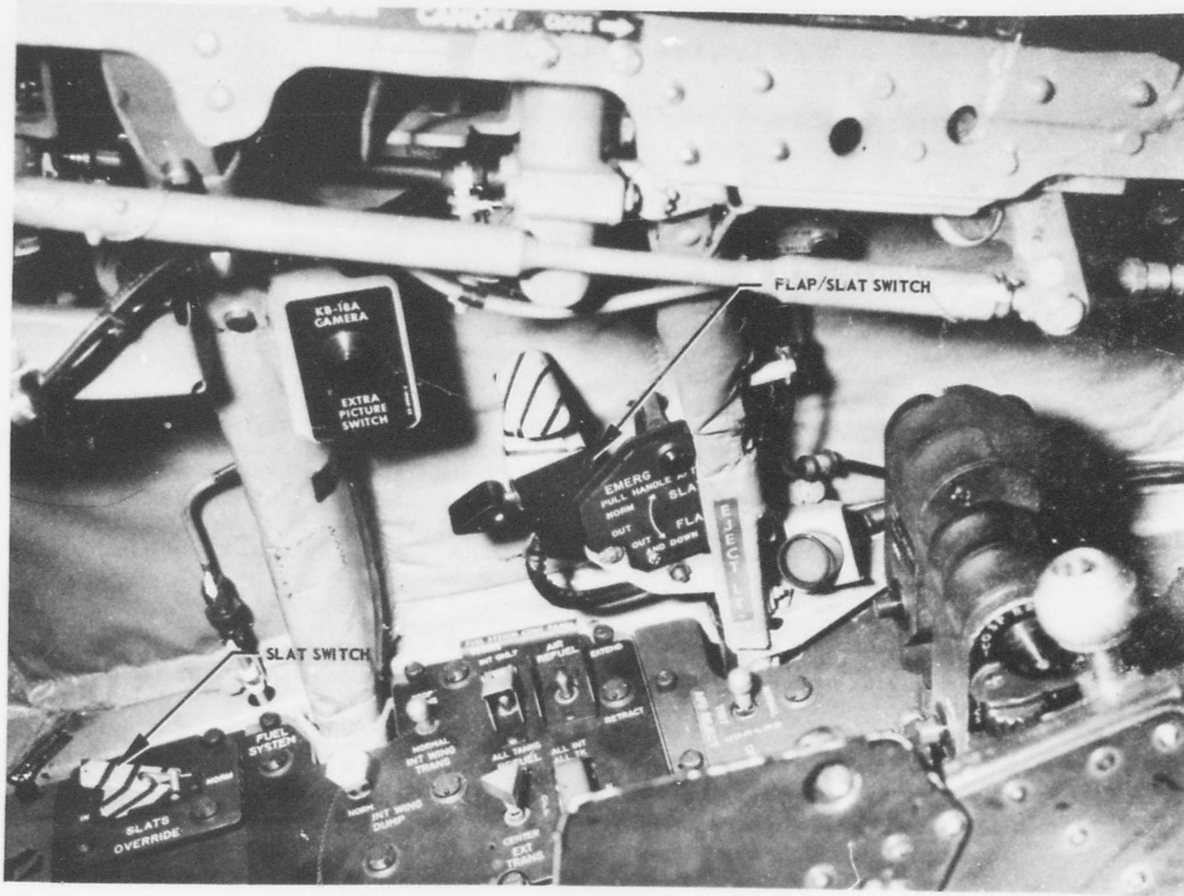


Figure 13 Leading Edge Slat and Flap/Slat Switches

TEST AND EVALUATION

PERFORMANCE TESTS

TAKEOFF

Tests were conducted to determine the takeoff characteristics and performance of the F-4E with the two-position slat kit installed. All performance takeoffs were recorded by Askania phototheodolite cameras from brake release through a height of approximately 200 feet. Ambient temperature, pressure, and wind speed and direction were simultaneously recorded for later data analysis.

Performance takeoffs were performed in the takeoff configuration (TO) described in table I, with maximum afterburning thrust and loading 1 (no external stores). Loading 1, which has an Eliminate Range Zero System (EROS) pod on station 4, is referred to in the text as no external stores. The pod is an AIM-7 shape weighing approximately 200 pounds and has a drag index of 1.4, both of which have negligible effect on the aircraft. With both engines operating at approximately 80 percent, brakes held, and nose gear steering engaged to insure nose gear alignment, the brakes were released and both throttles advanced to full military thrust. At this point engine speed (rpm), exhaust gas temperature, and nozzle position were checked and the throttles advanced full forward to maximum afterburning thrust. During the takeoff roll, directional control was maintained with nosewheel steering until the rudder became effective at approximately 70 KIAS.

The normal takeoff procedure outlined in the F-4E Flight Manual indicates that sufficient aft stick should be applied prior to nosewheel liftoff speed to attain the desired pitch attitude. As the nose rises, pitch attitude must be controlled to maintain 10 to 12 degrees nose up for takeoff. This technique was considered unsatisfactory for the slat-equipped F-4E: early and/or rapid aft stick movement may result in over-rotation and the stabilator contacting the runway; also, slow and/or delayed aft stick movement will result in increased takeoff ground roll. The technique determined most satisfactory for slat-equipped F-4E aircraft was as follows: at approximately 80 KIAS, aft stick was smoothly applied to attain the desired 10 to 12 degrees pitch attitude just prior to liftoff. Normal takeoff procedures for slat-equipped F-4E aircraft should be changed to reflect the results of these tests. The Normal Takeoff section of the Flight Manual pertaining to rotation technique should be revised to read as follows: **(R 1)** [2]

> "Aft stick should be smoothly applied at approximately 80 KIAS to attain 10 to 12 degrees pitch attitude just prior to aircraft fly-off."

The results of the takeoff tests are presented in table III and figure 15. These data were not corrected for nonstandard ambient conditions and the comparisons made with the Flight Manual were for the test day conditions.

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[2] Boldface numerals preceded by an R correspond to the recommendation numbers tabulated in the Conclusions and Recommendations section of this report.

Table III

TAKEOFF DISTANCE COMPARISON
F-4E USAF S/N 66-287A
J79-GE-17 Engines
Takeoff Configuration
Dry Concrete Runway
Loading 1: No External Stores
Takeoff Gross Weight: 45,000 lb

Flight No.	Ambient Temperature (deg C)	Headwind Component (kt)	Distance to Liftoff (ft)	
			Two-Position Slat Test Aircraft	Flight Manual Data
279	21	5	2,580	2,500
280	31	1	2,850	2,500
281	35	5	2,500	2,800
282	26	12	2,575	2,450
283	34	5	2,675	2,720

LEVEL FLIGHT ACCELERATIONS

Level flight accelerations were performed to determine the speed schedules that would result in the maximum rate of climb and to check the Flight Manual schedules and level acceleration data. Data were obtained at various altitudes in both maximum afterburning and military thrust.

Level flight accelerations were performed with loading 1, from near the minimum flying speed to the limit speed for the test data. The technique used was to stabilize the airplane near the minimum flying speed. The thrust setting was advanced to military thrust or maximum afterburning as desired, and the aircraft was allowed to accelerate at a constant altitude to the maximum speed at that altitude and thrust setting. The results of the level acceleration tests are presented in figures 16 through 34. A comparison of the Flight Manual level flight envelope, the flight envelope established during F-4E Category II testing (reference 6), and the flight envelope resulting from the installation of the two-position wing leading edge slat is presented in figure 35. The installation of the two-position wing leading edge slat has degraded the maximum speed capability of the aircraft slightly. The Flight Manual should be revised to reflect the changes in the level flight envelope for F-4E aircraft equipped with the two-position slat. **(R 2)**

The Flight Manual climb speed schedules for maximum and military thrust are in good agreement with the maximum rate of climb potential data presented in figures 20 and 22. It was interesting to note that when the aircraft was in a climb near its combat ceiling, the slats automatically extended when the AOA reached 10 units and the rate of climb increased rapidly by an additional 1,000 feet per minute.

Test day and standard day excess thrust and rate of climb potential were determined as outlined in the Climb Potential Determination section, appendix I, and in reference 7. Inflight thrust was obtained by use of a MDC computer program using established J79-GE-17 engine performance data. Test day thrust was determined by entering power lever position (military and maximum thrust only), altitude, Mach number, and free air temperature for the test condition into the program. Standardized thrust was obtained in the same manner except that standard altitude and free air temperature were used. Fuel flow data resulting from the level flight accelerations were not corrected for nonstandard test conditions.

TURNING PERFORMANCE

To evaluate the maneuvering capability of the test airplane, accelerating, decelerating, and thrust-limited turns were performed throughout the flight envelope of the aircraft in maximum afterburning thrust with loading 1 (no external stores). Accelerating turns were performed by banking the airplane into a turn at a constant normal load factor, at a speed where the excess thrust was positive and increasing, and allowing the airplane to accelerate to the thrust limit while holding as constant an altitude as possible. Decelerating turns were per-performed by banking the airplane into a turn at the completion of a level acceleration. The airplane was then turned at a constant normal load factor and altitude, and allowed to decelerate to initial stall buffet. Results of the accelerating and decelerating turns are presented in figures 36 through 49.

Maximum afterburning thrust-limited turning performance tests were conducted at 10,000, 20,000 and 35,000 feet pressure altitude with loading 1. At the test altitude an acceleration was performed to a selected Mach number. The airplane was then banked into a turn at a constant altitude while sufficient normal load factor was attained to stabilize airspeed. Approximately 360 degrees of turn were recorded during each stabilized turn. Thrust-limited turning performance data were also obtained from accelerating turns by allowing the airplane to accelerate at the test condition to near the thrust limit. These data were obtained at various cg positions from approximately 25 to 32 percent mean aerodynamic chord (MAC) and were corrected to 32.9 percent as outlined in appendix I. Thrust-limited turning performance data are presented in figure 50.

The thrust-limited turning capability presented in the F-4E Flight Manual indicates a sustained load factor higher than was demonstrated during Category II testing. These data were generated from thrust available and the airplane drag polars. Thrust-limited turning performance data obtained during the test program indicate a significant increase above the performance demonstrated during F-4E Category II testing (reference 6). The F-4E Flight Manual for slat-equipped aircraft should be revised to indicate the sustained load factor capabilities demonstrated during this test program. **(R 3)**

Turning performance maneuvers were also used to obtain drag data by the technique outlined above. While the aircraft decelerated or accelerated in the turn at a constant normal load factor, altitude, and thrust setting a range of lift and drag coefficients were obtained. These parameters were calculated as outlined in the drag determination section of appendix I. Drag data are presented in figures 51 through

54, appendix I. These data were also corrected to a cg of 32.9 percent MAC. Performance data to be obtained from these drag polars should be corrected to a more forward cg. The cg should be approximately 28.5 percent MAC, which would be representative of the clean airplane at combat weight (41,185 pounds). **(R 4)**

CRUISE PERFORMANCE

Level flight tests were conducted to obtain the change in cruise performance resulting from the two-position slat installation in both the retracted and extended positions. Data were obtained at various altitudes in loading 1.

Cruise performance data were obtained from stabilized conditions of airspeed and fuel flow at a constant weight-pressure ratio (airplane gross weight divided by the ratio of test atmospheric pressure to sea level standard day atmospheric pressure). A constant weight-pressure ratio (W/δ_a) was maintained by flying at successively higher altitudes to compensate for the decreasing gross weight due to fuel consumption. All data were obtained in the cruise (CR) configuration.

The results of the level flight tests are presented in figures 55 through 59. Comparisons of the test aircraft and corresponding data derived from F-4E Category II tests (reference 6) and the Flight Manual are presented in figure 55. These data show a degradation in cruise performance of up to four percent for the retracted slat and seven percent for the extended slat. The cruise performance section of the F-4 Flight Manual should be revised to reflect the cruise performance obtained during this test. **(R 5)**

STATIC THRUST CALIBRATION

A static thrust calibration was performed on 20 June 1972 at the AFFTC static thrust facility to check the installed static thrust of the J79-GE-17 engines in the test aircraft.

The gas generator data presented in figures 60 and 61 summarize the results of the static thrust calibration. With both engines operating, and with all systems on that are normally operating at takeoff, the thrust in maximum afterburning and military settings was 15,250 and 9,200 pounds per engine, respectively.

Engine speed and exhaust gas temperature operating schedules are presented in figures 62 through 65.

FLYING QUALITIES TESTS

TAKEOFF

Takeoffs were performed with several combinations of external stores, gross weight, cg position, and military or maximum afterburning thrust. The normal takeoff configuration with slats extended and flaps down 30 degrees was used for all takeoffs unless noted otherwise.

Applying full aft stick deflection prior to reaching 80 KIAS resulted in nosewheel liftoff at speeds significantly lower than obtained with the basic F-4E. The initial rotation rate was also increased.

Takeoff attitude could be attained at airspeeds that would allow liftoff at speeds too low for adequate lateral stability. Several uncommanded wing drops, similar to those reported in reference 4, occurred during the test program and were attributed to the low liftoff speeds and resulting inadequate lateral stability.

The modified takeoff technique described in the Takeoff Performance section of this report eliminated the early liftoff problem. Liftoff then occurred at a speed where lateral stability and controllability were adequate. A slight, unobjectionable forward stick deflection was needed just after liftoff to arrest rotation rate. Control forces with 3 units aircraft nose down (AND) trim were high, but not excessive during the ground run, and lightened at liftoff. Trim changes resulting from retraction of the landing gear and flaps were minor.

The external store loadings tested provided slower initial pitch rates during rotation. One takeoff performed with store loading A2 (right 370-gallon tank half full, left 370-gallon tank empty), required approximately one-half to two-thirds lateral stick deflection after liftoff to hold up the right wing.

One takeoff was made with the slats initially retracted, then allowed to extend just after liftoff. The resulting transients and trim changes were barely noticeable.

TRIM CHANGES

Trim changes resulting from actuation of the landing gear, speed brakes, flaps, and leading edge slats were evaluated. In the normal gear-down speed range, extension and retraction of the landing gear produced a negligible pitch trim change. Flap extension caused a definite, easily controlled, nose down trim change comparable to that of the basic F-4E. Speed brake actuation caused a moderate, easily controlled, nose up trim change (opposite in direction from that of the basic F-4E).

Trim changes occurring with normal slat extension and retraction were insignificant. The aircraft response to slat extension at 10 units AOA was a very slight nose down trim change. Using manual slat control to extend the slats at AOA's other than the normal operating point did not produce any unsatisfactory characteristics. Trim changes due to asymmetric slat extension are discussed in the Asymmetric Slat Conditions section of this report.

MANEUVERING STABILITY

Maneuvering stability was evaluated by performing constant Mach number windup turns over a wide range of trim Mach numbers at two altitudes. All the data presented are for the aircraft with AIM-7 stores only (loadings 1a and 1b). The windup turns were performed by trimming the aircraft for level flight at the chosen altitude and Mach number then banking into a turn while increasing load factor. Altitude was sacrificed to maintain constant Mach number. The throttles and longitudinal trim were not moved during the maneuvers. Figures 66 through 75 show the maneuver points determined from figures 76 through 85. Figures 86 through 99 show the stick force and stabilator position data obtained during the maneuvers. The method used to determine the maneuver points is described in appendix I. Figures 100 through 111 show time histories of several of the windup turns performed.

For subsonic speeds at 37,000 feet altitude, windup turns performed with an aft cg position showed low or negative stability for most of the range of normal force coefficient (C_N) below 0.9. The effect was most noticeable in the 13 to 16 degree noseboom angle of attack range (17 to 20 units production indicator AOA). At C_N's above approximately 0.9, a rapid increase in stick force per g and stabilator position per C_N gradients was noted. This gradient increase was similar in nature to that reported in references 4 and 5, but reduced in effect. The aircraft's pitch response and pitch rate capability at high C_N's were satisfactory, and the increased stick force and deflection needed to attain C_N's greater than 0.9 provided additional security against inadvertently exceeding safe AOA limits.

The test aircraft was not fitted with a gunsight, but simulated air-to-ground and air-to-air tracking (with an unslatted F-4 target) showed that terminal tracking could be effectively accomplished up to 30 units AOA without excessive pilot workload.

STATIC AND DYNAMIC LONGITUDINAL STABILITY

Static longitudinal stability tests were performed at 10,000 and 35,000 feet altitudes with basic store loadings 1 and 3. The aircraft was trimmed for one-g level flight at a specified airspeed and altitude, then the airspeed was varied above and below the trim airspeed by performing a slow "push-pull" longitudinal control input. Throttle position and longitudinal trim position were not disturbed from their trim settings. Figures 112 and 113 show a summary of the data shown in figures 114 through 128 for the cruise and combat configurations. Power approach configuration data are shown in figures 129 and 130.

The effects of cg position and external store loadings on the static stability of the aircraft were comparable in nature to those experienced with the basic F-4E. Apparent and real static stability in the CR and combat (CO) configurations were determined by taking the slopes of the stick force and stabilator position versus C_N data at the trim C_N values. Store loading 1 (stability index number = 0) exhibited adequate stability, but the stability was significantly reduced by the effects of store loading 3 (stability index number = 129). Power approach configuration data for store loading 1 and a mid cg position indicate reduced stability in the 17 to 21 unit AOA range. This low static margin was noticed as difficulty in holding 19 units AOA precisely during landing approaches.

Dynamic longitudinal stability was evaluated by exciting the short-period oscillatory motion of the aircraft with a quick longitudinal control doublet or impulse input. After completing the control input, the pilot attempted to hold the stick steady in the neutral position. The aircraft's oscillatory response was computer analyzed to provide the damping ratio and damped period data shown in figures 131 and 132. Figures 133 through 141 show time histories of several of the tests.

As expected, stability augmentation system (SAS)-off oscillations had less damping than the SAS-on oscillations, and rearward cg movement reduced damping also. The period of the oscillation increased with altitude and rearward cg movement. Pilot-induced oscillations (PIO's) are a potential problem at high speeds and low altitudes due to the low SAS-off damping, particularly with aft cg locations. No Flight Manual change is required for the slat-equipped aircraft, since there already is a NOTE describing PIO susceptibility in the Operating Limitations section of the current Flight Manual.

TRANSONIC SPEED STABILITY

Transonic speed stability was evaluated by trimming for level flight at approximately 0.85 Mach, then increasing the thrust to maximum afterburner and accelerating to approximately 1.2 Mach. After terminating the acceleration run, the aircraft was retrimmed for level flight, and the throttles were retarded to IDLE. During both the accelerating and decelerating runs, the pilot attempted to hold altitude constant by longitudinal control inputs. Figure 142 shows the data obtained during the level acceleration and deceleration. Figure 143 shows the transonic characteristics during high-g decelerating turns with maximum afterburning thrust. Figures 144 and 145 show time histories of the level transonic acceleration and deceleration.

Stabilator and stick force variations with Mach number were similar to those of the basic F-4E during the one-g acceleration/deceleration maneuvers. During the high-g decelerating turns, it was noted that the transonic "dig-in" characteristics of the test aircraft were much less severe than the basic F-4E's.

ROLL PERFORMANCE

Aileron and rudder rolls were performed at 10,000 and 35,000 feet altitude over a wide range of speeds. The maneuvers were initiated with abrupt aileron or rudder inputs from a level flight attitude or a stabilized high-g turn. The SAS was on for all tests.

Figure 146 shows roll data for the CR and CO configurations at 10,000 feet altitude. Comparable data for the basic F-4E were not available, but comments from both contractor and USAF pilots indicated that the high-AOA aileron rolling capability was slightly improved over that of the basic F-4E, while low AOA aileron roll performance was unchanged. Figures 149 and 150 show time histories of typical rolls performed at this altitude.

Roll capability at 35,000 feet is shown in figure 147 for the CR and CO configurations. Aileron roll performance at high AOA's was slightly improved, while at low and mid AOA's (below 20 units) aileron roll performance was approximately the same as that of the unslatted F-4E. Rudder rolls performed at high AOA's showed improved performance, but it was noted that rudder rolling performance decreased rapidly at lower AOA's. The variation of rudder rolling performance with angle of attack was much more noticeable than with the unslatted F-4E. Figures 151 through 153 show typical roll time histories at this altitude.

Low speed roll capability in the power approach configuration is shown in figure 148. The roll helix angle was determined by the method described in appendix I. As was noted with the CR and CO configuration roll tests, low AOA aileron roll performance was approximately the same as the unslatted aircraft's, while at higher AOA's the aileron roll performance was slightly improved. The improvement over the basic F-4E of aileron roll performance was more noticeable in the CR and CO configuration tests than in the power approach (PA) configuration rolls. Rudder roll performance depended strongly on AOA: rolls at high AOA showed slightly increased performance; while rolls at lower AOA's did not show any increase in performance. Coordinated use of both aileron and rudder inputs gave the most favorable roll response at high AOA's. Figures 154 through 156 show typical PA configuration roll time histories.

STATIC DIRECTIONAL STABILITY

Static directional stability was evaluated by performing sideslips in the PA and CR configurations at several trim speeds at 10,000 feet altitude. The maneuvers were performed by slowly applying rudder pedal force while using lateral stick inputs to maintain a constant heading. Figures 157 through 162 show the control and attitude parameters of the aircraft plotted against sideslip angle. Static directional stability was satisfactory throughout the envelope tested, but the increased dihedral effect of the test aircraft was noticeable. Sideslips in the PA configuration caused increased difficulty in controlling AOA. A sideslip attempted while trimmed at 24 units AOA (production indicator) could not be stabilized in bank angle or AOA at sideslip angles greater than approximately ± 2 degrees.

POWER APPROACH CONFIGURATION EVALUATION

Power approach flying qualities were evaluated with landing gear and flaps down and slats extended. In addition, landing approaches were flown with several combinations of simulated slat and flap malfunctions. These approaches are discussed in the Asymmetric Slat Conditions section of this report.

Longitudinal flying qualities were satisfactory but were adversely affected by low static stability in the 17 to 20 units AOA range. This region of reduced stability made precise control of AOA moderately difficult during landing approaches at 19 units AOA. This difficulty would have been greater without the 16-pound longitudinal control feel system overbalance modification which had been installed in the test aircraft before the testing began. Terminating the approach with a flare to 20 to 21 units AOA was easily accomplished and resulted in reduced sink rates at touchdown.

Lateral-directional flying qualities in the PA configuration were generally not as good as those experienced with unslatted F-4E's, but were still termed satisfactory. Lateral control was adequate at 19 units AOA with either aileron or rudder inputs. Due to the increased dihedral effect of the slat-extended configuration, the test aircraft was more susceptible to roll disturbances caused by gusty crosswinds. This susceptibility to gust upsets was especially noticed just before touchdown where lateral control effectiveness was reduced by ground effect.

Figure 163 shows the approach speed data gathered during the tests. Approach speed with slats and flaps extended was approximately 7 knots higher than experienced with the unslatted aircraft. Although no landing data are included in this report, the following observations were made for the slat-equipped F-4E:

1. The aircraft had increased residual thrust during landing roll due to the lack of a BLC installation.

2. Approach speeds were higher and drag was reduced due to the lower maximum flap deflection.

These changes all tended to increase the stopping distance during landings. Landing performance tests should be conducted to insure that accurate data are presented in the Flight Manual for the slat-equipped F-4E aircraft. **(R 6)**

STALL APPROACH CHARACTERISTICS AND AURAL TONE STALL WARNING SYSTEM

Stall approach characteristics were evaluated with several combinations of aircraft configuration, external stores, load factors, and slat conditions. Figure 164 shows a summary of the results, and figures 165 through 169 show time histories of several of the tests. The buffet onset data shown in figure 164 are incomplete because pilot comments noting buffet were not available for all the stall approaches flown. The wing rock onset data shown were obtained from the time histories of the maneuvers.

The aerodynamic stall warning characteristics of the test aircraft were generally better than those of the previously-evaluated slat configurations (references 2, 3, 4, and 5). Stall warning from wing rock or yaw oscillations, which occurred at 25 to 27 units AOA usually, was considered unreliable due to the non-repeatability of the characteristics. If the 24- to 27-unit AOA range was traversed at a moderately high pitch rate, it was possible to increase AOA to 32 units without any wing rock or directional instability. Buffet was of limited usefulness as a stall warning because of the large range between buffet onset AOA's and actual stall/ loss of control AOA. The buffet levels were of lower intensity at all AOA's than those of the basic F-4E, and were mild enough not to mask the other aerodynamic stall warnings. The increase in stick force and position gradients at high C_N's, as discussed in the Maneuvering Stability section of this report, acted as an effective deterrent to exceeding safe AOA limits.

The aural tone stall warning system was scheduled by angle of attack as shown in figure 170. Because of the increased angle of attack capability of the slat-equipped aircraft, and the slightly improved aerodynamic stall warning, artificial stall warning was less critical than in the basic F-4E. The aural tone high schedule (figure 170) was defined from pilot comments obtained from previous slat tests. When considering the most favorable qualitative combination of turning performance and high angle of attack flying qualities, the 23- to 25-unit AOA range was considered the maximum maneuvering angle of attack. However, it should be noted that load factor limits of the aircraft can be attained at decreased AOA's in the low altitude regions of the flight envelope. In addition, thrust-limited turning capabilities of the aircraft were not considered in determining this maximum maneuvering AOA. The aural tone system, as presently scheduled, is effective as both a stall warning device and a maneuvering capability indicator.

ASYMMETRIC SLAT CONDITIONS

General

Several test flights were utilized to fully evaluate flying qualities with simulated failures in one or more slat actuators. All the flights were flown with no external stores except the EROS pod (loading 1). The slat asymmetry referred to in the following sections is defined as both slats on one wing retracted and both slats on the opposite wing extended.

Trim Changes

Longitudinal trim changes accompanying asymmetric slat actuation were similar to those noted for normal symmetric slat extension. The trim change was barely perceptible both at one g and at elevated load factors. The asymmetric actuation was noted mainly as a tendency to roll into the wing with retracted slats. Little yaw resulted from asymmetric actuation at 10 units AOA.

High AOA Characteristics

The rolling tendency of the asymmetric slat configuration increased with angle of attack. Lateral control requirements as a function of angle of attack are shown in figure 171. At approximately 19 units AOA (production indicator), full lateral stick deflection toward the wing with extended slats was required to control bank angle. Above 19 to 20 units AOA, rudder inputs were helpful in controlling the increasing rolling tendency.

Light buffet onset was noted at the slat extension AOA during asymmetric actuation at one g. Moderate buffet was noted at 18 to 19 units AOA during one-g stall approaches. Wing rock and yaw oscillations did not occur consistently, but did sometimes begin in the AOA range of 23 to 26 units.

Windup turns were performed at 35,000 feet with the asymmetric slat extension. The general characteristics and lateral control requirements were similar to the one-g characteristics, except for the roll-off starting at 20 to 21 units AOA being more abrupt and not controllable with rudder inputs. The maneuvers were terminated when the roll-off started. Moderate buffet onset was at 16 to 17 units AOA. Dig-in characteristics during high-g transonic decelerations were less severe than those experienced with the basic F-4E and comparable to the symmetric slat condition characteristics.

Power Approach Configuration

A 19-unit AOA approach was flown with the asymmetric slat condition and gear and flaps down. Longitudinal controllability was similar to that noted during normal symmetric slat approaches in that holding 19 units AOA precisely was moderately difficult. Lateral-directional controllability was sufficient at 19 units AOA. Approach speed with the asymmetric slats was 4 to 5 knots higher than the normal symmetric slat approach speed.

One 19-unit approach was flown with gear and flaps down and all slats retracted. Buffet intensity was noticeably higher, but angle of attack control was easier than with the slats extended. Lateral and longitudinal controllability was sufficient throughout the approach. Approach speed at 19 units AOA was approximately the same as with extended slats.

Two approaches were flown with normal slat extension and retracted flaps. Pilot comments indicate increased workload and difficulty in controlling sink rate. Approach speed was increased by 15 to 20 knots.

One approach at 19 units AOA was flown with both slats and flaps retracted. Lateral controllability was poor; the ailerons were not effective, and rudder inputs were necessary for adequate roll response. Approach speed was approximately 20 knots above the normal slats out, flaps down speed.

Table IV summarizes the results of the different slat/flap combinations tested. This information should be included in the Flight Manual for slat-equipped aircraft. (R 7)

ANGLE OF ATTACK INDICATIONS

An inflight, out-of-ground-effect calibration of the production angle of attack indicator versus noseboom angle of attack is shown in figure 172. The shift in calibration between the PA and CR configurations is similar to that of the basic F-4E, and is attributed to the airflow disturbance caused by the nose landing gear door when the gear is extended. Slat position appeared to have no effect on the calibration.

Table IV

ASYMMETRIC SLAT TEST SUMMARY

Slat Position	Flap Position	Approximate Change in Approach Speed[1]	Comments
Right - retracted Left - extended	30° down	+4 to 5 kt	Lateral control adequate.
Retracted	30° down	None	Buffet intensity higher, AOA control easier.
Extended	Retracted	+15 to 20 kt	Sink rate hard to control.
Retracted	Retracted	+20 kt	Poor lateral controllability.

Notes:

[1]Increase in approach speed above a normal flaps down (30 degrees), slat extended approach at 19.2 units AOA.

[2]All approaches were flown at 19 units AOA.

CONCLUSIONS AND RECOMMENDATIONS

The two-position slat test results show an increase in turning capability in the subsonic portion of the flight envelope compared with that of the basic F-4E, and were comparable to those obtained with the previous fixed slat configuration, Agile Eagle IV. Flying qualities of the slatted F-4E were basically comparable to those of the unslatted aircraft. Most noticeable in the flying qualities area was the increased maneuvering capability at high angles of attack.

The takeoff rotation technique described in the Flight Manual was considered unsatisfactory for the slat-equipped F-4E: early and/or rapid aft stick movement may result in overrotation and the stabilator contacting the runway; slow and/or delayed aft stick movement will result in increased takeoff ground roll.

1. The Normal Takeoff section of the Flight Manual pertaining to rotation technique should be revised to read as follows (page 12):

> "Aft stick should be smoothly applied at approximately 80 KIAS to attain 10 to 12 degrees pitch attitude just prior to aircraft fly-off."

The installation of the two-position wing leading edge slat has degraded the maximum speed capability of the aircraft slightly.

2. The Flight Manual should be revised to reflect the changes in the level flight envelope for F-4E aircraft equipped with the two-position slat (page 13).

Thrust-limited turning performance obtained during this test program indicated a significant increase above that demonstrated during F-4E Category II testing (reference 6).

3. The F-4E Flight Manual for slat-equipped aircraft should be revised to indicate the sustained load factor capabilities demonstrated during this test program (page 14).

The drag data presented were corrected to a cg position of 32.9 percent MAC.

4. Performance data to be obtained from these drag polars should be corrected to a more forward cg. This cg should be approximately 28.5 percent MAC, which would be representative of the clean airplane at combat weight (41,185 pounds) (page 15).

The cruise data obtained during the tests show a degradation in cruise performance of approximately four percent for the retracted slat configuration and seven percent for the extended slat.

5. The cruise performance section of the F-4 Flight Manual should be revised to reflect the cruise performance obtained during this test program (page 15).

The aircraft pitch response and pitch rate capability at high C_N's were satisfactory, and the increased stick force and deflection needed to attain C_N's greater than 0.9 provided additional security against inadvertently exceeding safe AOA limits.

Simulated air-to-air tracking tests showed that terminal tracking could be effectively accomplished up to 30 units AOA without excessive pilot workload.

Static and dynamic longitudinal stability in the cruise and combat configurations was comparable to that of the unslatted F-4E. However, in the power approach configuration with no external stores and a mid cg position reduced static stability was noted in the 17 to 21 units AOA range. This region of reduced stability made precise control of AOA moderately difficult during landing approaches at 19 units AOA.

Transonic "dig-in" characteristics of the slat equipped test aircraft were much less severe than those of the basic F-4E.

The high-AOA aileron rolling capability was slightly improved over the basic F-4E, while low AOA aileron roll performance was unchanged. Rudder rolls performed at high AOA's showed improved performance, but reduced rapidly at lower AOA's. Coordinated use of both aileron and rudder inputs gave the most favorable roll response at high AOA.

Static directional stability was satisfactory throughout the flight envelope tested, but the increased dihedral effect of the test aircraft was noticeable.

Lateral-directional flying qualities in the power approach configuration were generally not as good as experienced with the unslatted F-4E, but were still termed satisfactory.

The F-4E aircraft equipped with the two-position leading edge slat had increased residual thrust during the landing roll due to the deleted BLC system. This, combined with the higher approach speeds and reduced drag caused by the lower maximum flap deflection, would tend to increase the stopping distance during landing.

6. Landing performance tests should be conducted to insure that accurate data are presented in the Flight Manual for the slat-equipped F-4E aircraft (page 20).

The aerodynamic stall warning characteristics of the test aircraft were generally better than those of the previously evaluated slat configurations, as well as those of the unslatted aircraft.

Tests performed to evaluate the F-4E flying qualities with simulated failures in one or more slat actuators revealed only minor, acceptable degradations from the symmetric slat condition characteristics. Trim changes with asymmetric slat actuation were barely perceptible. The asymmetric actuation was noted mainly as a tendency to roll into the wing with retracted slats. "Dig-in" characteristics during high-g transonic decelerations were less severe than experienced with the basic F-4E and comparable to the symmetric slat extension characteristics.

A 19-unit AOA approach was flown with the asymmetric slat condition and gear and flaps down. Longitudinal controllability was similar to that noted during normal symmetric slat approaches in that holding 19 units AOA precisely was moderately difficult. Lateral-directional controllability was sufficient at 19 units AOA. Approach speed with the asymmetric slats was 4 to 5 knots higher than the normal symmetric slat approach speed.

One 19-unit approach was flown with gear and flaps down and all slats retracted. Buffet intensity was noticeably higher, but angle of attack control was easier than with the slats extended. Lateral and longitudinal controllability was sufficient throughout the approach. Approach speed at 19 units AOA was approximately the same as with extended slats.

Two approaches were flown with normal slat extension and retracted flaps. Pilot comments indicate increased workload and difficulty in controlling sink rate. Approach speed was increased by 15 to 20 knots.

One approach at 19 units AOA was flown with both slats and flaps retracted. Lateral controllability was poor; the ailerons were not effective, and rudder inputs were necessary for adequate roll response. Approach speed was approximately 20 knots above the normal slats out, flaps down speed.

7. The information contained in table IV of this report should be included in the Flight Manual for slat-equipped F-4E aircraft (page 22).

APPENDIX I
DATA ANALYSIS METHODS AND TEST DATA

CLIMB POTENTIAL DETERMINATION

Test day excess thrust was obtained during level accelerations and turning performance tests. It was then standardized and converted to rate of climb potential, or specific excess power, to enable the thrust-limited performance of the aircraft to be evaluated.

The method used to calculate rate of climb potential was based on the flightpath accelerometer (FPA) measurement. Data obtained from the FPA was very useful in yielding consistent results. To obtain climb potential the following equation was used:

$$R/C = \frac{dH}{dt} + \frac{V}{g}\frac{dV}{dt} = V\left(\frac{F_n - D}{W}\right)$$

where

R/C = test day rate of climb potential

$\frac{dH}{dt}$ = rate of change of altitude

g = acceleration of gravity

$\frac{dV}{dt}$ = acceleration along the flightpath

V = true airspeed

W = airplane gross weight

F_n = net thrust

D = net drag

$\frac{F_n - D}{W}$ = specific excess thrust = FPA

using the FPA to obtain R/C results in the following

$$R/C = V\ (FPA)\ 101.28$$

where

R/C = test day rate of climb potential in ft/min

V = true airspeed in knots

Rate of climb potential calculated from test conditions was corrected for nonstandard temperature effects on velocity and thrust. The temperature effect on velocity correction to rate of climb potential was obtained from the following equation:

$$V_s = V_t \sqrt{T_s/T_t}$$

where subscripts denote standard and test velocities and temperatures, respectively. The correction to rate of climb potential for nonstandard temperature effects on velocity is therefore

$$\Delta R/C_{vel} = \left(\sqrt{T_s/T_t} - 1 \right) V \times FPA$$

The thrust correction to rate of climb potential for nonstandard temperature is

$$\Delta R/C_{thrust} = \frac{V_s}{W} (Fn_s - Fn_t)$$

where

V_s = standard day true airspeed

W = airplane gross weight

Fn_s = standard day net thrust

Fn_t = test day net thrust

Since aircraft drag for a given attitude and Mach number is a function of both normal acceleration and aircraft gross weight, a correction must be made to compensate for nonstandard weight and normal acceleration. Using the test day rate of climb potential equation and evaluating it for both the test day drag, D_t, and the standard day drag, D_s, yields the rate of climb potential correction for drag.

$$R/C_{drag} = \frac{V_s}{W} (D_t - D_s)$$

where

$D = C_D \, (q) \, S$

$C_D = f(C_N, M)$

$$C_{N_s} = \frac{N_{z_s} W_s}{q S}$$

$$C_{N_t} = \frac{N_{z_t} W_t}{q S}$$

q = dynamic pressure

S = aircraft wing area

N_z = normal load factor

W = aircraft gross weight

C_D = drag coefficient

s = standard day

t = test day

These relationships can be determined from the aircraft drag polars which, for this evaluation, were obtained from wind tunnel measurements. It is acknowledged that the absolute magnitudes of these drag polars may not be exactly representative of the test aircraft; however, the accuracy of these corrections is enhanced by using only small incremental changes on the drag polar.

A momentum correction to rate of climb potential was obtained using the following equation:

$$\Delta R/C_m = V_s \left(\frac{F_{n_s} - D_s}{W_s} \right) - V_s \left(\frac{F_{n_s} - D_s}{W_t} \right)$$

Finally, corrected rate of climb potential was obtained by combining the above corrections with test day climb potential.

$$R/C_{corrected} = R/C + \Delta R/C_{vel} + \Delta R/C_{thrust} + \Delta R/C_{drag} + \Delta R/C_m$$

The complete derivation of the corrections used to obtain standard rate of climb potential can be found in reference 7.

DRAG DETERMINATION

Drag data for the test aircraft were obtained during turning performance maneuvers. Lift coefficient was calculated using the following equation.

$$C_L = C_N/\cos \alpha$$

where

C_L = lift coefficient

α = angle of attack

C_N = (nW)/(qS)

n = normal load factor

W = aircraft gross weight

q = dynamic pressure

S = aircraft wing area

Drag for the test aircraft was calculated using the FPA and thrust available.

$$D = F_n - FPA\ (W)$$

where

F_n = thrust available

FPA = flightpath acceleration

W = aircraft gross weight

and

$$C_D = \frac{D}{qS}$$

The drag coefficient was then corrected to a reference cg location of 32.9 percent MAC. This correction was established using figure 14 and the following equation.

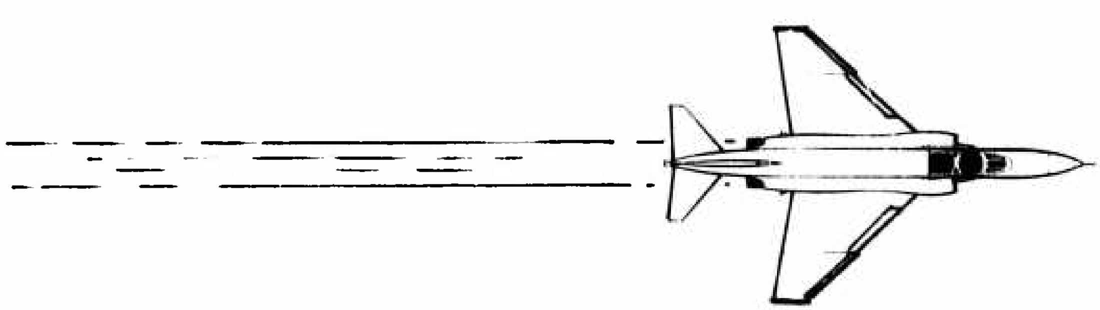
$$C_{D_{corrected}} = C_D + (\Delta C_D/\Delta cg)\ \Delta cg$$

where

C_D = drag coefficient at test cg position

$\Delta C_D/\Delta cg$ = obtained from figure 173 at the test C_L

Δcg = cg_{test} - 32.9 percent



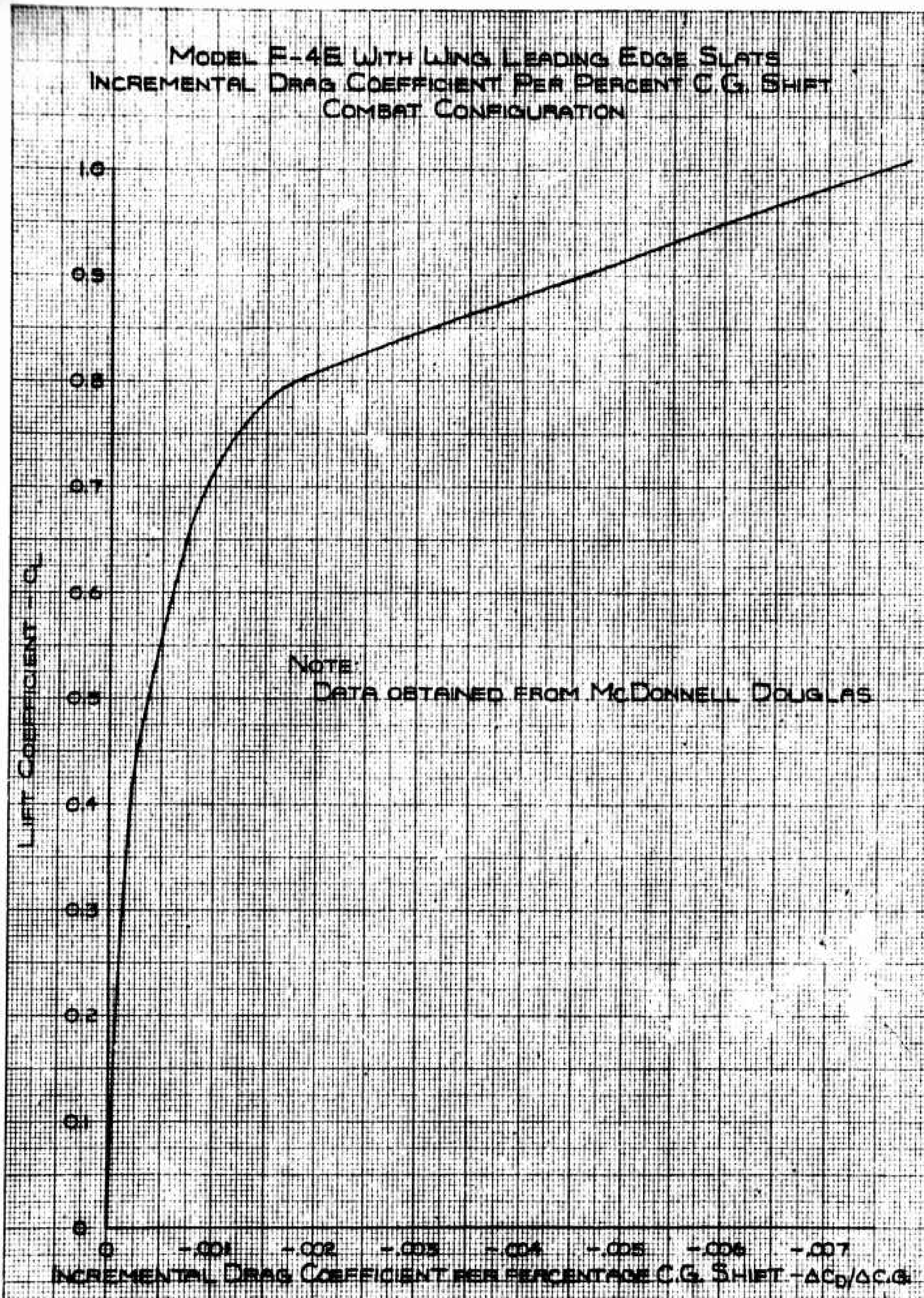


FIGURE 14 DRAG CORRECTION FOR C.G. SHIFT

DYNAMIC LONGITUDINAL STABILITY DETERMINATION

The damping ratios and damped periods shown in the short period damping data were determined by a computer program that matched the aircraft response to an ideal second order oscillatory response. The damping ratio and damped period were extracted from the equation used to generate the matching second-order oscillation.

MANEUVERING STABILITY DETERMINATION

Maneuver points were determined from the windup turns performed by the following method:

1. Slopes of the longitudinal stick force (F_s) versus load factor (g) and stabilator position (δ_s) versus normal force coefficient (C_N) were taken at several C_N values. These slopes were taken from data at both forward and aft cg locations and approximately equal altitudes, Mach numbers, and gross weights.

2. The slopes were plotted versus cg location, and straight lines were faired through points of equal C_N values. The intersection of the extrapolated straight lines and the slope = 0 line provided the cg location at which the slopes were reduced to zero. The cg position at which $dF_s/dg = 0$ was called the apparent maneuver point, and the cg position for $d\delta_s/dC_N = 0$ was the maneuver point.

3. The maneuver points were plotted versus C_N for the several speeds and altitudes tested.

ROLL CAPABILITY DETERMINATION

Time-to-bank data were measured from the time point at which the initial control deflection occurred. Roll helix angle was calculated for the low speed roll data by the following formula:

roll helix angle = pb/2V

where

p = average roll rate for the initial 30 degrees of bank, found by taking $30°/(t_{30} \times 57.3)$ in radian/sec

b = aircraft wing span in ft

V = calibrated airspeed in ft/sec

TEST DATA

Figures 15 Through 172

F-4E USAF S/N 66-287A

LOADINGS : 1a AND 1b : FWD/AFT AIM-7'S

TO CONFIGURATION
MAX A/B THRUST

SYMBOL	GROSS WT (LB)	SYMBOL	GROSS WT (LB)
○	44,700	◁	43,500
□	44,200	▽	43,600
△	44,000	▷	43,500
◁	44,000	◁	43,900
▷	43,600	◇	44,000
▽	43,700	△	43,400
◁	43,800	◁	43,300
○	43,900	▽	43,500
□	43,000	▷	44,700
△	43,700	○	43,600
◁	43,900	◇	43,700
□	43,800	○	43,500
▽	43,900	△	43,100
◁	43,300		

NOTE : TAKEOFF TECHNIQUE USED: FULL AFT STICK DEFLECTION PRIOR TO REACHING 80 KIAS.

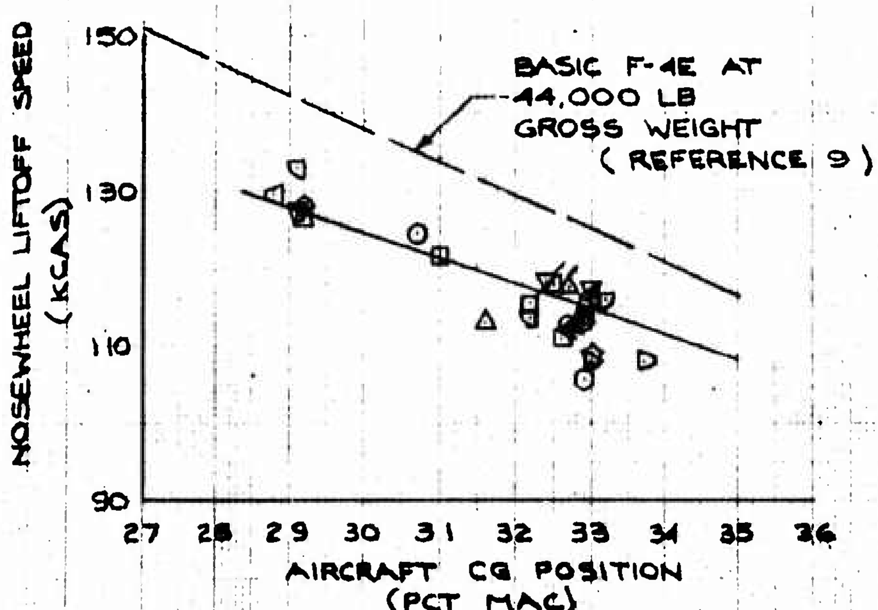


FIGURE 15 NOSEWHEEL LIFTOFF SPEED

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST - COMBAT CONFIGURATION

SYMBOL	FLIGHT-RUN	ALTITUDE (FT)	SYMBOL	FLIGHT-RUN	ALTITUDE (FT)
○	279-3	5,000	△	247-5	36,000
□	282-3	10,000	▽	254-5	36,000
◇	280-3	20,000	0	246-6	40,000

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

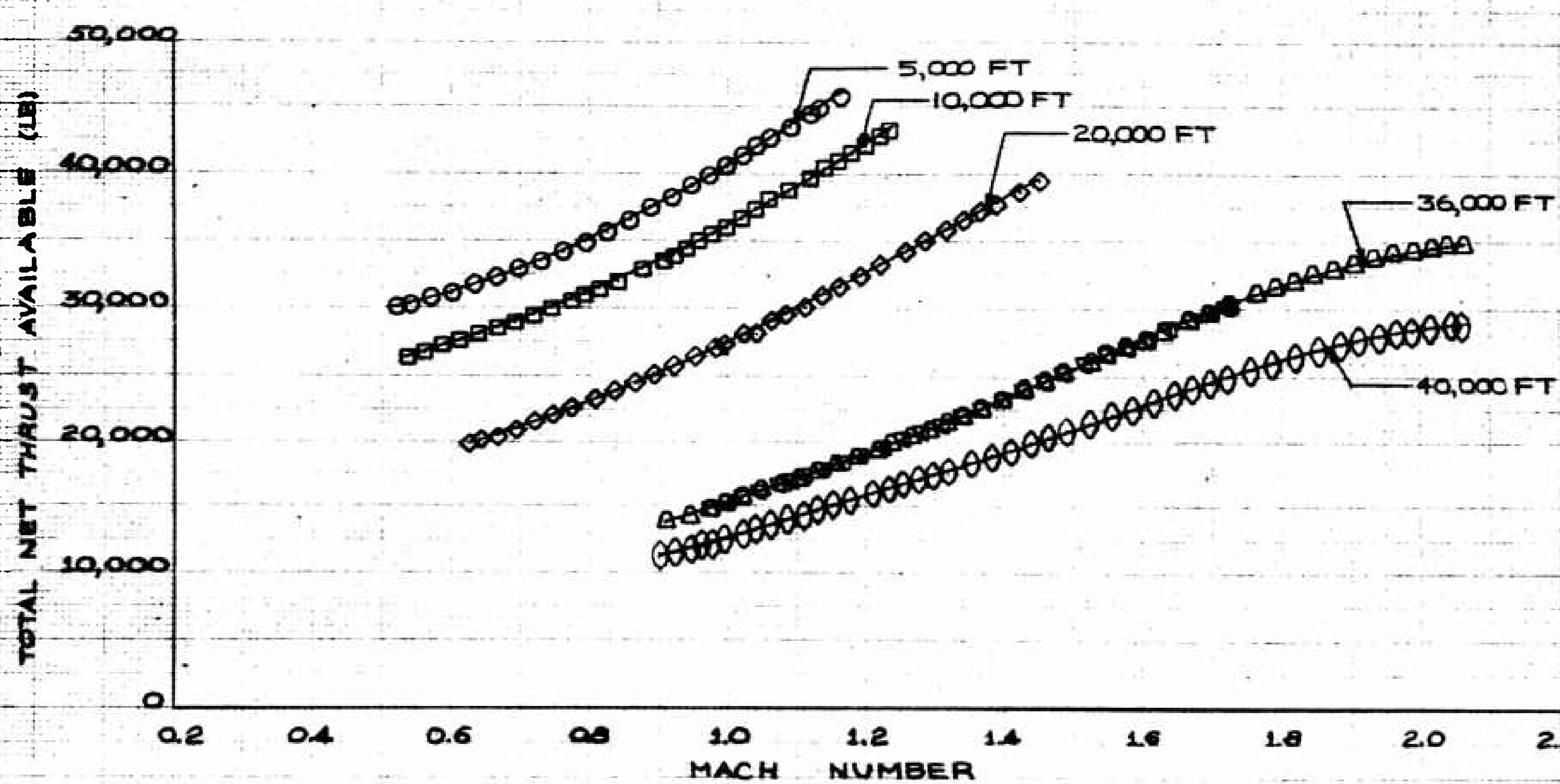


FIGURE 16 NET THRUST AVAIBLE

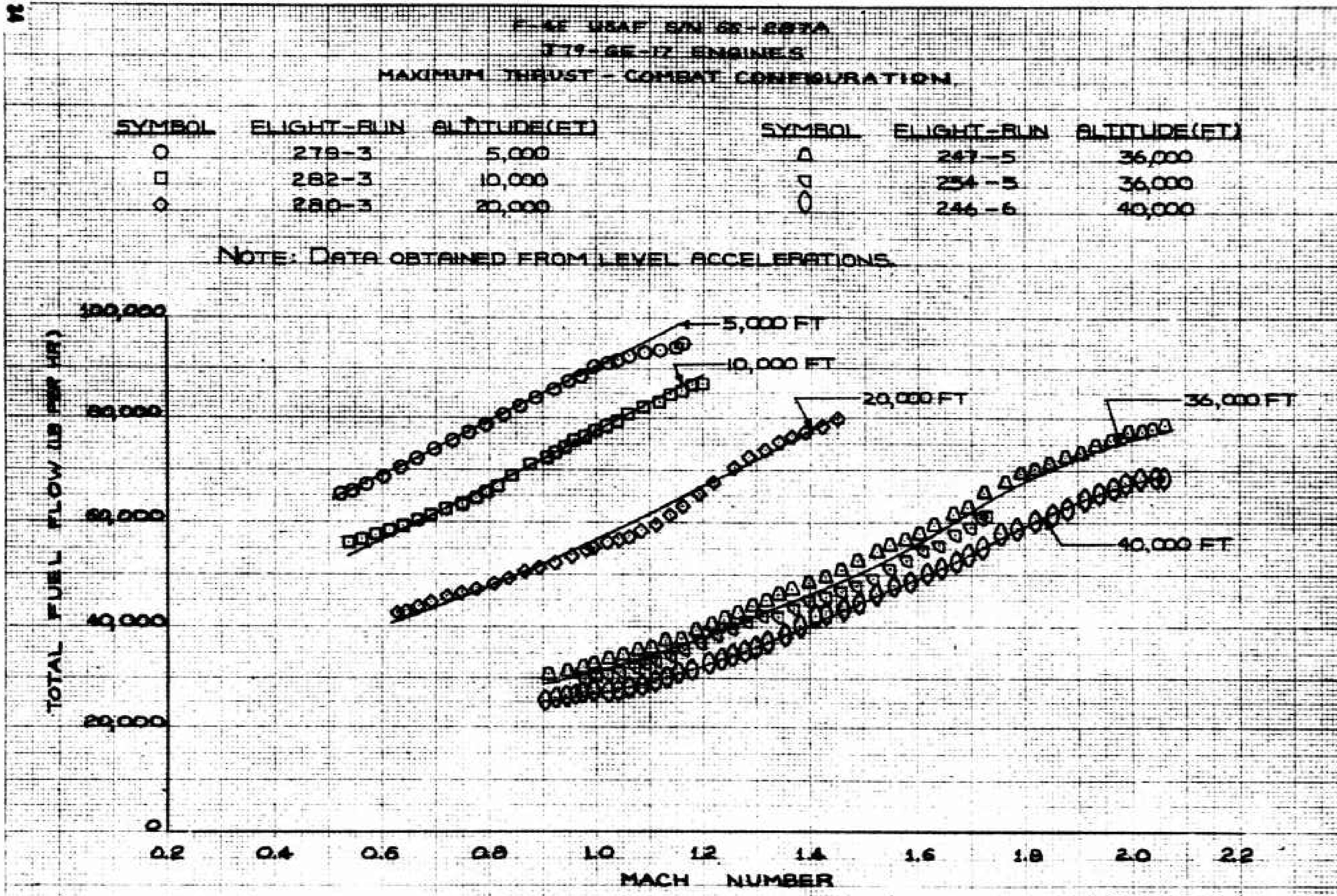


FIGURE 17 FUEL FLOW

F-4E USAF S/N 66-287A

J79-GE-17 ENGINES

MILITARY THRUST - CRUISE CONFIGURATION

SYMBOL	FLIGHT-RUN	ALTITUDE (FT)	SLATS
□	241-9	10,000	RETRACTED
□	256-4	10,000	EXTENDED
◇	233-11	20,000	RETRACTED
△	233-9	20,000	EXTENDED
○	253-3	25,000	RETRACTED
▽	232-15	35,000	RETRACTED
△	232-11	35,000	EXTENDED
▽	247-4	36,000	RETRACTED
◇	236-7	40,000	RETRACTED
□	236-6	40,000	EXTENDED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

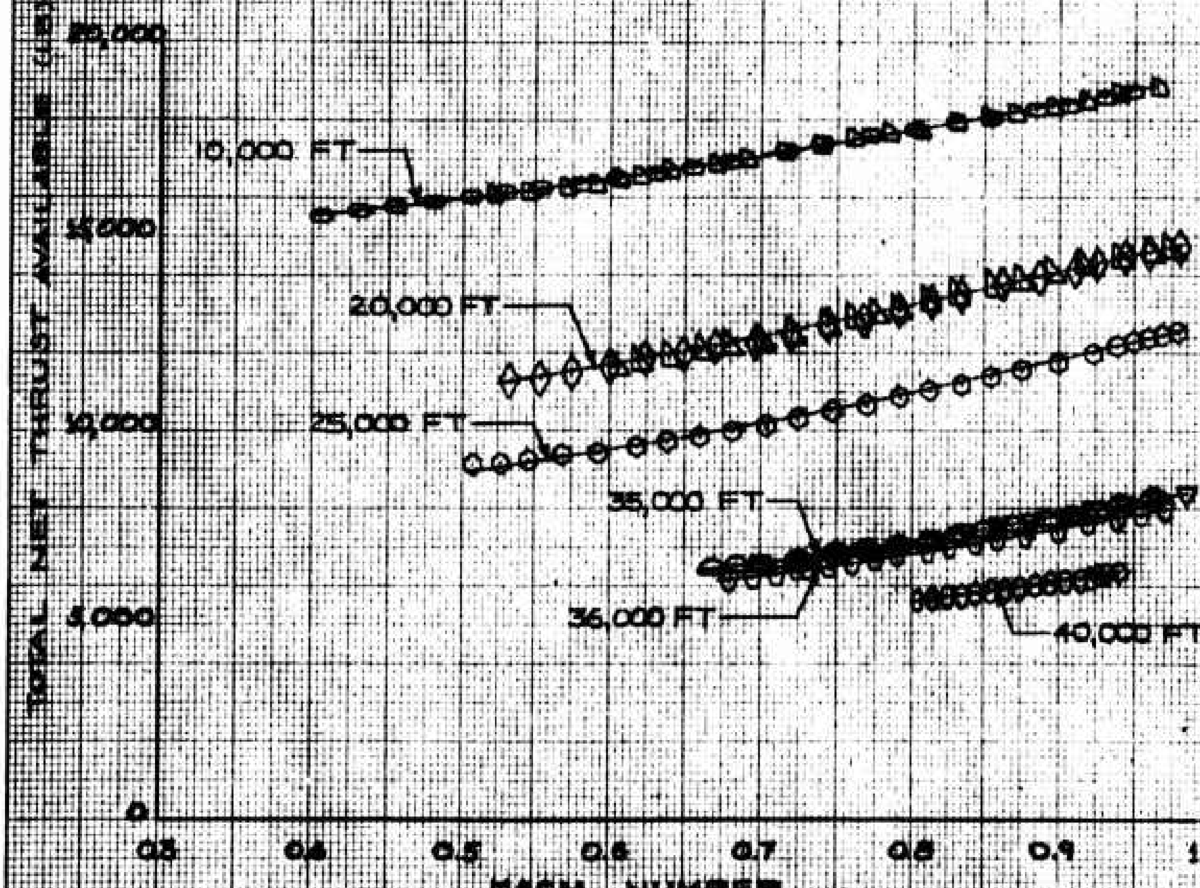


FIGURE 15 THRUST AVAILABLE

F-4E USAF S/N 66-287A

J79-GE-17 ENGINES

MILITARY THRUST - CRUISE CONFIGURATION

SYMBOL	FLIGHT-RUN	ALTITUDE (FT)	SLATS
	241-9	10,000	RETRACTED
	256-4	10,000	EXTENDED
	233-11	20,000	RETRACTED
	233-9	20,000	EXTENDED
	253-3	25,000	RETRACTED
	232-15	35,000	RETRACTED
	232-11	35,000	EXTENDED
	247-4	36,000	RETRACTED
	236-7	40,000	RETRACTED
	236-6	40,000	EXTENDED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

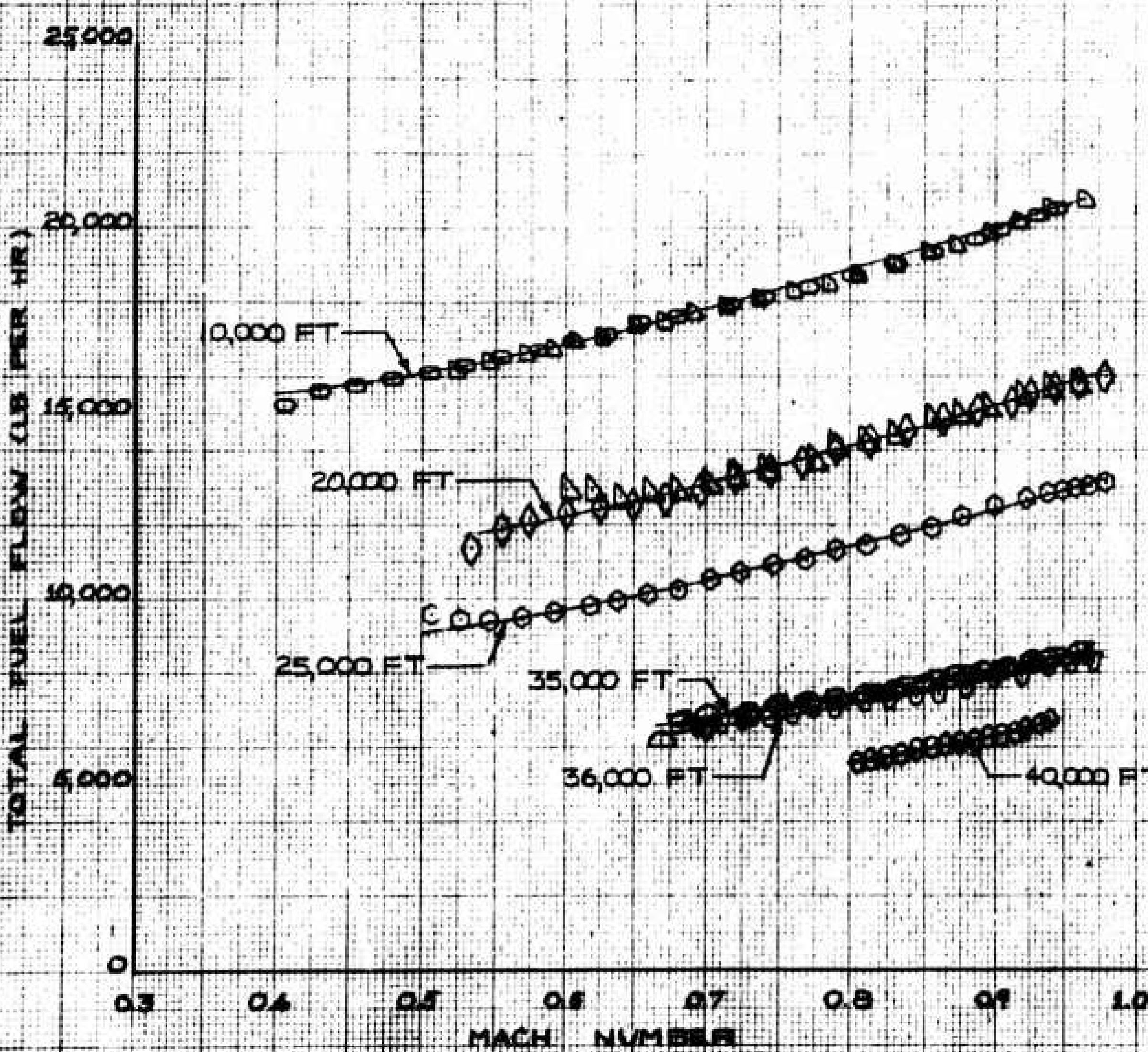


FIGURE 19 FUEL FLOW

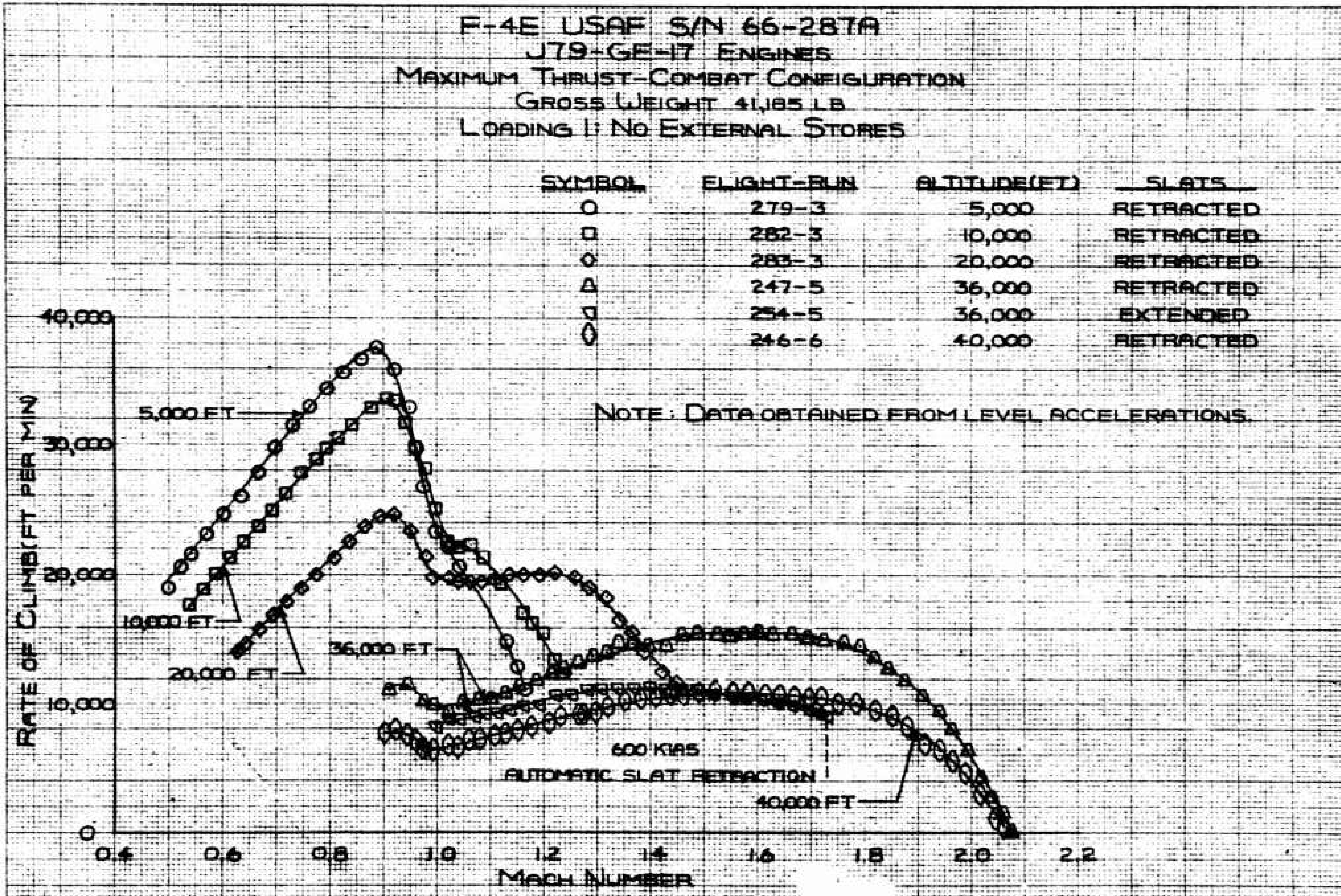


Figure 20 Climb Potential

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Maximum Thrust–Combat Configuration
Gross Weight 41,185 LB
Loading I: No External Stores

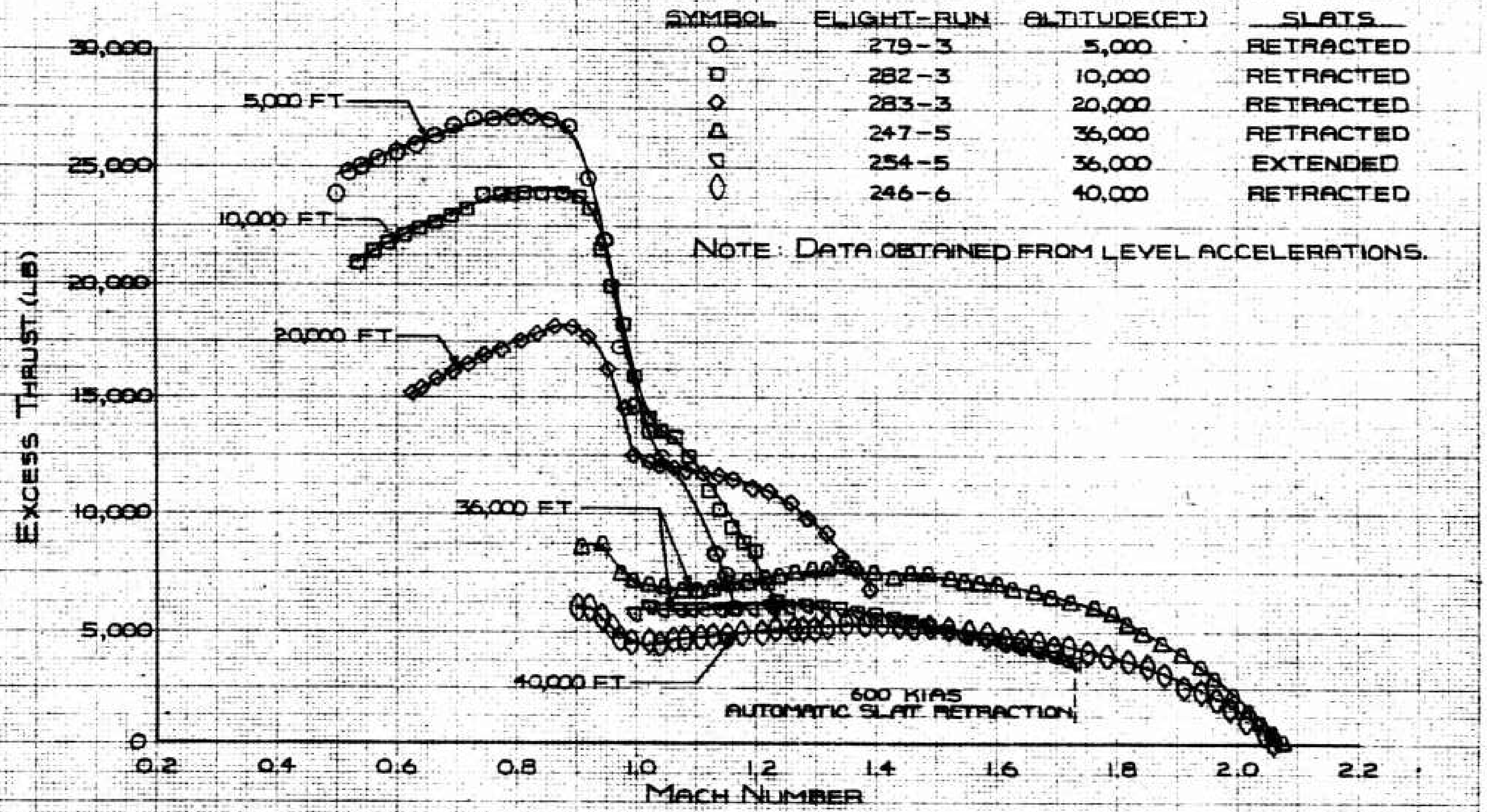


Figure 21 Excess Thrust

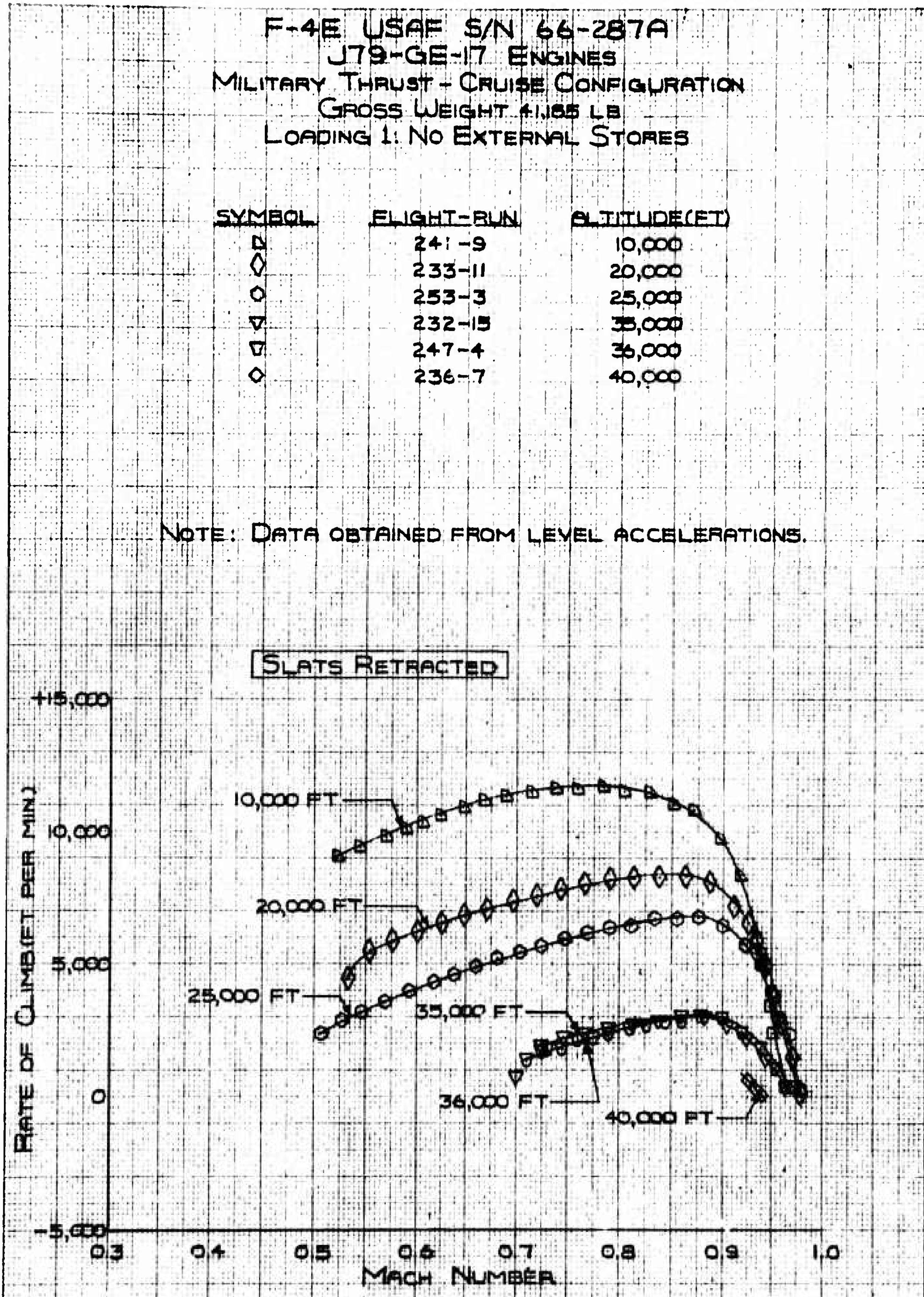


Figure 22 Climb Potential

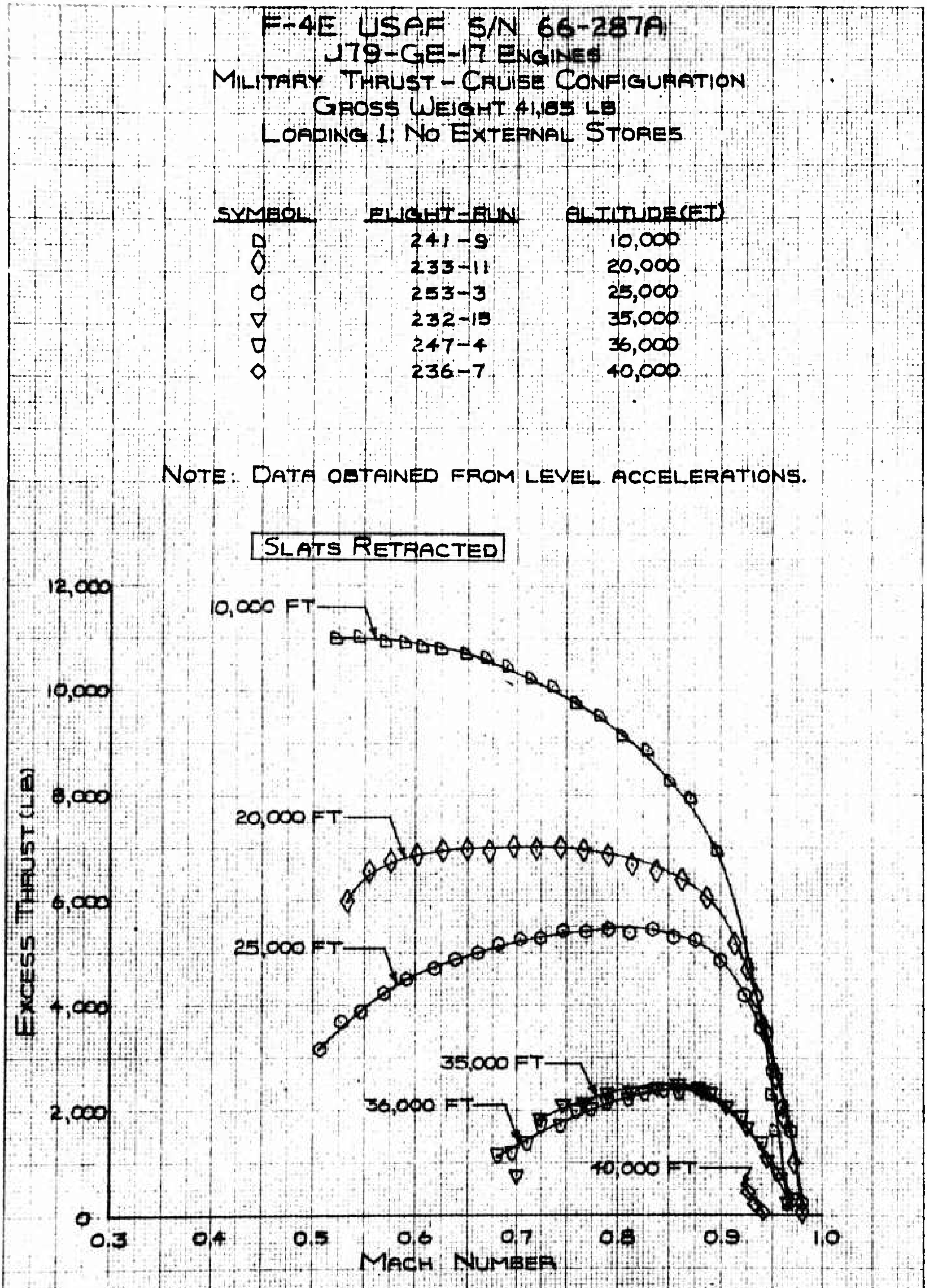


Figure 23. Excess Thrust

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Military Thrust - Cruise Configuration
Gross Weight 41,185 LB
Loading 1: No External Stores

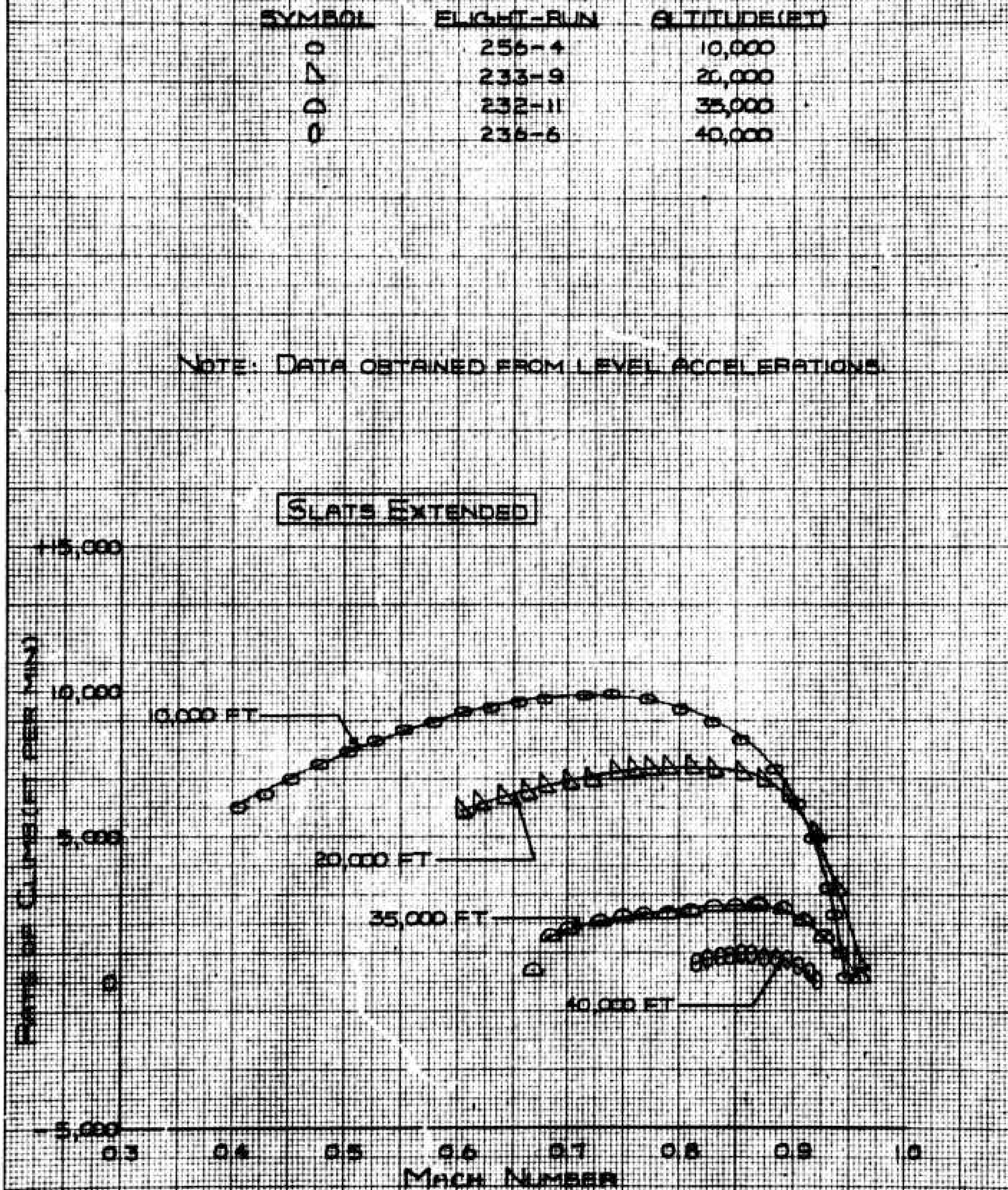


Figure 24 Climb Potential

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Military Thrust - Cruise Configuration
Gross Weight 41,185 LB
Loading 1: No External Stores

Symbol	Flight-Run	Altitude (FT)
○	256-4	10,000
△	233-9	20,000
◁	232-11	35,000
▯	236-6	40,000

Note: Data obtained from level accelerations.

Slats Extended

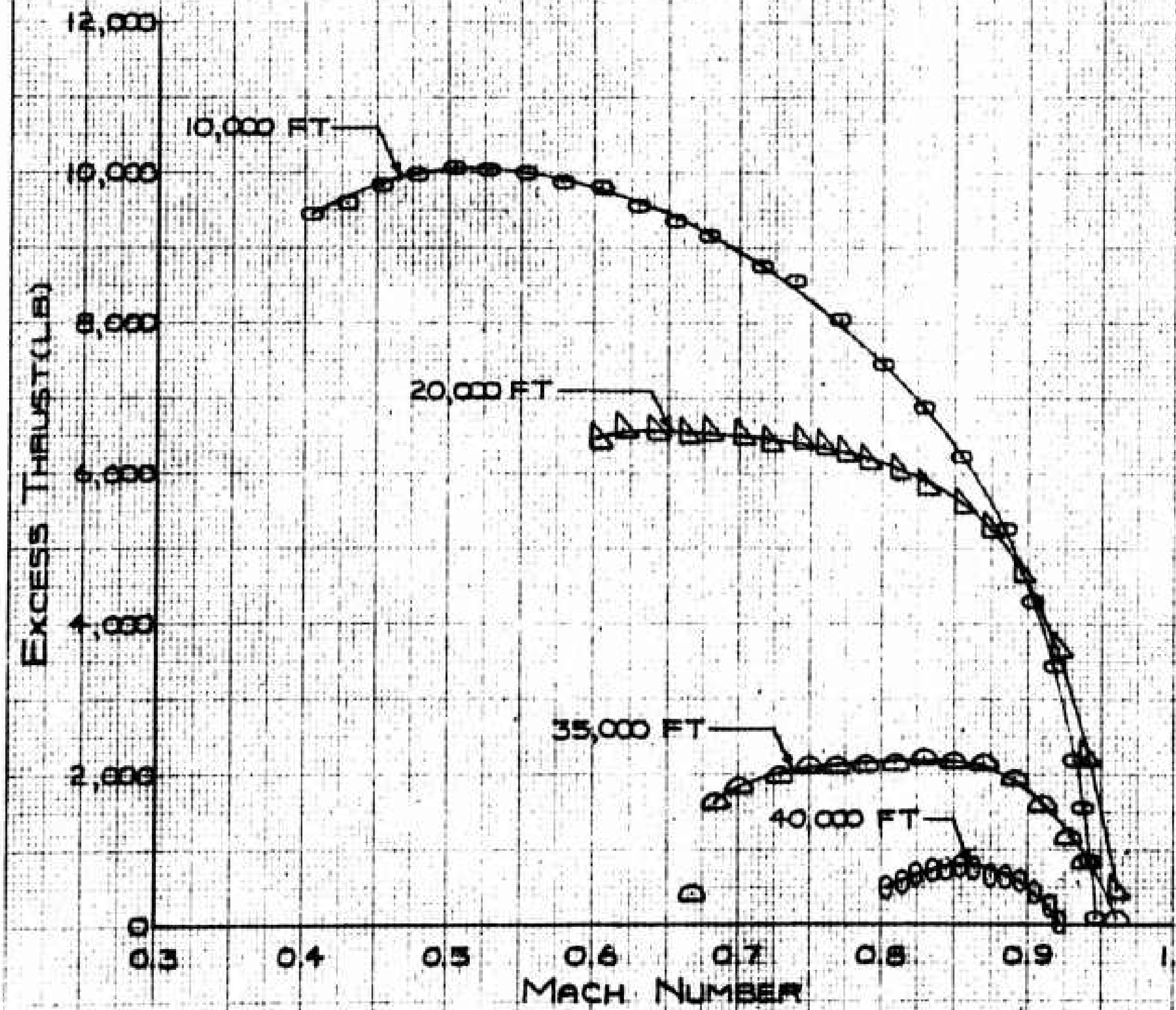


Figure 25. Excess Thrust

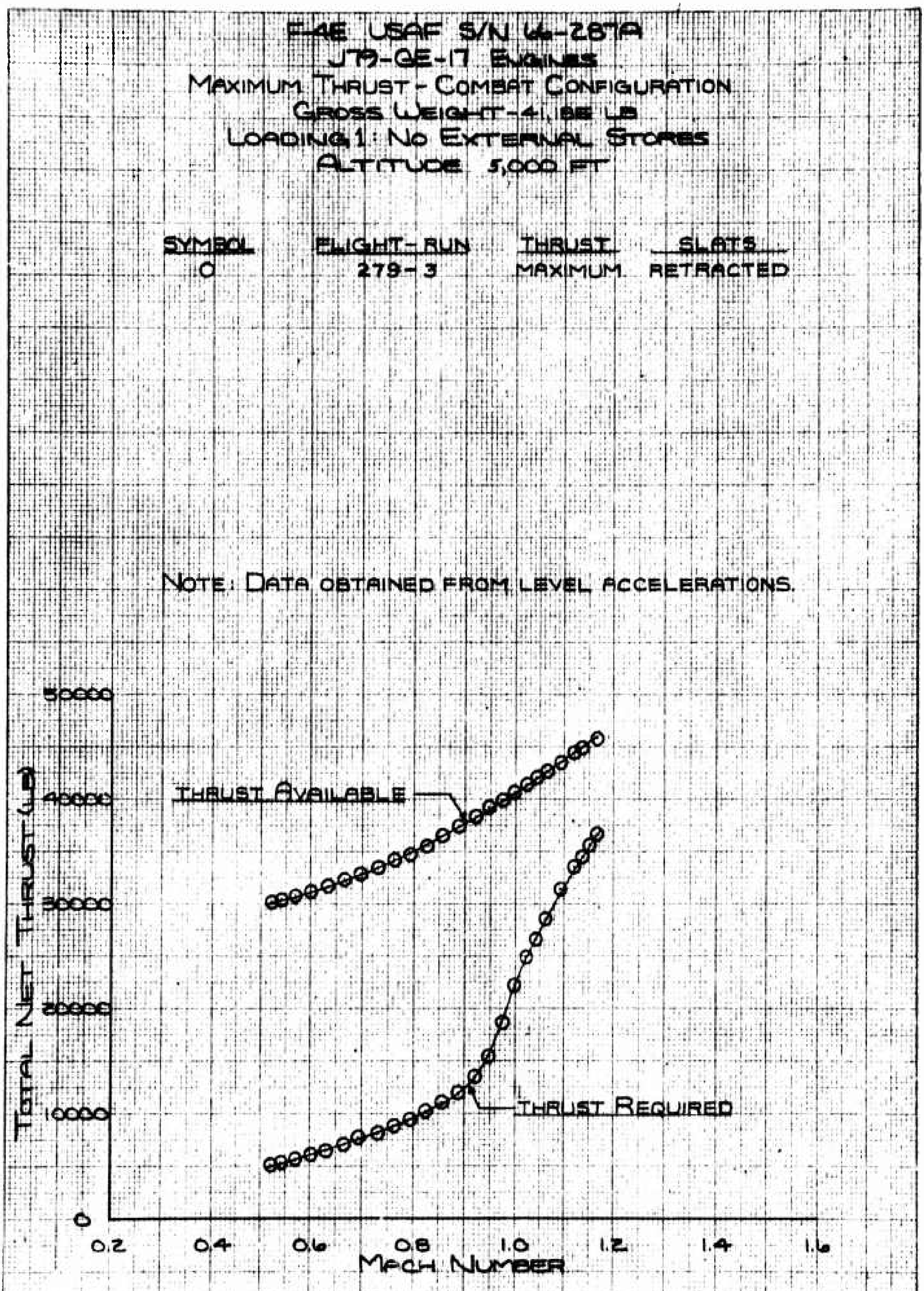


FIGURE 26. NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
COMBAT AND CRUISE CONFIGURATION
GROSS WEIGHT 41,85 LB
LOADING 1: NO EXTERNAL STORES
ALTITUDE 10,000 FT

SYMBOL	FLIGHT-RUN	THRUST	SLATS
□	262-3	MAXIMUM	RETRACTED
△	241-9	MILITARY	RETRACTED
○	256-4	MILITARY	EXTENDED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

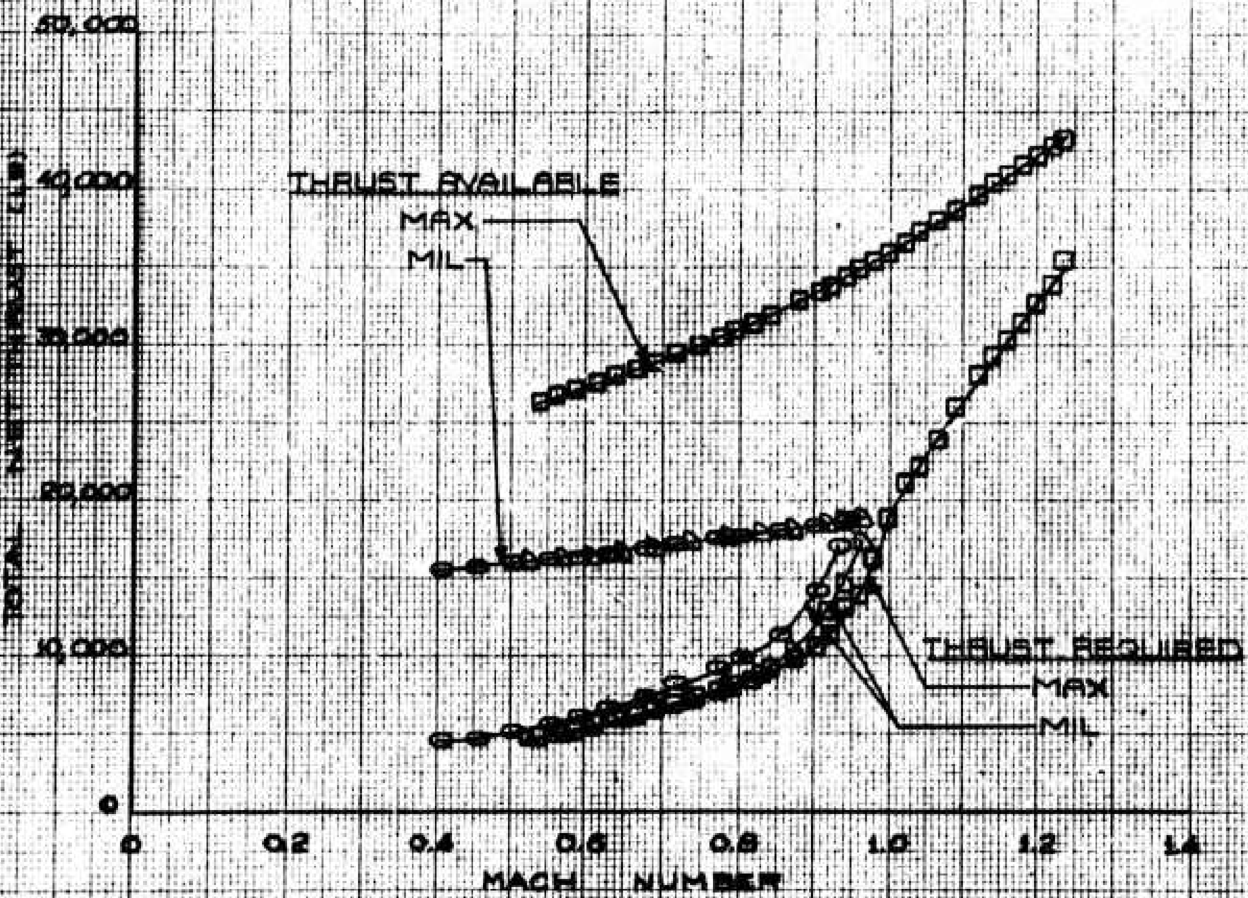


FIGURE 27 NET THRUST

F-4E USAF S/N 66 287A
J79-GE-17 ENGINES
COMBAT AND CRUISE CONFIGURATION
GROSS WEIGHT 41,185 LB
LOADING 1: NO EXTERNAL STORES
ALTITUDE 20,000 FT

SYMBOL	FLIGHT - RUN	THRUST	SLATS
○	280-3	MAXIMUM	RETRACTED
◇	233-11	MILITARY	RETRACTED
◺	233-9	MILITARY	EXTENDED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

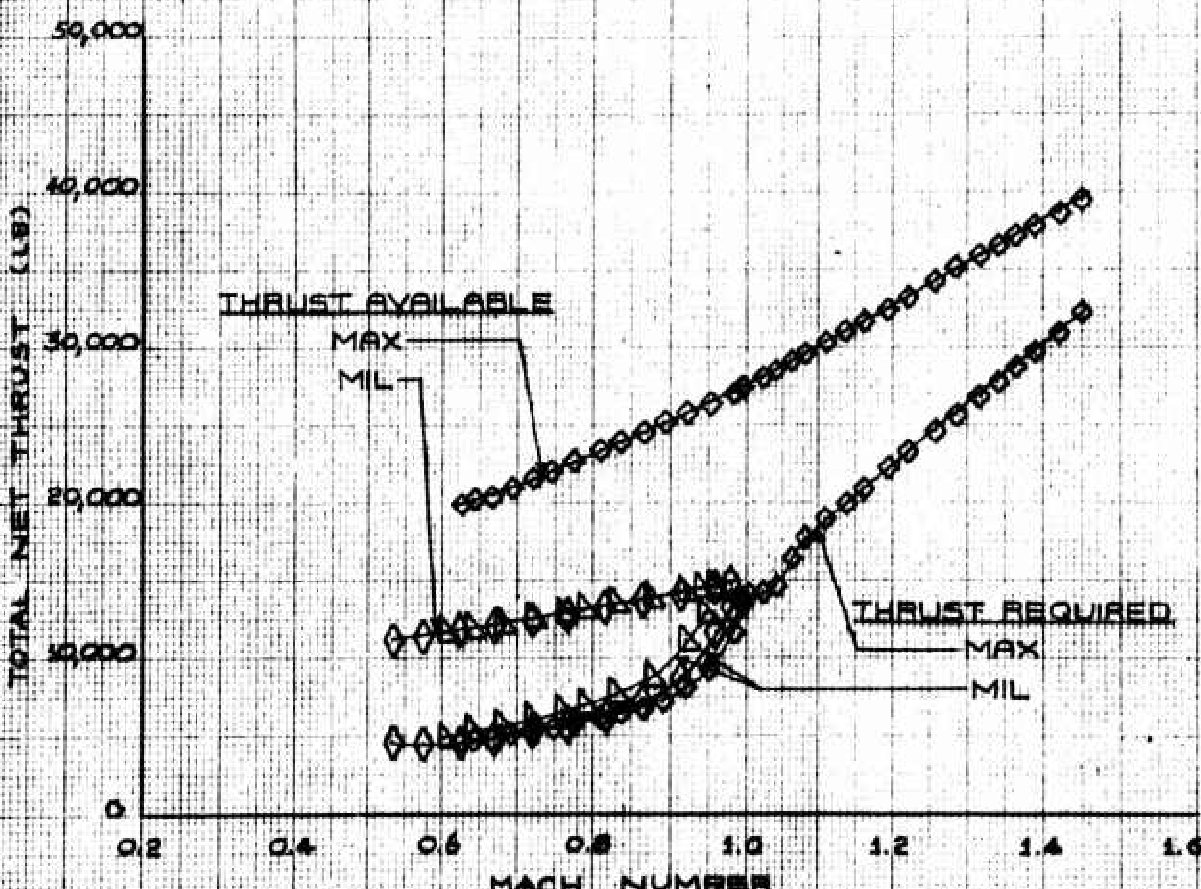


FIGURE 28 NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Military Thrust - Cruise Configuration
Gross Weight 41,185 LB
Loading I: No External Stores
Altitude 25,000 FT

Symbol	Flight - Run	Slats
O	253 - 3	Retracted

Note: Data obtained from level accelerations.

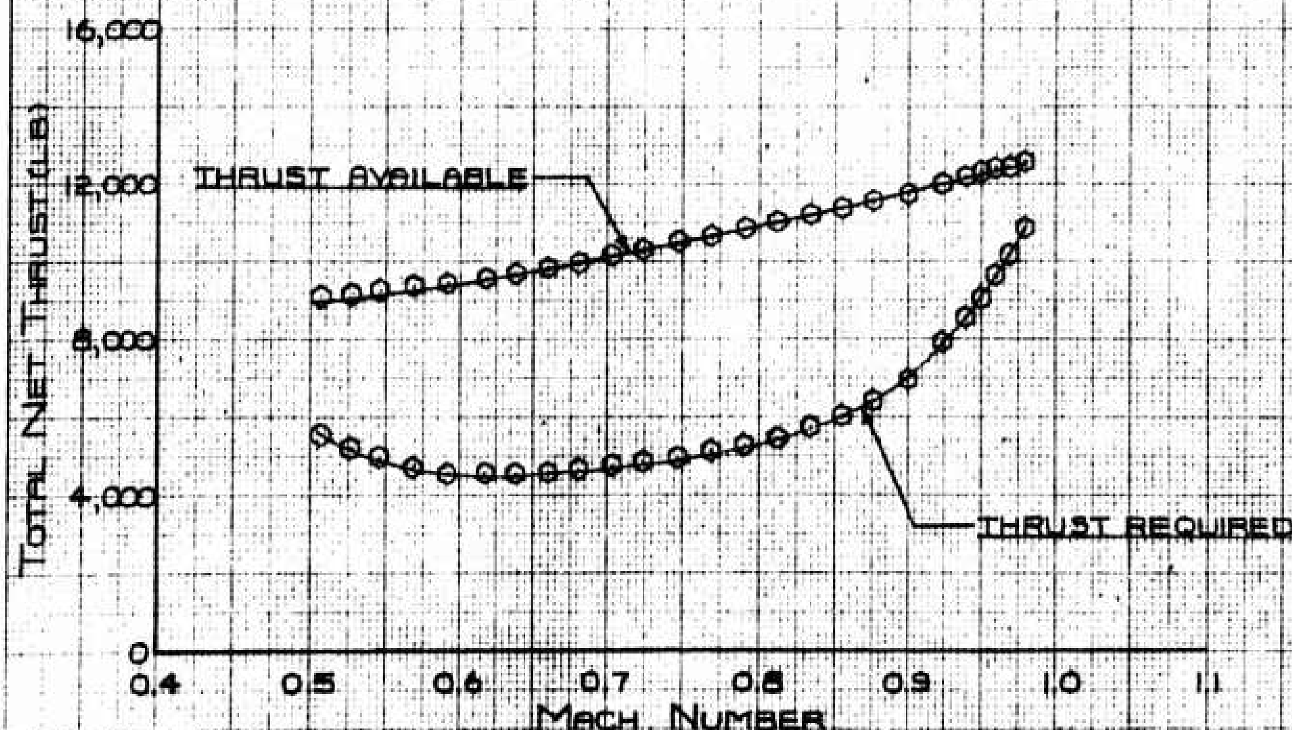


Figure 29 Net Thrust

F-4E USAF S/N 66-287A ;
J79-GE-17 ENGINES
MILITARY THRUST - CRUISE CONFIGURATION
GROSS WEIGHT 41,165 LB
LOADING 1: NO EXTERNAL STORES
ALTITUDE 35,000 FT

SYMBOL	FLIGHT - RUN	SLATS
○	232 - 11	EXTENDED
▽	232 - 15	RETRACTED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

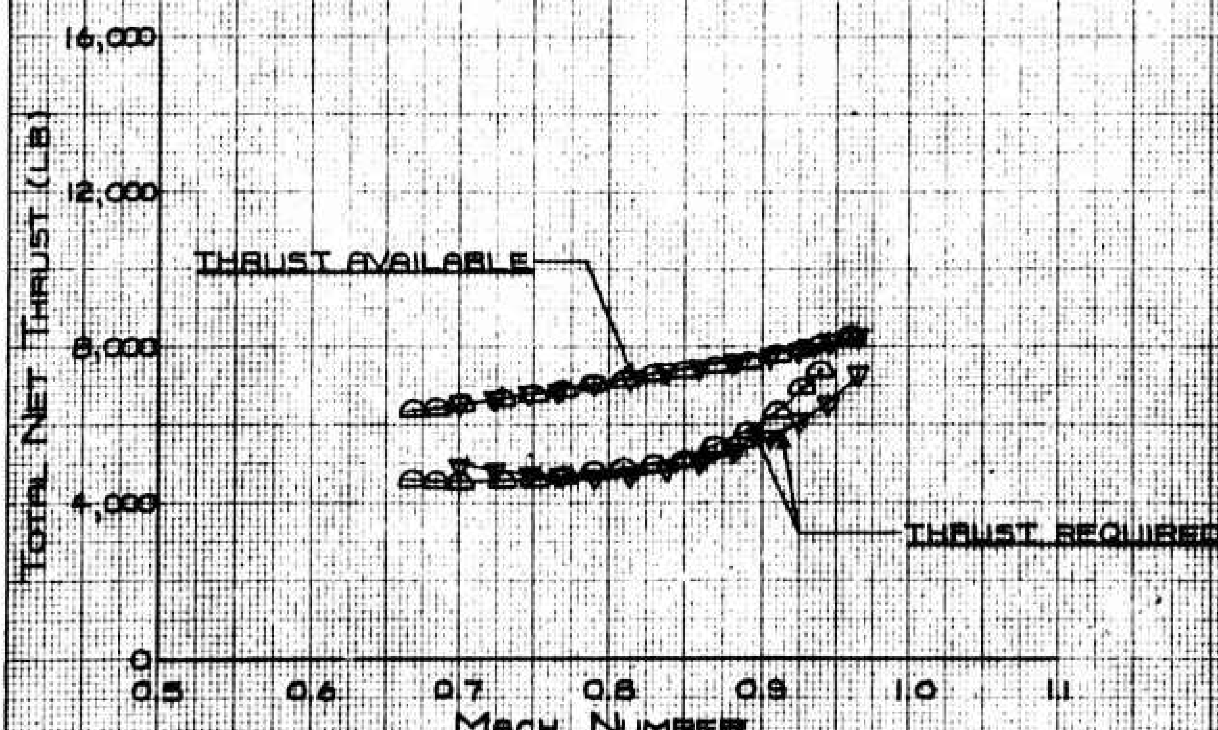


FIGURE 30 NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST-COMBAT CONFIGURATION
GROSS WEIGHT 41,185 LB
LOADING I: NO EXTERNAL STORES
ALTITUDE 36,000 FT

SYMBOL	FLIGHT-RUN	THRUST	SLATS
Δ	247-5	MAXIMUM	RETRACTED
◁	254-5	MAXIMUM	EXTENDED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

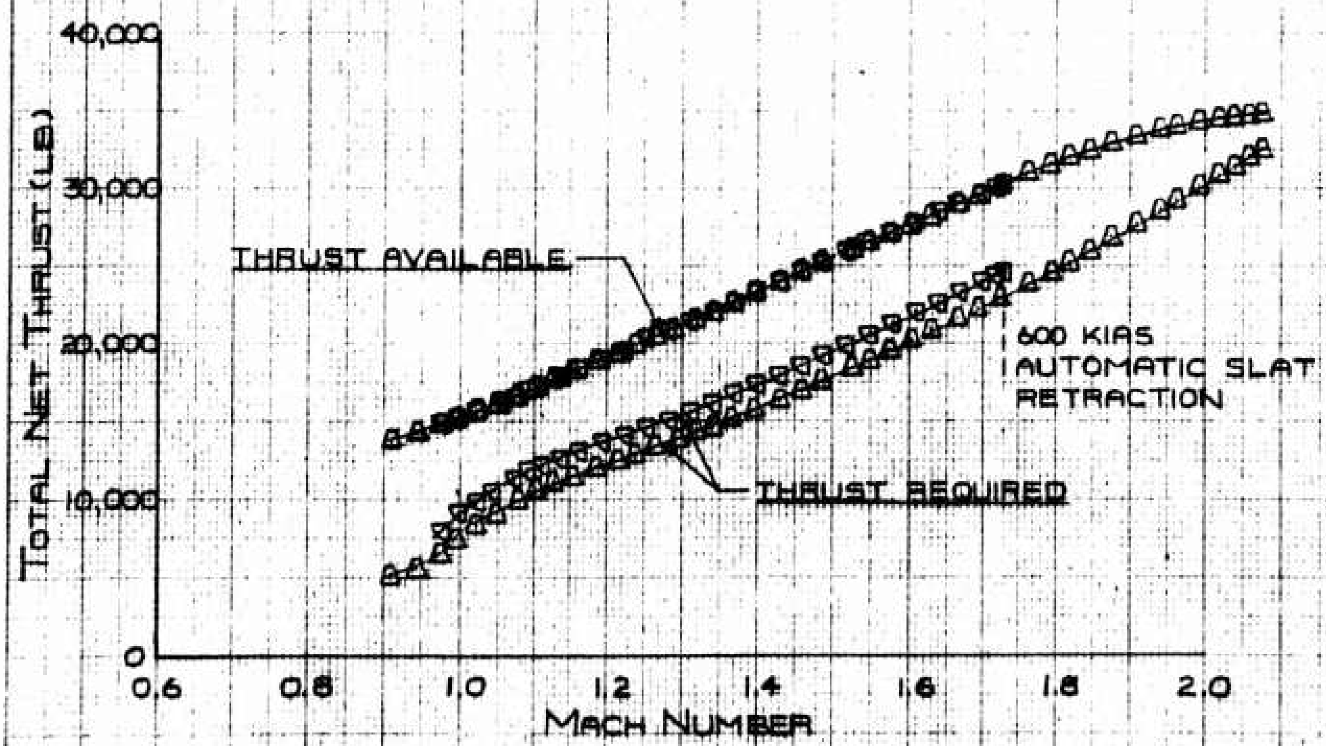


FIGURE 31 NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MILITARY THRUST - CRUISE CONFIGURATION
GROSS WEIGHT 41,185 LB
LOADING 1: NO EXTERNAL STORES
ALTITUDE 36,000 FT

SYMBOL	FLIGHT-RUN	SLATS
▽	247-4	RETRACTED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

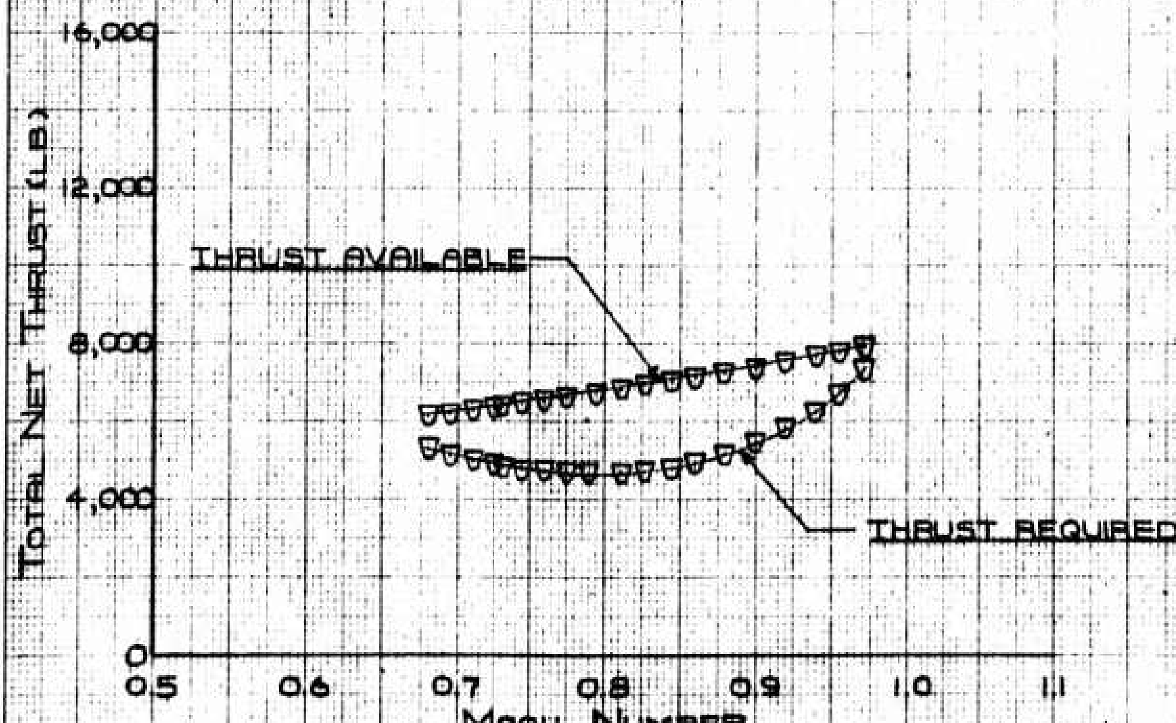


FIGURE 32 NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST-COMBAT CONFIGURATION
GROSS WEIGHT 41,185 LB
LOADING 11: NO EXTERNAL STORES
ALTITUDE 40,000 FT

SYMBOL	FLIGHT-RUN	SLATS
O	246-6	RETRACTED

NOTE: DATA OBTAINED FROM LEVEL ACCELERATIONS.

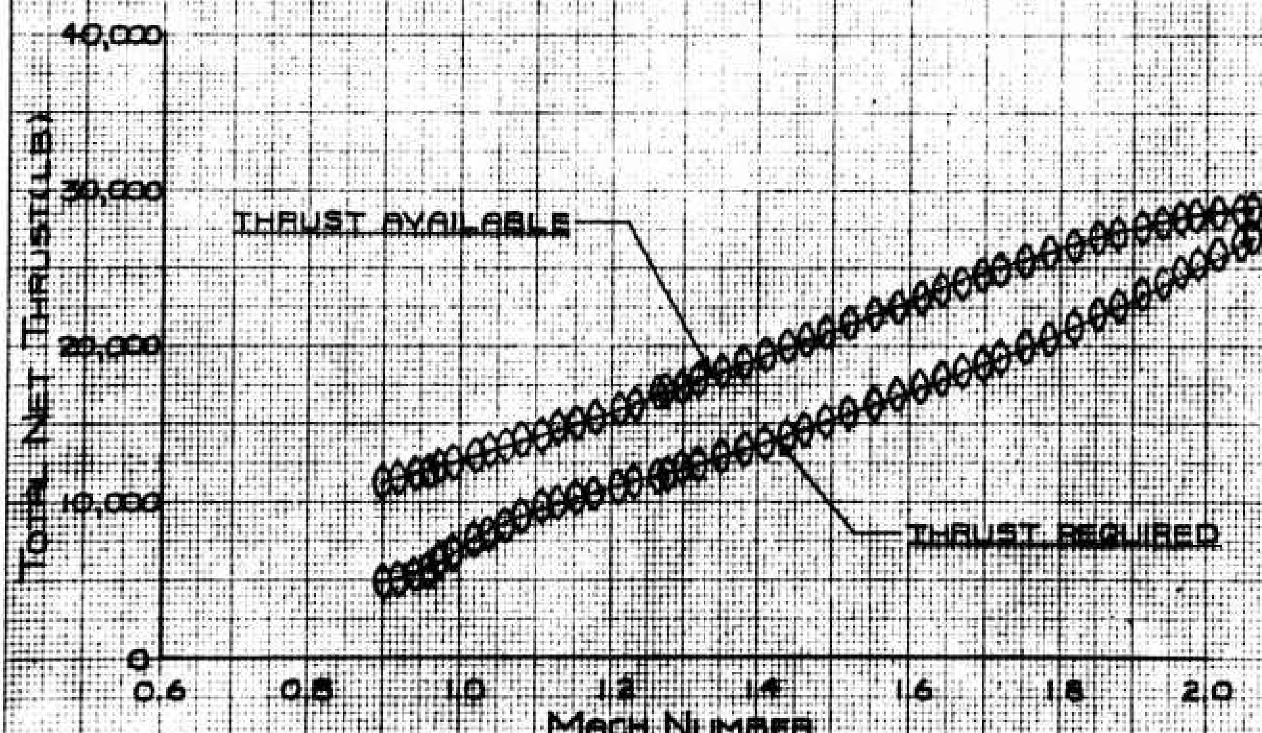


FIGURE 33 NET THRUST

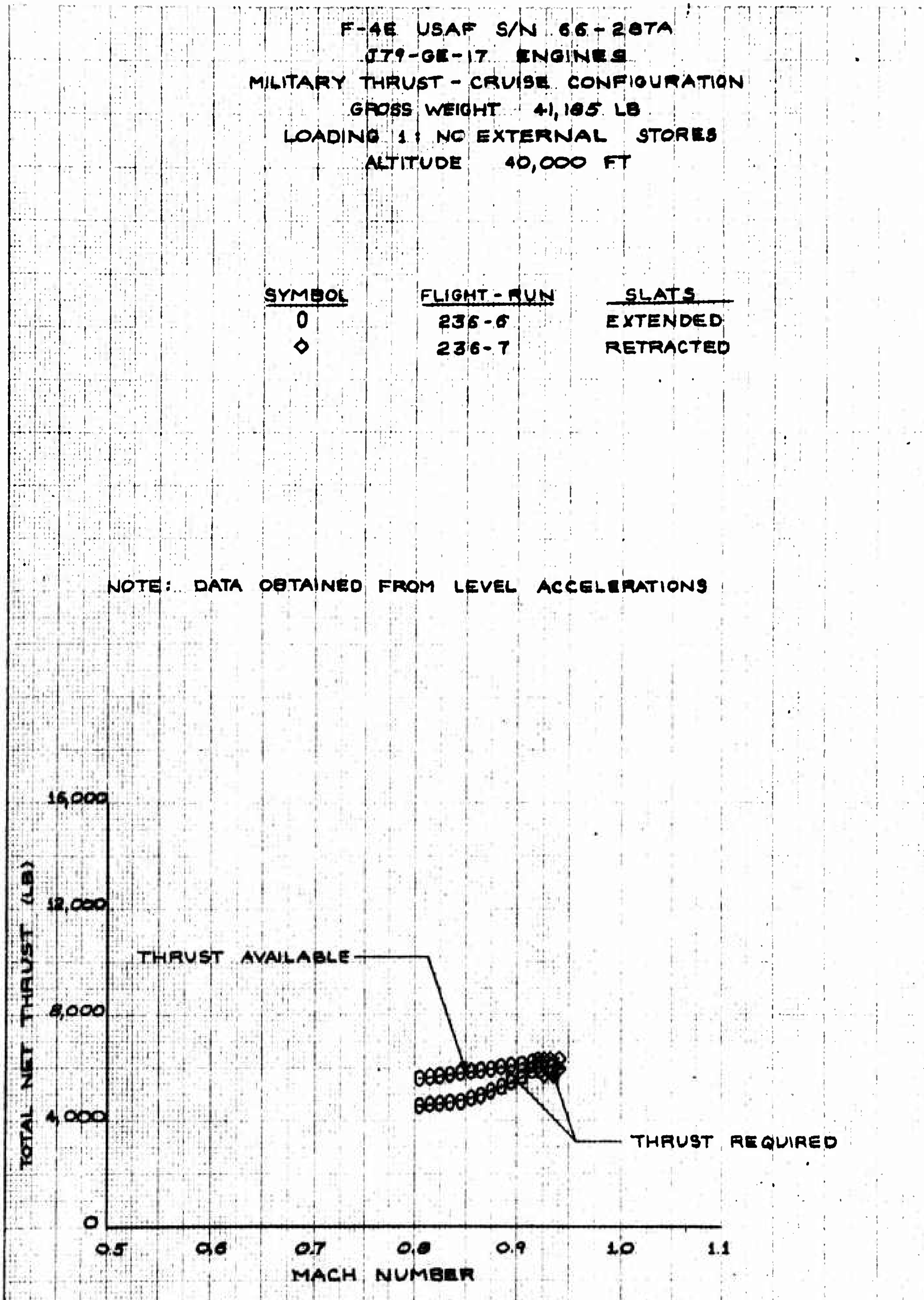


FIGURE 34 NET THRUST

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
COMBAT AND CRUISE CONFIGURATION

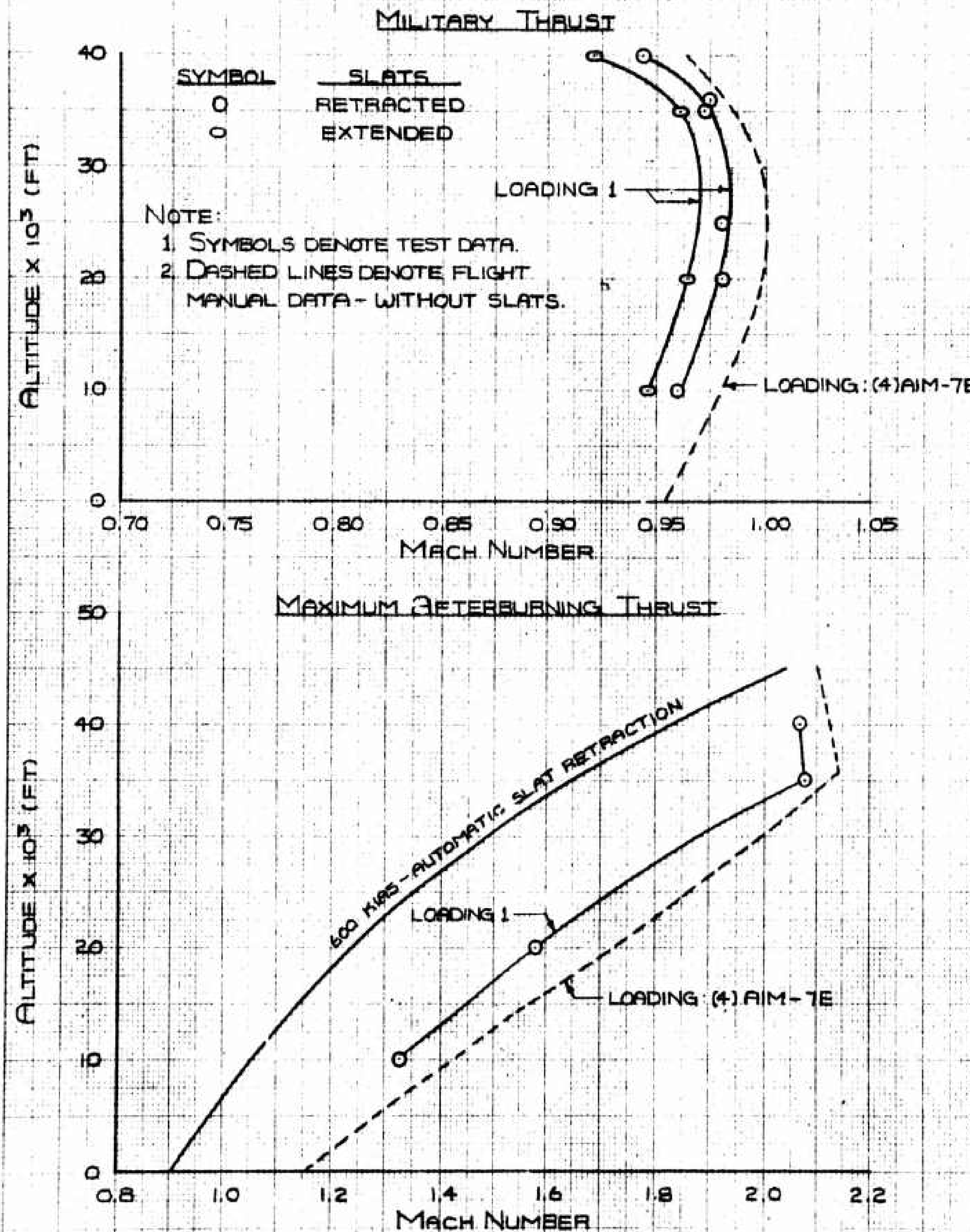


FIGURE 35. LEVEL FLIGHT ENVELOPE

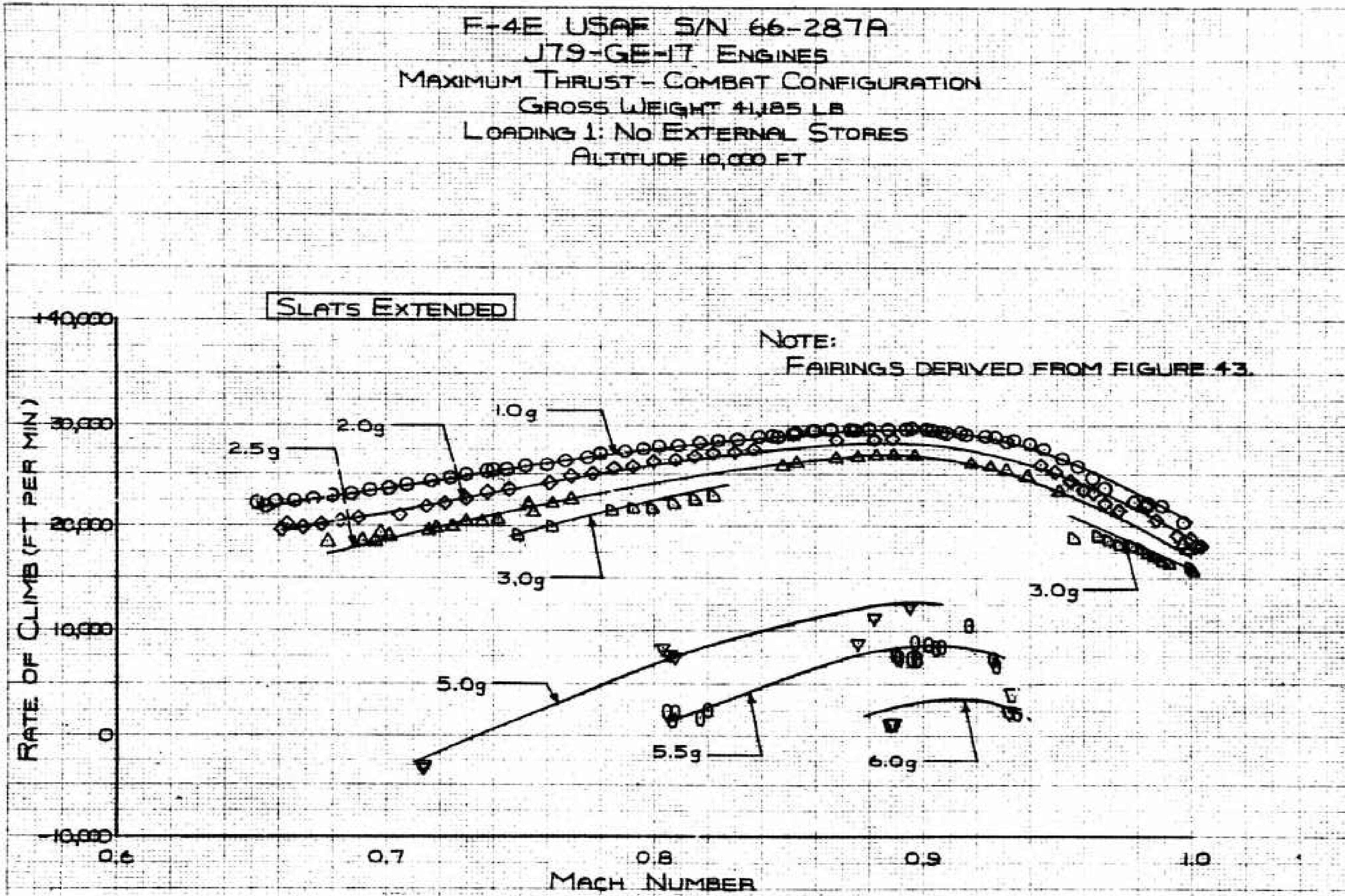
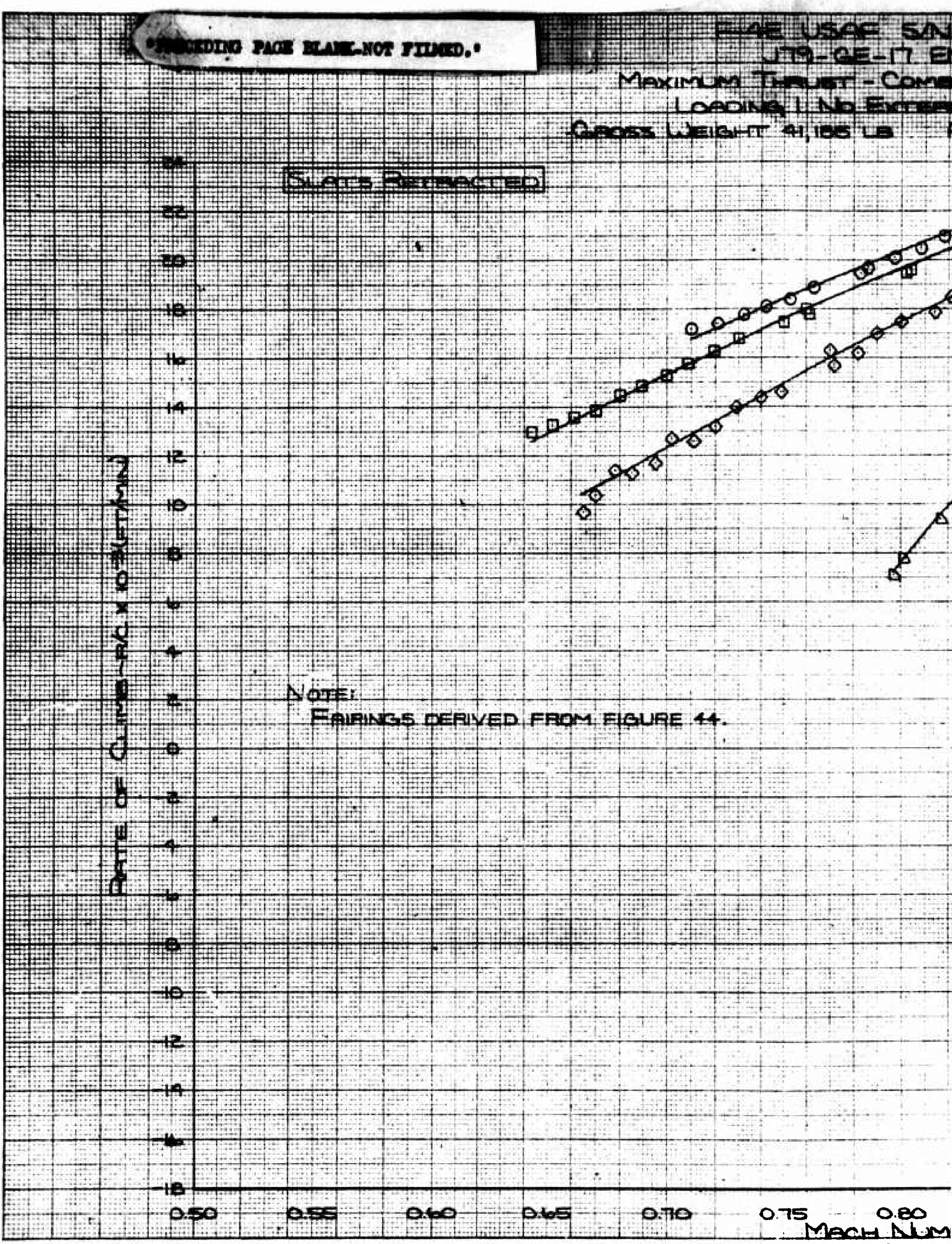


Figure 36 Climb Potential


F-4E USAF S/N
J79-GE-17 EN
MAXIMUM THRUST - COMB
LOADING 1 NO EXTER
GROSS WEIGHT 41,185 LB
SLATS RETRACTED
RATE OF CLIMB - R/C x 10^-3 (FT/MIN)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
NOTE:
FAIRINGS DERIVED FROM FIGURE 44.
0.50
0.55
0.60
0.65
0.70
0.75
0.80
MACH NUM

2

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MUM THRUST - COMBAT CONFIGURATION
LOADING I NO EXTERNAL STORES
EIGHT 41,185 LB ALTITUDE 20,000 FT.

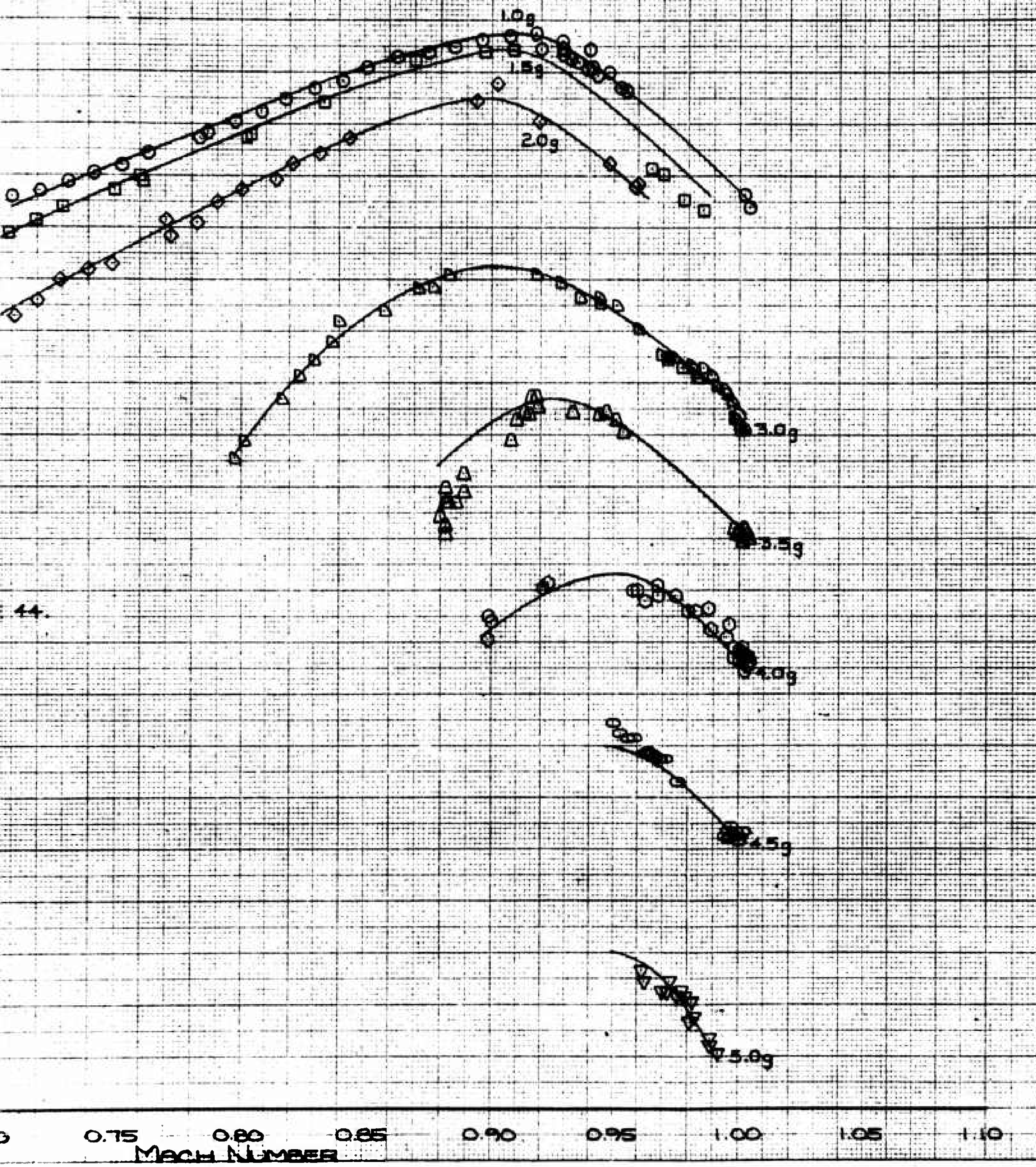


FIGURE 37 CLIMB POTENTIAL

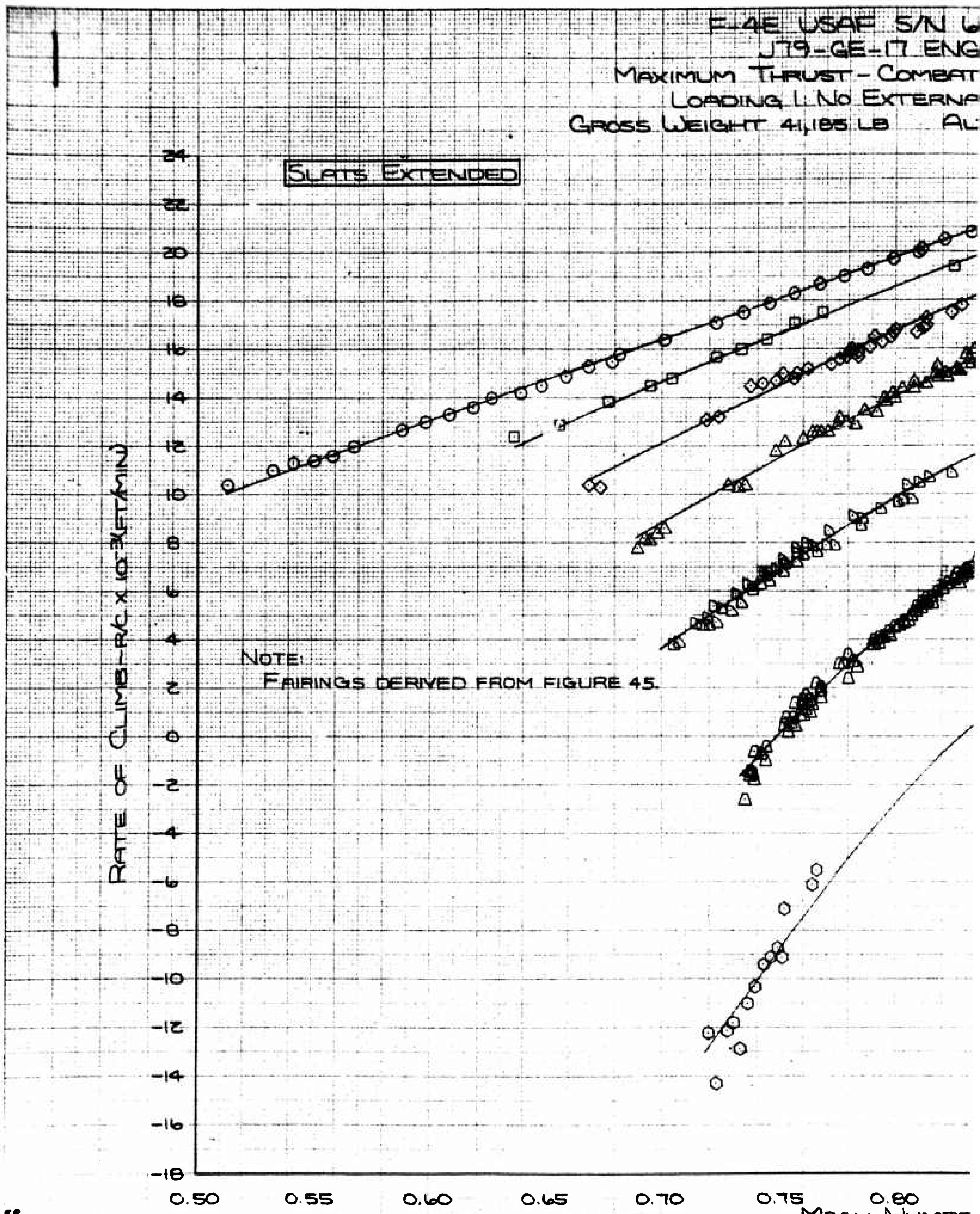
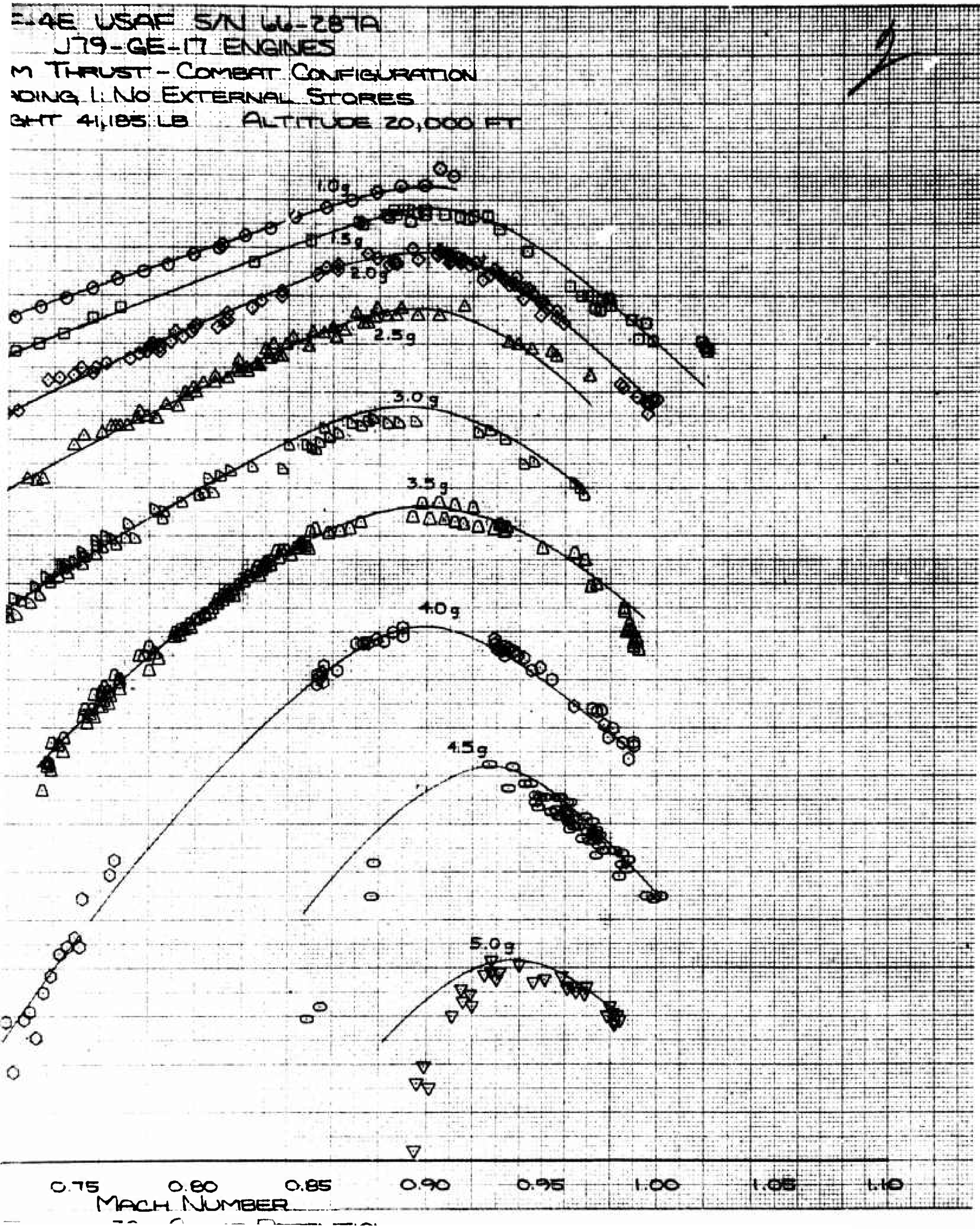


FIGURE 38. CLIMB F


-4E USAF S/N 66-287A
J79-GE-17 ENGINES
M THRUST - COMBAT CONFIGURATION
ADING I: NO EXTERNAL STORES
GHT 41,185 LB ALTITUDE 20,000 FT
1.0g
1.5g
2.0g
2.5g
3.0g
3.5g
4.0g
4.5g
5.0g
0.75
0.80
0.85
0.90
0.95
1.00
1.05
1.10
MACH NUMBER

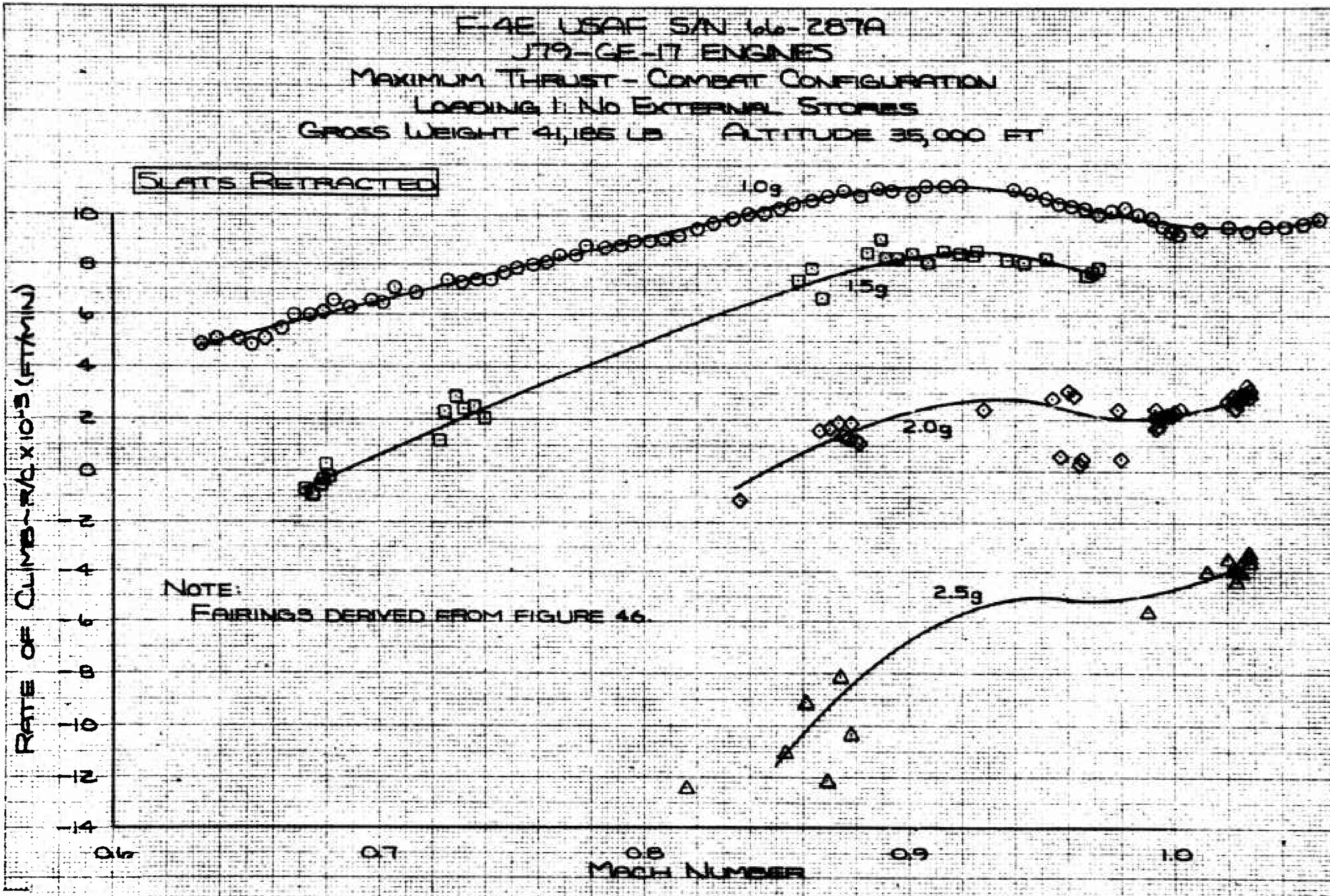


FIGURE 39 CLIMB POTENTIAL

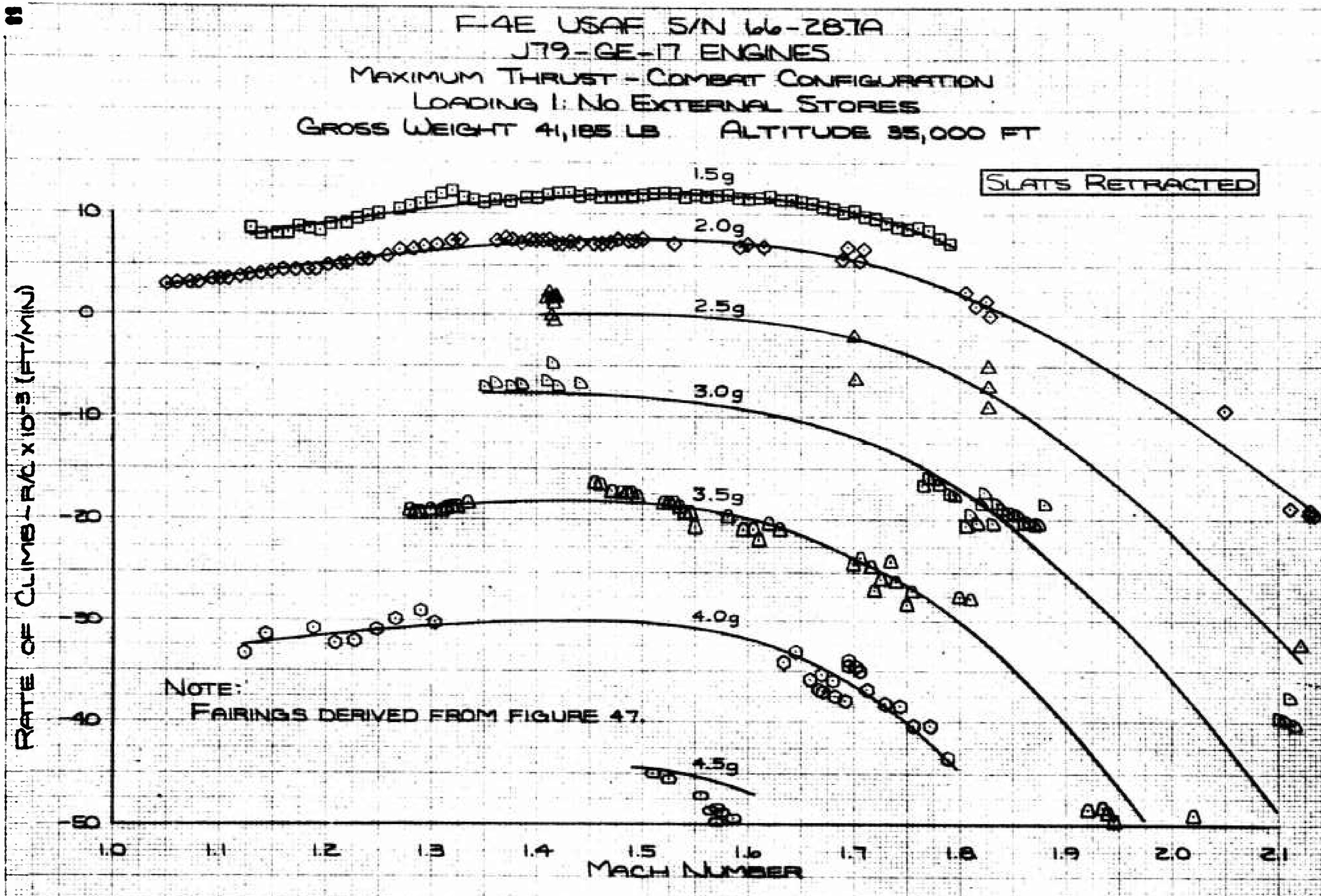


FIGURE 40 SUPERSONIC CLIMB POTENTIAL

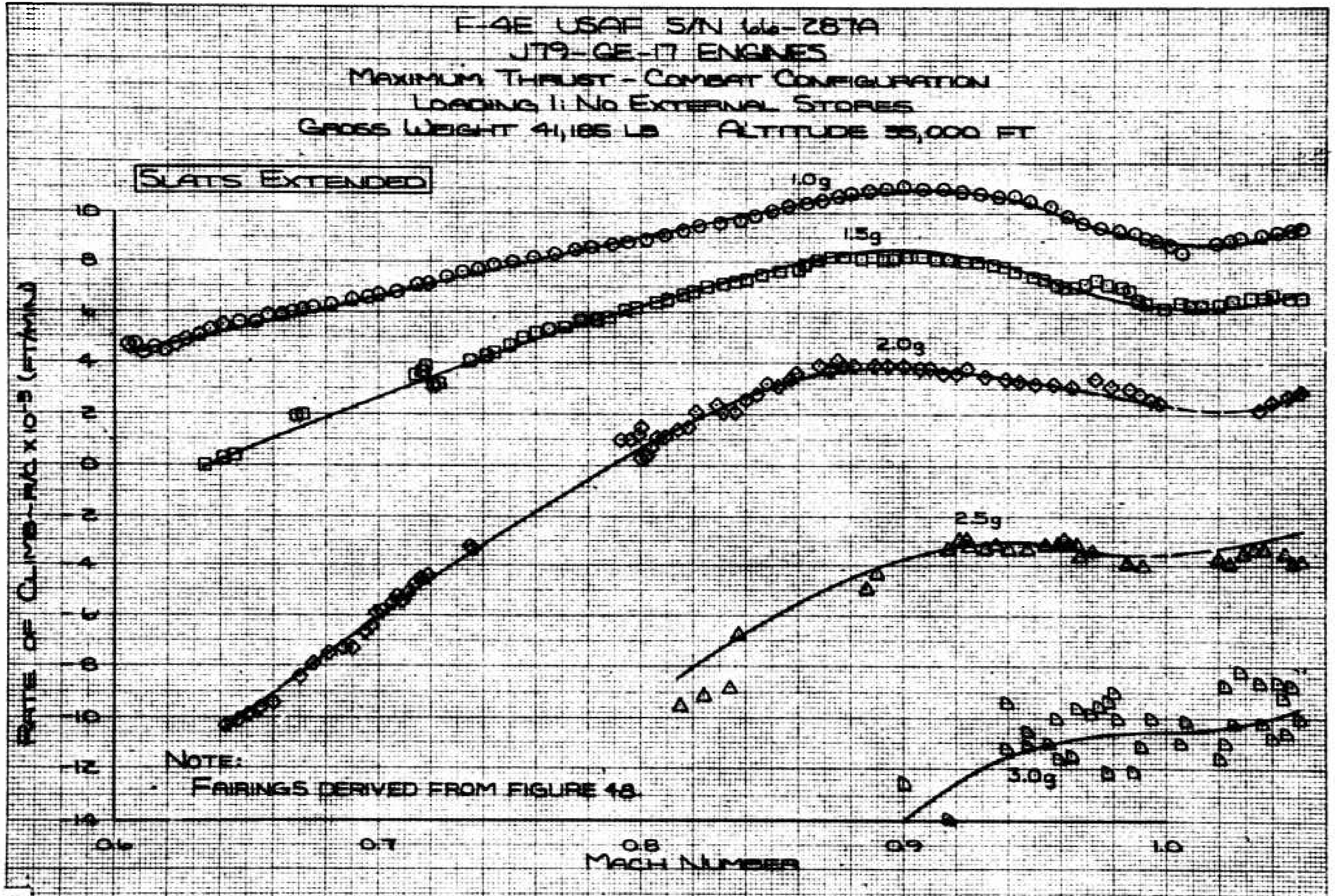


FIGURE 41 CLIMB POTENTIAL

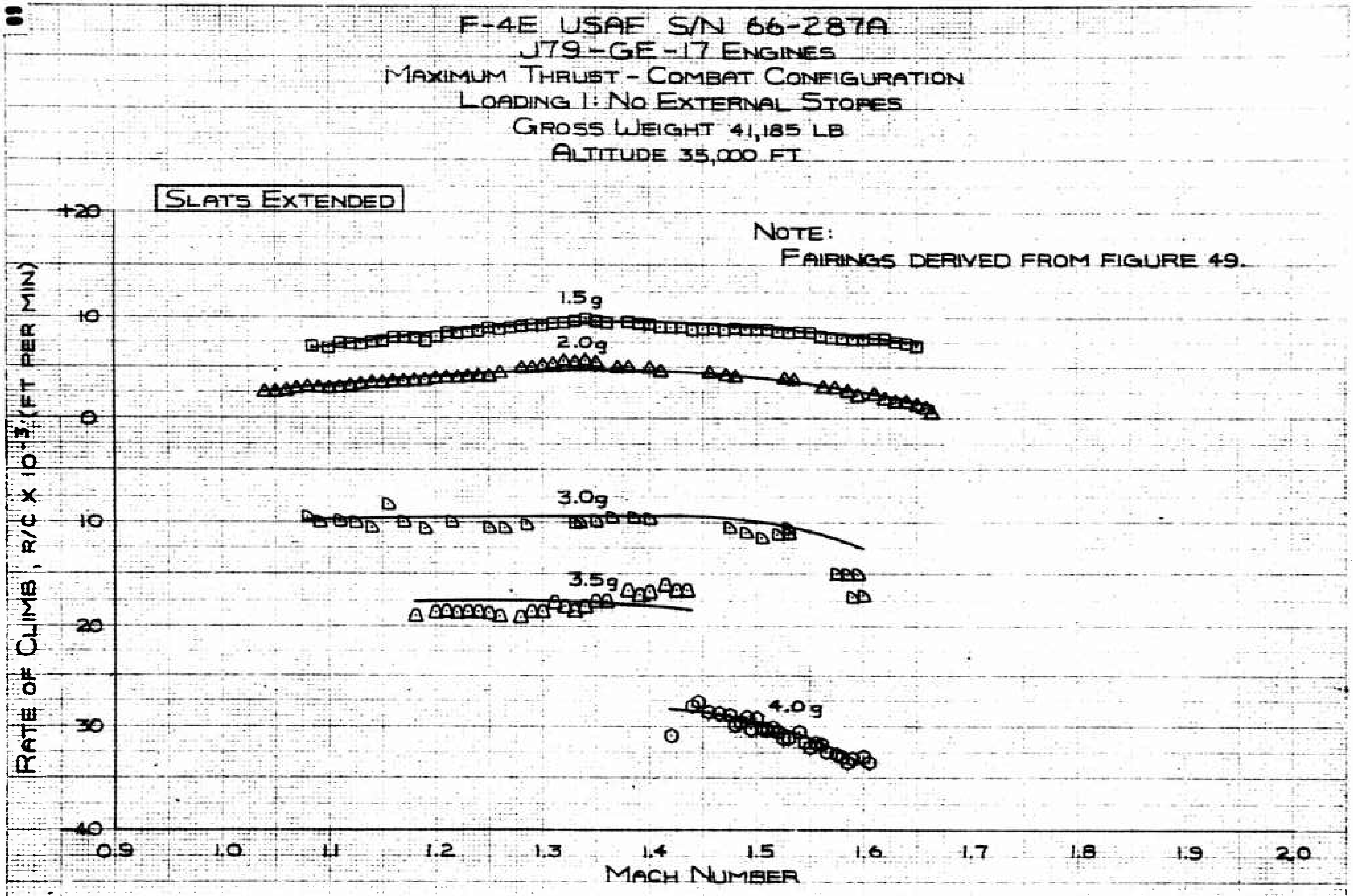


FIGURE 42 . SUPERSONIC CLIMB POTENTIAL

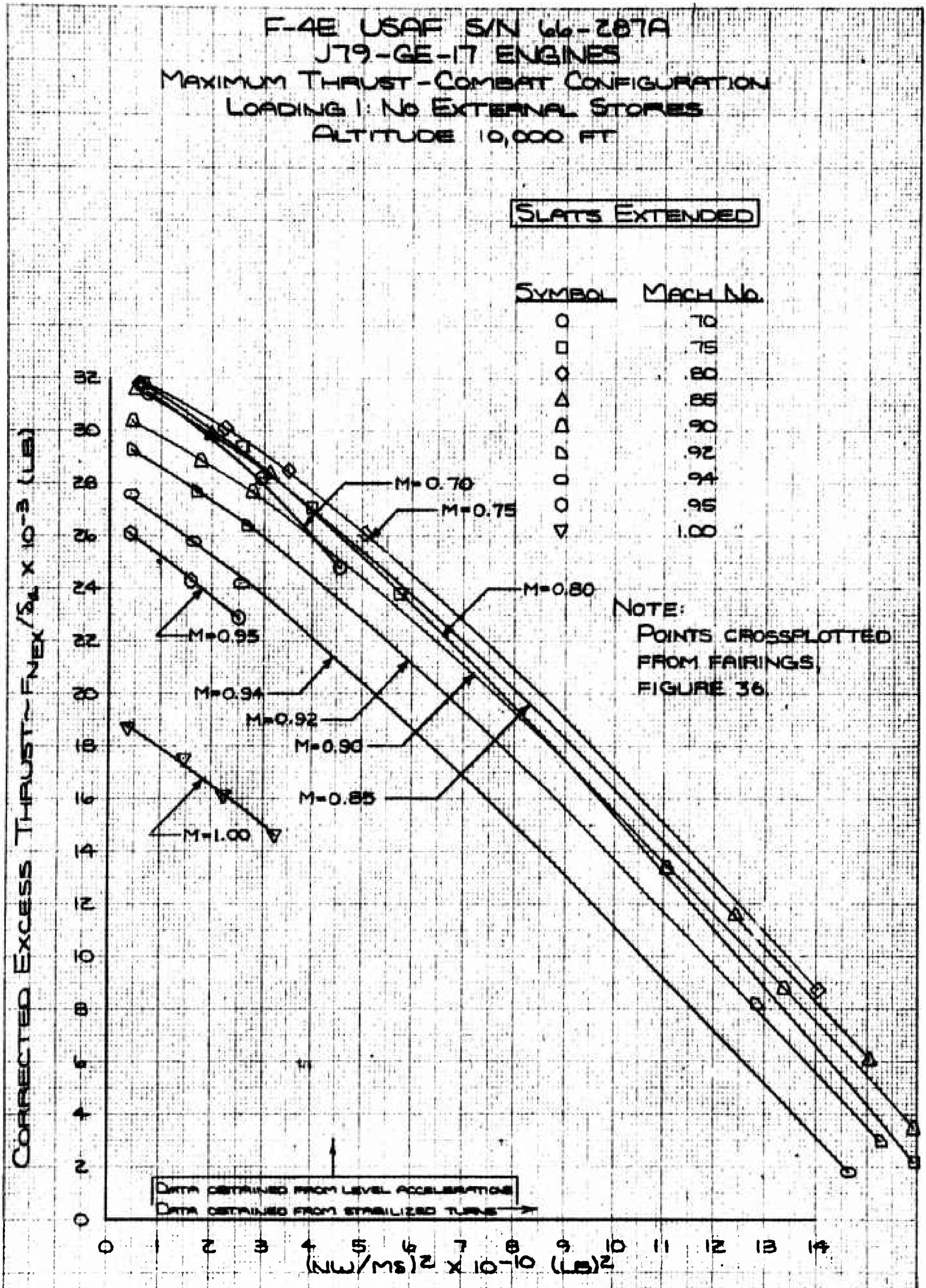


FIGURE 43 GENERALIZED THRUST-LIMITED PERFORMANCE

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST-COMBAT CONFIGURATION
LOADING I: NO EXTERNAL STORES
ALTITUDE 20,000 FT

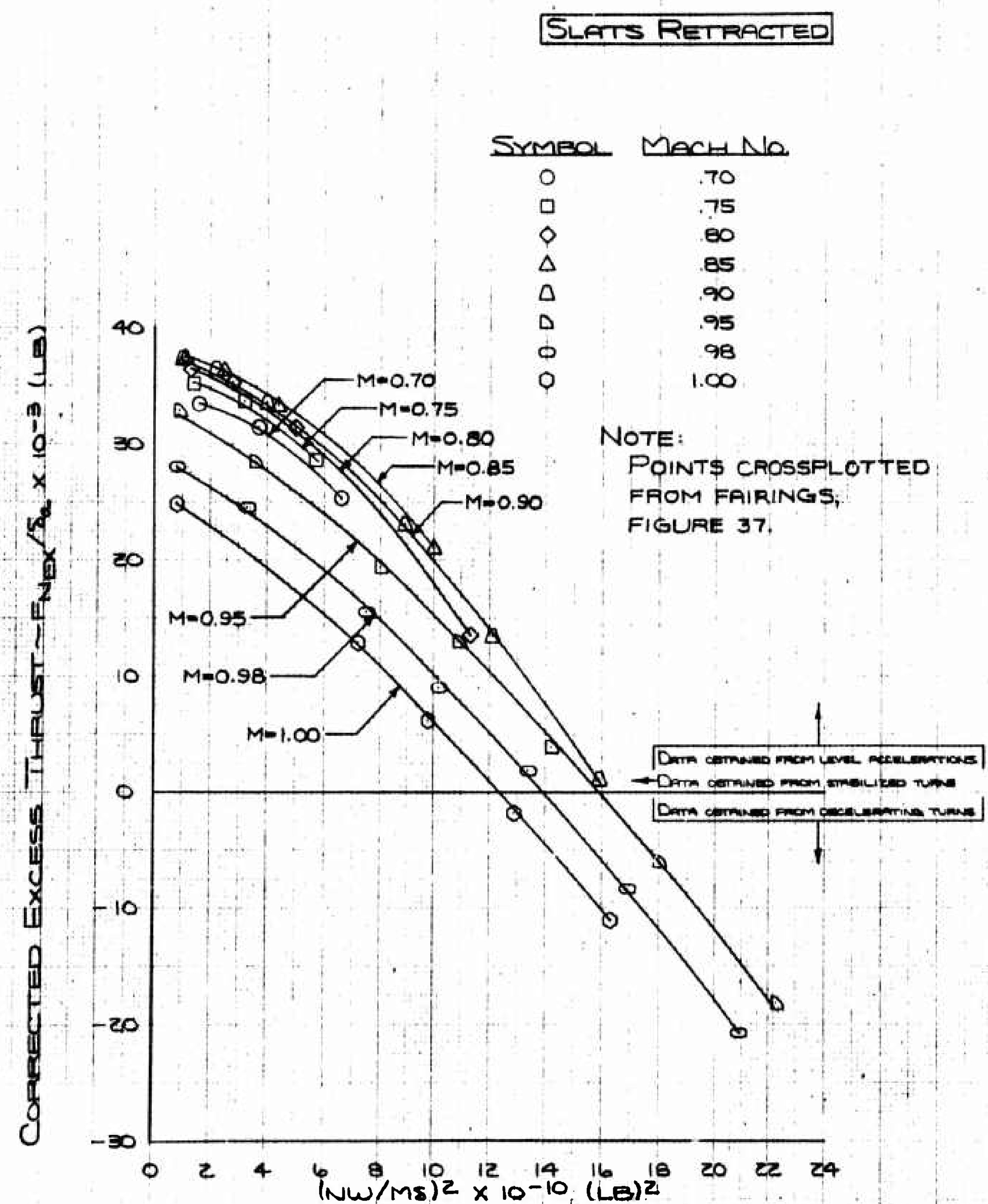


 FIGURE 44 GENERALIZED THRUST-LIMITED PERFORMANCE

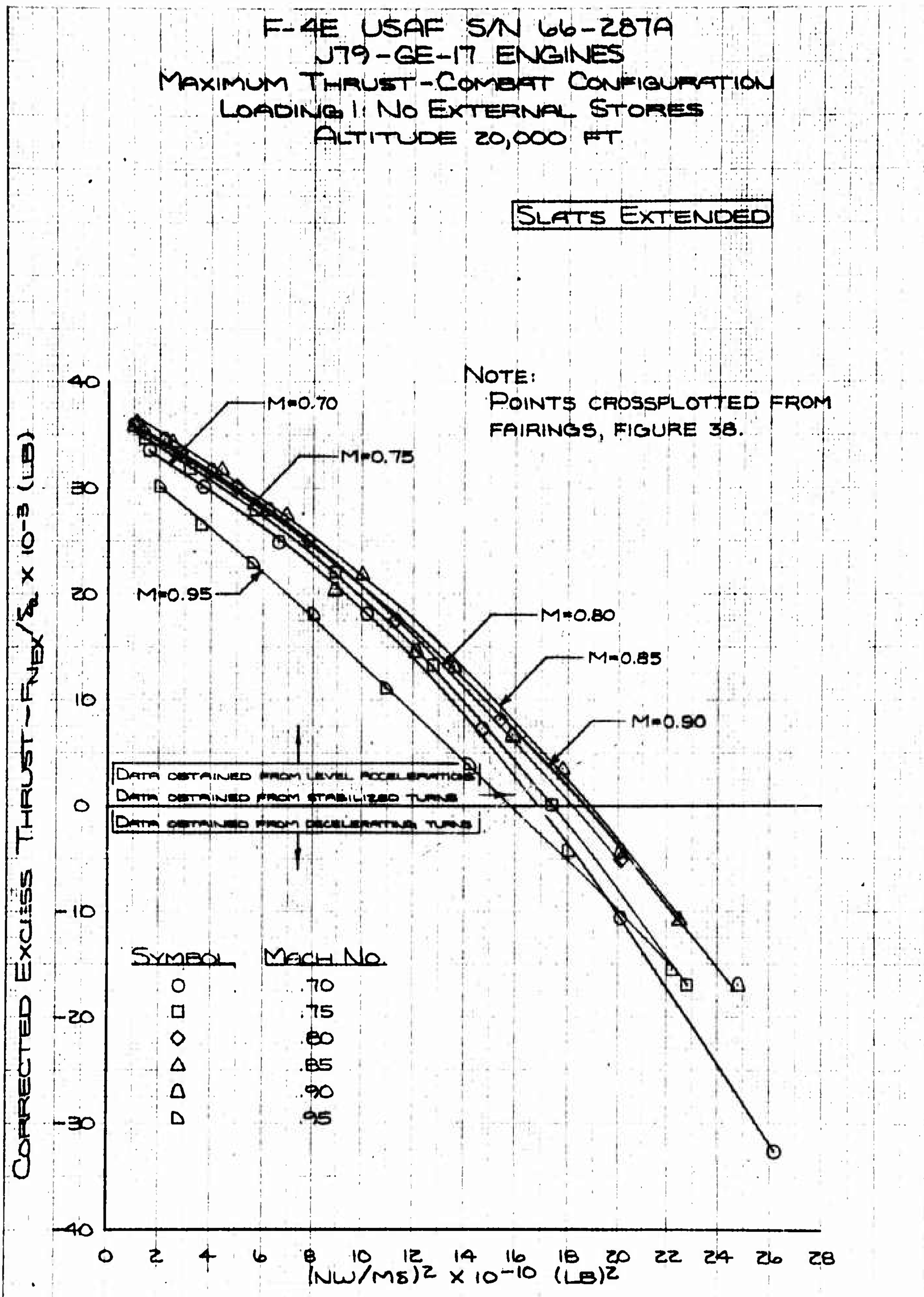


FIGURE 45. GENERALIZED THRUST-LIMITED PERFORMANCE

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST-COMBAT CONFIGURATION
LOADING I: NO EXTERNAL STORES
ALTITUDE 35,000 FT

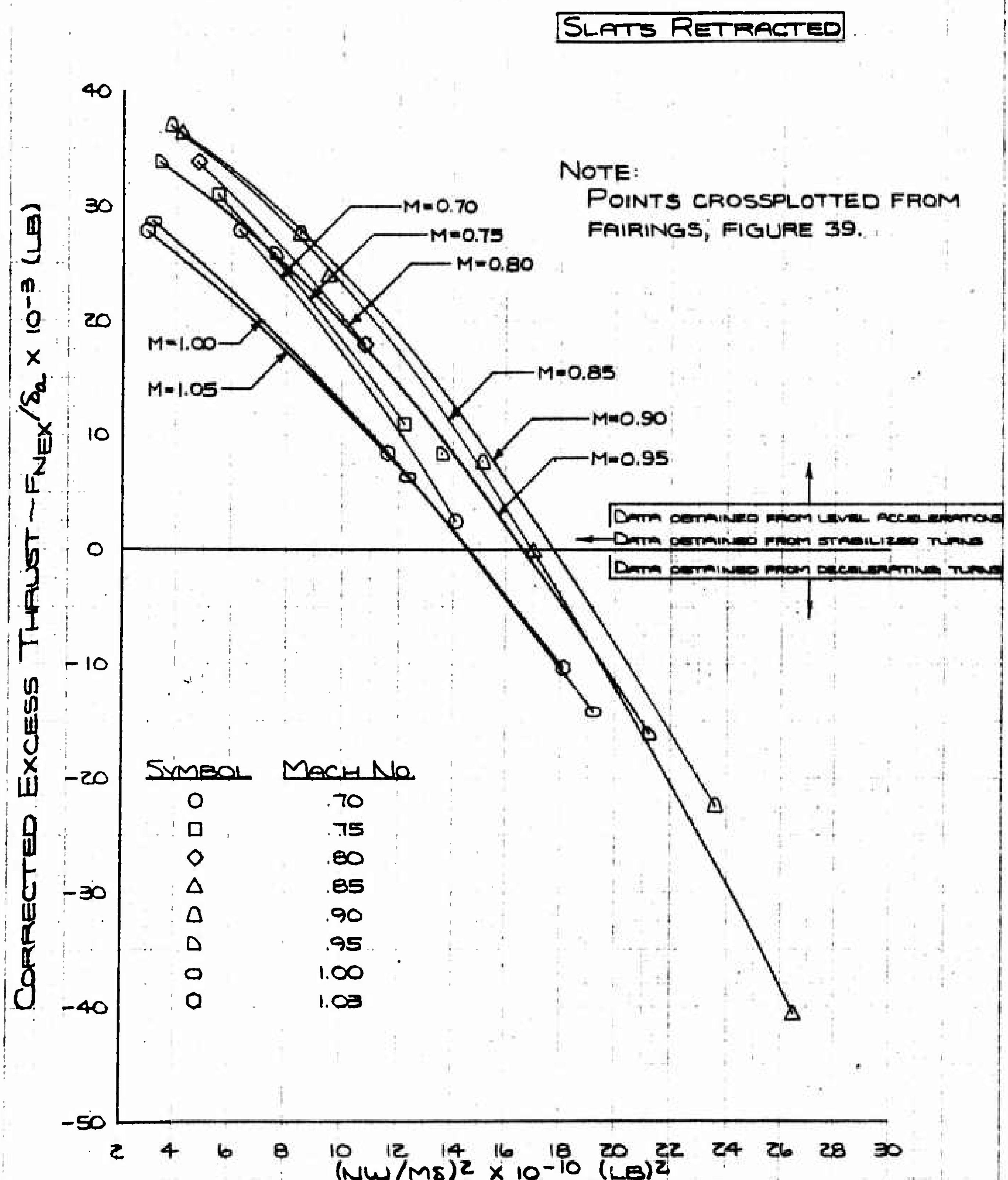


FIGURE 46 GENERALIZED THRUST-LIMITED PERFORMANCE

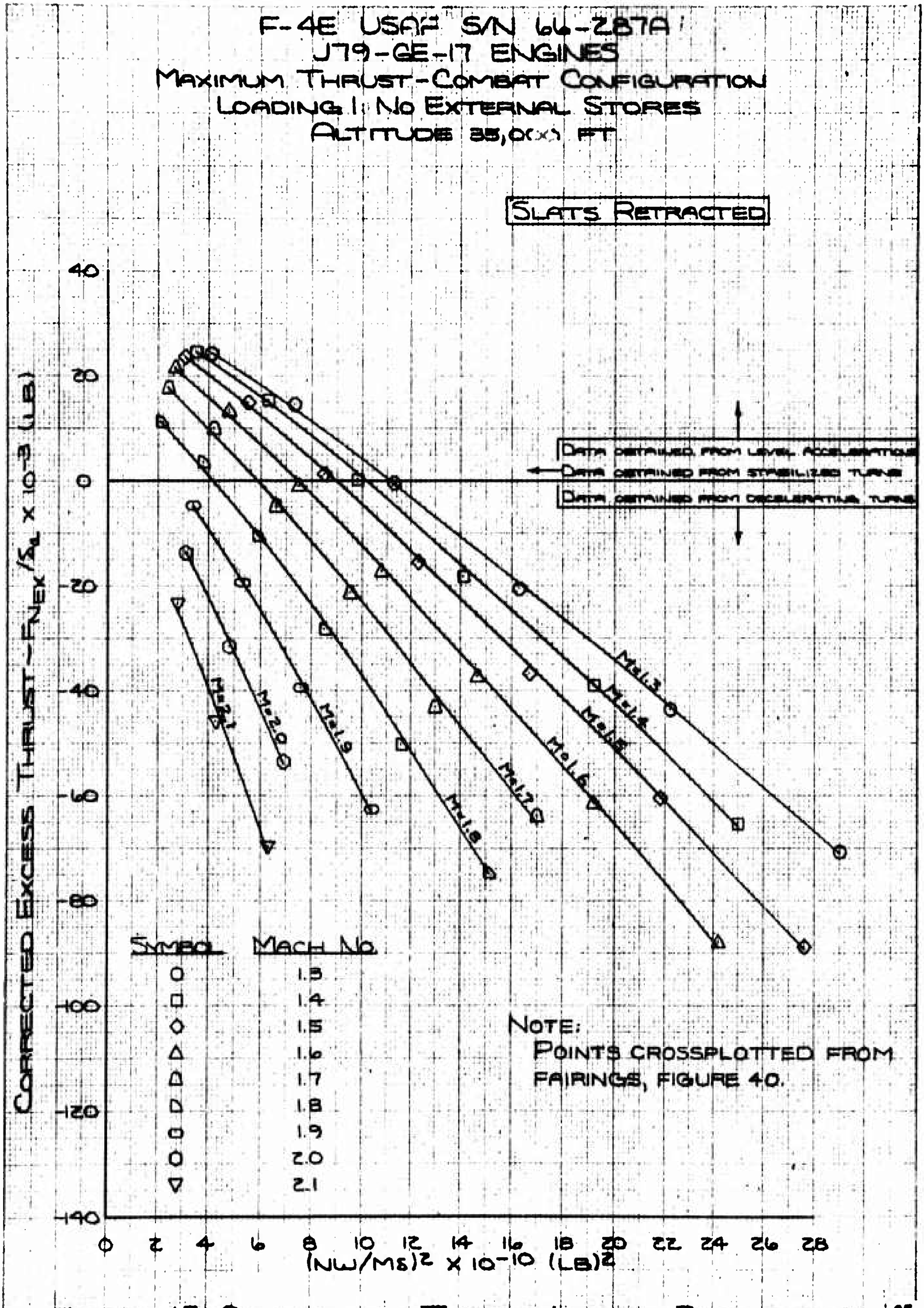


FIGURE 47. GENERALIZED THRUST-LIMITED PERFORMANCE

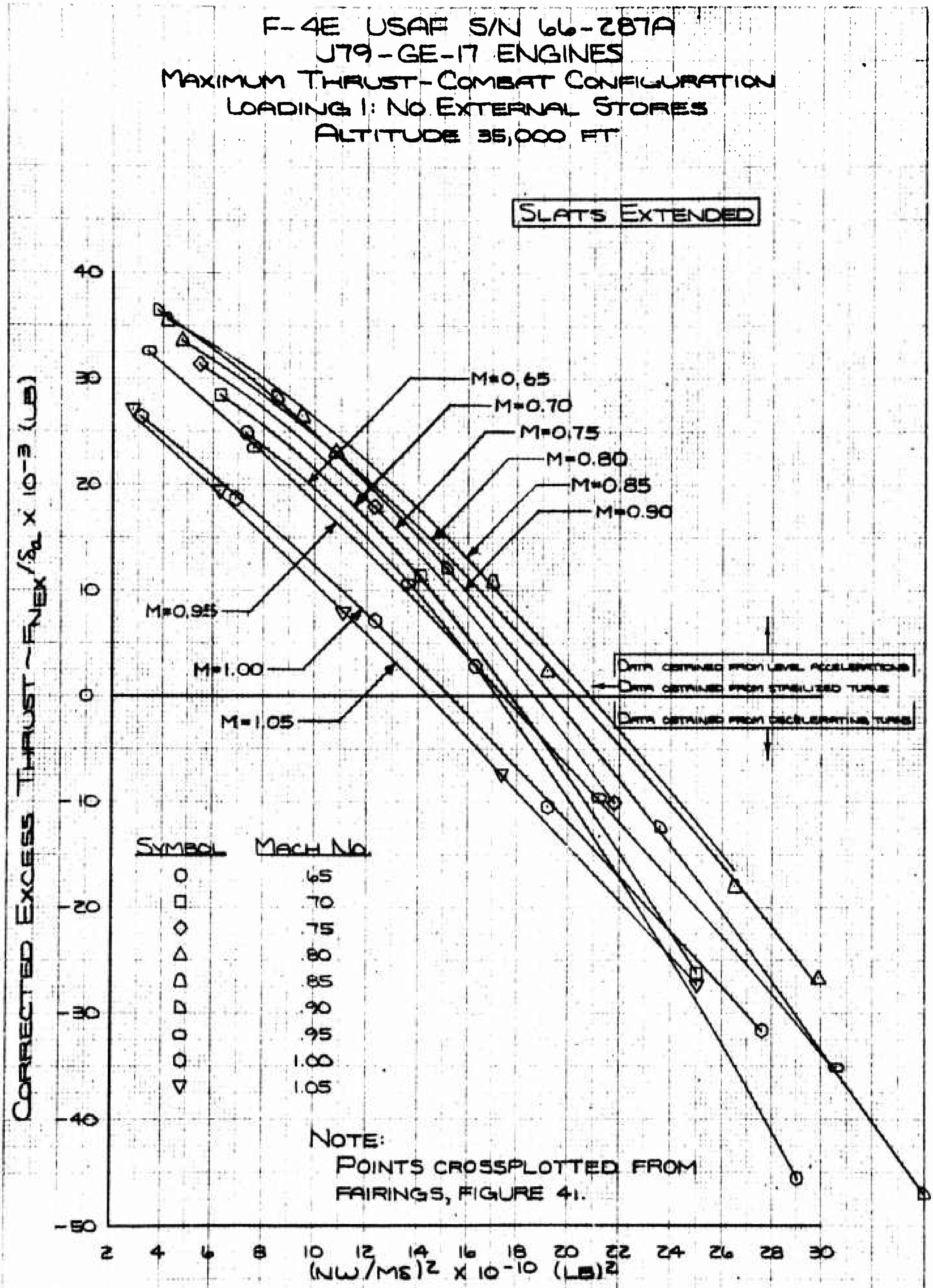


FIGURE 48. GENERALIZED THRUST-LIMITED PERFORMANCE

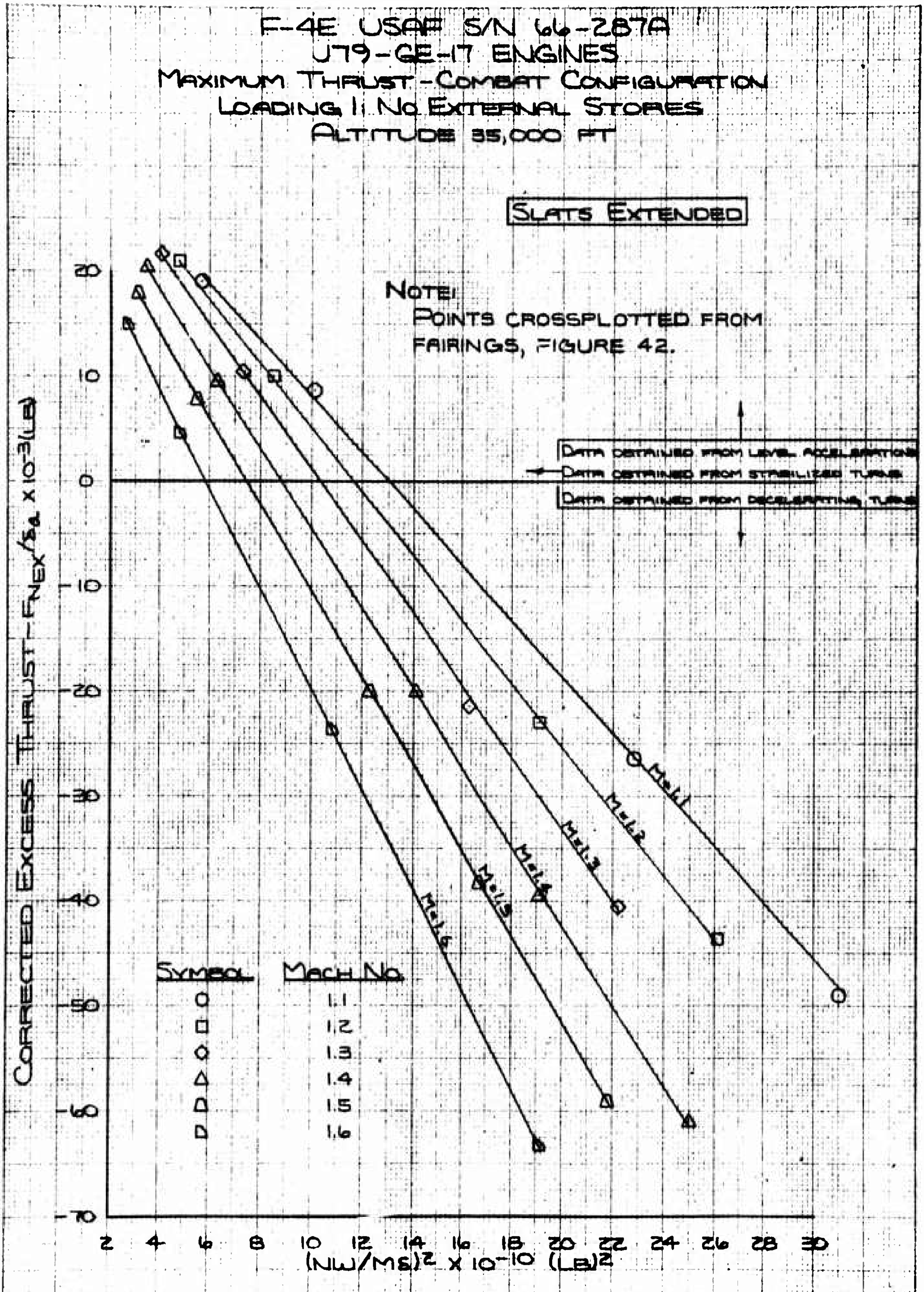


FIGURE 49 GENERALIZED THRUST-LIMITED PERFORMANCE

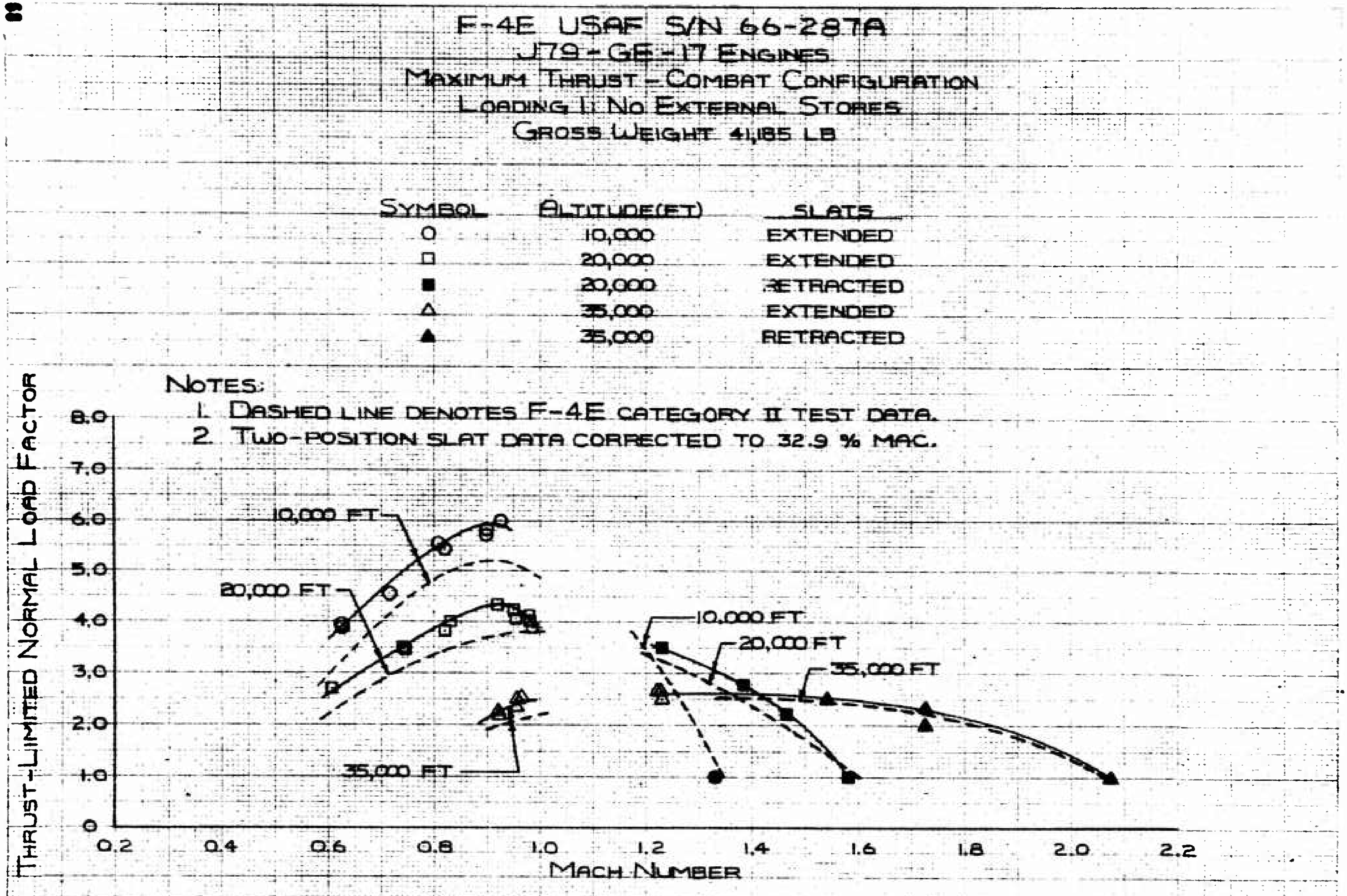


FIGURE 50. MAXIMUM A/B THRUST-LIMITED TURN PERFORMANCE

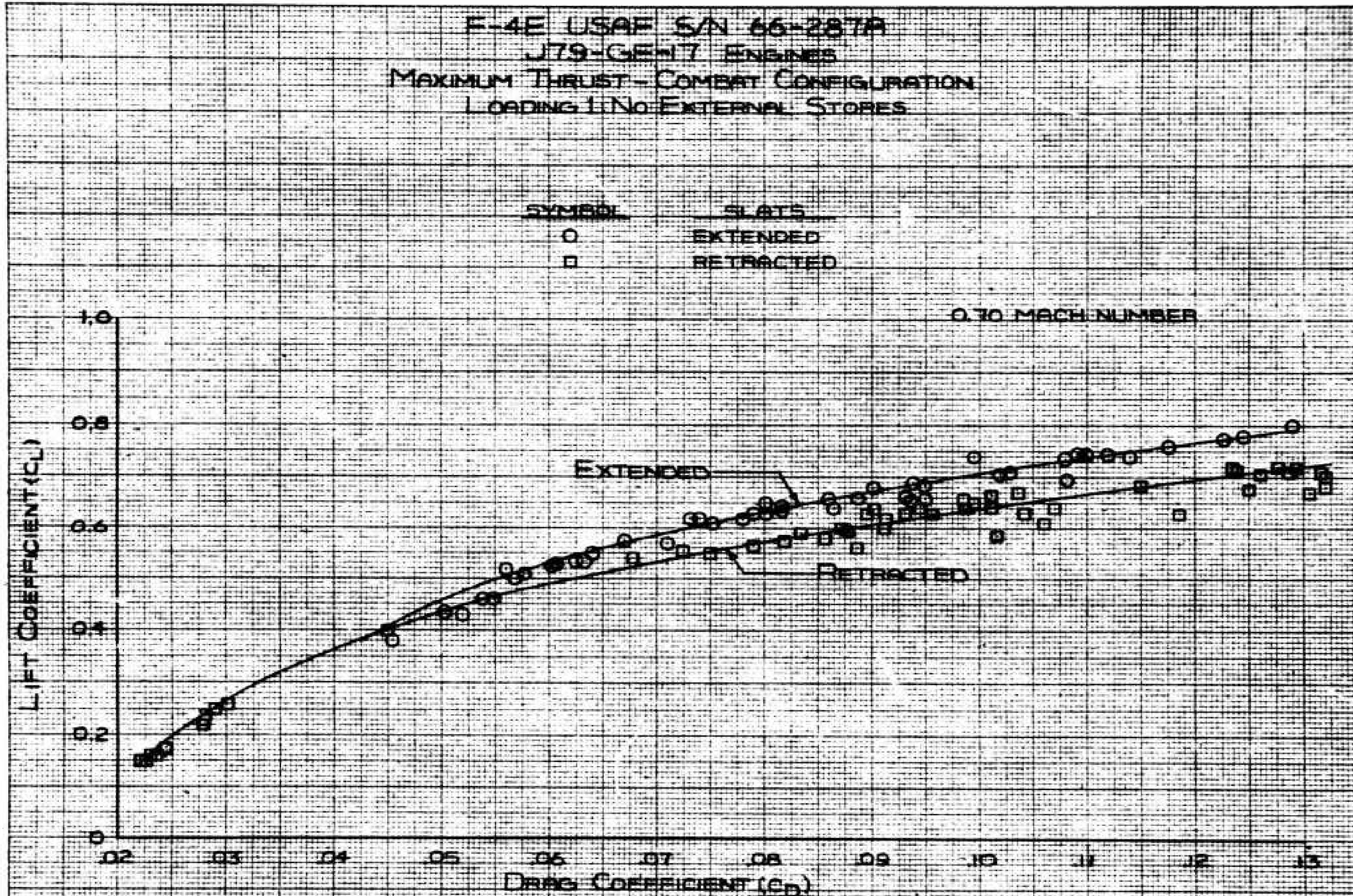


Figure 51 Drag Polar

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Maximum Thrust - Combat Configuration
Loading 1: No External Stores

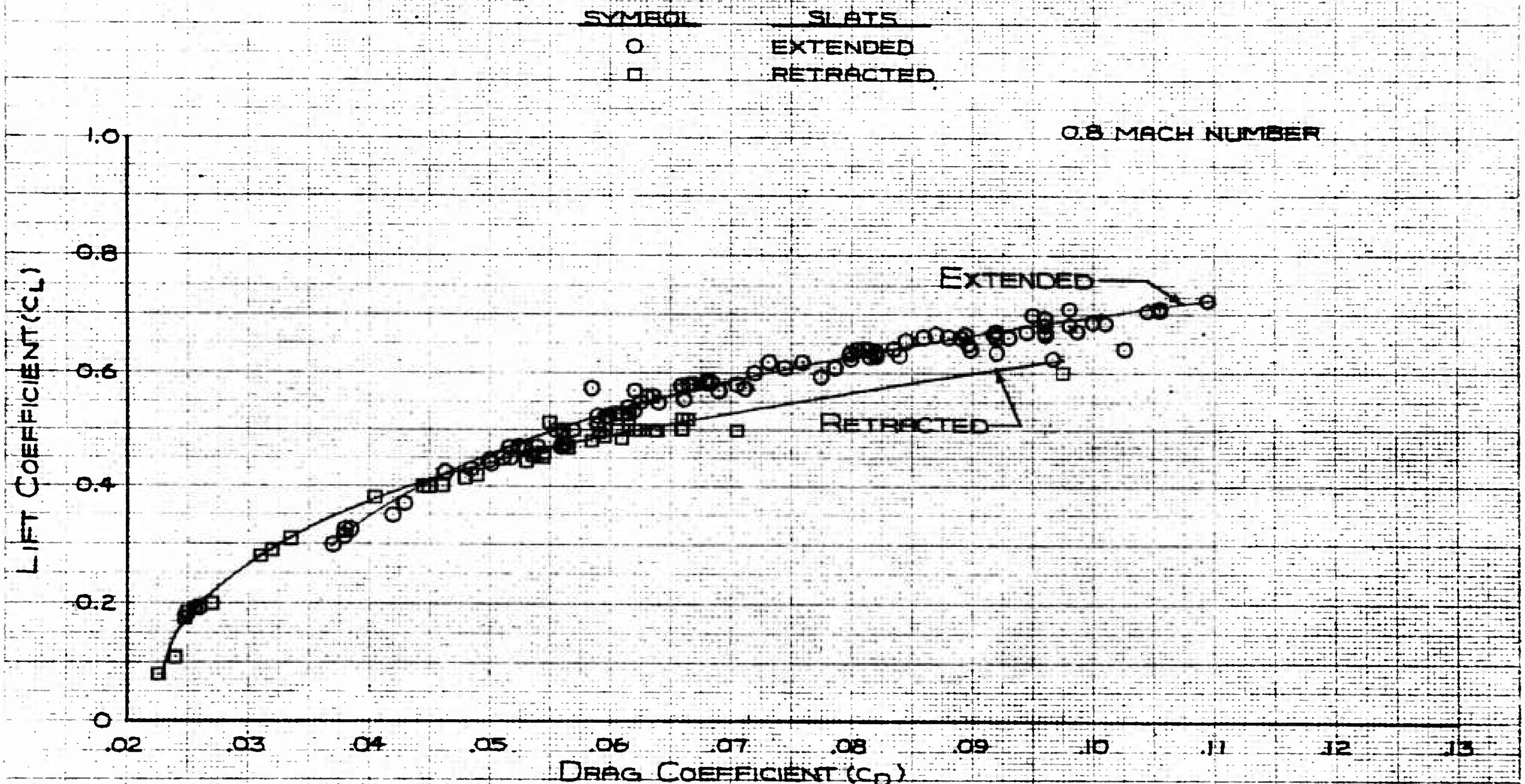


Figure 52 Drag Polar

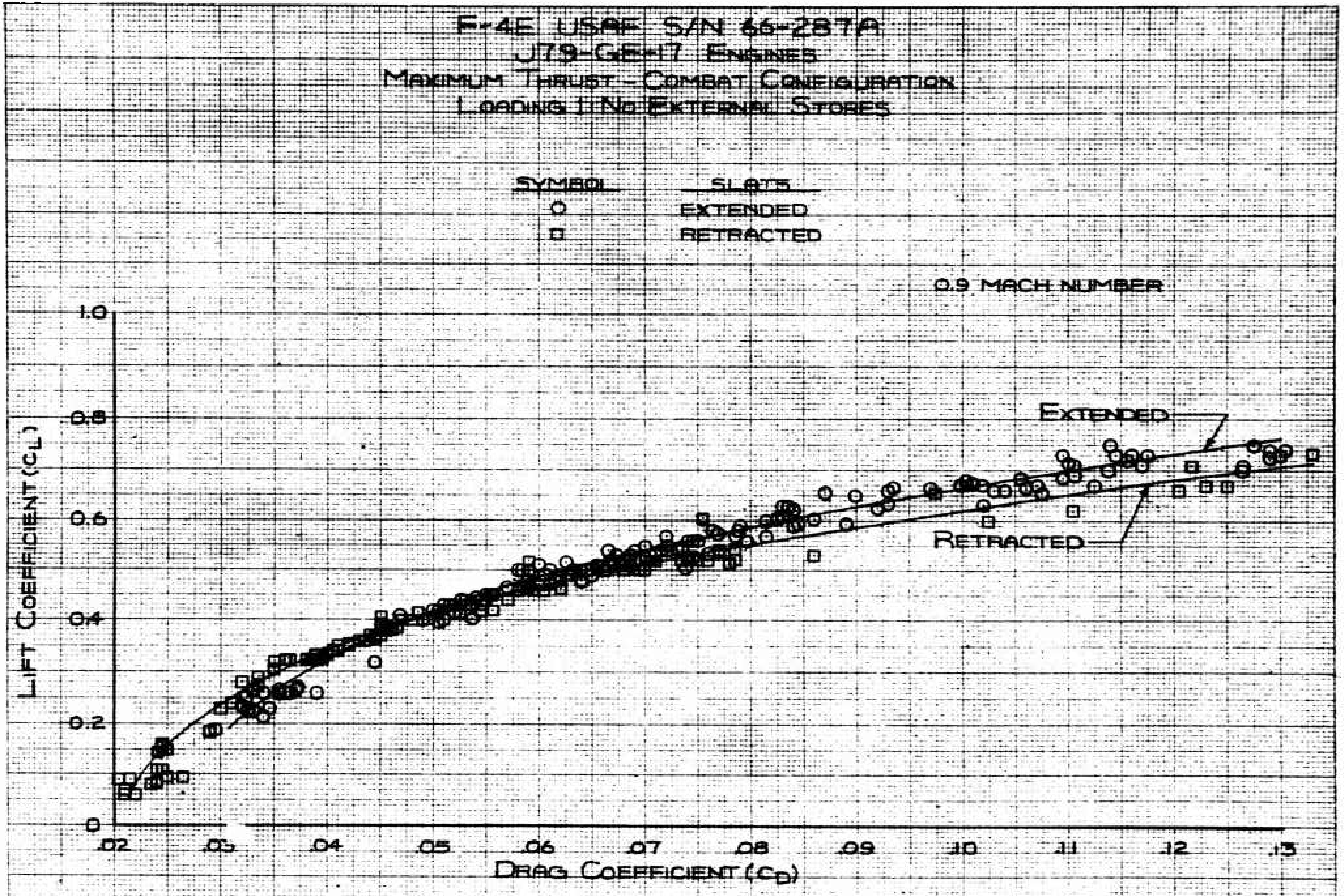


Figure 53 Drag Polar

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MAXIMUM THRUST - COMBAT CONFIGURATION
LOADING 1: NO EXTERNAL STORES

SYMBOL	SLATS
O	EXTENDED
□	RETRACTED

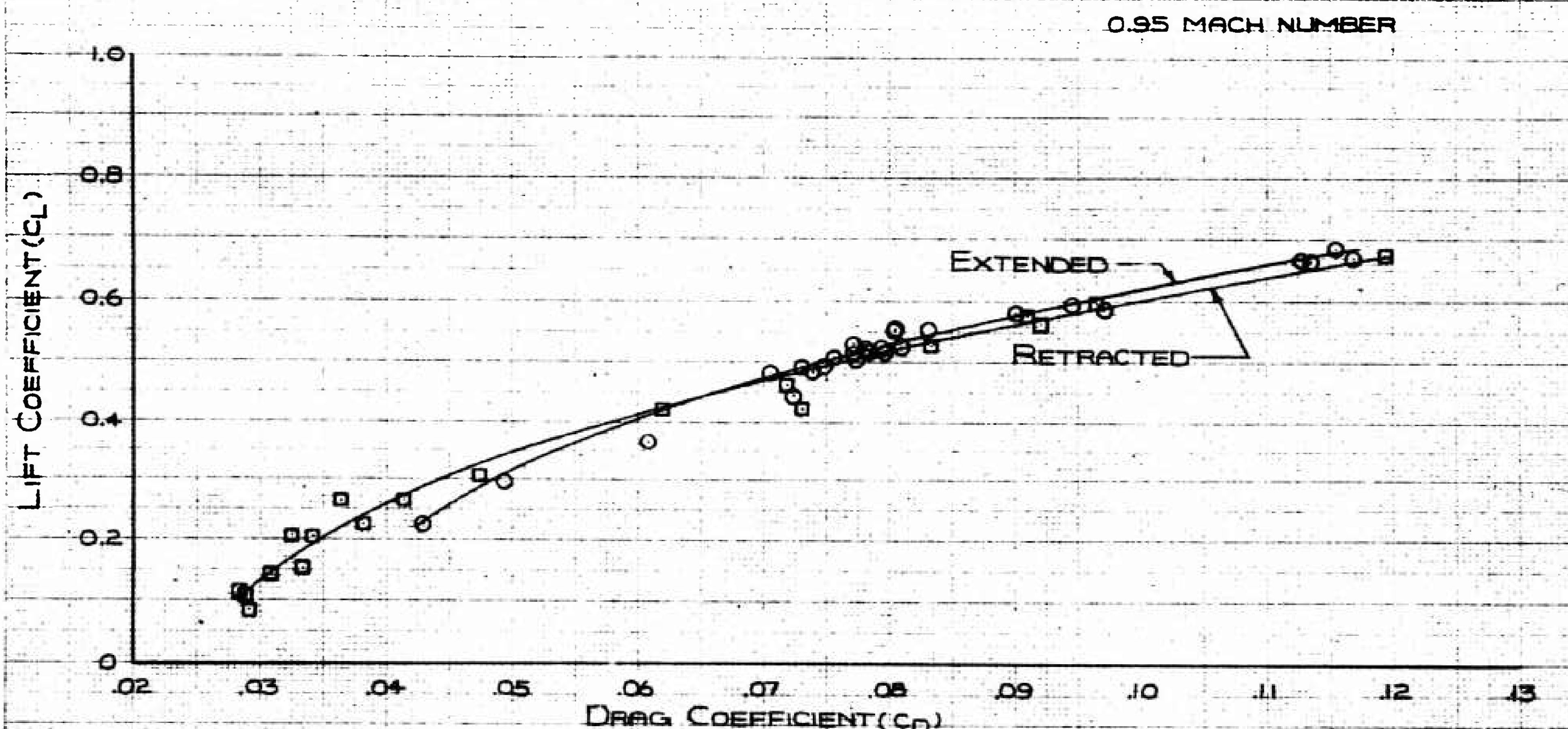
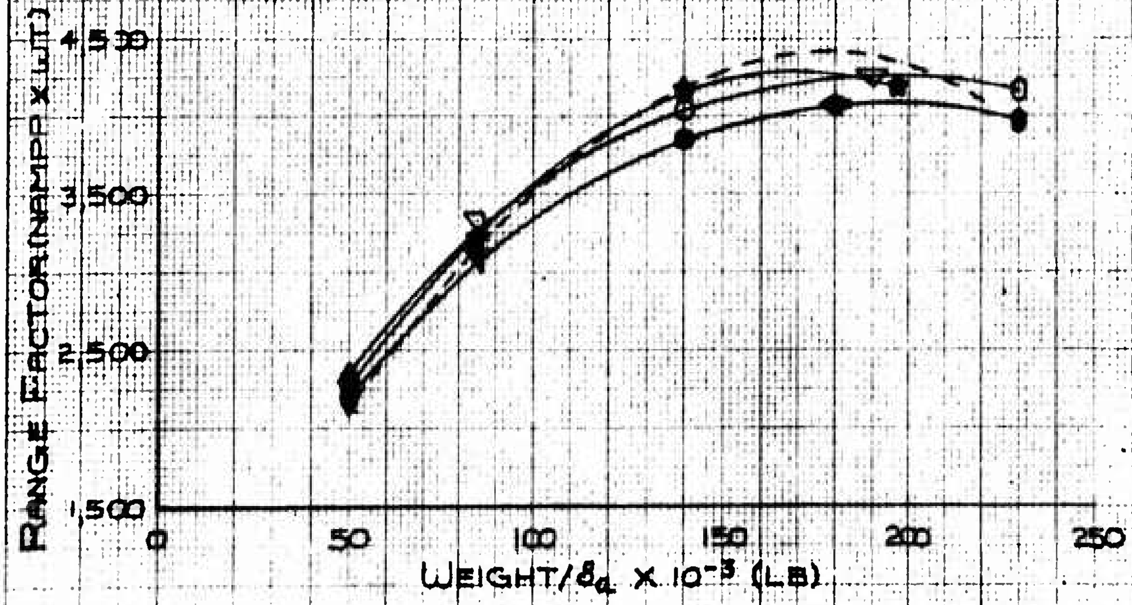


FIGURE 54 . DRAG POLAR

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Cruise Configuration

SYMBOL	ALTITUDE (FT)	GROSS WEIGHT (LB)	W/δ_a	LOADING	SLATS
◇	5,000	40,800	50,000	1	RETRACTED
◁	21,000	37,300	85,000	1	RETRACTED
○	30,000	41,700	140,000	1	RETRACTED
▽	37,600	39,300	190,000	1	RETRACTED
▯	41,300	40,300	230,000	1	RETRACTED
◆	7,000	37,500	50,000	1	EXTENDED
◀	22,000	36,700	85,000	1	EXTENDED
●	31,000	40,100	140,000	1	EXTENDED
▼	38,000	37,600	180,000	1	EXTENDED
▮	42,000	38,400	230,000	1	EXTENDED

NOTE: 1. OPEN SYMBOLS DENOTE SLATS RETRACTED.
2. SOLID SYMBOLS DENOTE SLATS EXTENDED.
3. DASHED LINE DENOTES RESULTS OF F-4E CAT II TEST (REFERENCE 6).
4. ★ FLIGHT MANUAL DATA.



F-4E USAF S/N 66-287A
J79-GE-17 Engines
Cruise Configuration

Symbol	Altitude (FT)	Gross Weight (LB)	W/δ_a	Loading	Slats
◇	5,000	40,800	50,000	1	Retracted
◁	21,000	37,300	85,000	1	Retracted
○	30,000	41,700	140,000	1	Retracted
◁	37,600	39,300	190,000	1	Retracted
▯	41,300	40,300	230,000	1	Retracted
◆	7,000	37,500	50,000	1	Extended
◀	22,000	36,700	85,000	1	Extended
●	31,000	40,100	140,000	1	Extended
◆	38,000	37,600	180,000	1	Extended
▮	42,000	38,400	230,000	1	Extended

Note: 1. Open symbols denote slats retracted.
2. Solid symbols denote slats extended.
3. Dashed line denotes results of F-4E Cat II test (Reference 6).
4. —◆— Flight manual data.

Figure 55. Cruise Performance Summary (Concluded)

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
LOADING I: NO EXTERNAL STORES
CRUISE CONFIGURATION

SYMBOL	FLIGHT	ALTITUDE (FT)	WEIGHT (LB)	W/δ_a (LB)
◇	28	5,000	40,800	50,000
▽	43	21,000	37,300	85,000
○	43	30,500	41,700	140,000
▽	11	37,600	39,100	190,000
□	46	41,300	40,300	230,000

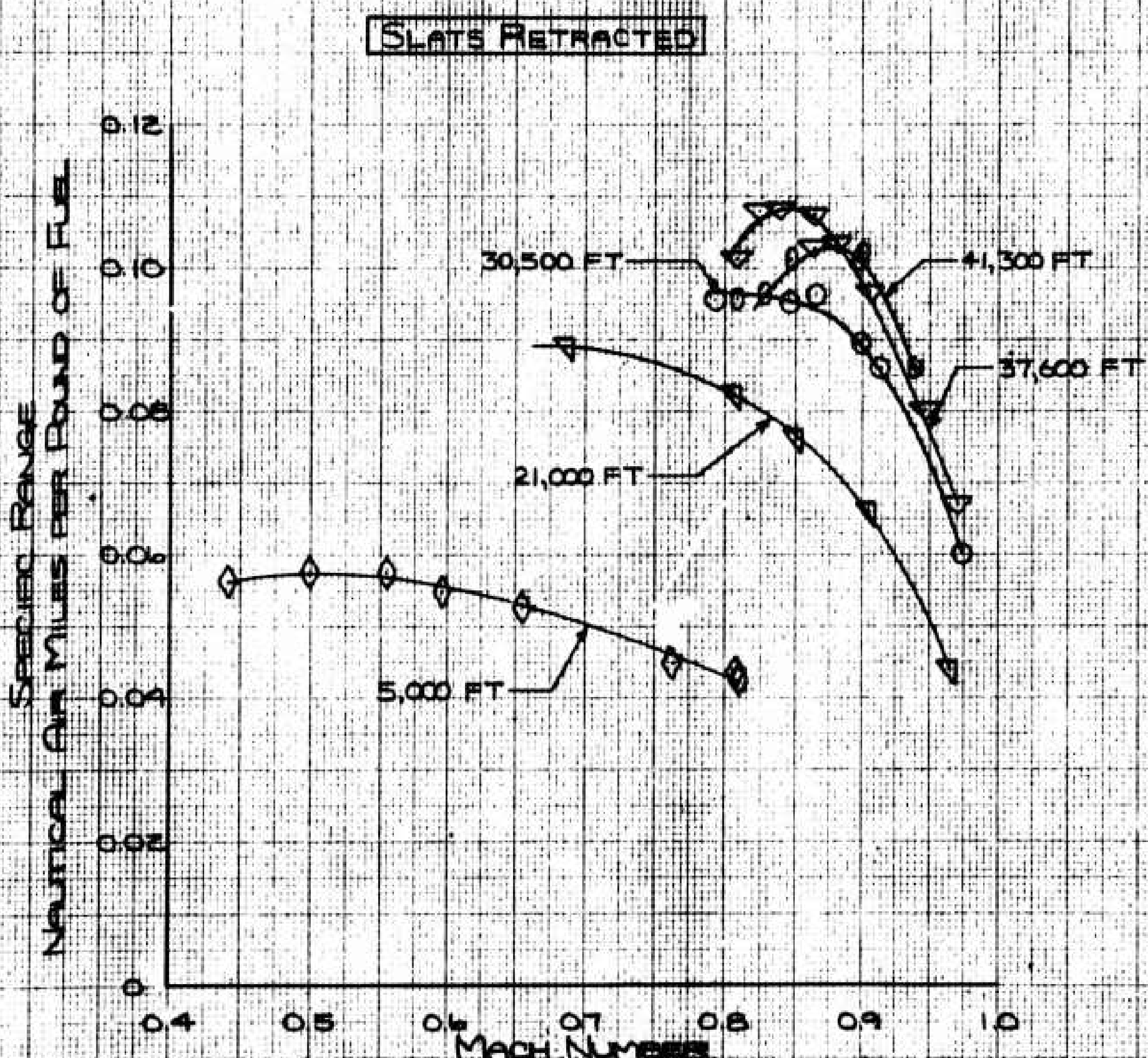


FIGURE 56 SPECIFIC RANGE

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
LOADING I: NO EXTERNAL STORES
CRUISE CONFIGURATION

SYMBOL	FLIGHT	ALTITUDE (FT)	WEIGHT (LB)	W/δ_a (LB)
◇	28	5,000	40,800	30,000
◁	43	21,000	37,300	85,000
○	43	30,500	41,700	140,000
▽	11	37,600	39,100	190,000
0	46	41,300	40,300	230,000

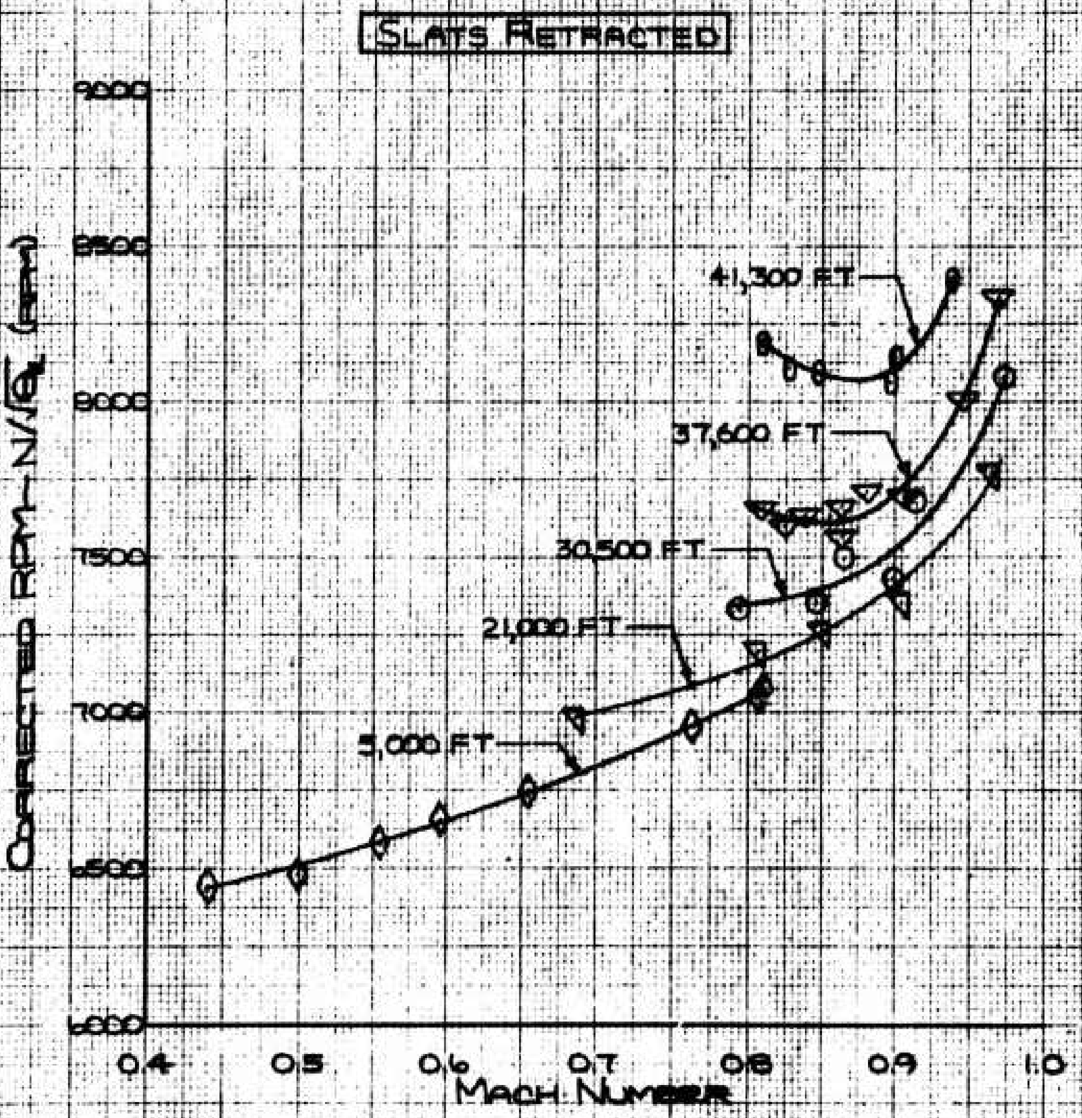


FIGURE 57. POWER REQUIRED

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
LOADING I: NO EXTERNAL STORES
CRUISE CONFIGURATION

SYMBOL	FLIGHT	ALTITUDE(FT)	WEIGHT(LB)	W/δ_a (LB)
◊	28	7,000	37,500	50,000
◁	43	22,000	36,700	85,000
○	43	31,000	40,100	140,000
◇	42	38,000	37,600	180,000
0	46	42,000	38,400	230,000

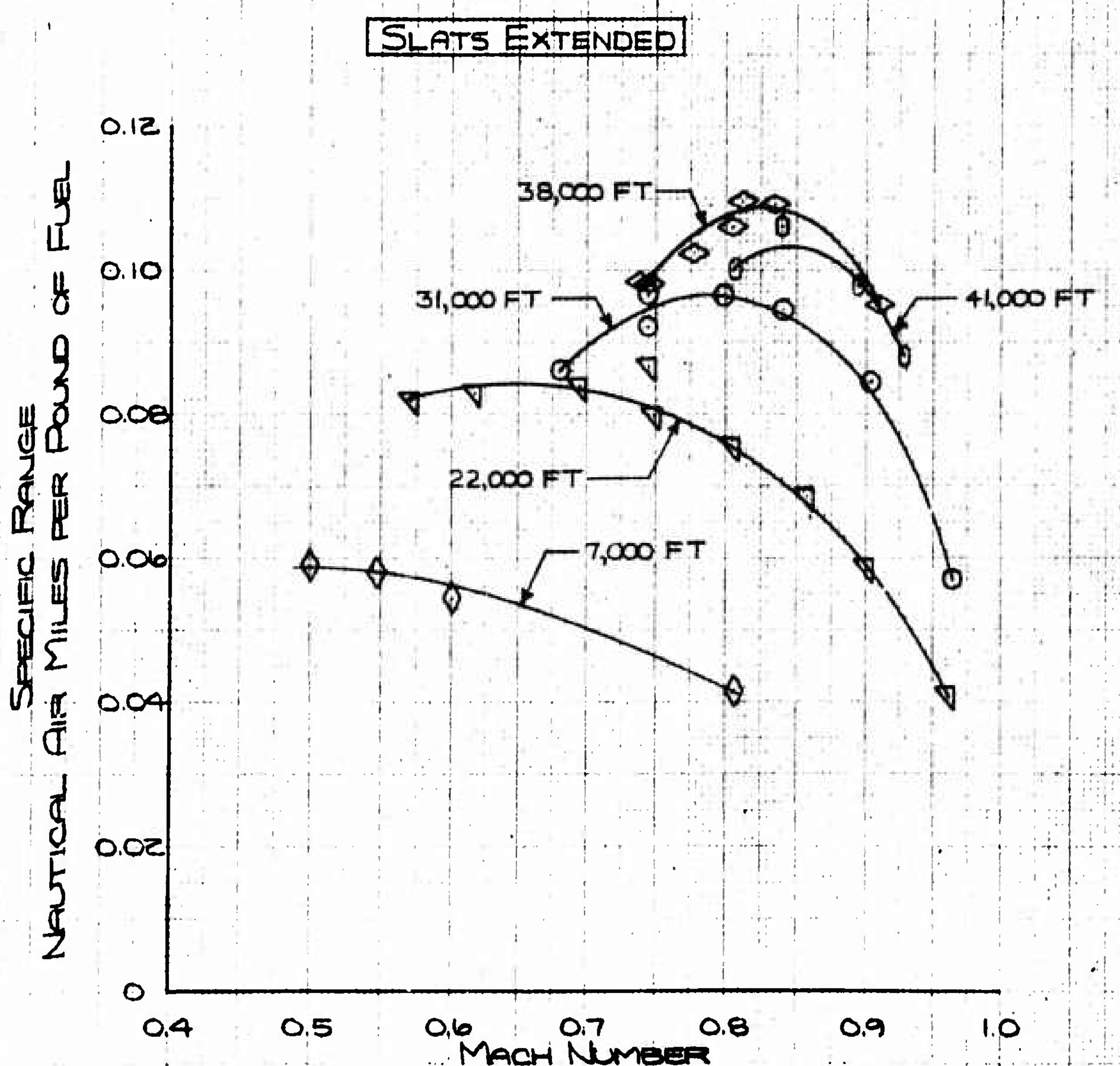


FIGURE 58 SPECIFIC RANGE

F-4E USAF S/N 66-287A
J79-GE-17 Engines
Loading I: No External Stores
Cruise Configuration

Symbol	Flight	Altitude (FT)	Weight (LB)	W/δ_a (LB)
◊	28	7,000	37,500	50,000
◁	43	22,000	36,700	85,000
O	43	31,000	40,100	140,000
◇	42	38,000	37,600	180,000
0	46	42,000	38,400	230,000

Slats Extended

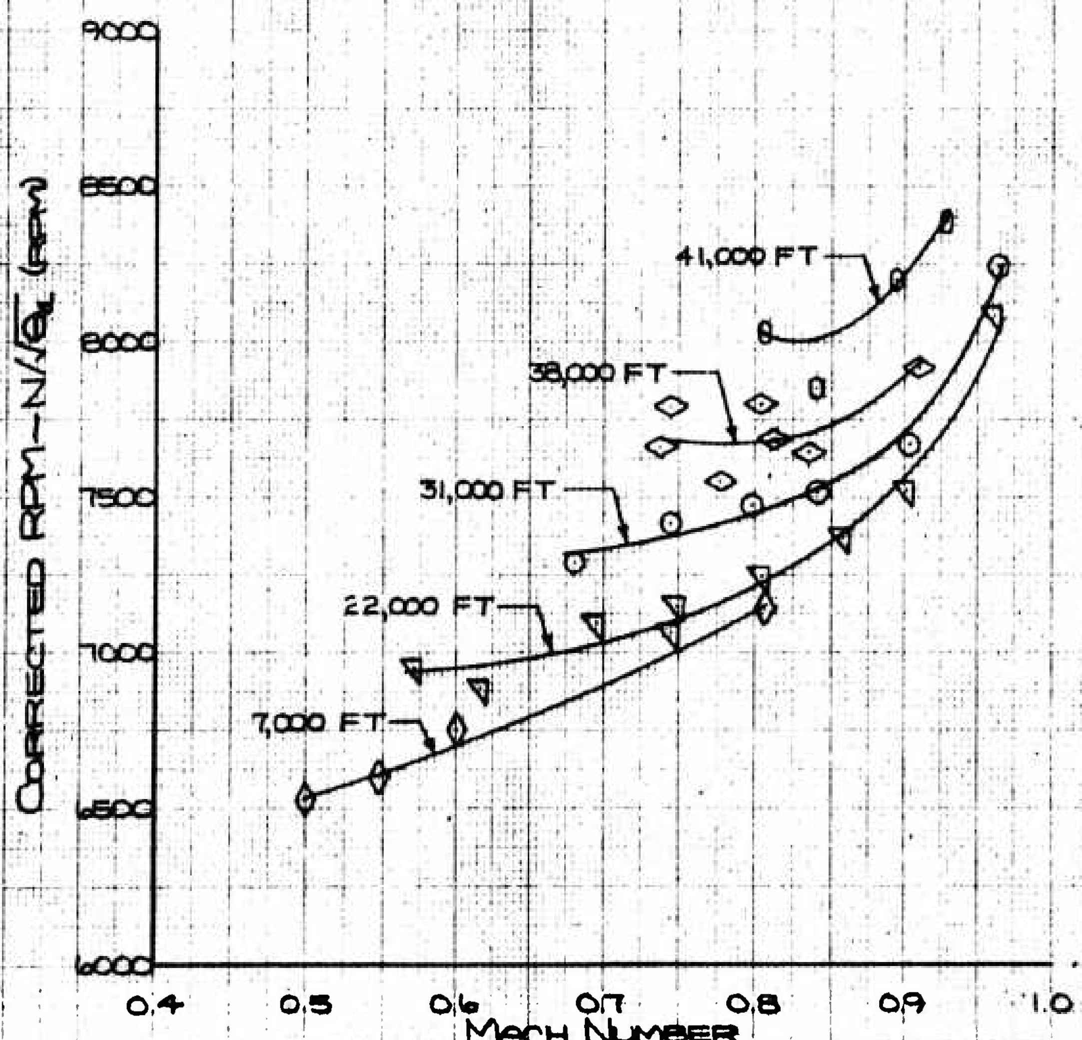


Figure 59 Power Required

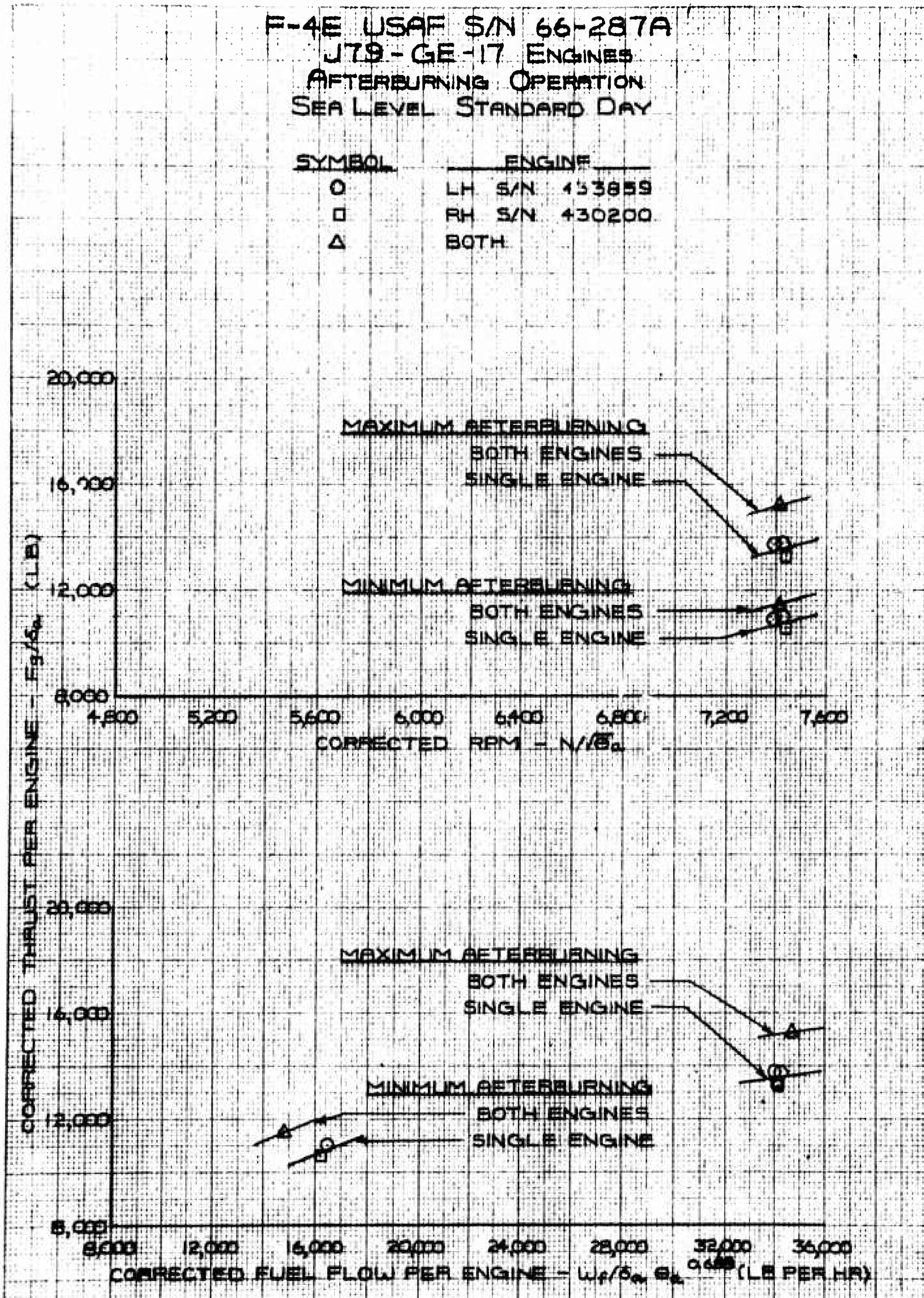


FIGURE 60 INSTALLED STATIC THRUST

"PRECEDING PAGE BLANK-NOT FILMED."

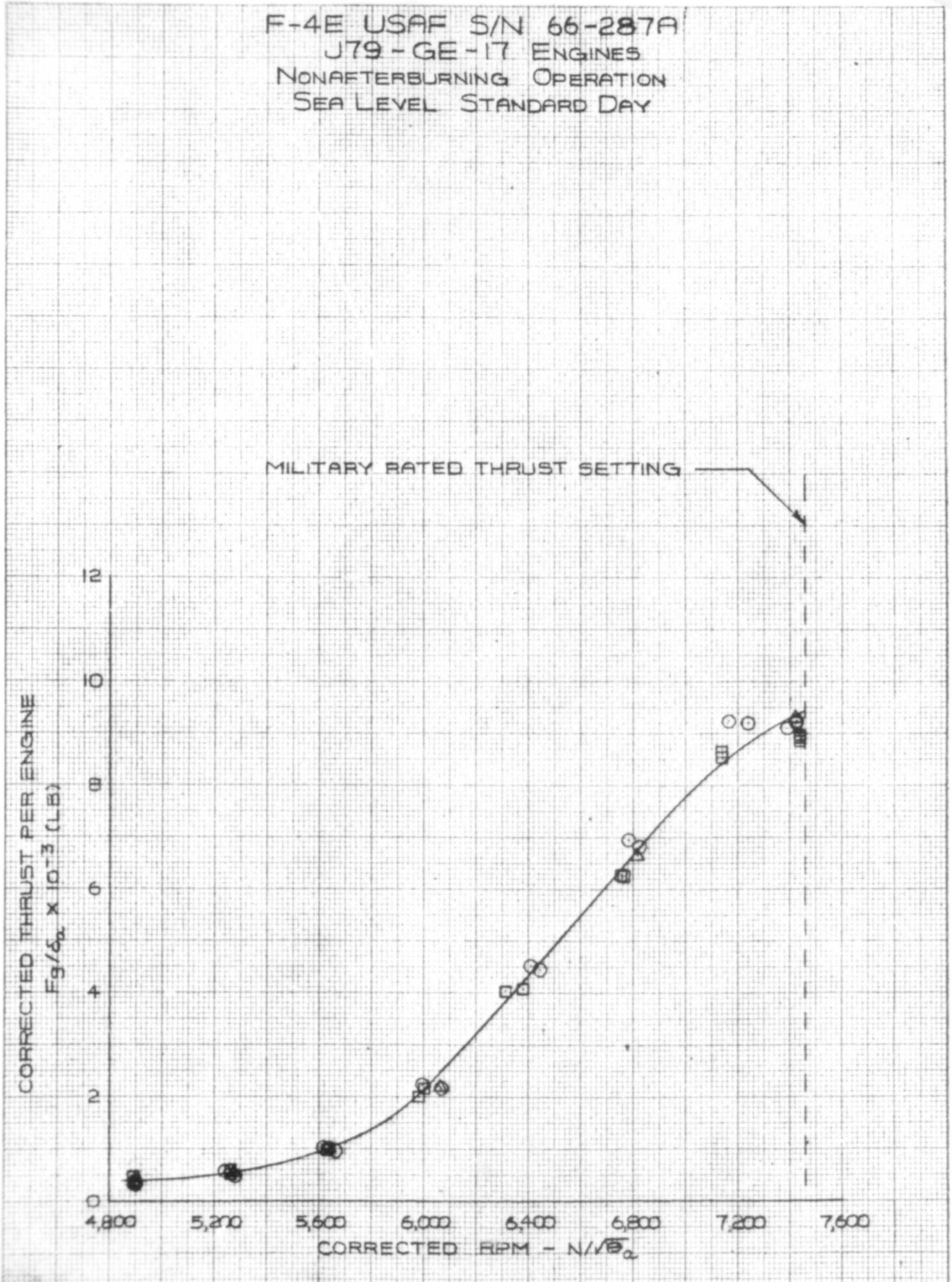


FIGURE 61 INSTALLED STATIC THRUST

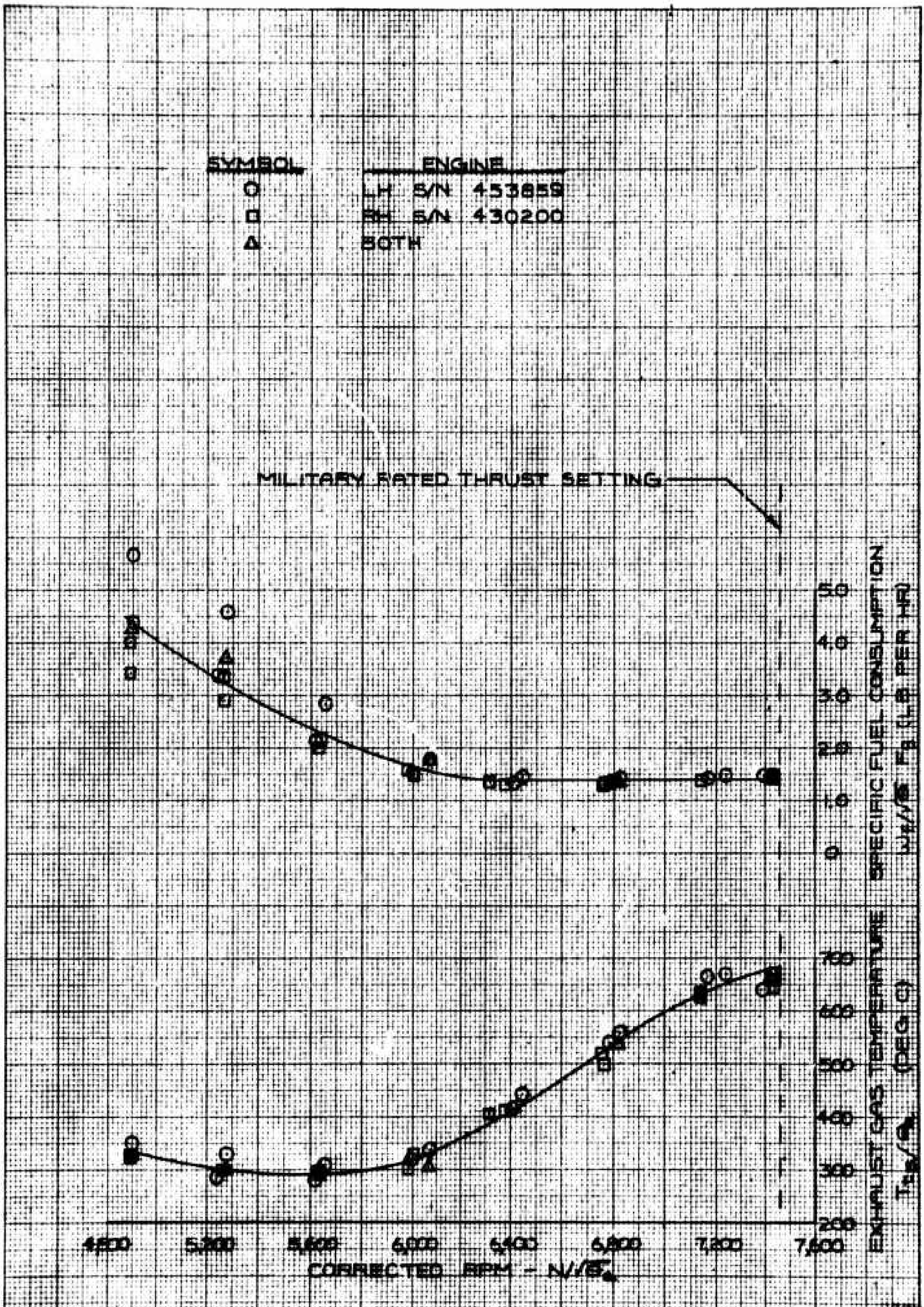


FIGURE 61 INSTALLED STATIC THRUST (CONCLUDED)

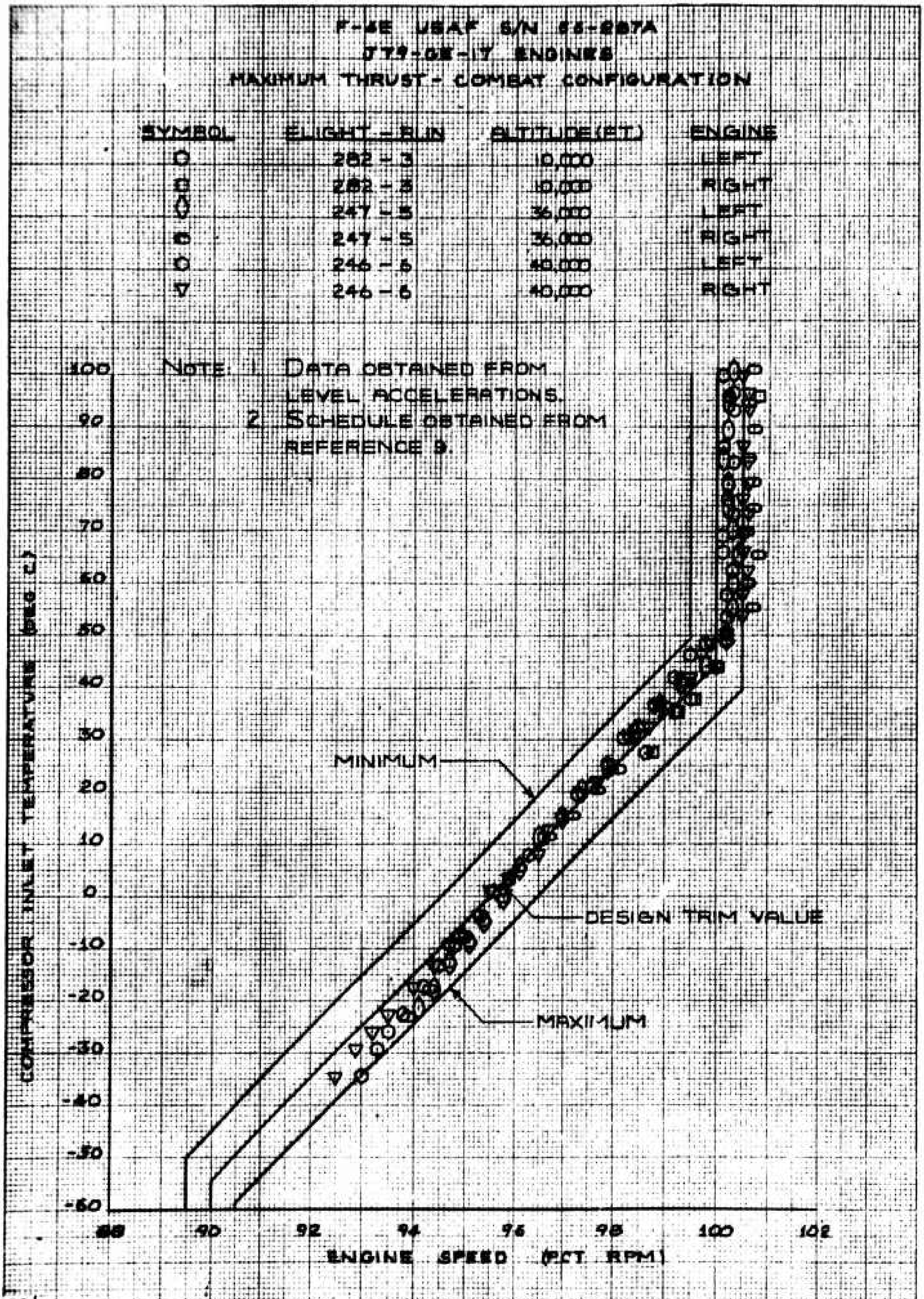


FIGURE 62. ENGINE SPEED SCHEDULE

F-4E USAF S/N 56-287A

J79-GE-17 ENGINES

MAXIMUM THRUST - COMBAT CONFIGURATION

SYMBOL	FLIGHT - RUN	ALTITUDE (FT.)	ENGINE
○	282 - 3	10,000	LEFT
□	282 - 3	10,000	RIGHT
◇	247 - 5	36,000	LEFT
▭	247 - 5	36,000	RIGHT
⬡	246 - 6	40,000	LEFT
▽	246 - 6	40,000	RIGHT

NOTE: 1. DATA OBTAINED FROM LEVEL ACCELERATIONS.
2. SCHEDULE OBTAINED FROM REFERENCE 9.

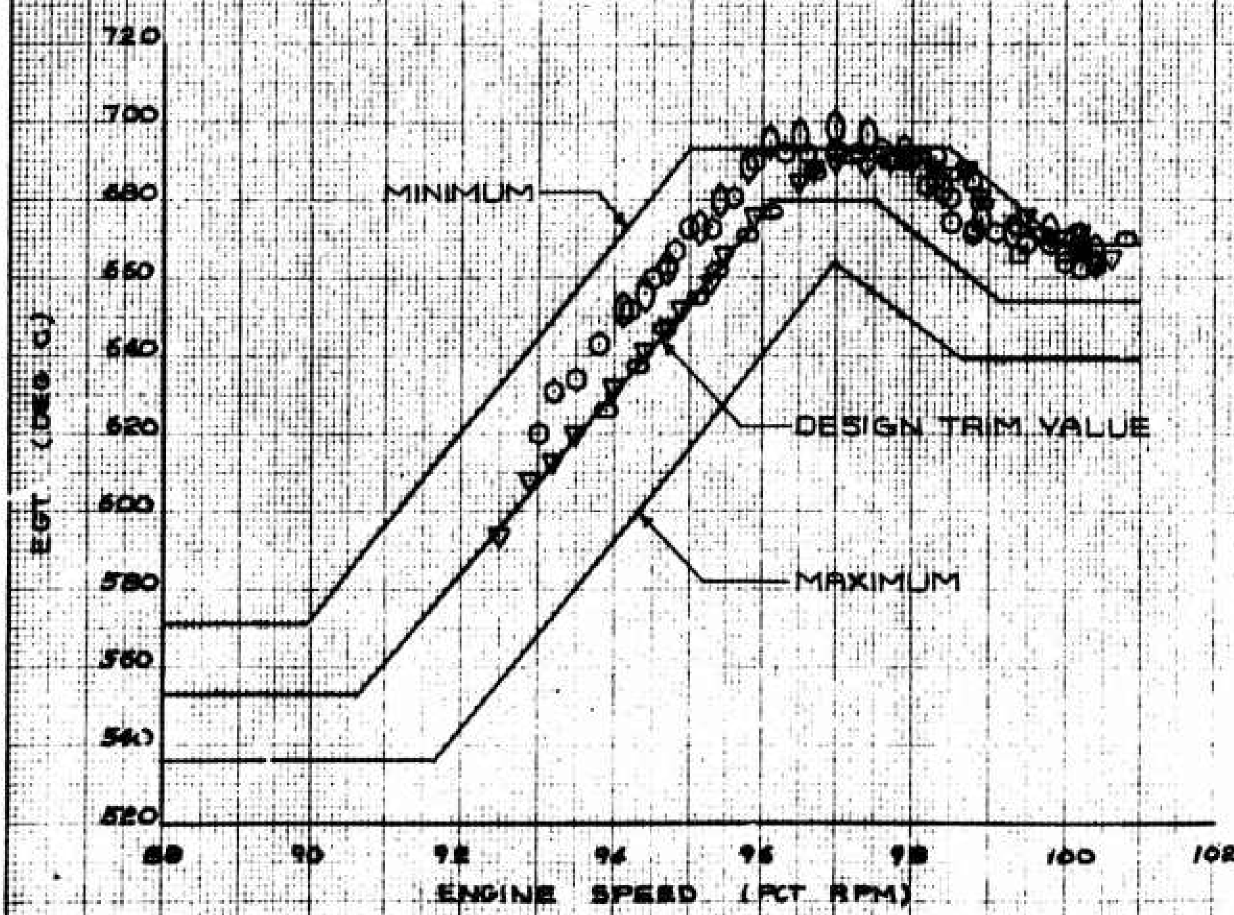


FIGURE 63 EGT SCHEDULE

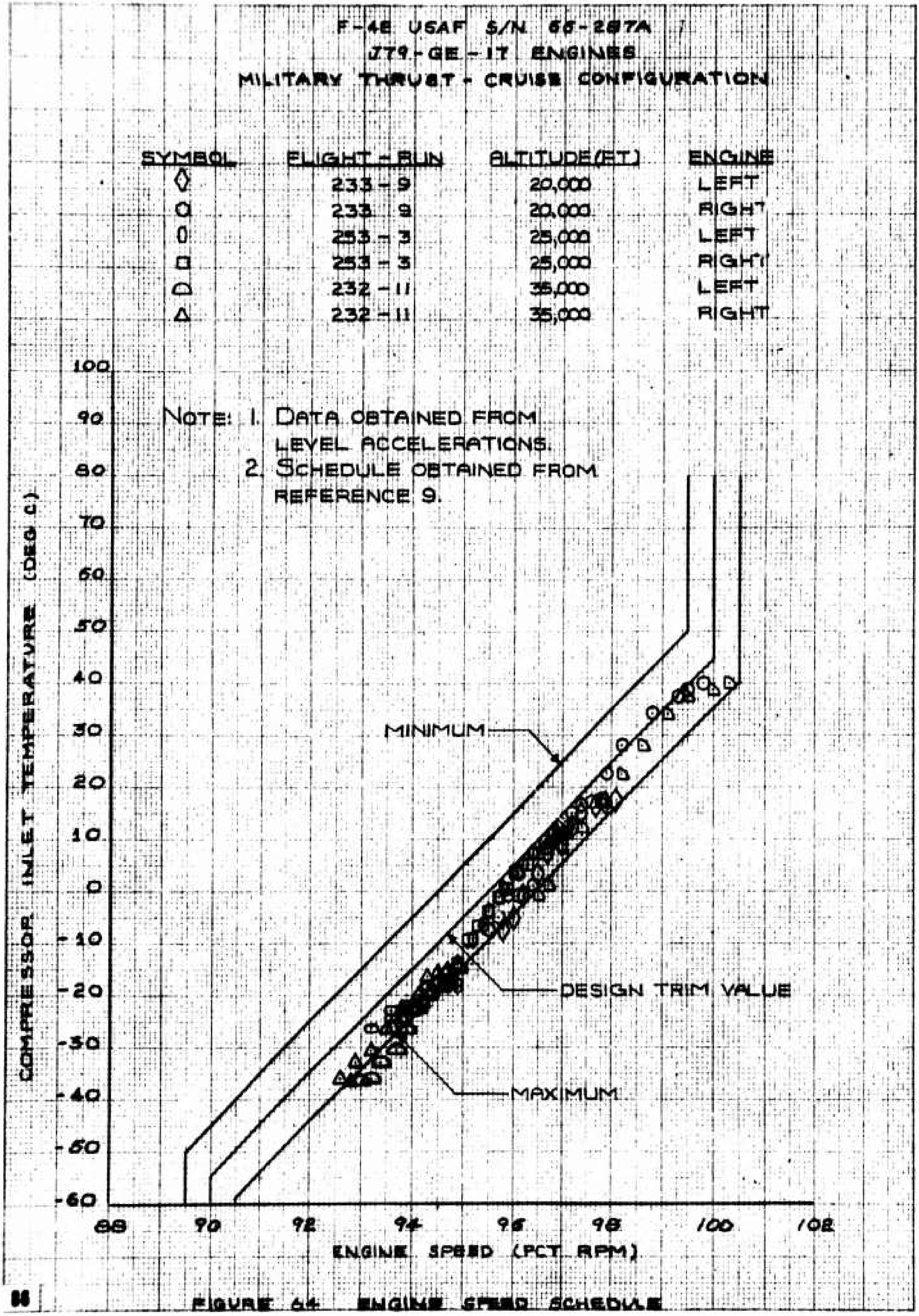


FIGURE 64 ENGINE SPEED SCHEDULE

F-4E USAF S/N 66-287A
J79-GE-17 ENGINES
MILITARY THRUST - CRUISE CONFIGURATION

SYMBOL	FLIGHT - RUN	ALTITUDE (FT)	ENGINE
◘	241 - 9	10,000	LEFT
○	241 - 9	10,000	RIGHT
◊	233 - 9	20,000	LEFT
◊	233 - 9	20,000	RIGHT
◘	253 - 3	25,000	LEFT
□	253 - 3	25,000	RIGHT
△	232 - 11	35,000	LEFT
△	232 - 11	35,000	RIGHT
△	236 - 6	40,000	LEFT
⊖	236 - 6	40,000	RIGHT

NOTE: 1. DATA OBTAINED FROM LEVEL ACCELERATIONS.
2. SCHEDULE OBTAINED FROM REFERENCE 9.

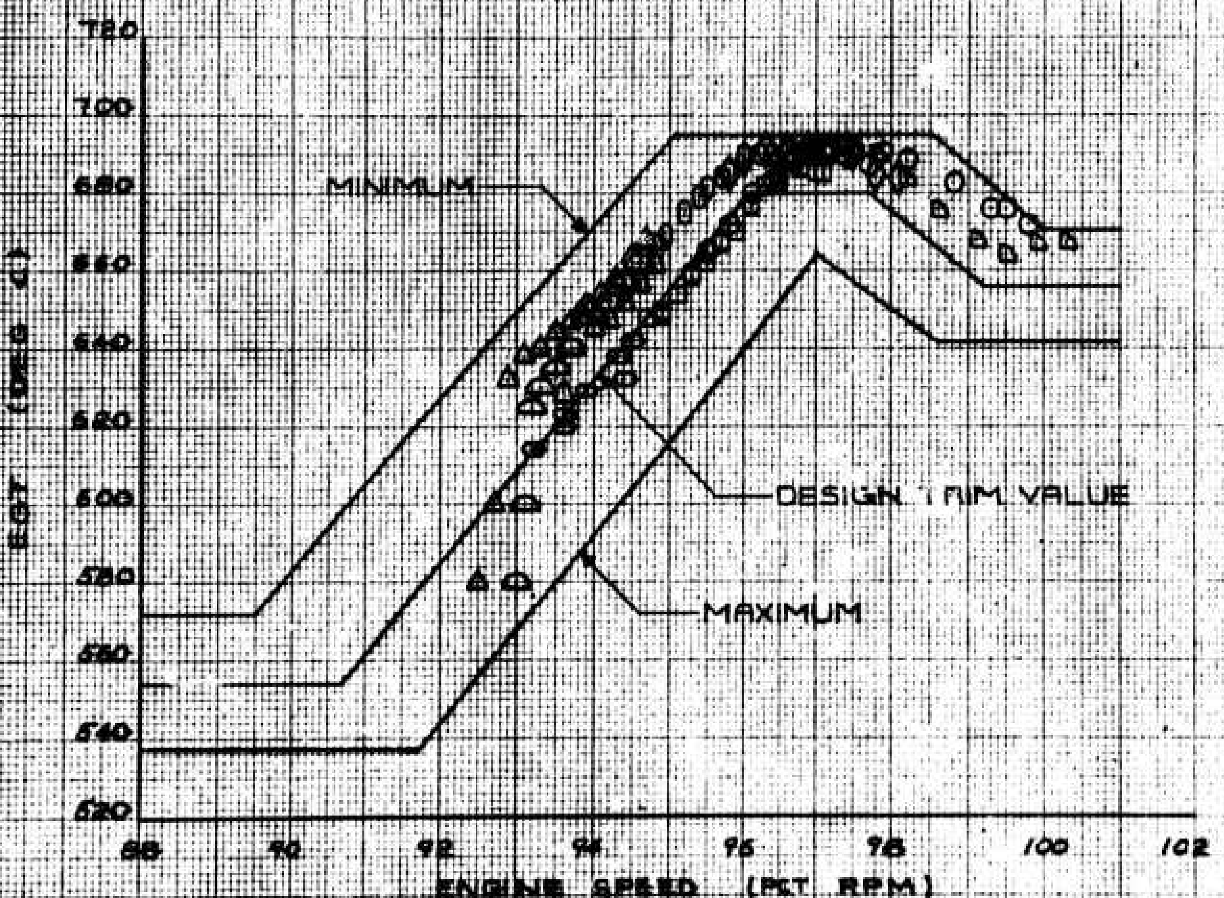


FIGURE 65 EGT SCHEDULE

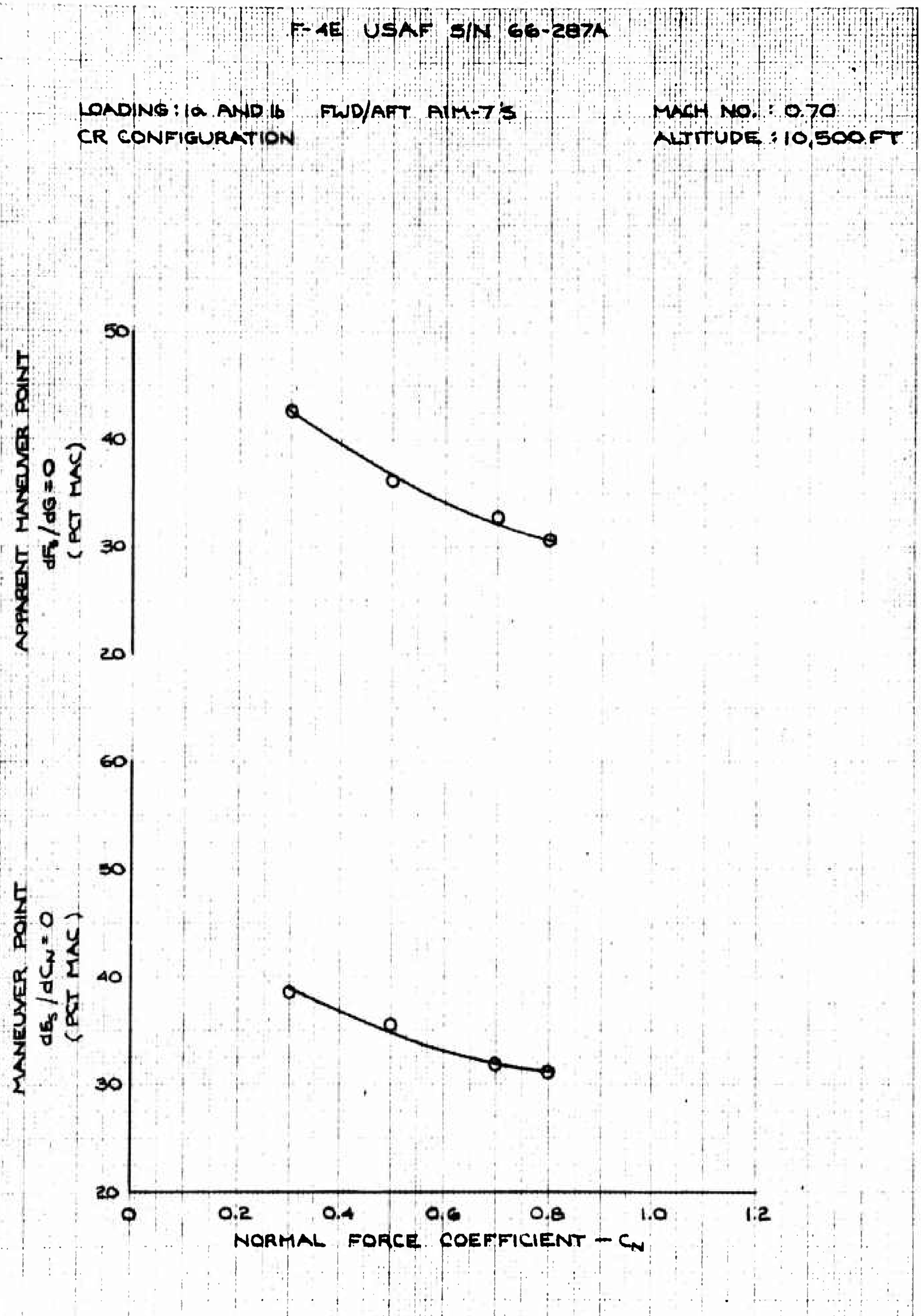


 FIGURE 66 MANEUVER POINTS

F-4E USAF S/N 66-287A

LOADING: 1a AND 1b FWD/AFT
CR CONFIGURATION

MACH NO: 0.85
ALTITUDE: 10,300 FT

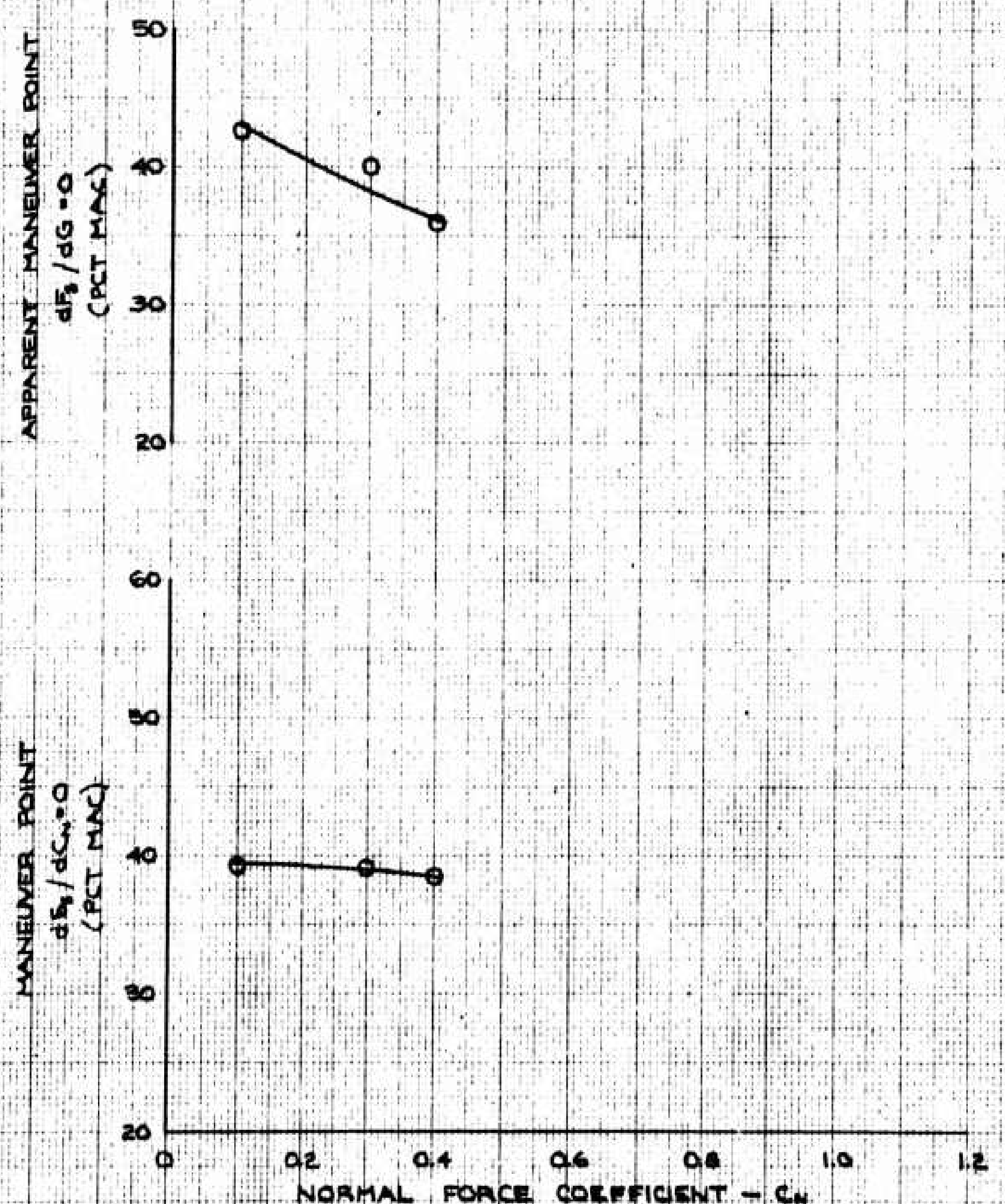


FIGURE 67 MANEUVER POINTS

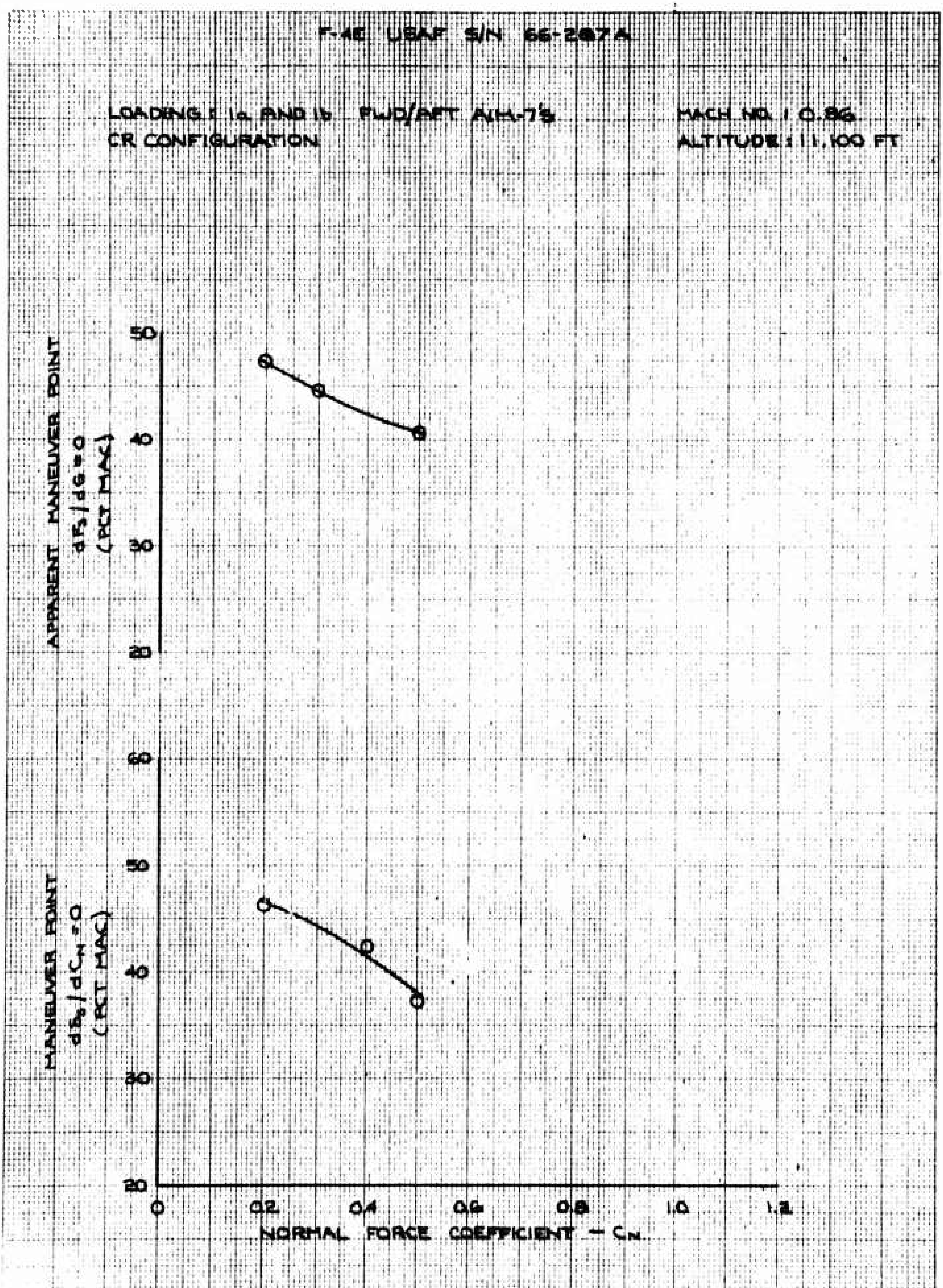


 FIGURE 68 MANEUVER POINTS

F-4E USAF S/N 66-287A

LOADING: 1a AND 1b FWD/AFT AIM-7'S
CR CONFIGURATION

MACH NO.: 0.91
ALTITUDE: 10,600 FT

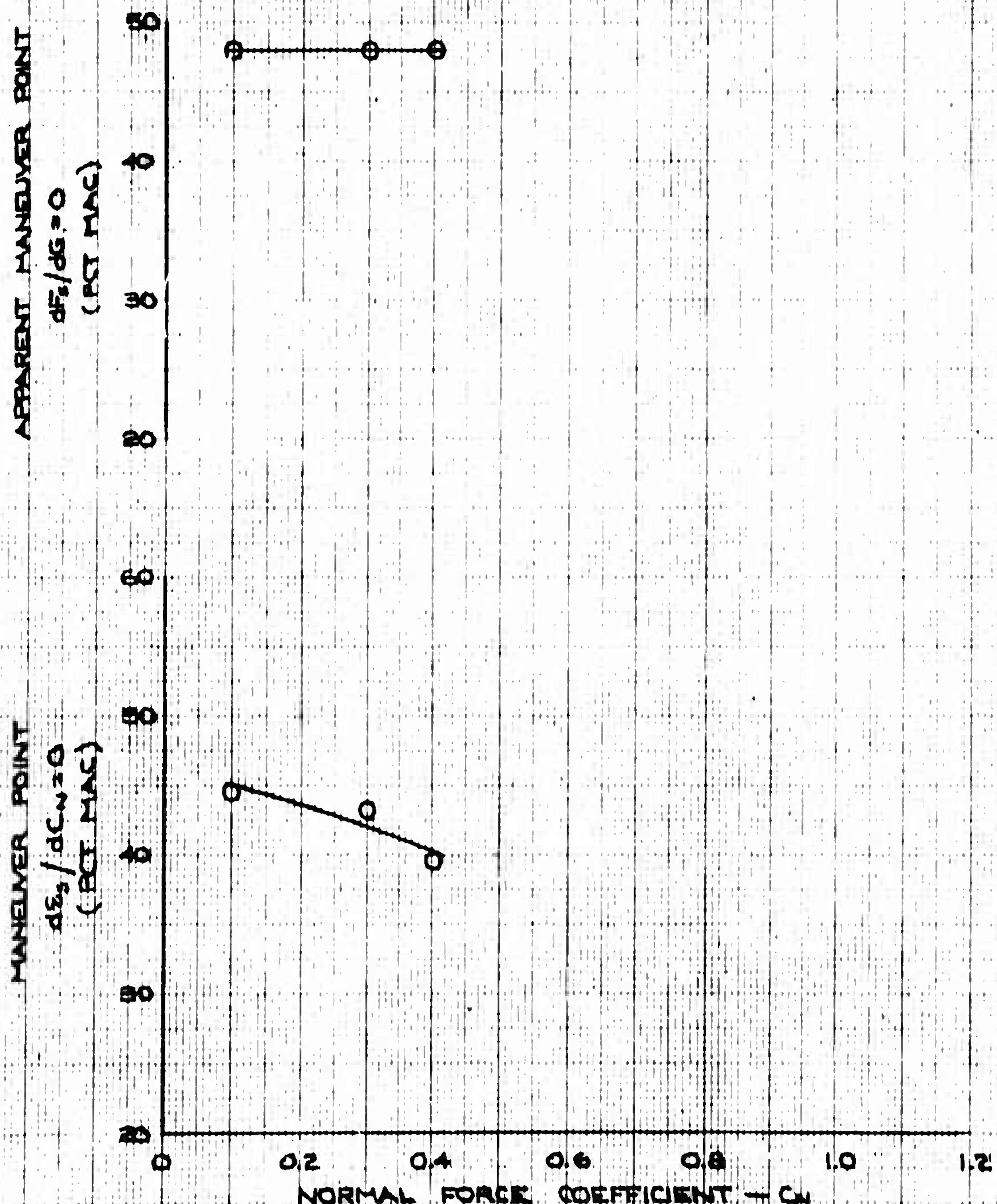


FIGURE 69 MANEUVER POINTS

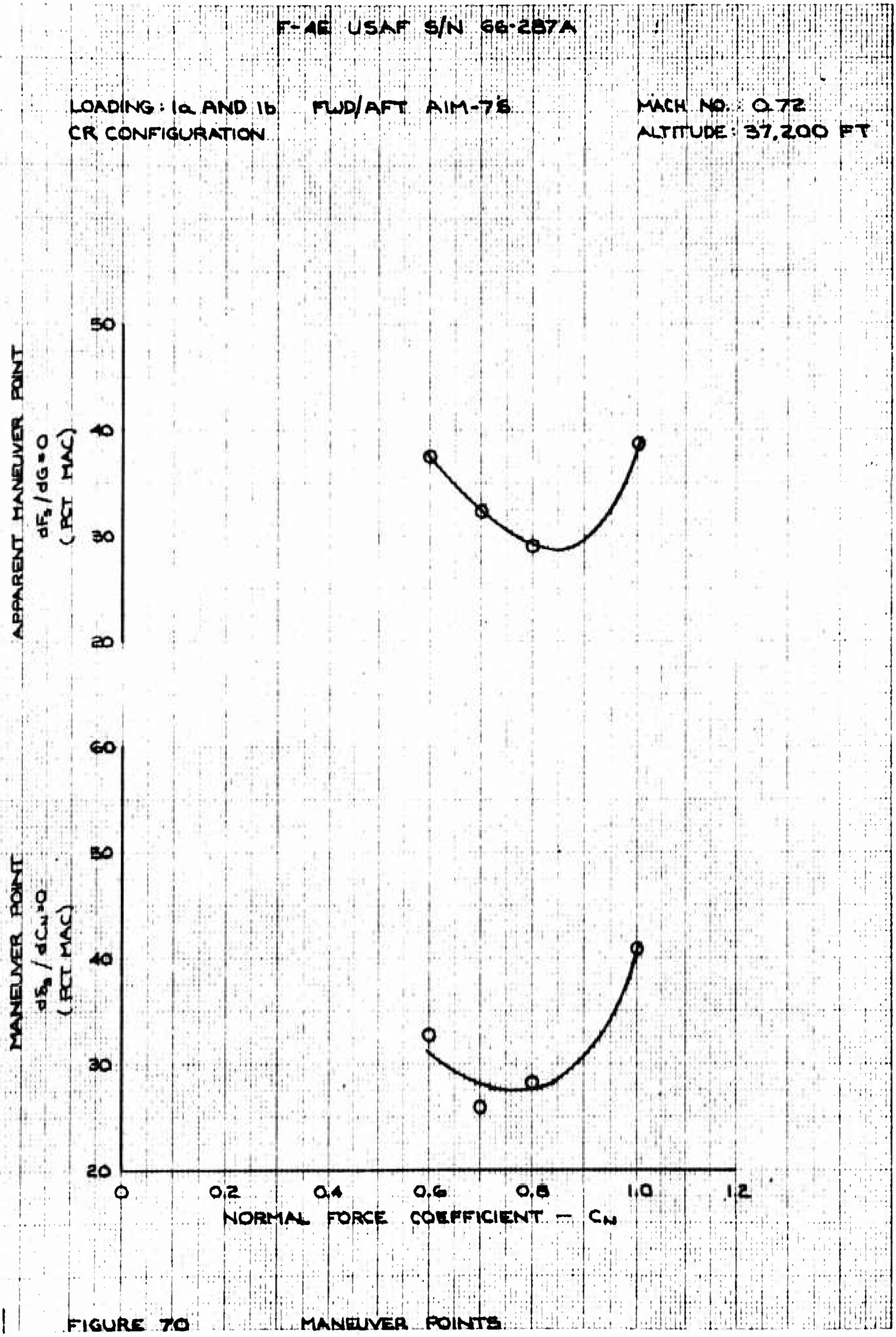


FIGURE 70 MANEUVER POINTS

F-4E USAF S/N 66-2[illegible]7A

LOADING: 1a AND 1b FWD/AFT AIM-7E
CO CONFIGURATION

MACH NO.: 0.82
ALTITUDE: 36,200 FT

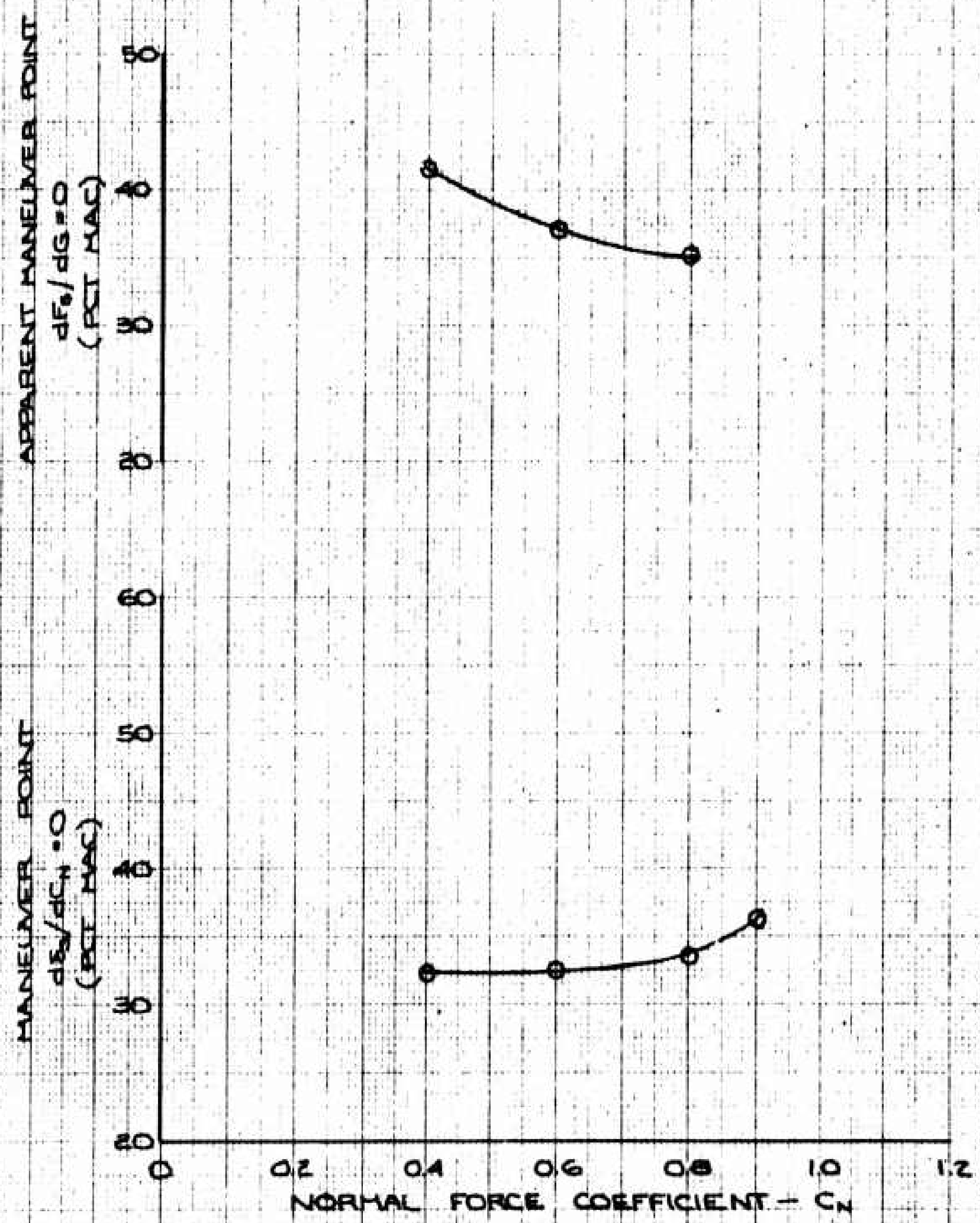


FIGURE 71 MANEUVER POINTS

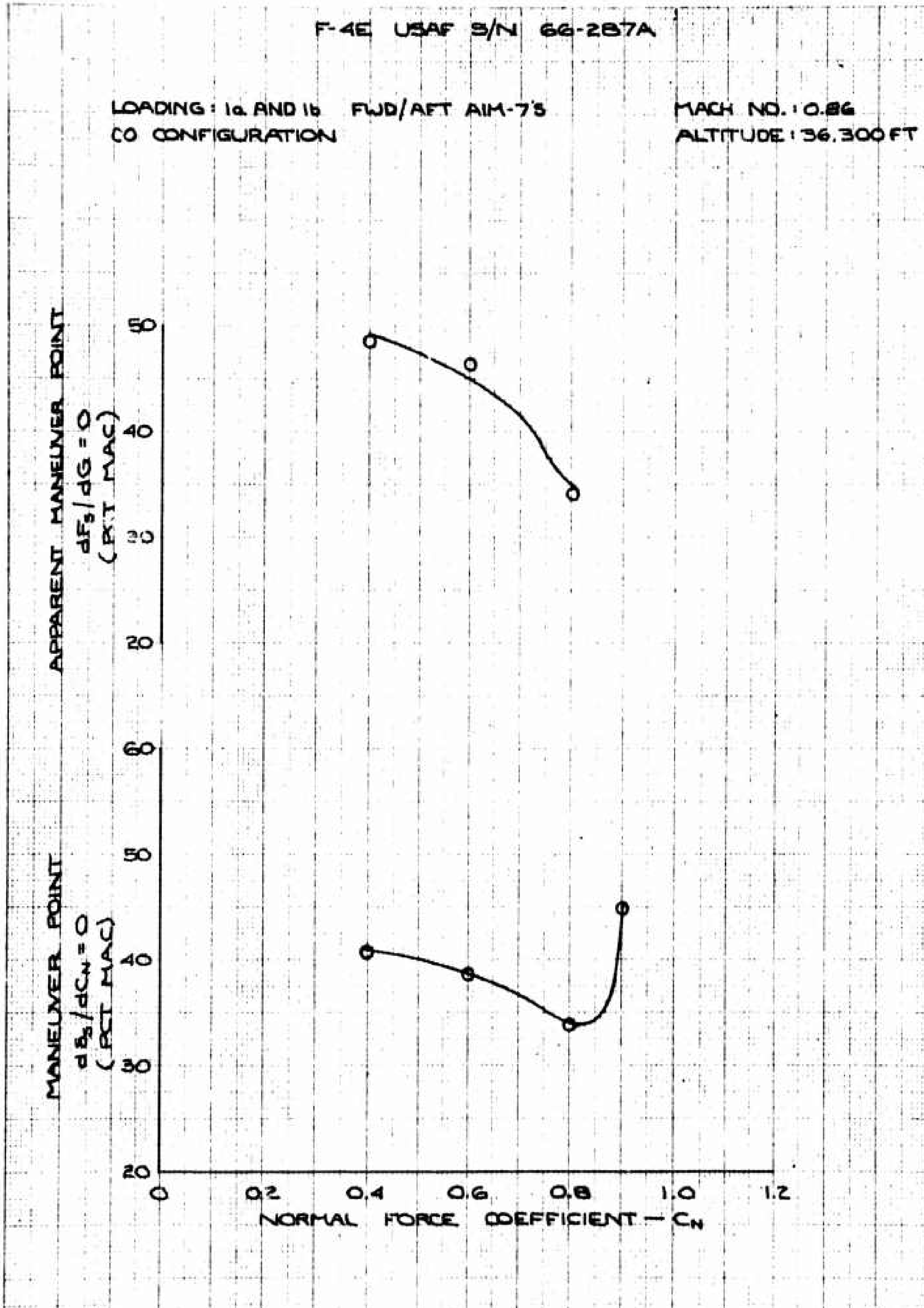


FIGURE 72 MANEUVER POINTS

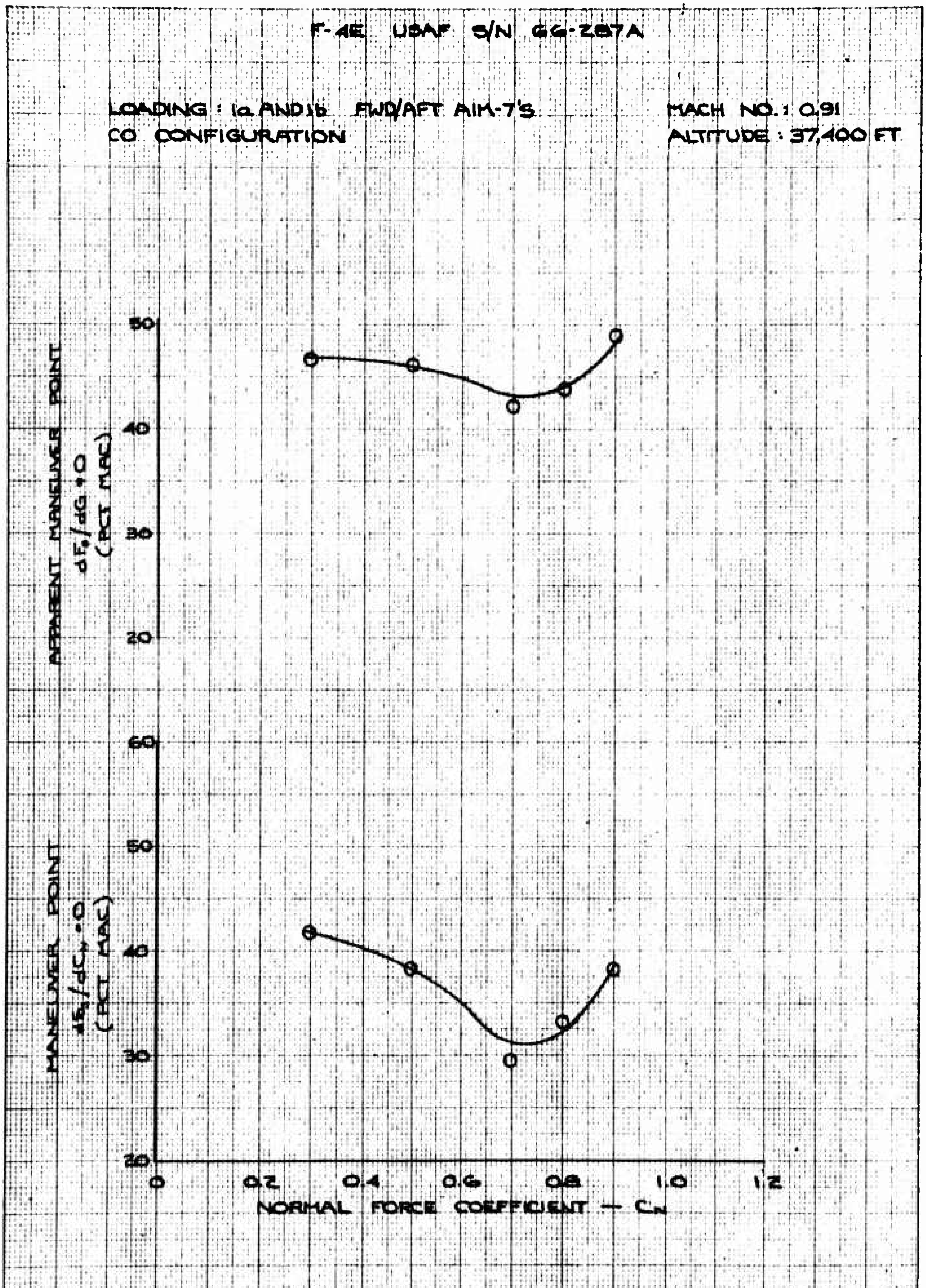


FIGURE 73 MANEUVER POINTS

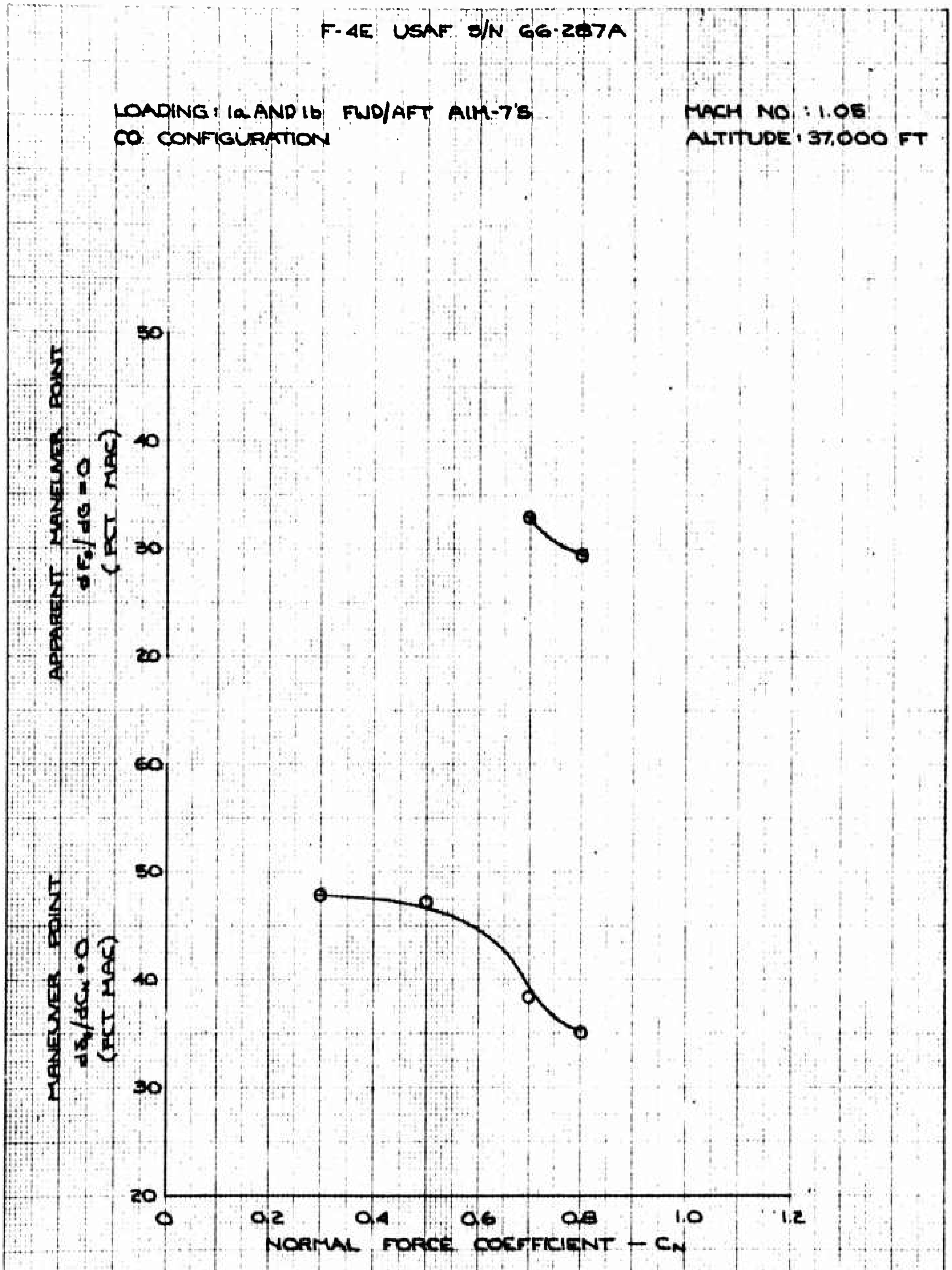


FIGURE 74 MANEUVER POINTS

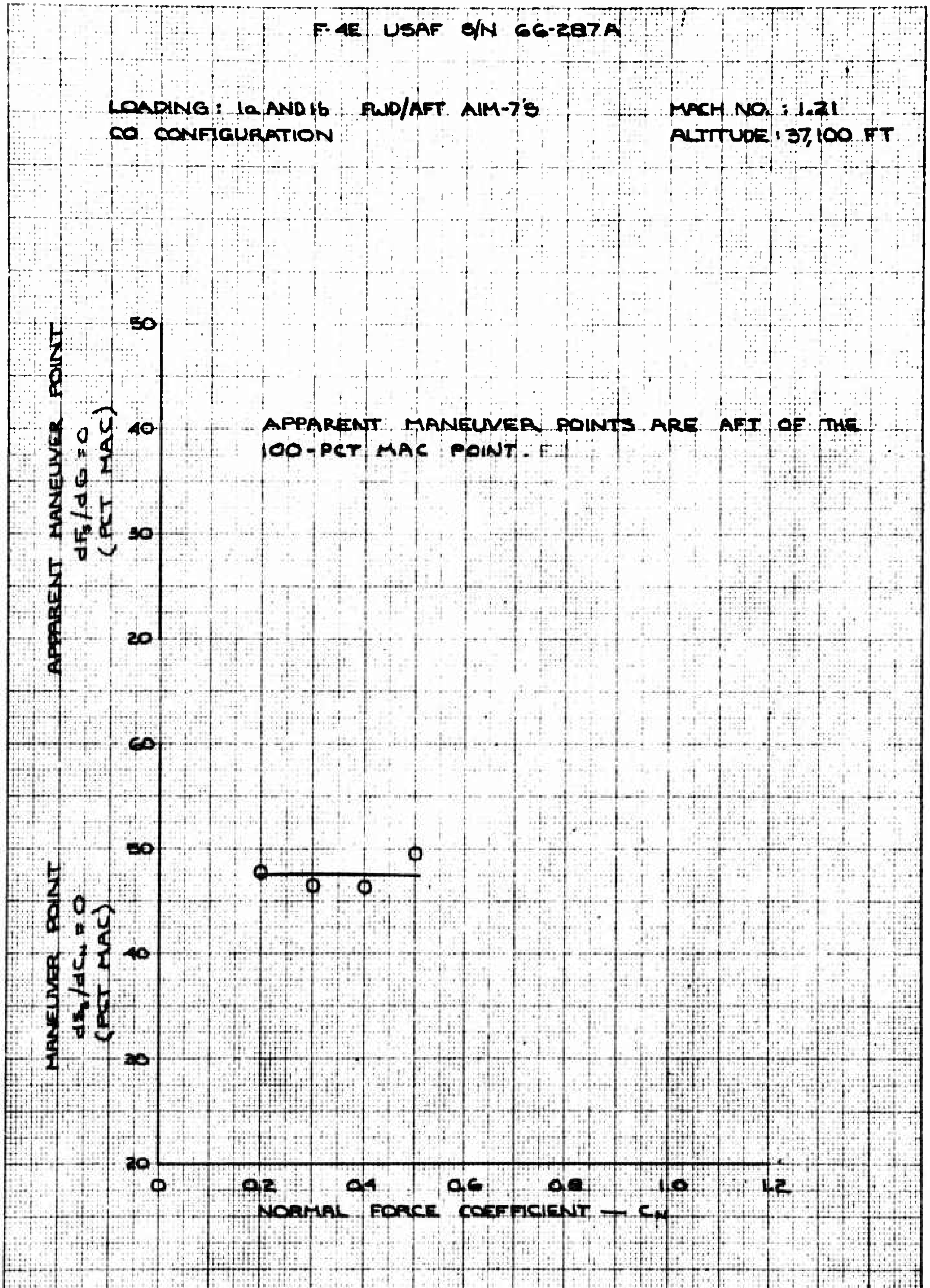


FIGURE 75 MANEUVER POINTS

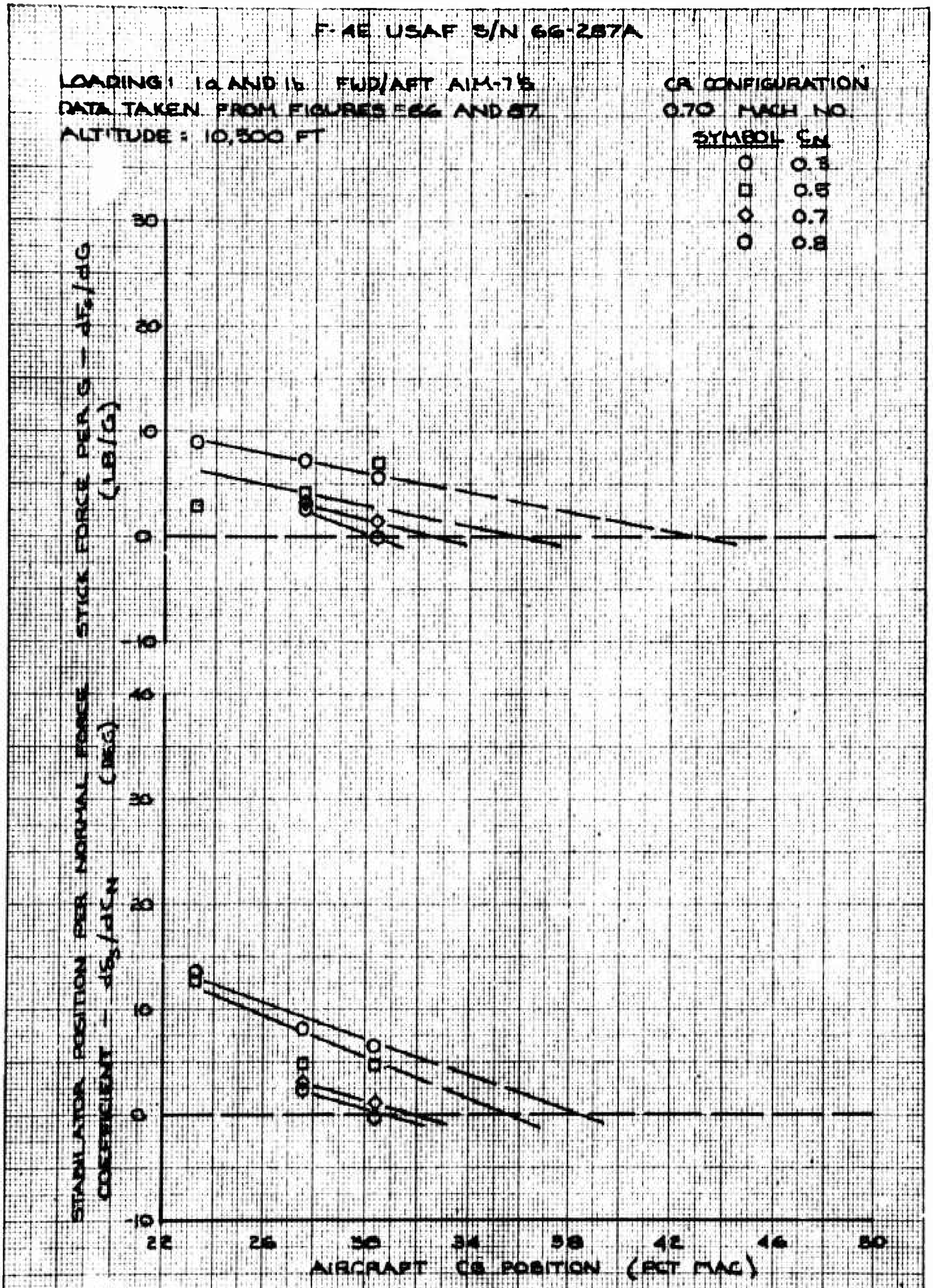


FIGURE 76 MANEUVER POINT DETERMINATION

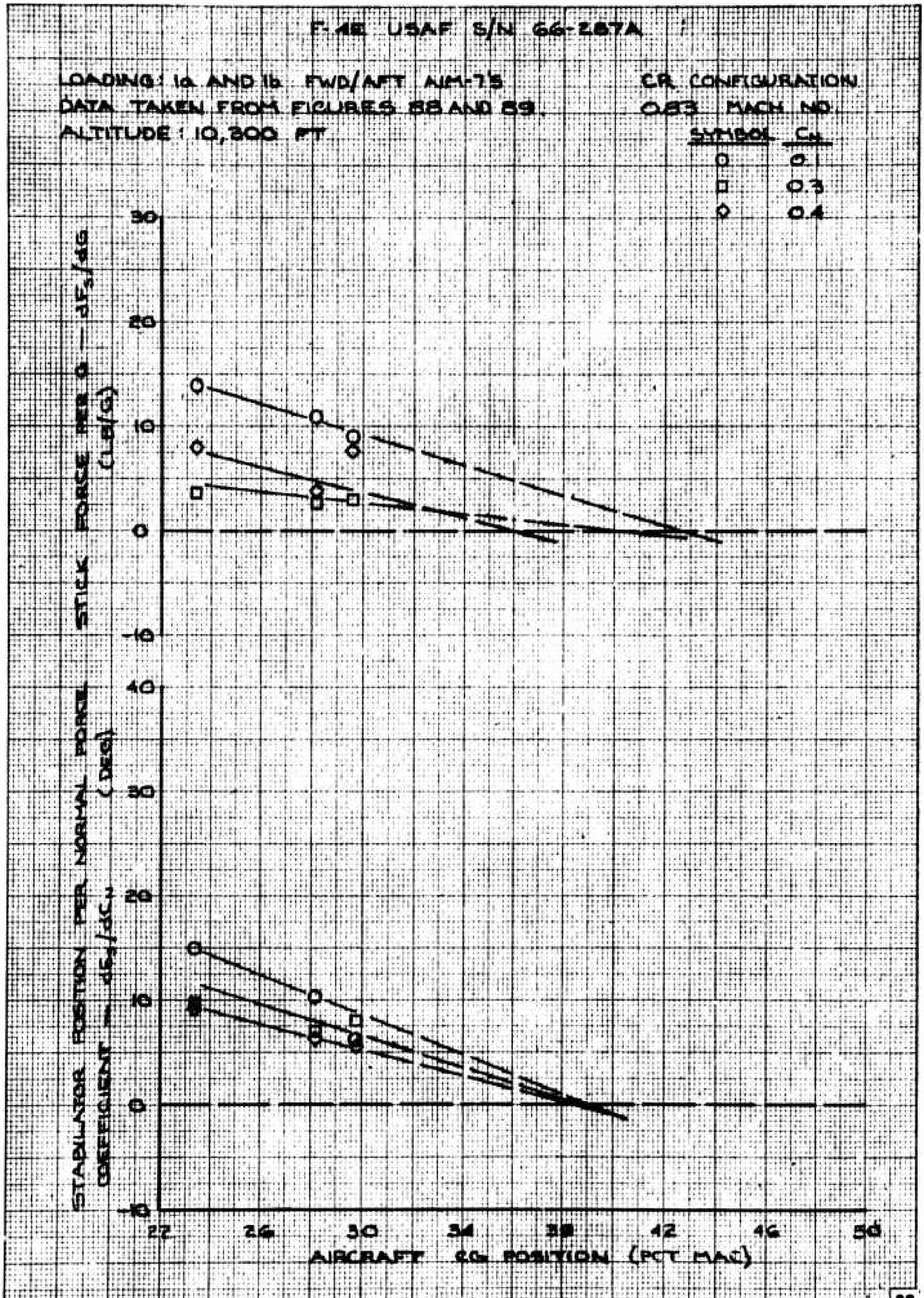


FIGURE 77 MANEUVER POINT DETERMINATION

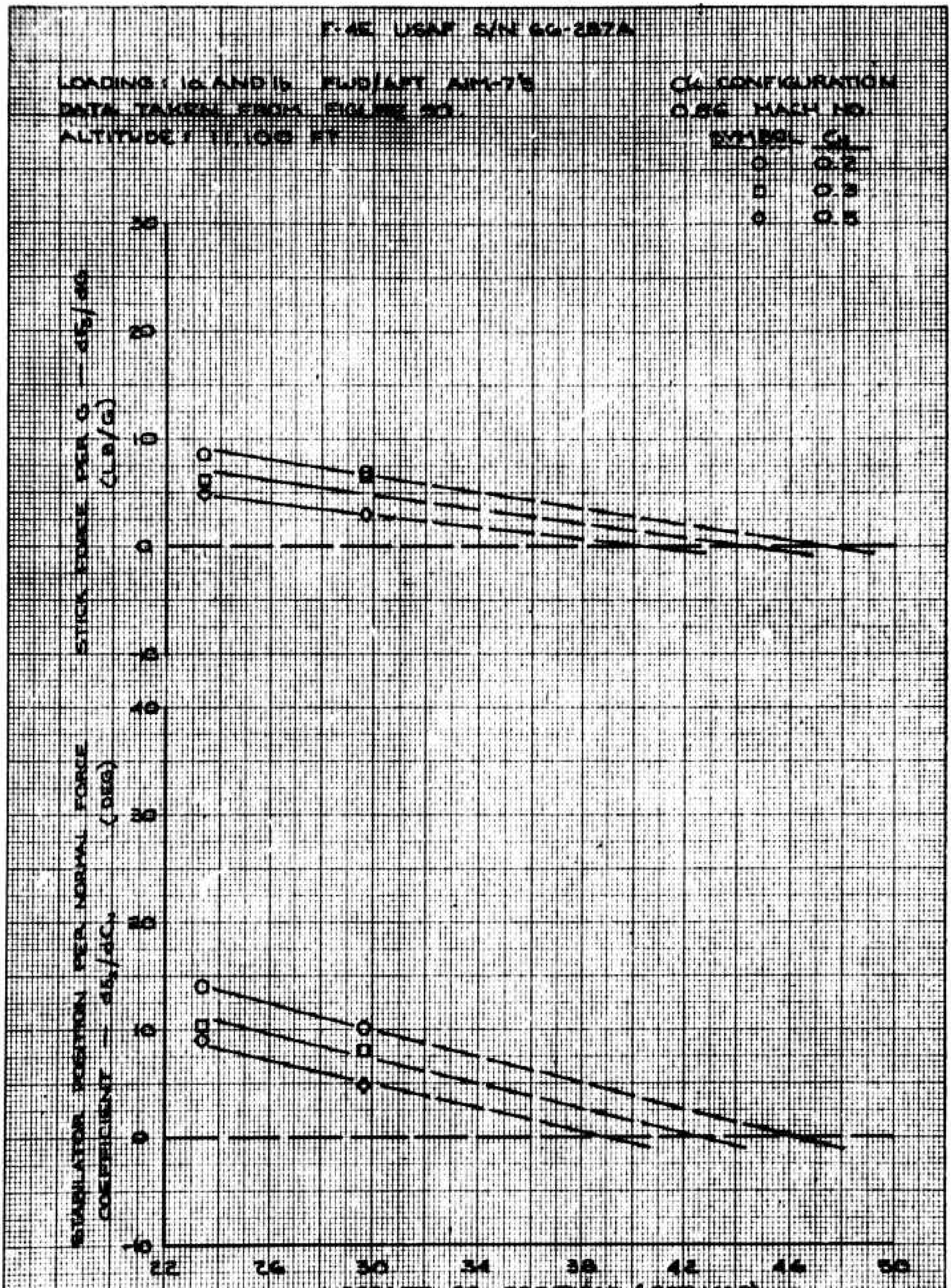


FIGURE 78 MANEUVER POINT DETERMINATION

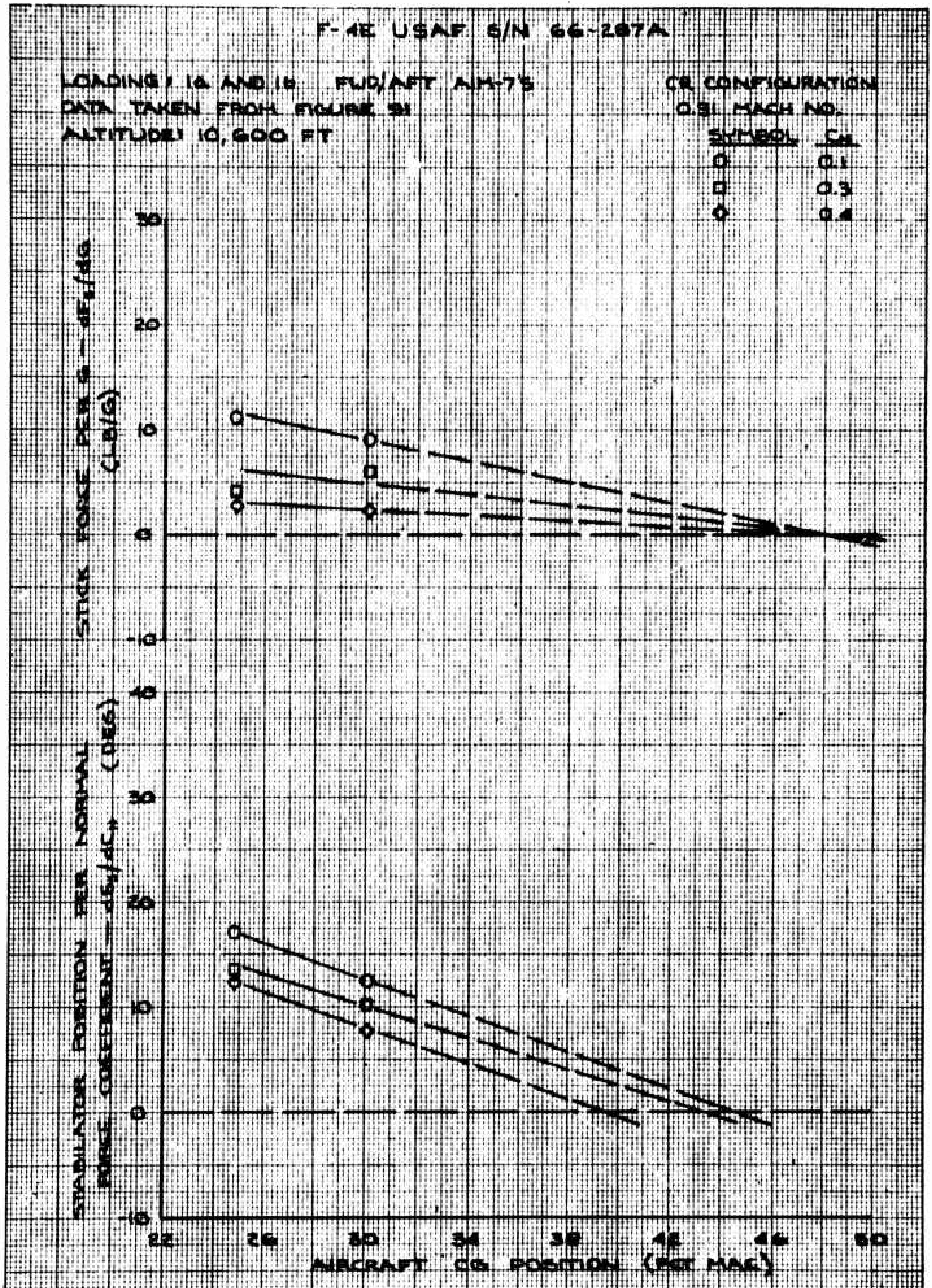


FIGURE 79 MANEUVER POINT DETERMINATION

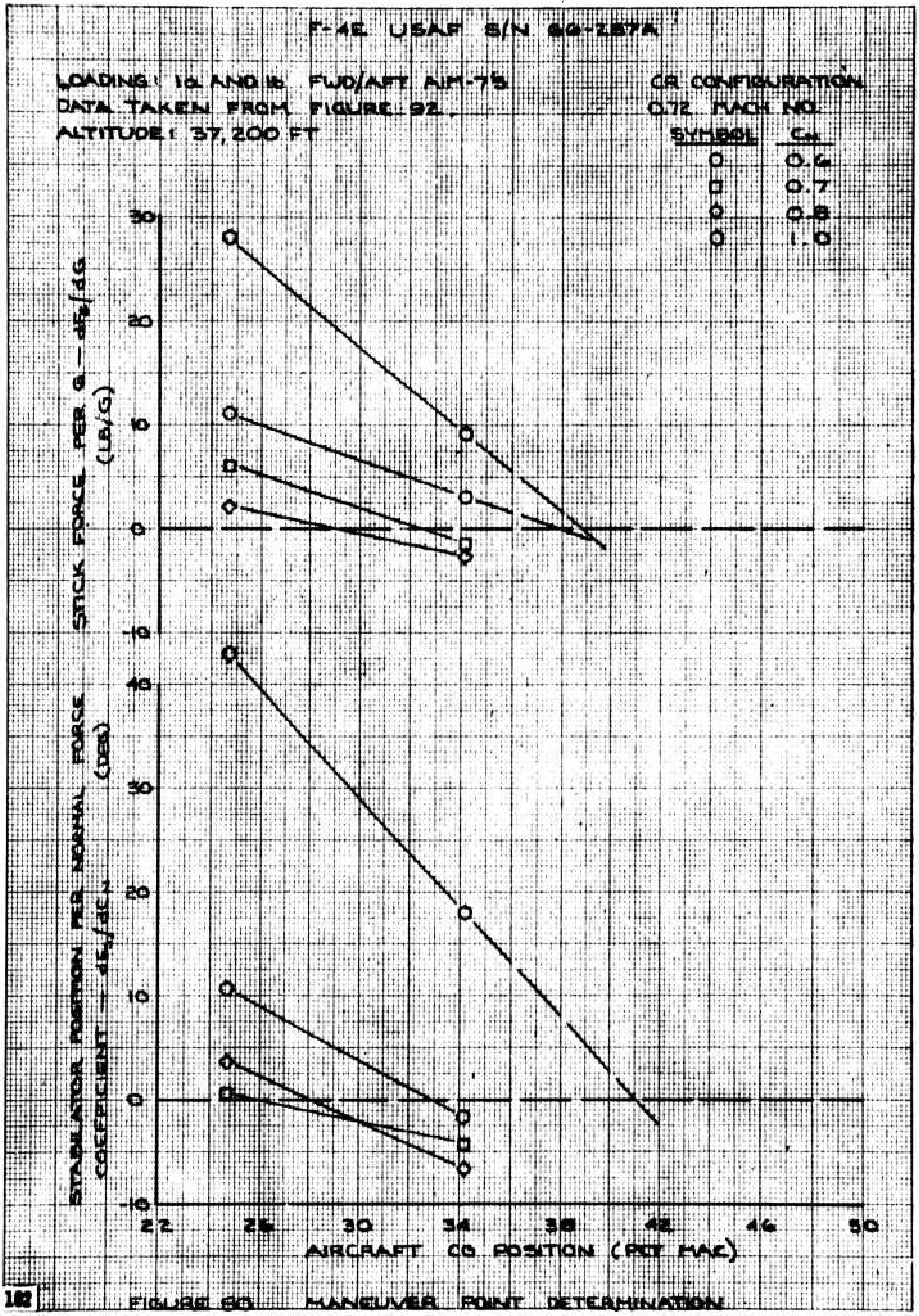


FIGURE 93 MANEUVER POINT DETERMINATION

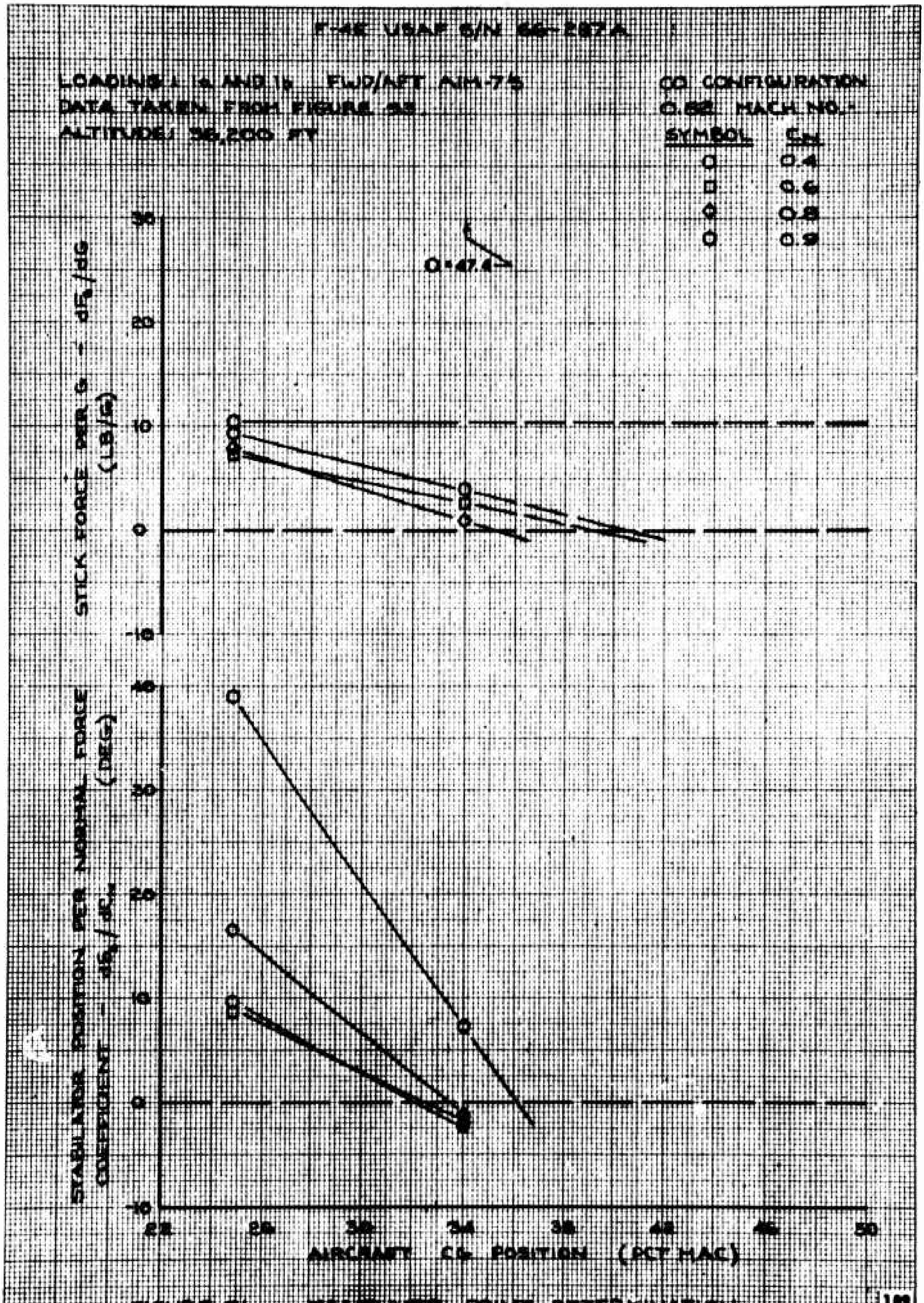


FIGURE 61 MANEUVER POINT DETERMINATION

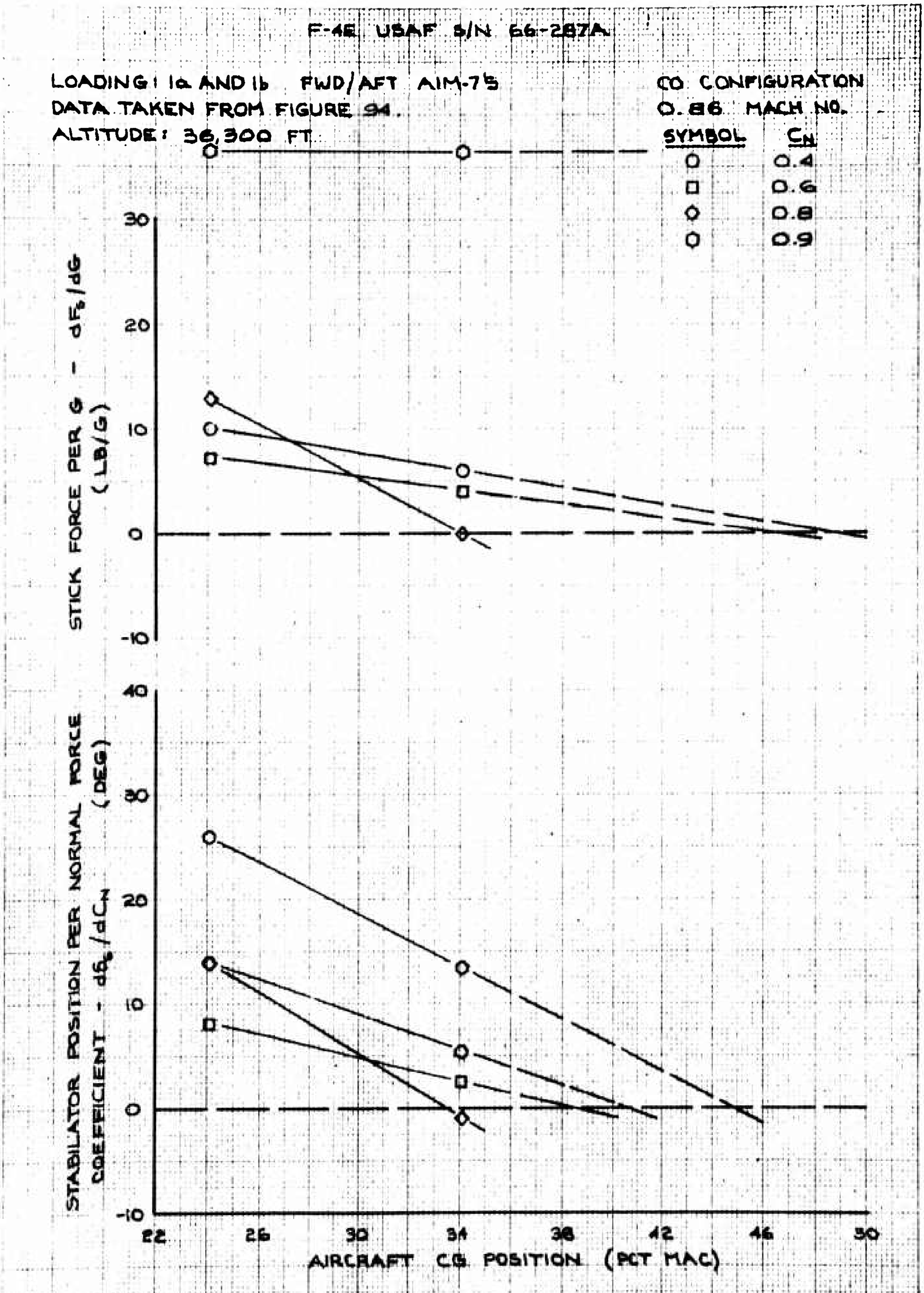


FIGURE 82 MANEUVER POINT DETERMINATION

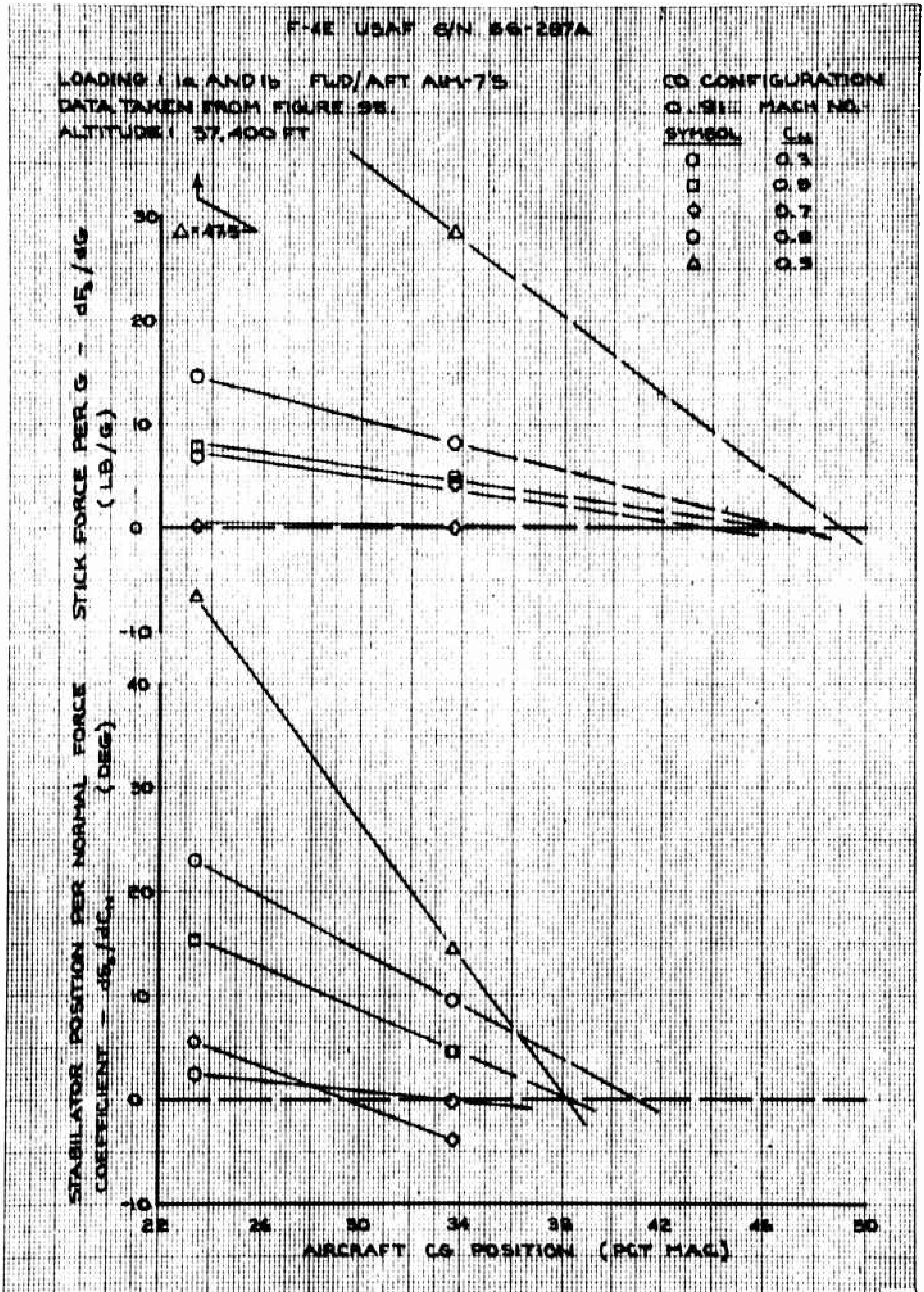


FIGURE 83 MANEUVER POINT DETERMINATION

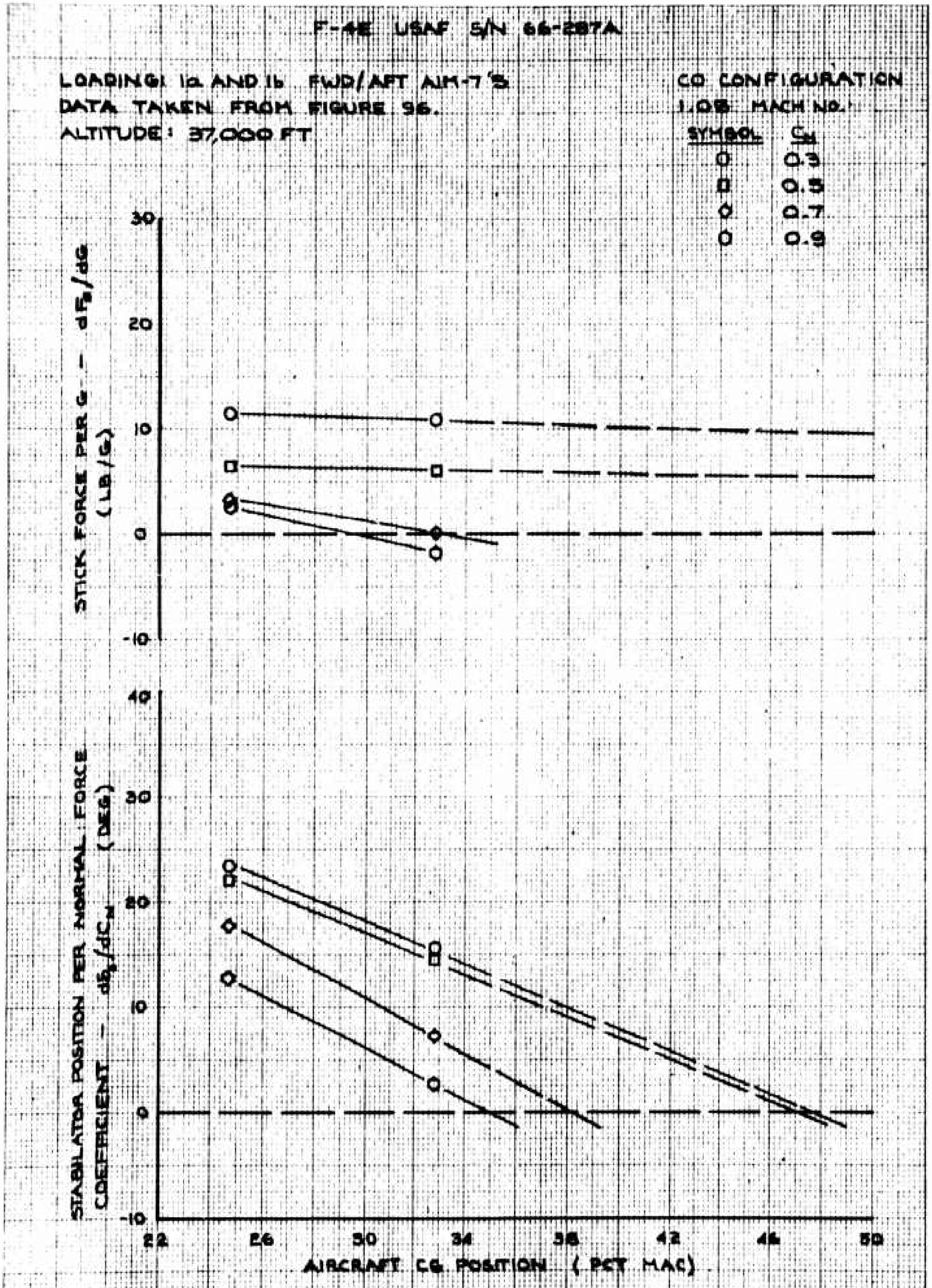


FIGURE 84 MANEUVER POINT DETERMINATION

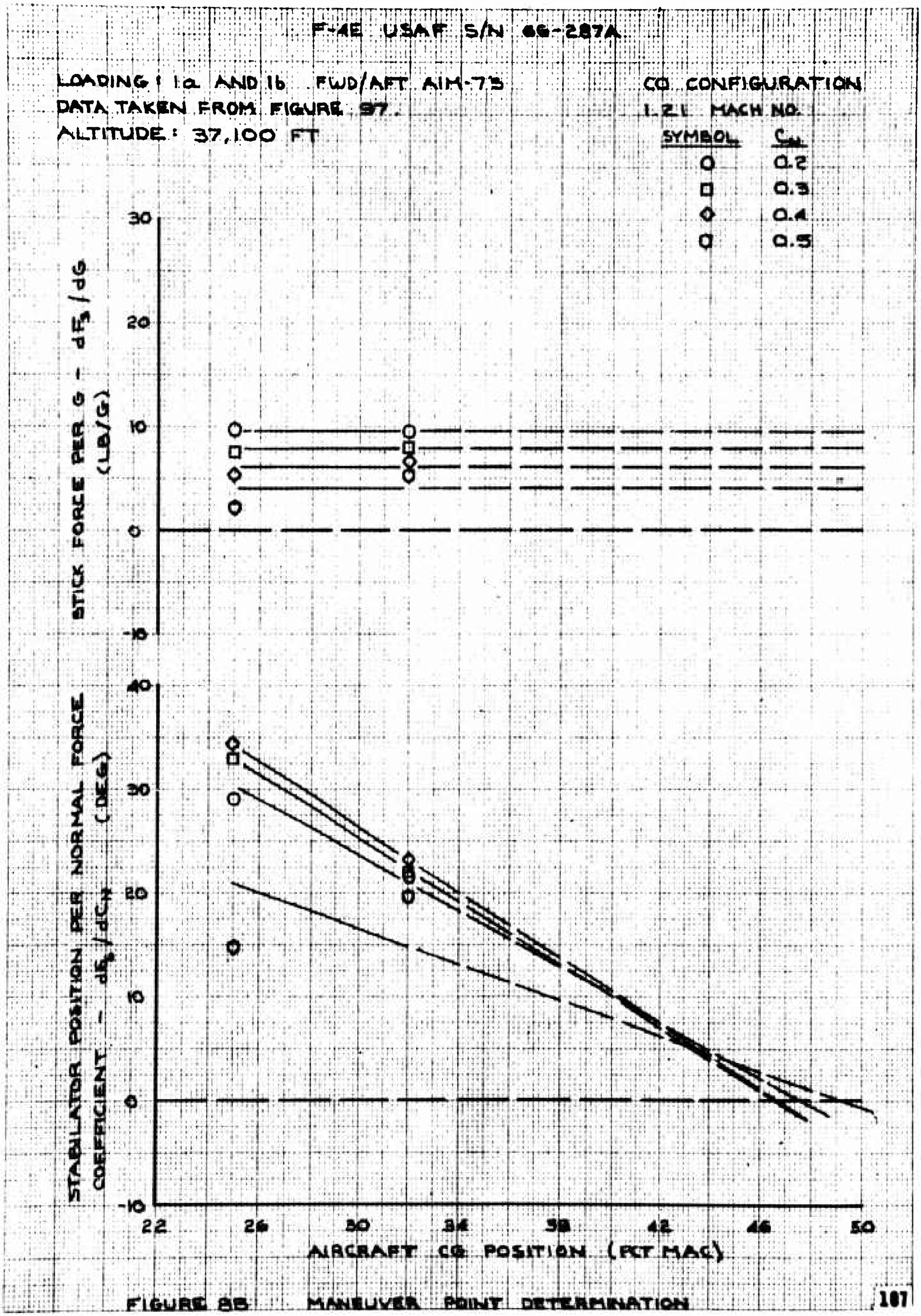


FIGURE 88 MANEUVER POINT DETERMINATION

F-4E USAF S/N 66-287A

LOADINGS: 1a: FWD AIM-7
1b: AFT AIM-7S

CR CONFIGURATION

SYMBOL	ALTITUDE (FT)	MACH NO.	KCAS	GROSS WT (LB)	CG POSITION (PCT MAC)
——○	10,500	0.70	387	40,100	23.3
– –□	10,800	0.70	387	37,400	30.4

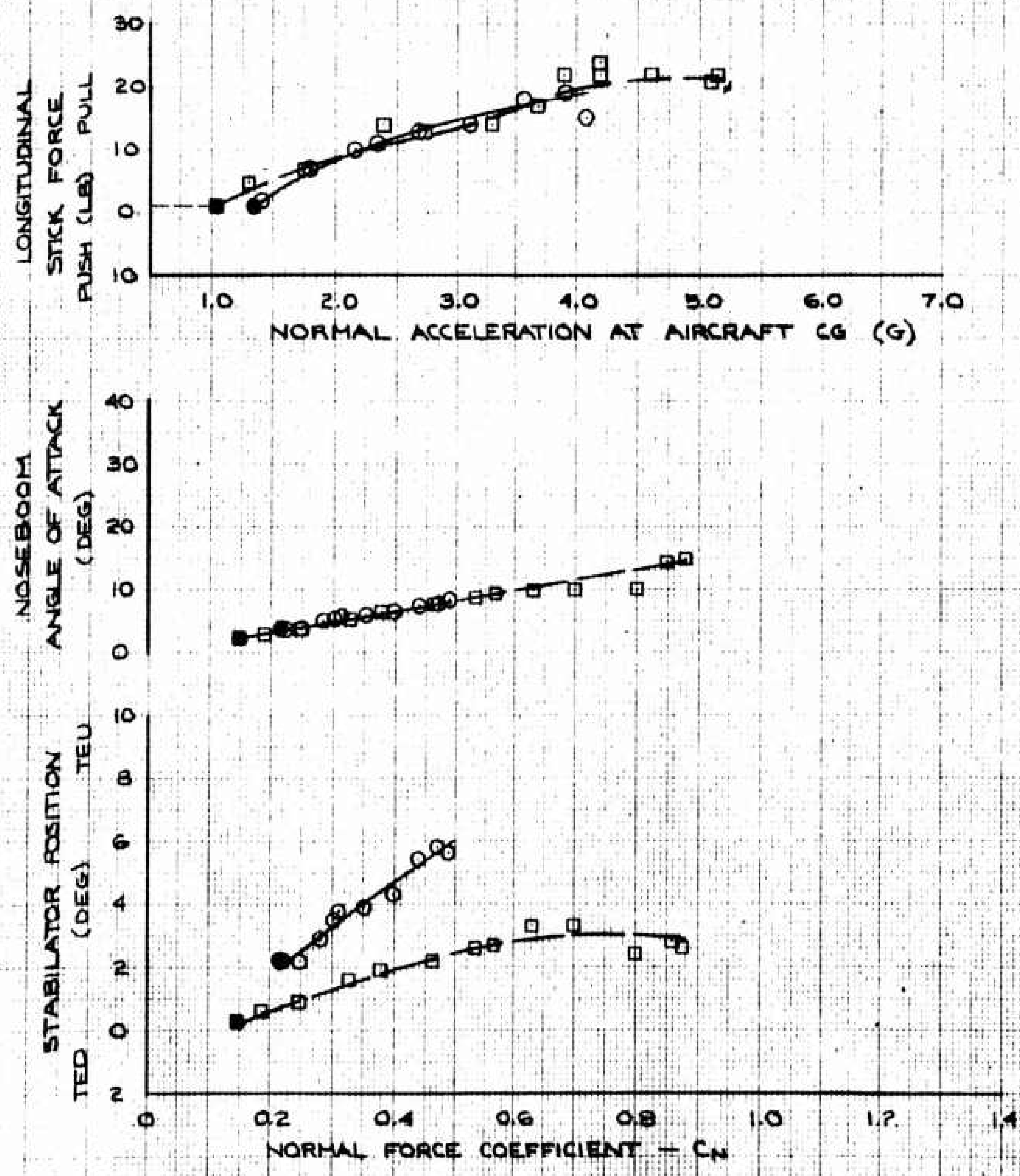


FIGURE 86 LONGITUDINAL MANEUVERING STABILITY

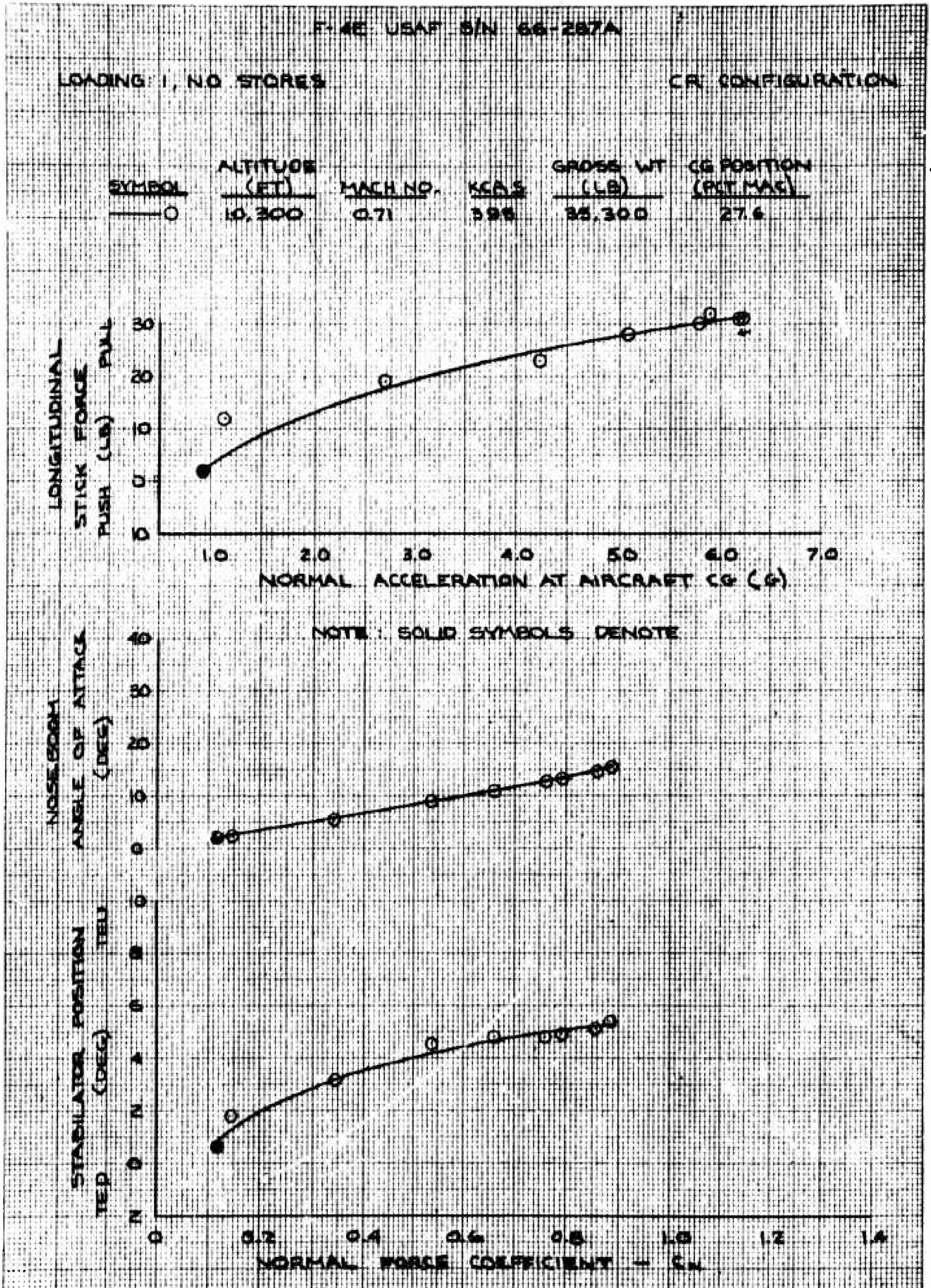


FIGURE 87 LONGITUDINAL MANEUVERING STABILITY

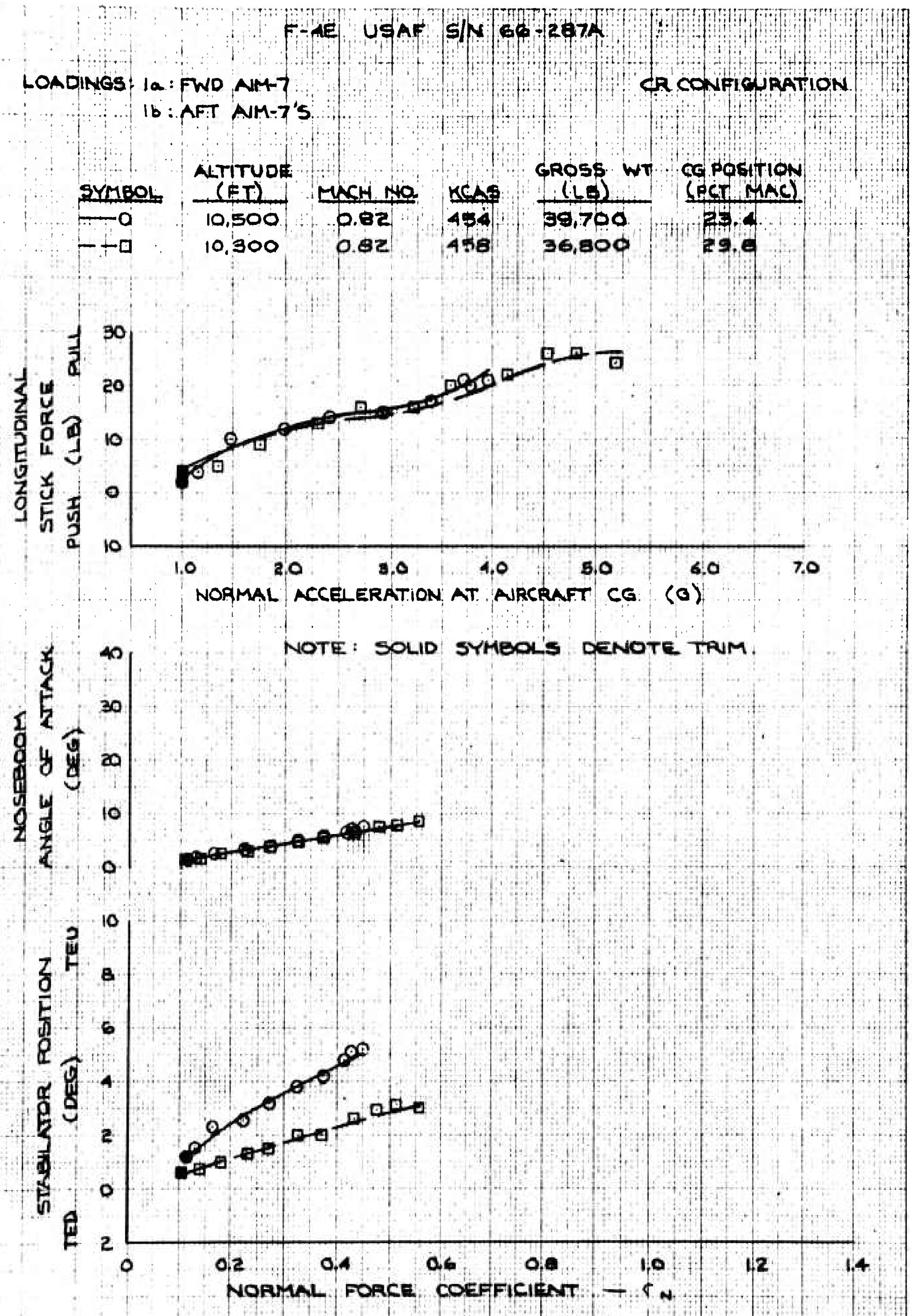


FIGURE 88 LONGITUDINAL MANEUVERING STABILITY

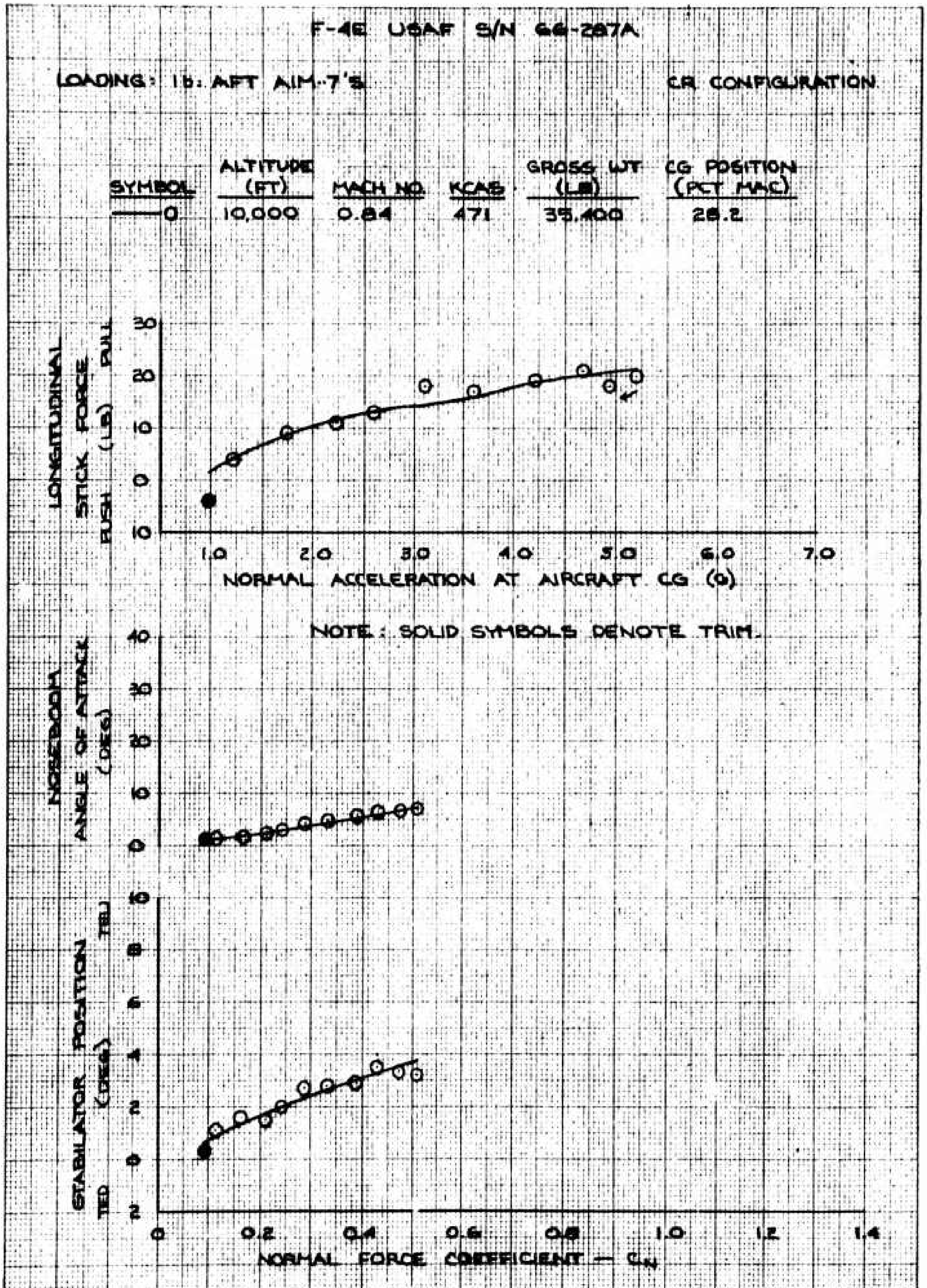


FIGURE 89 LONGITUDINAL MANEUVERING STABILITY

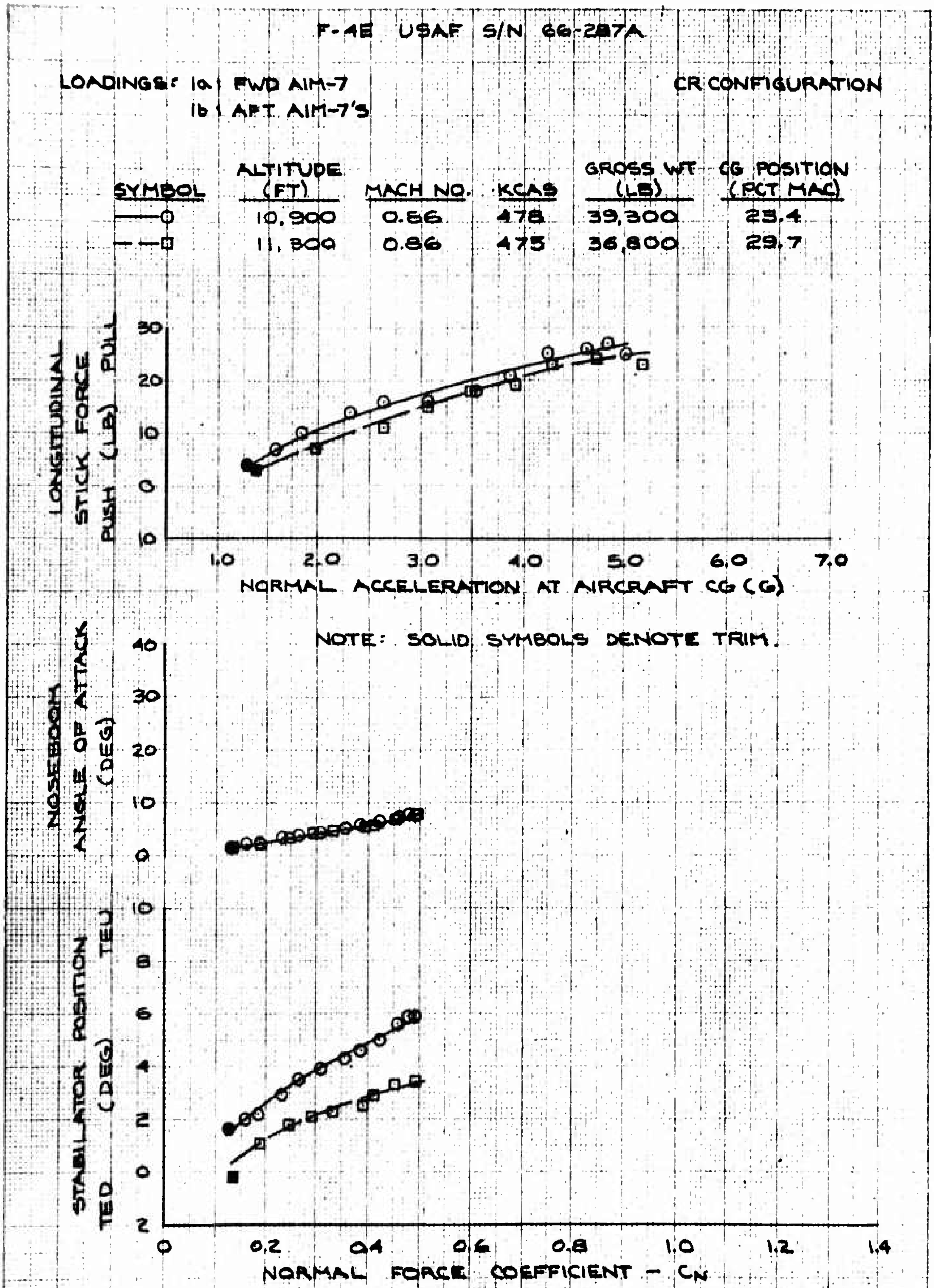


FIGURE 90 LONGITUDINAL MANEUVERING STABILITY

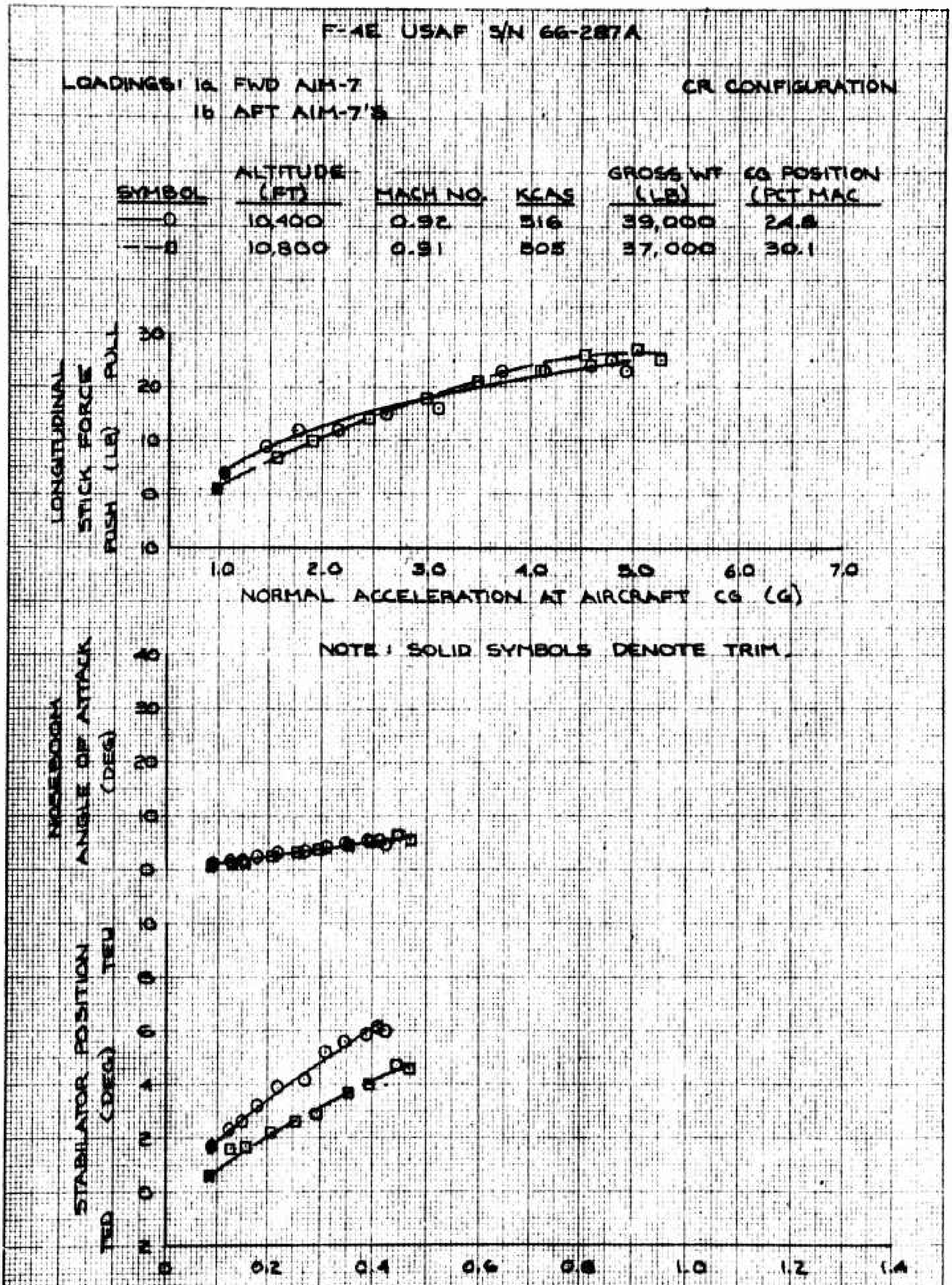


FIGURE 98 LONGITUDINAL MANEUVERING STABILITY

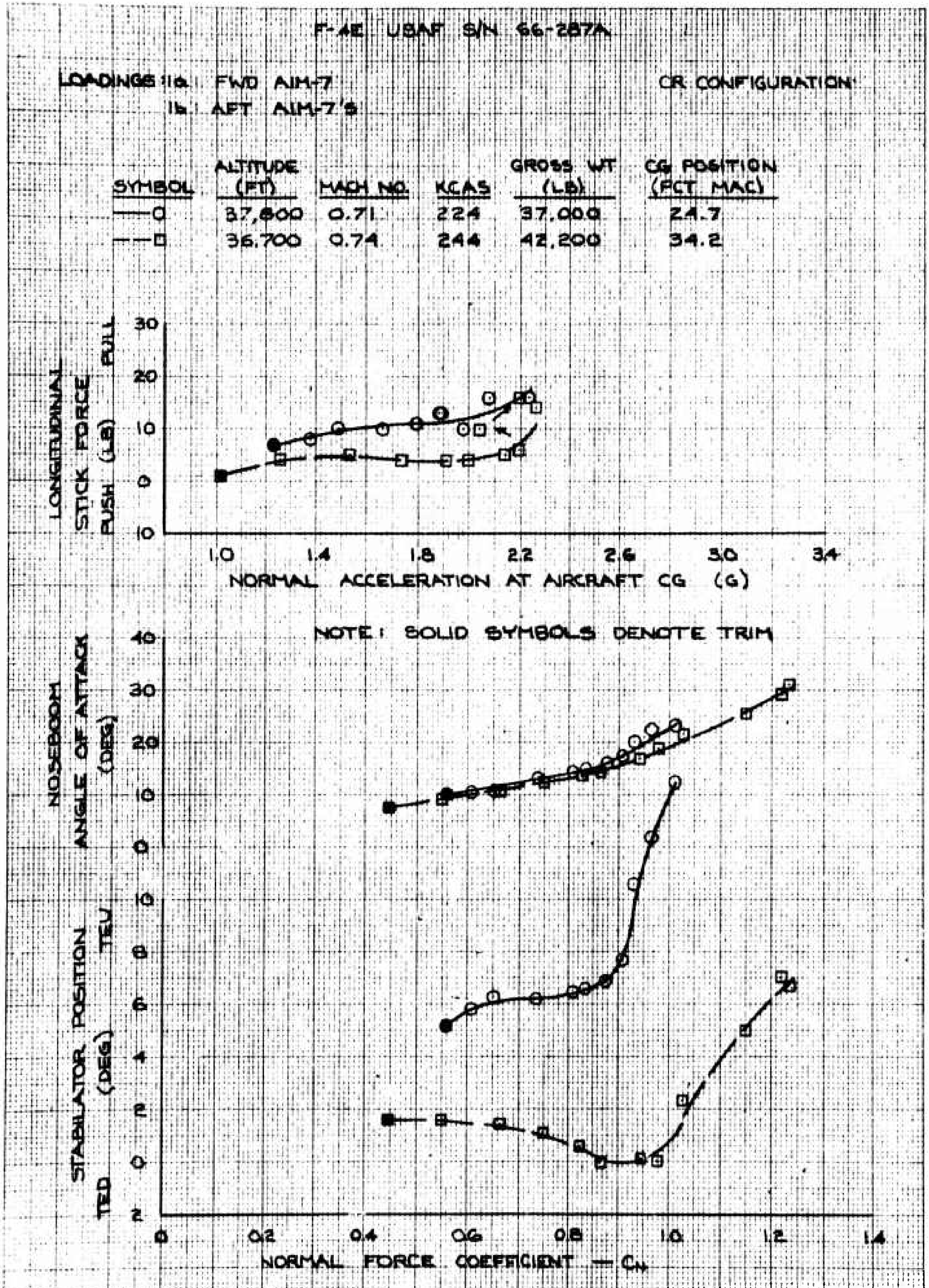


FIGURE 92 LONGITUDINAL MANEUVERING STABILITY

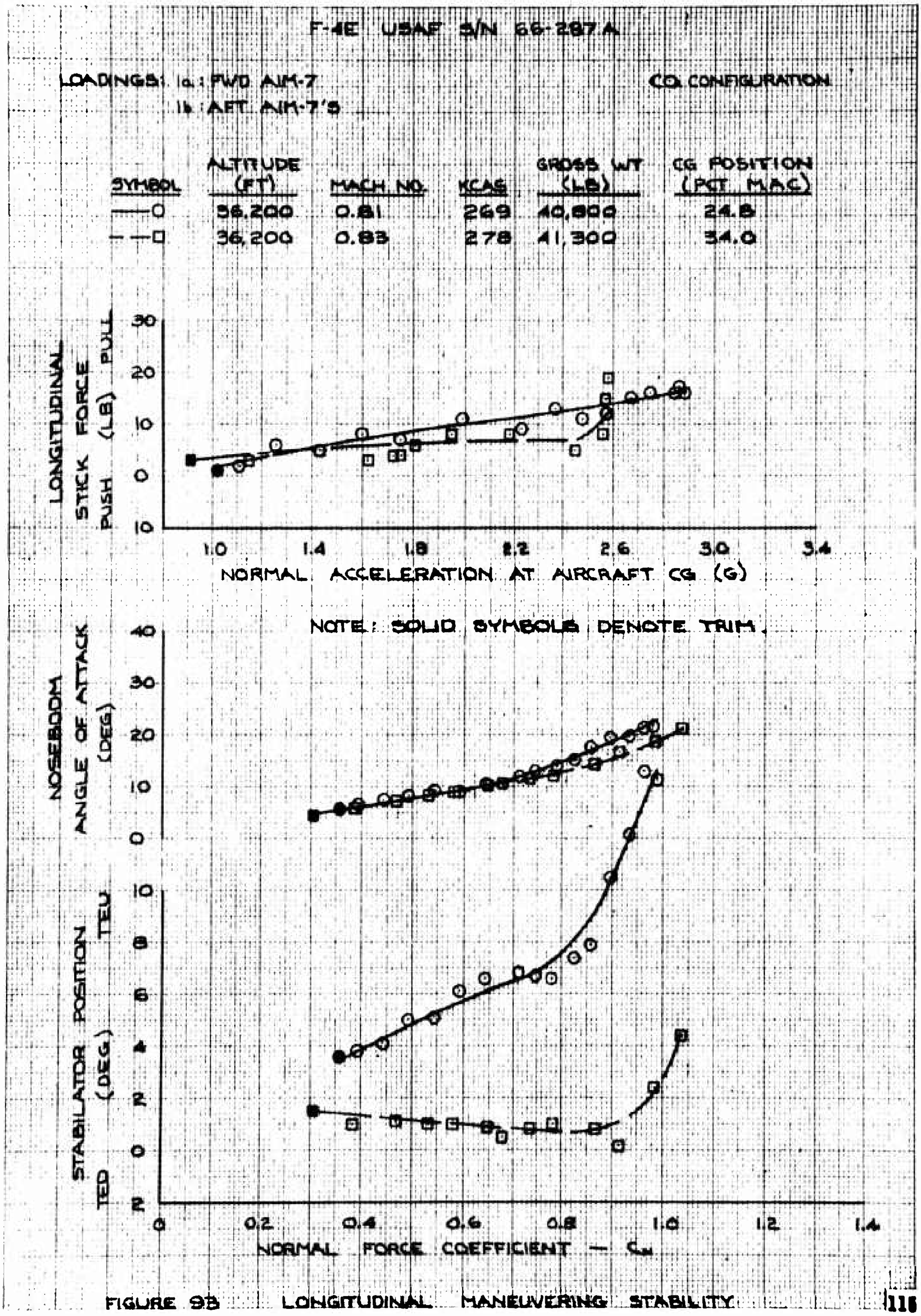


FIGURE 93 LONGITUDINAL MANEUVERING STABILITY

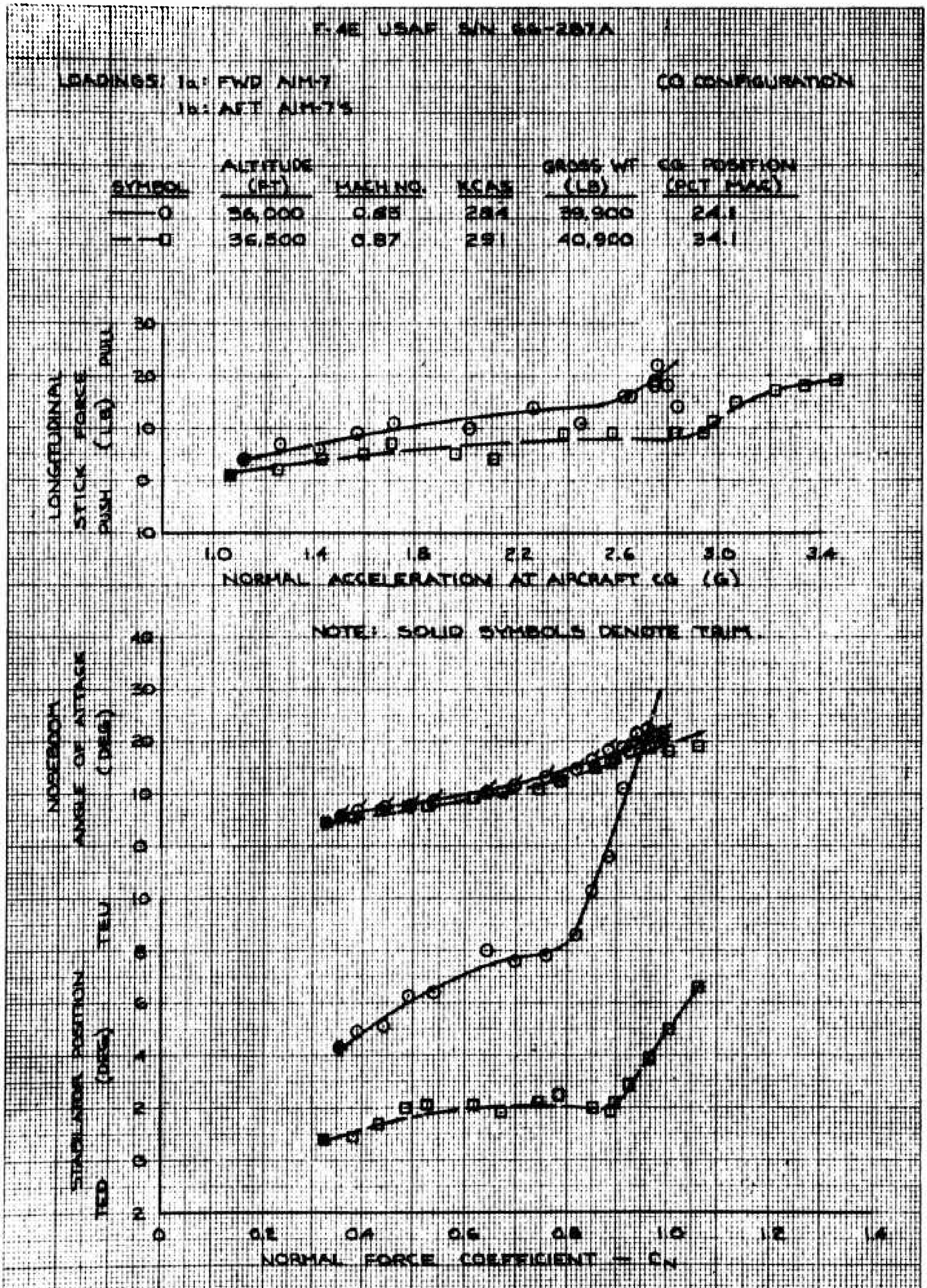


FIGURE [illegible] LONGITUDINAL MANEUVERING STABILITY

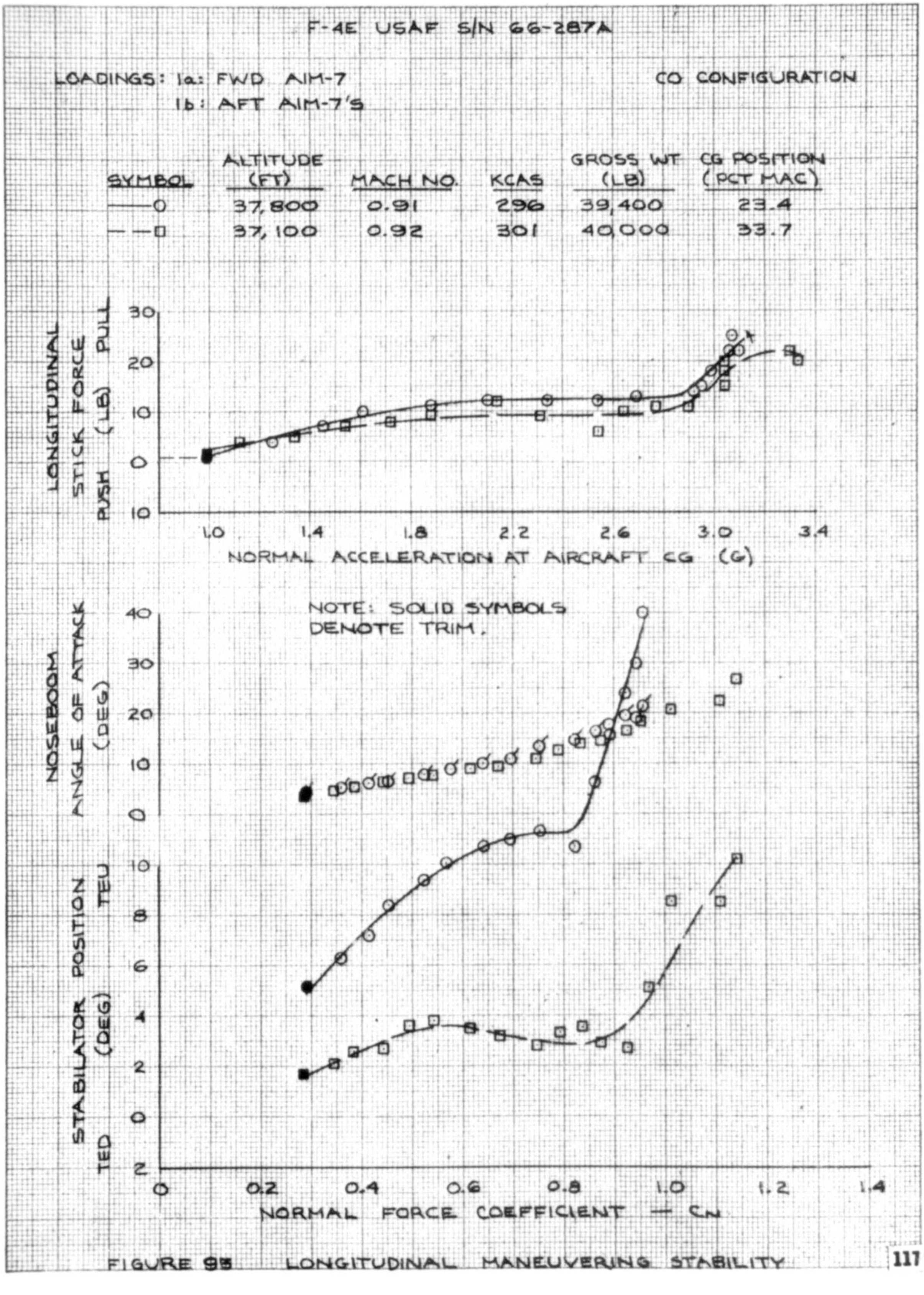


FIGURE 95 LONGITUDINAL MANEUVERING STABILITY

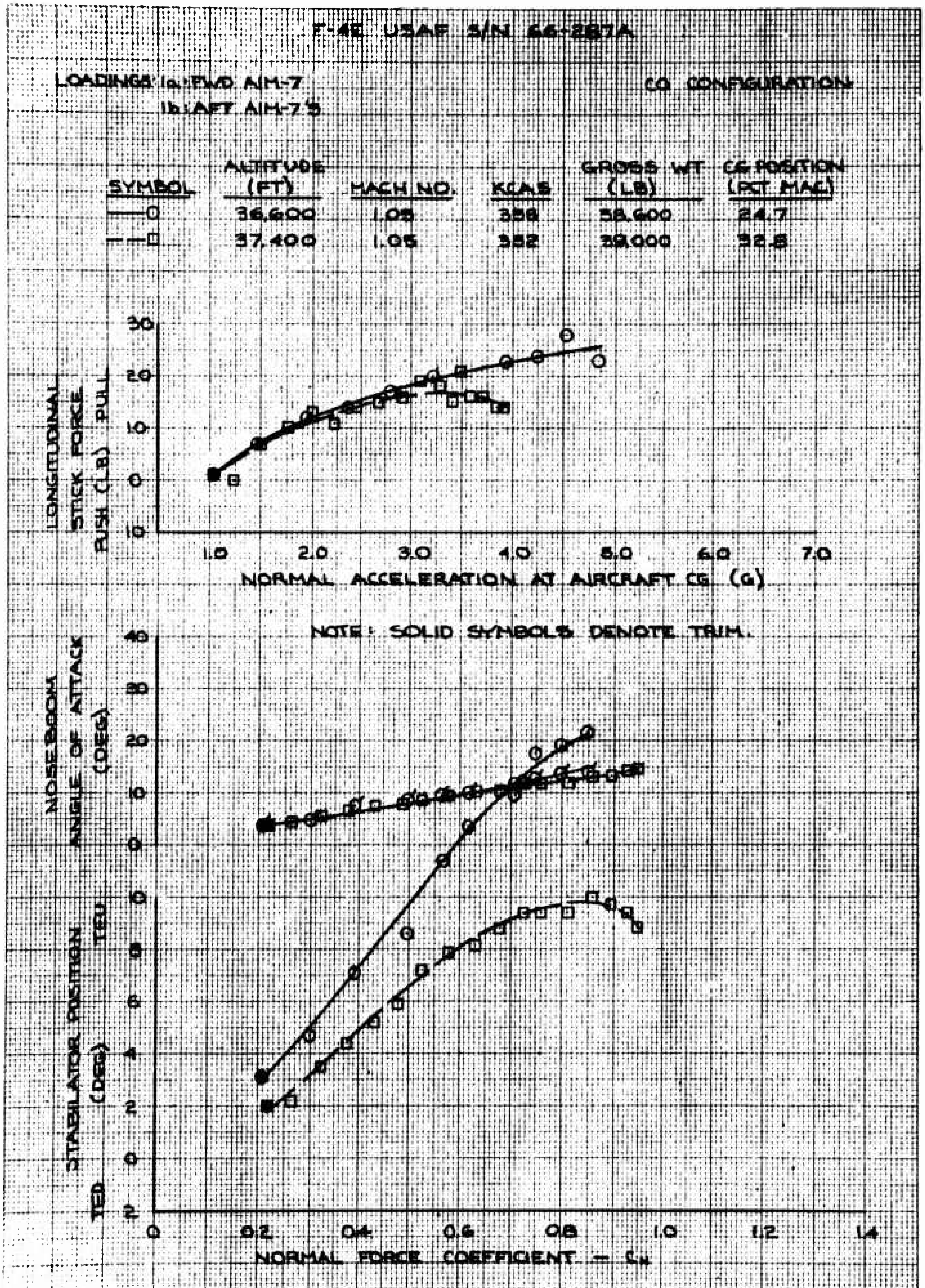


FIGURE 88 LONGITUDINAL MANEUVERING STABILITY

F-4E USAF S/N 66-287A

LOADINGS: 1(a) FWD AIM-7 CO CONFIGURATION
1(b) AFT AIM-7'S

SYMBOL	ALTITUDE (FT)	MACH NO.	KCAS	GROSS WT (LB)	CG POSITION (PCT MAC)
—○	36,900	1.22	423	36,900	25.0
--□	37,400	1.21	418	37,400	32.0

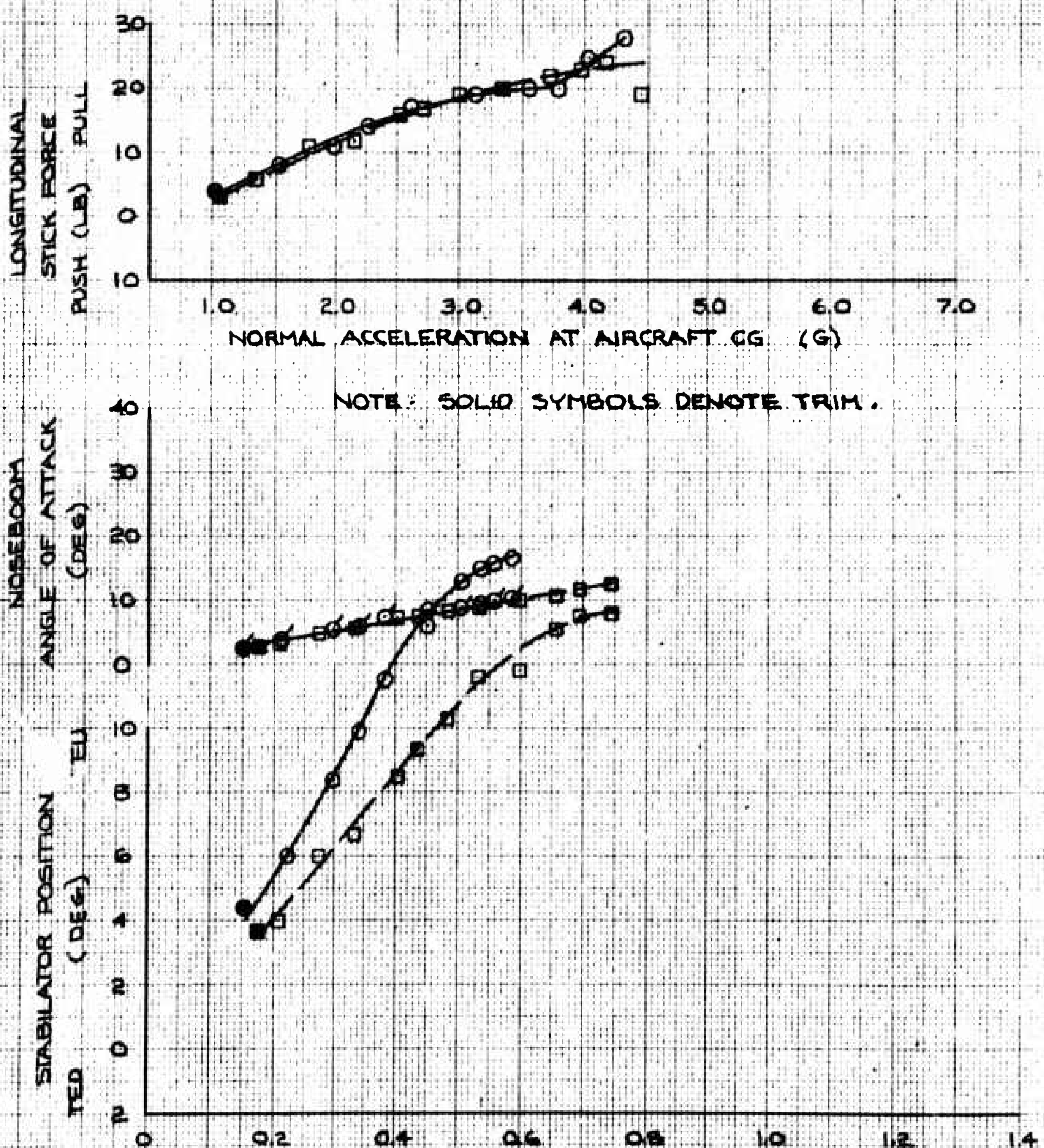


FIGURE 97 LONGITUDINAL MANEUVERING STABILITY

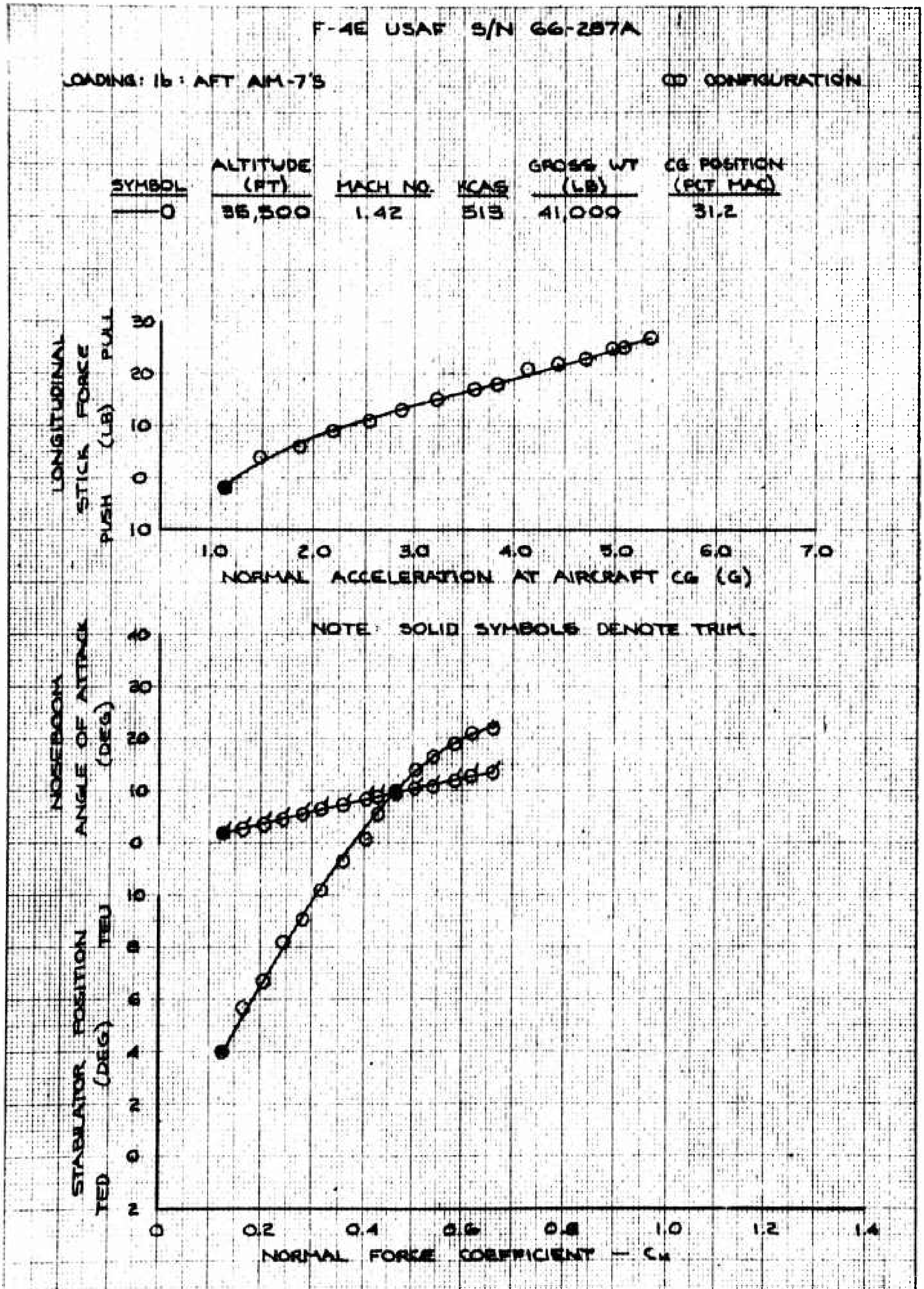


FIGURE 98 LONGITUDINAL MANEUVERING STABILITY

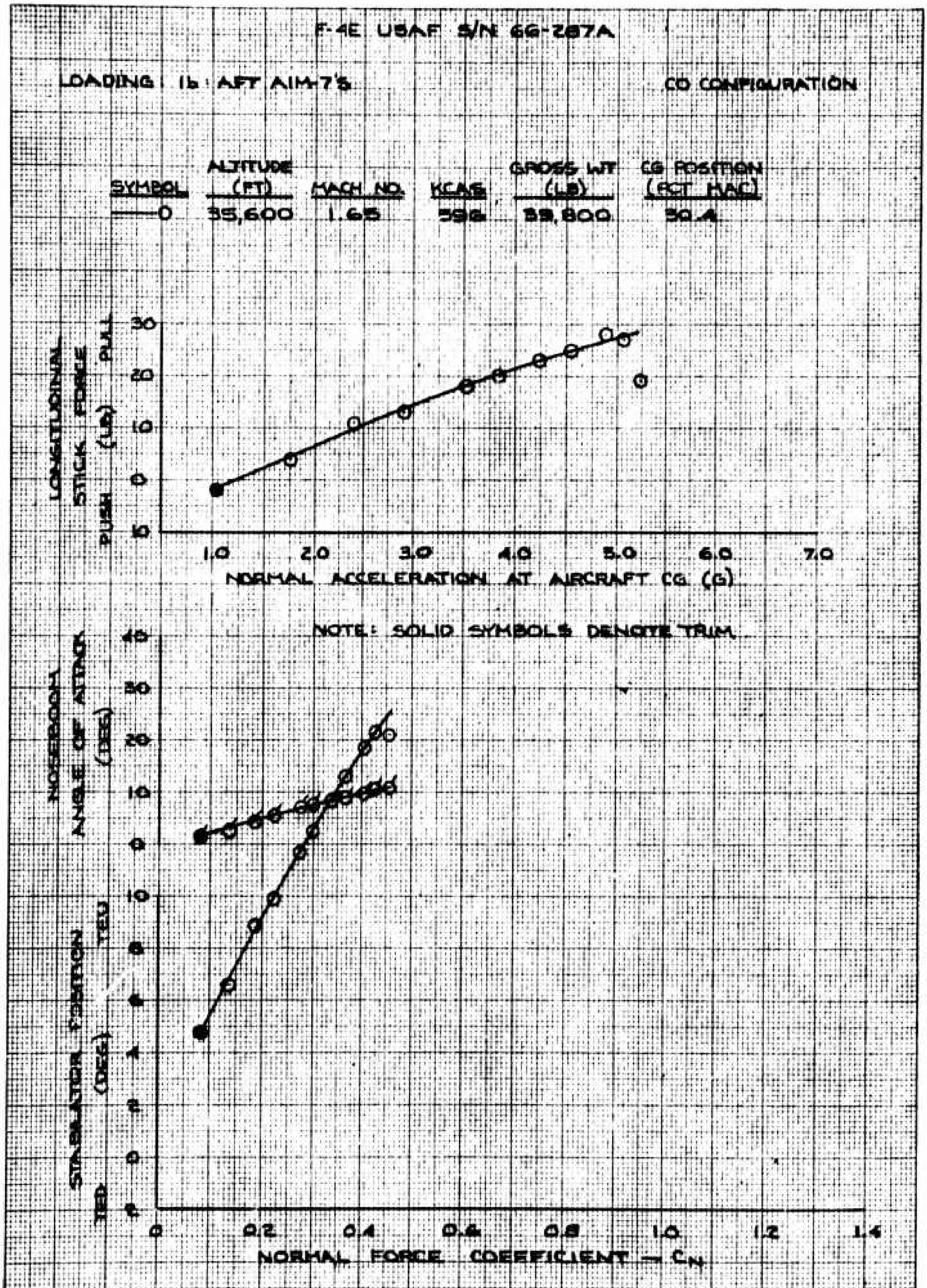


FIGURE 99 LONGITUDINAL MANEUVERING STABILITY

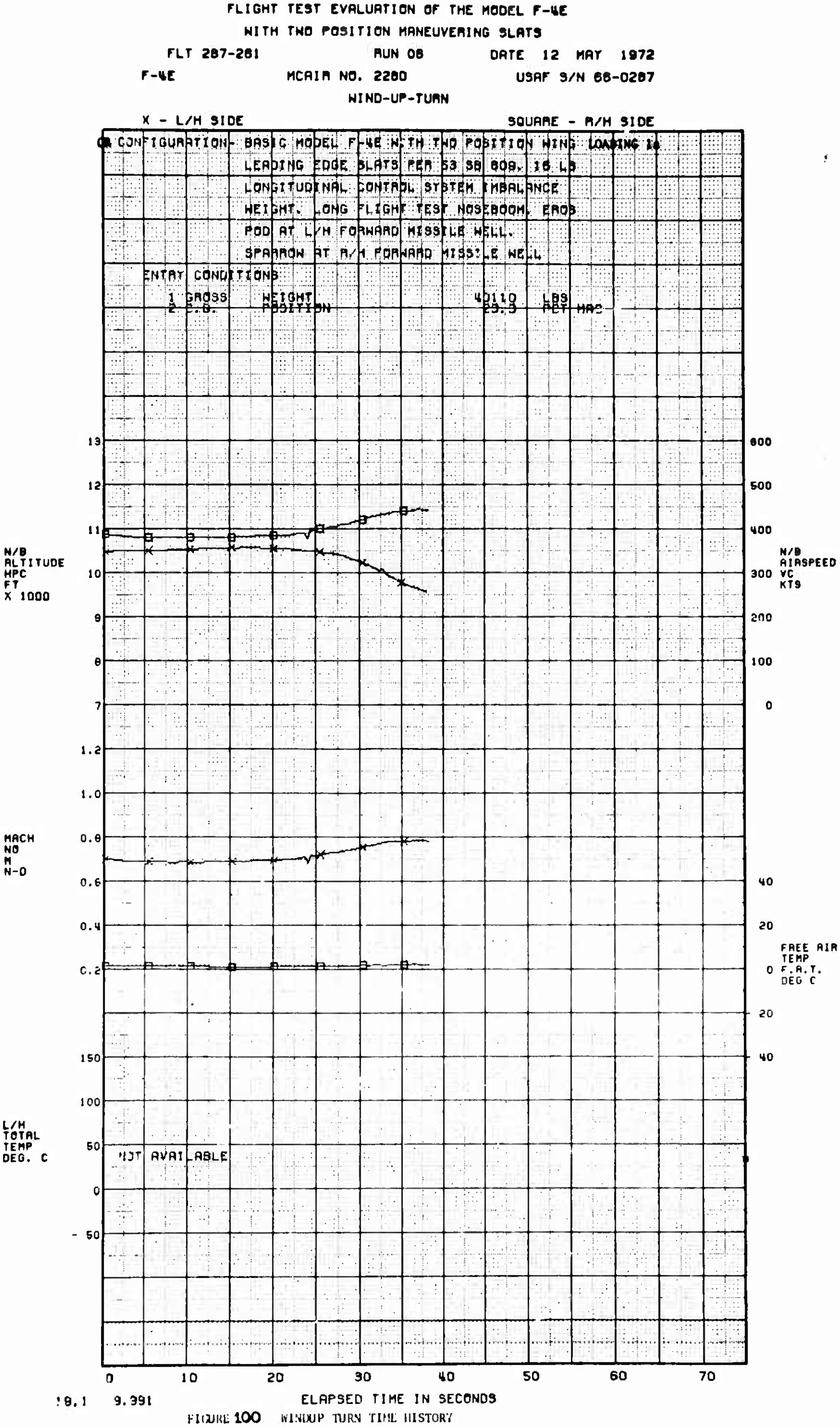


FIGURE 100 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-281 RUN 08 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

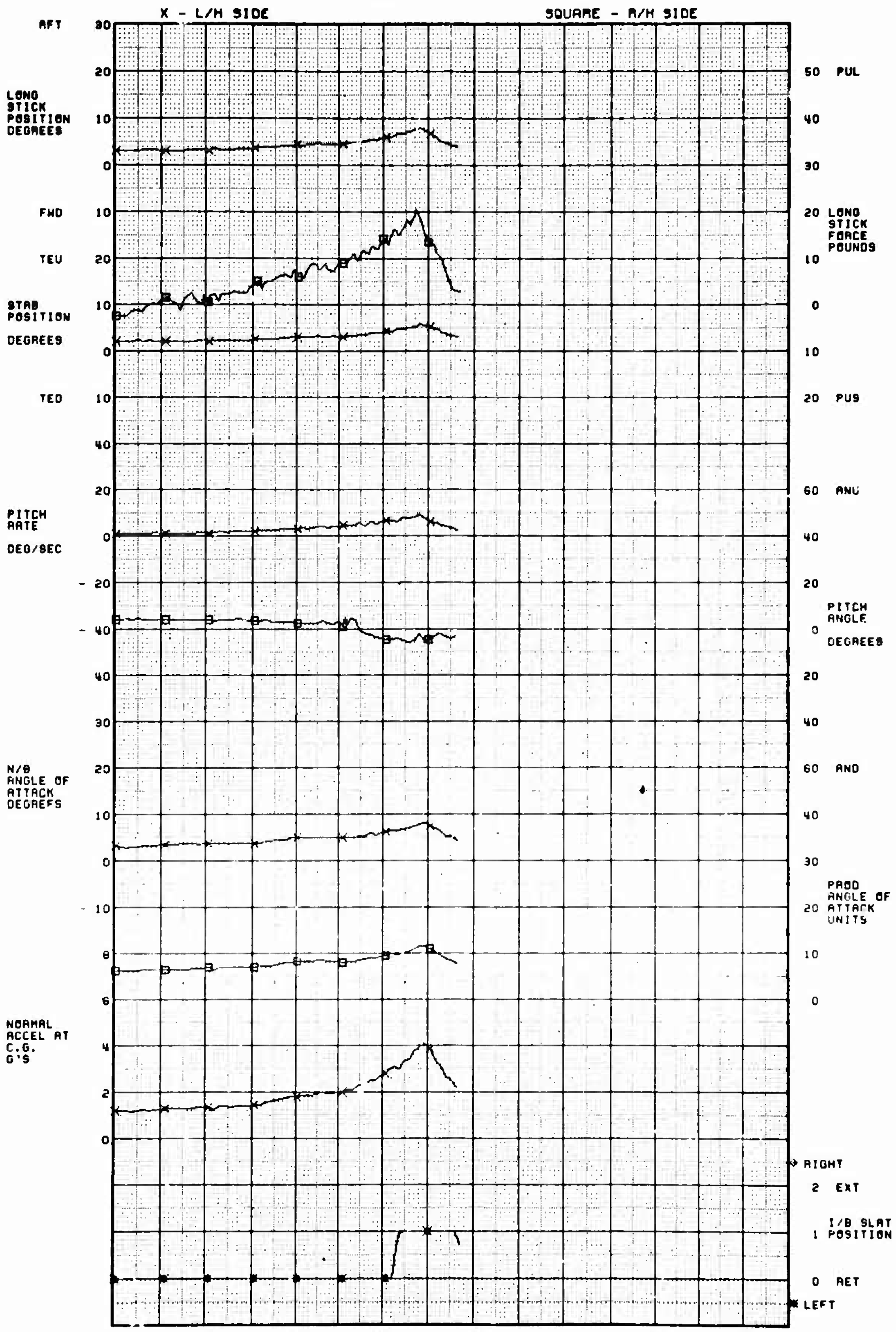


FIGURE 100 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-261 RUN 06 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

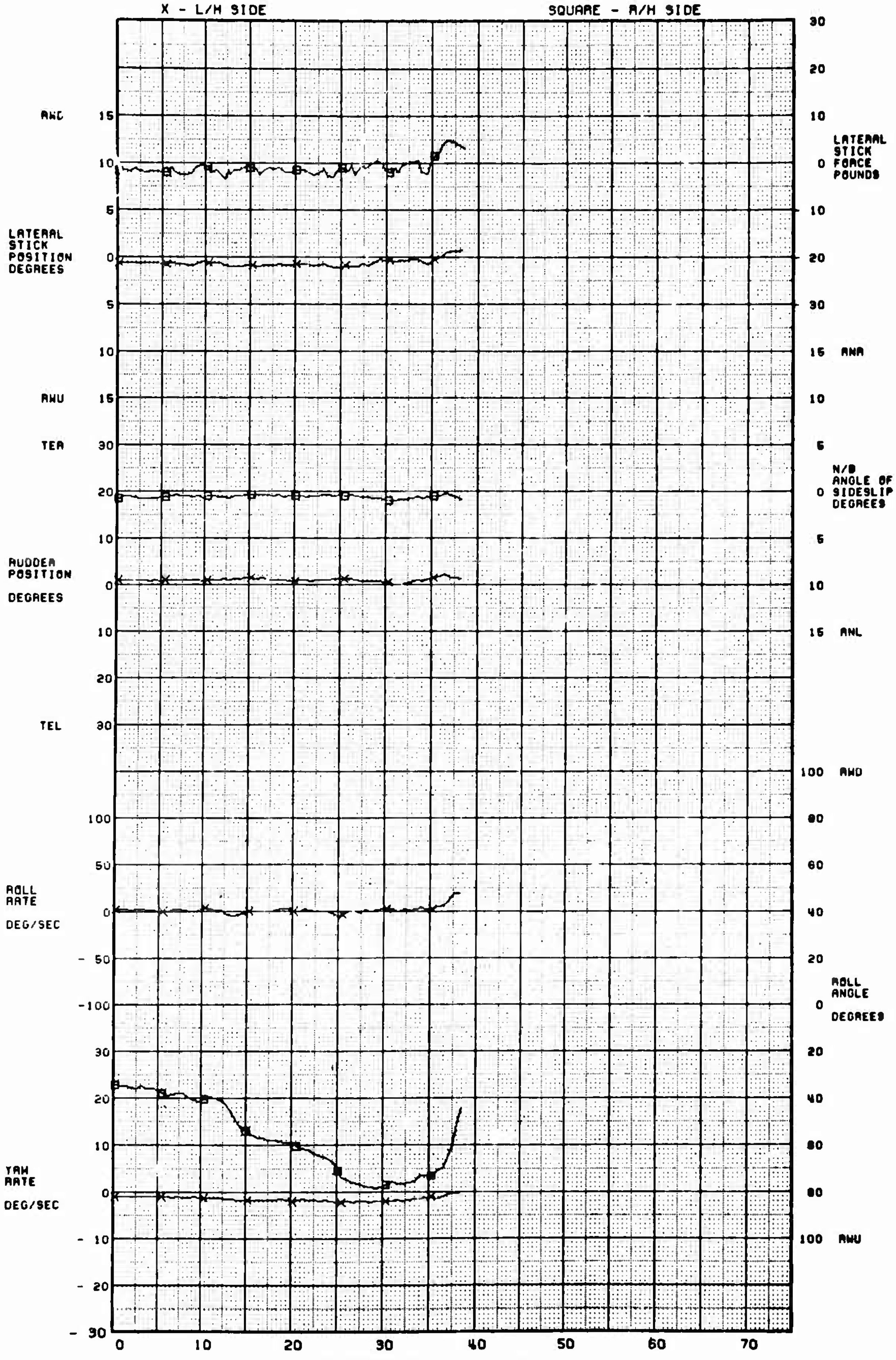


FIGURE 100 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-261 RUN 06 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

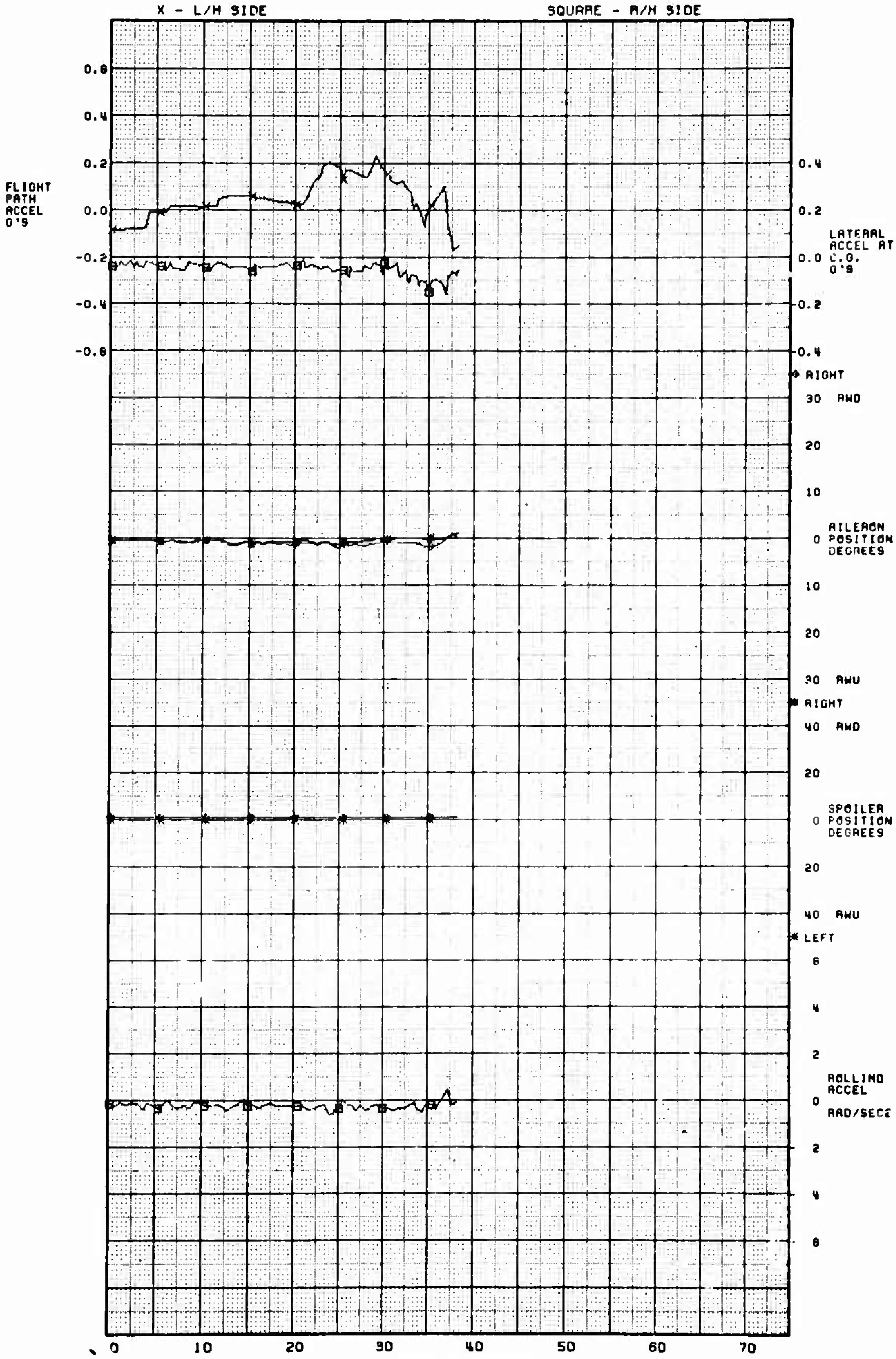


FIGURE 100 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 13 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

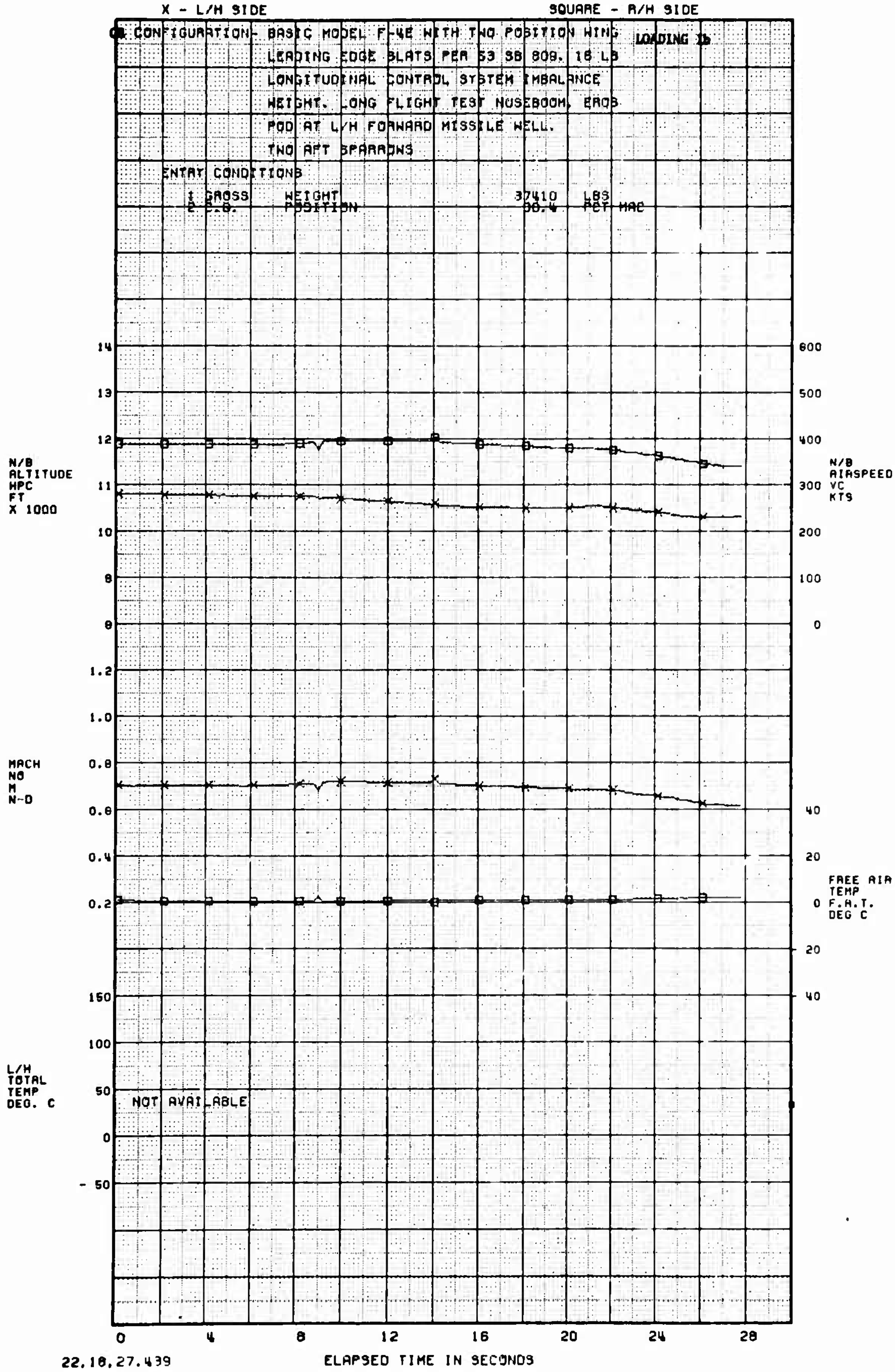


FIGURE 101 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 13 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

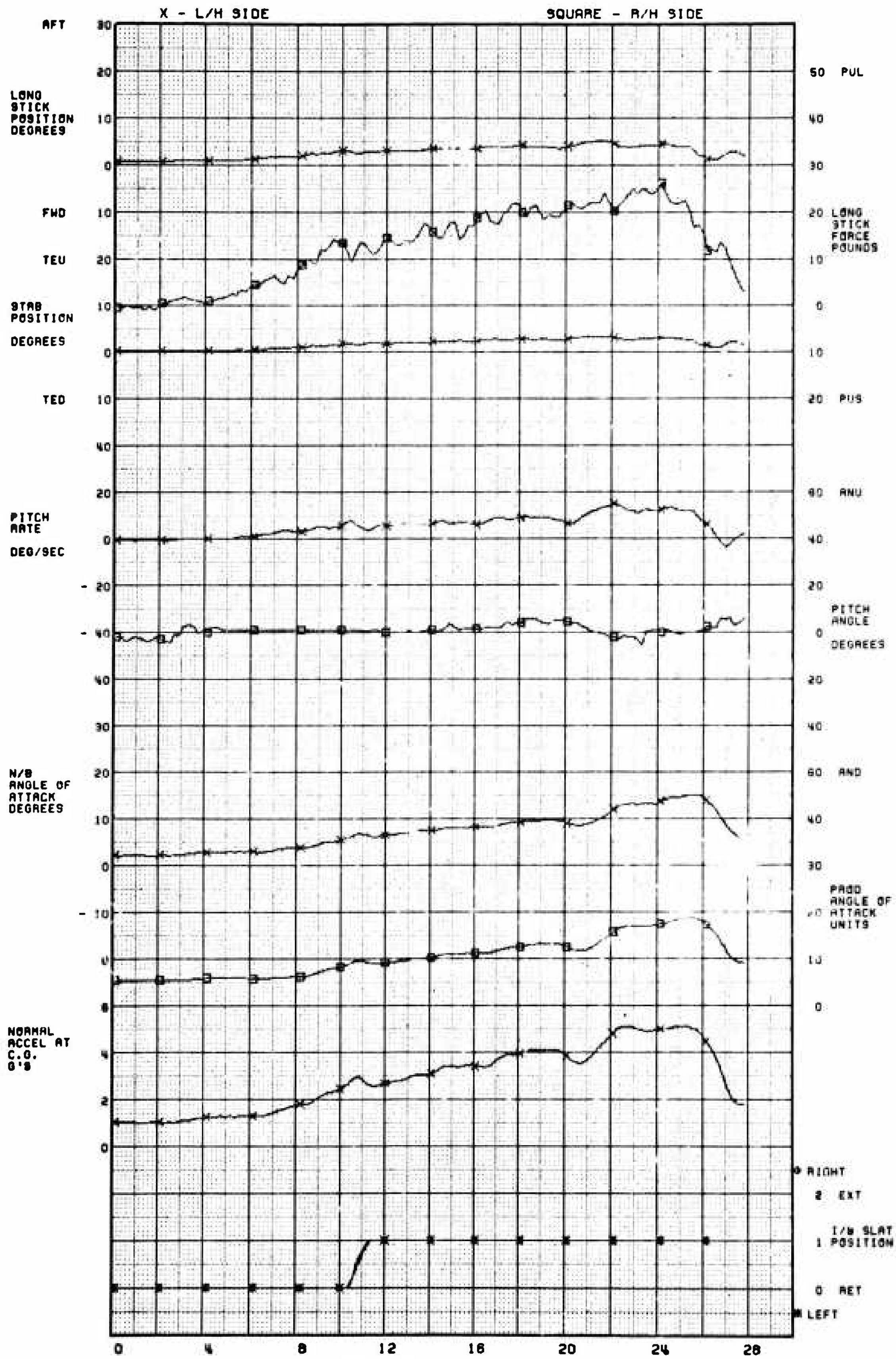


FIGURE 101 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 13 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 68-0287
WIND-UP-TURN

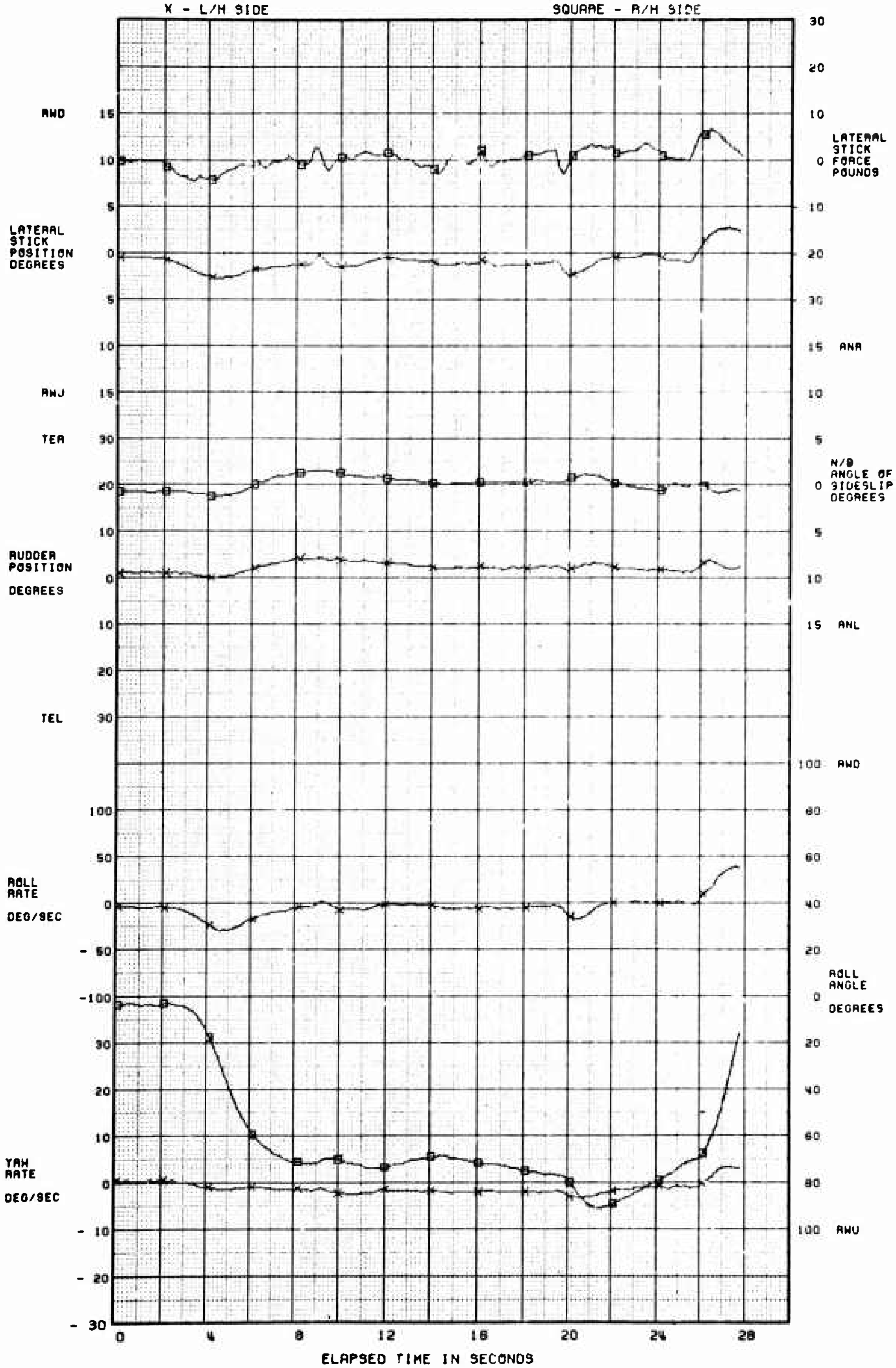


FIGURE 101 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 13 DATE 15 MAR 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

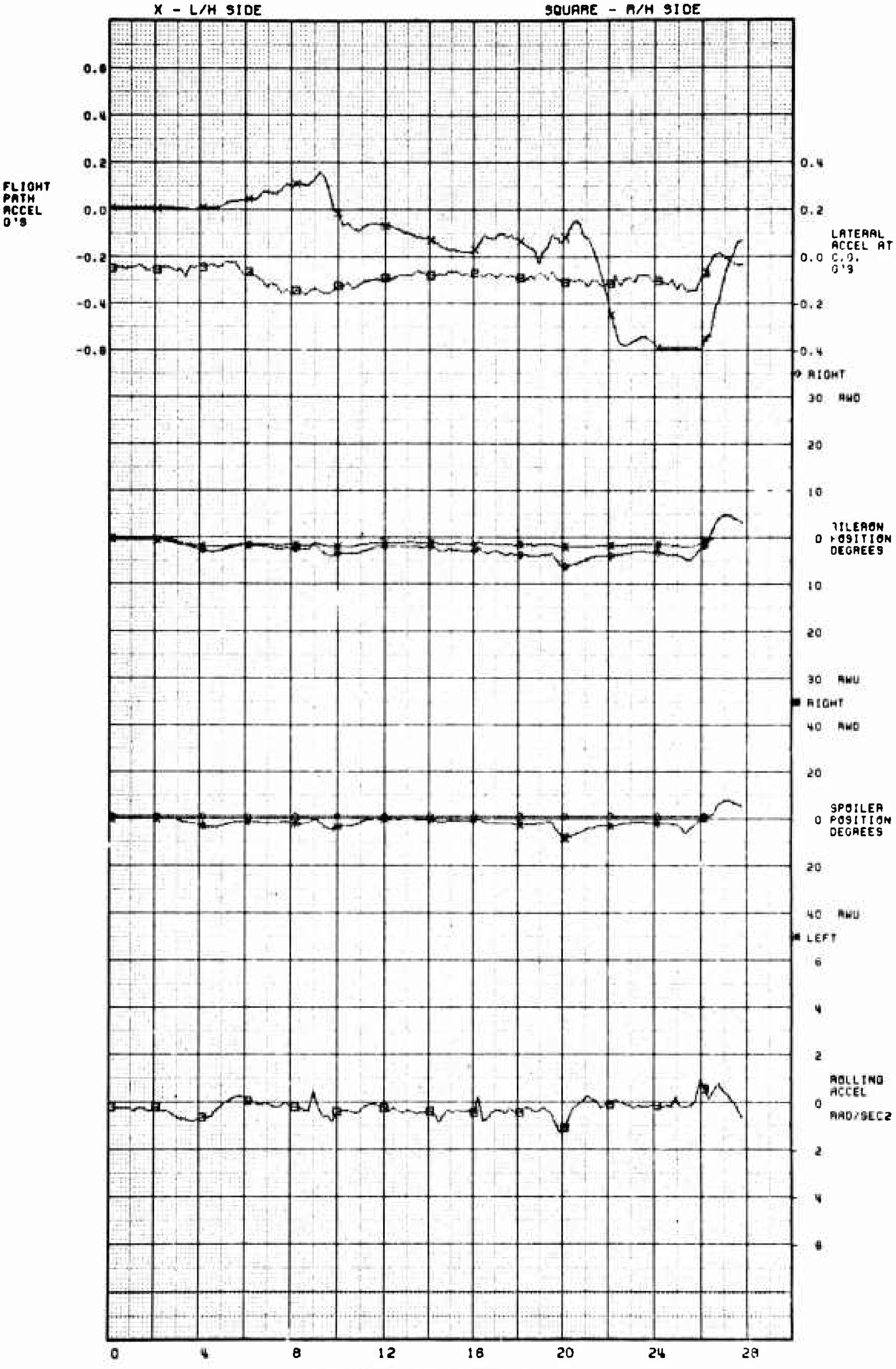


FIGURE 101 WINDUP TURN TIME HISTORY (CONCLUDED)

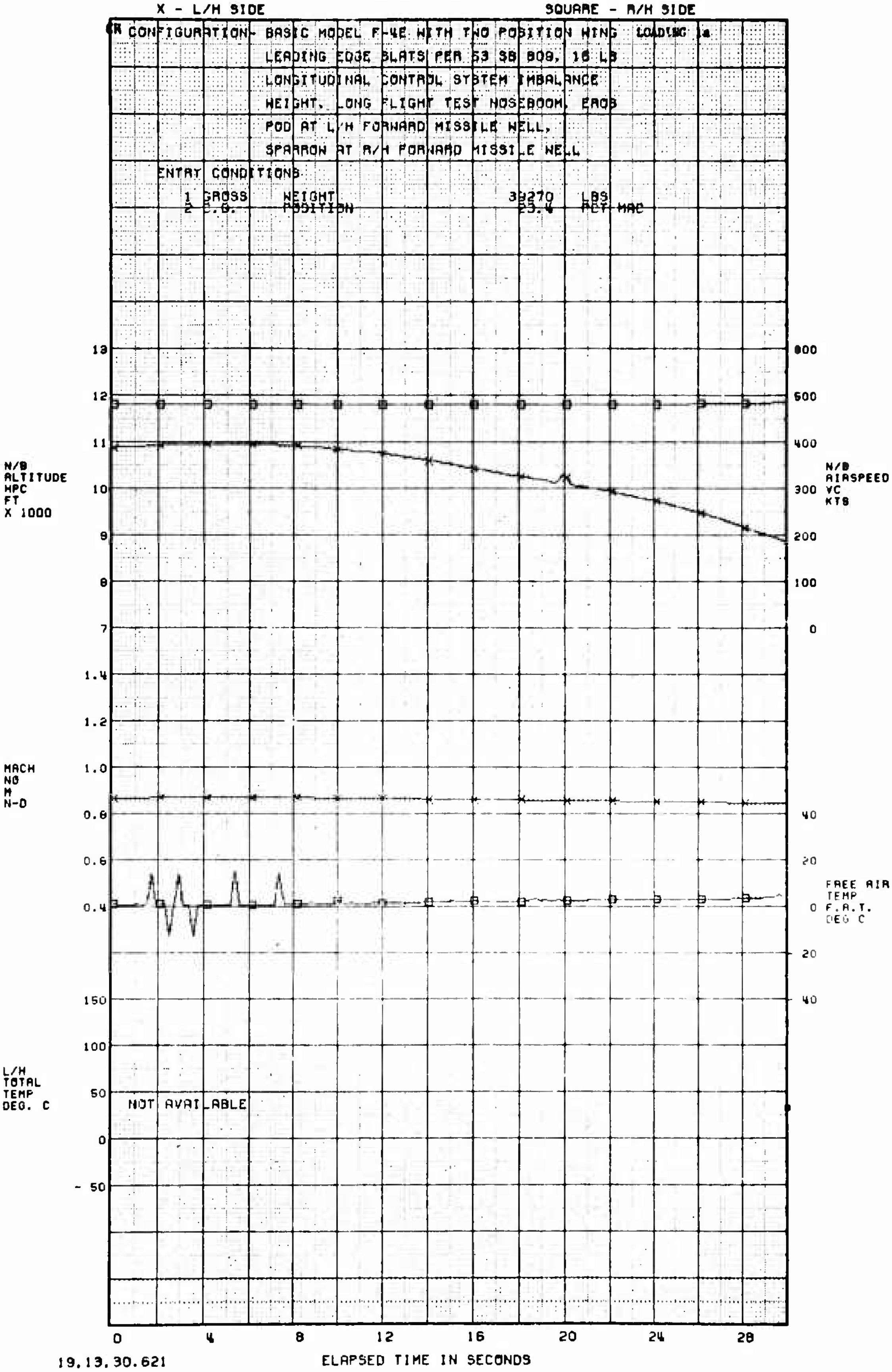
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-281 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

X - L/H SIDE SQUARE - R/H SIDE



19.13.30.621

FIGURE 102 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-261 RUN 08 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

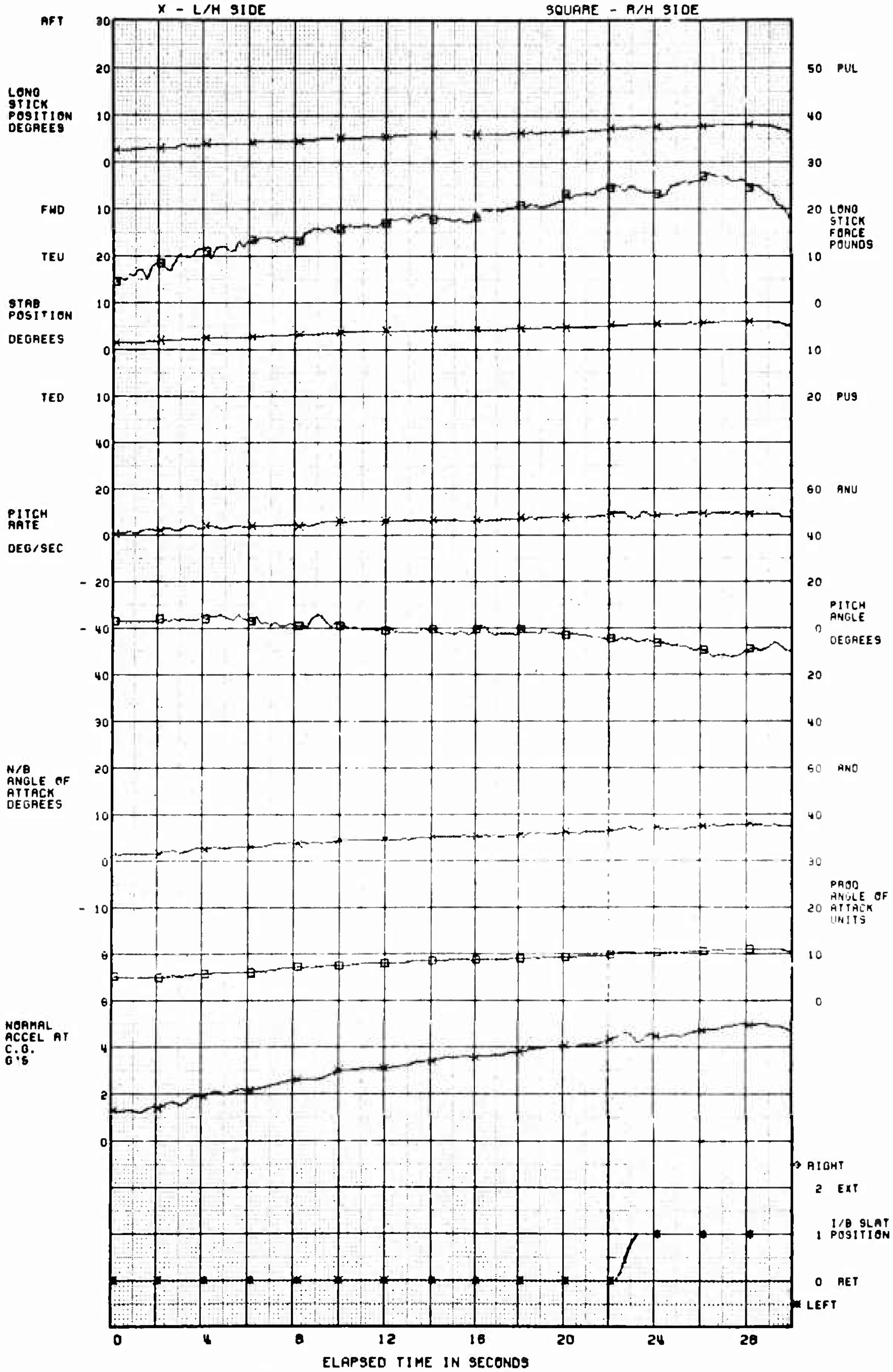


FIGURE 102 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-261 RUN 08 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

X - L/H SIDE SQUARE - R/H SIDE

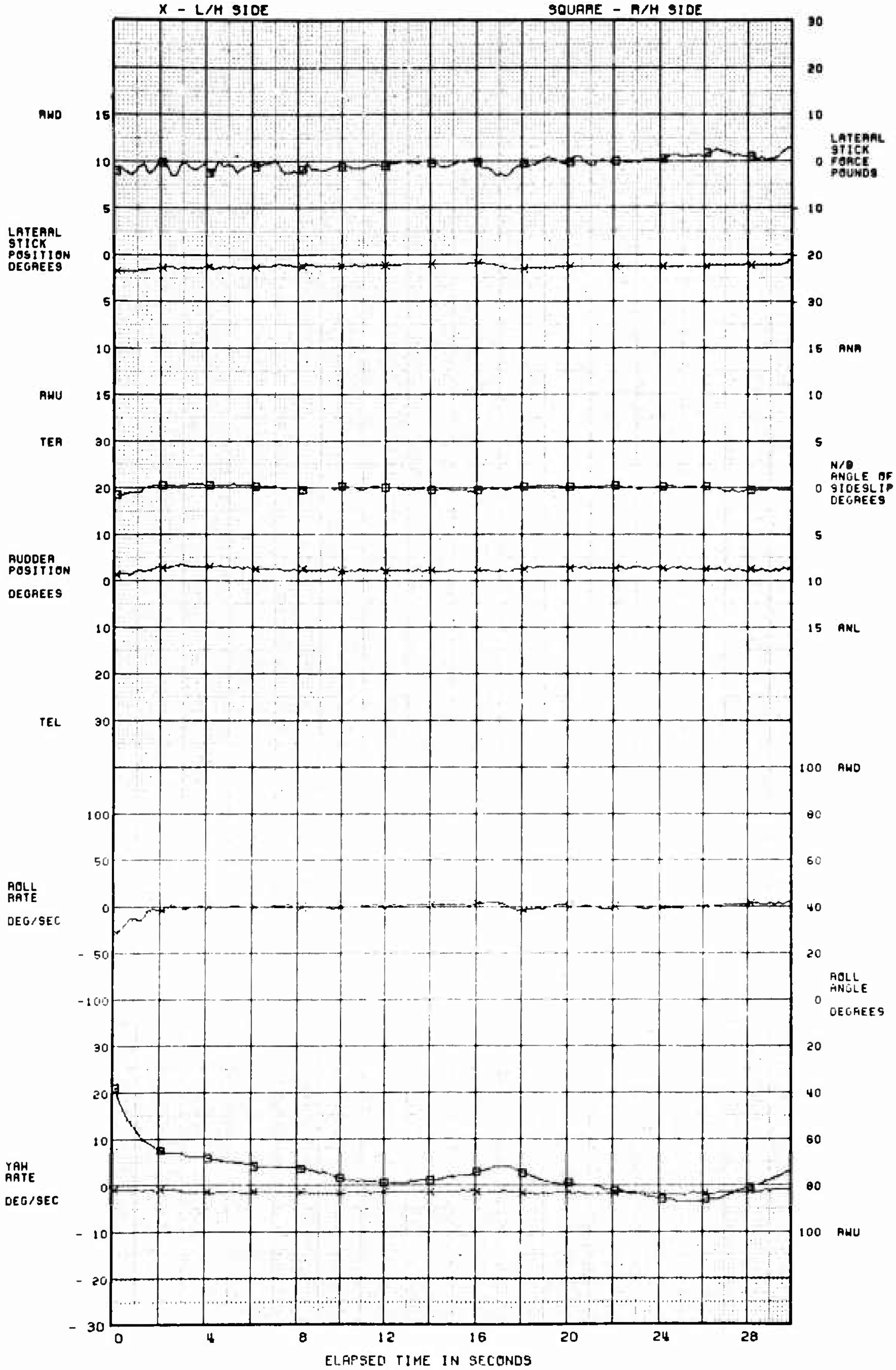


FIGURE 102 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-261 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

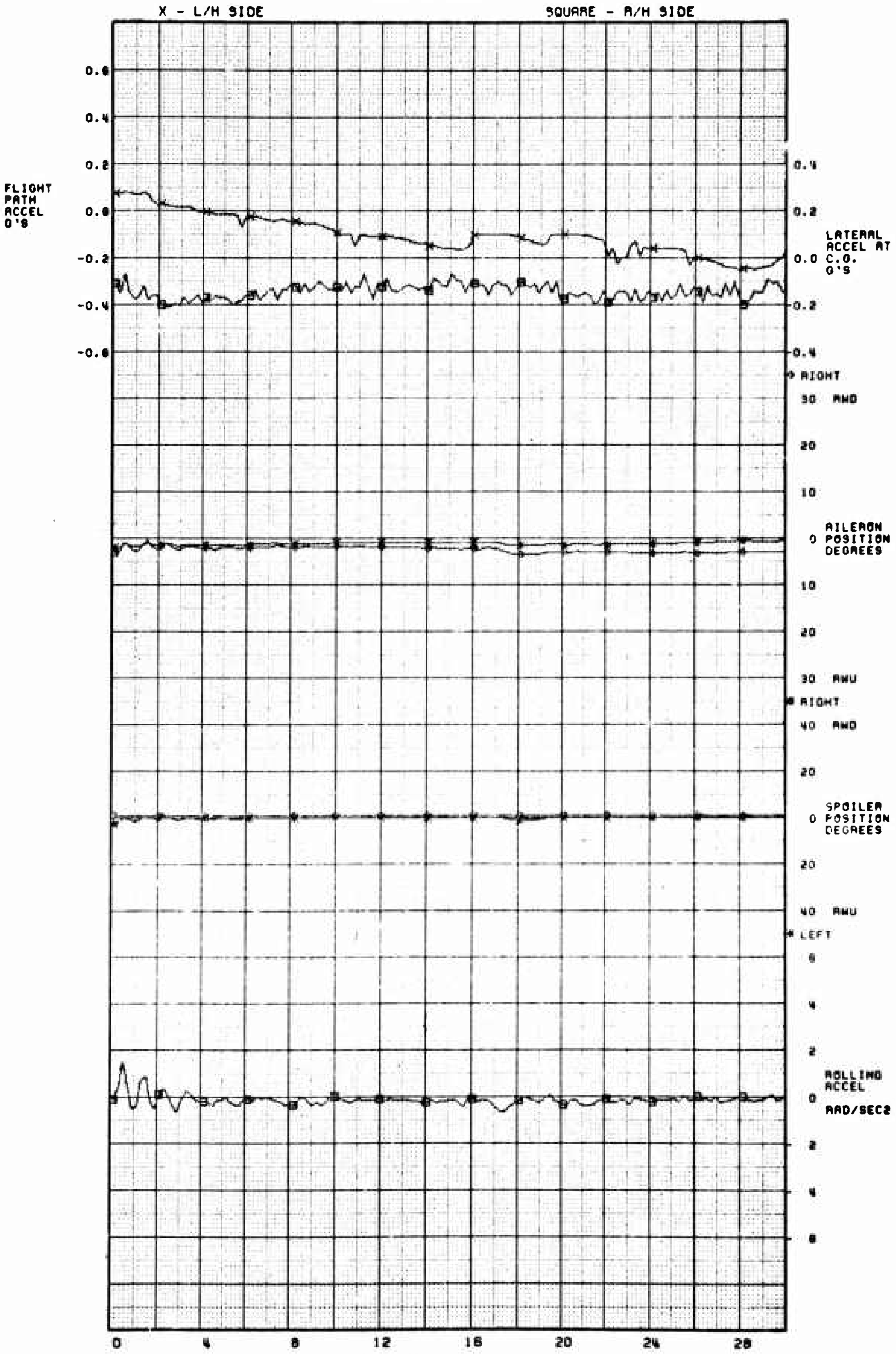


FIGURE 102 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 15 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

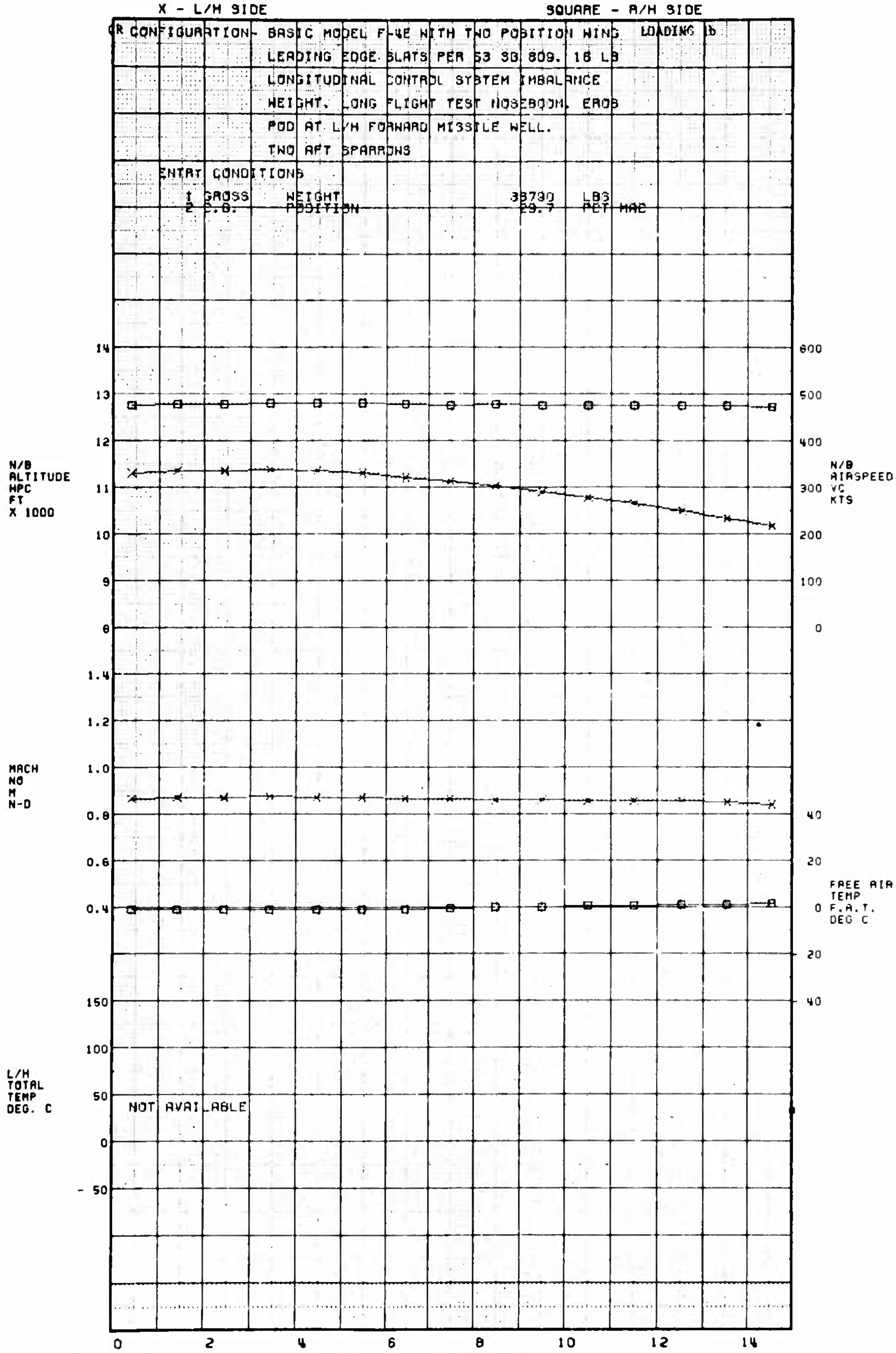


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FIGURE 103 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 15 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

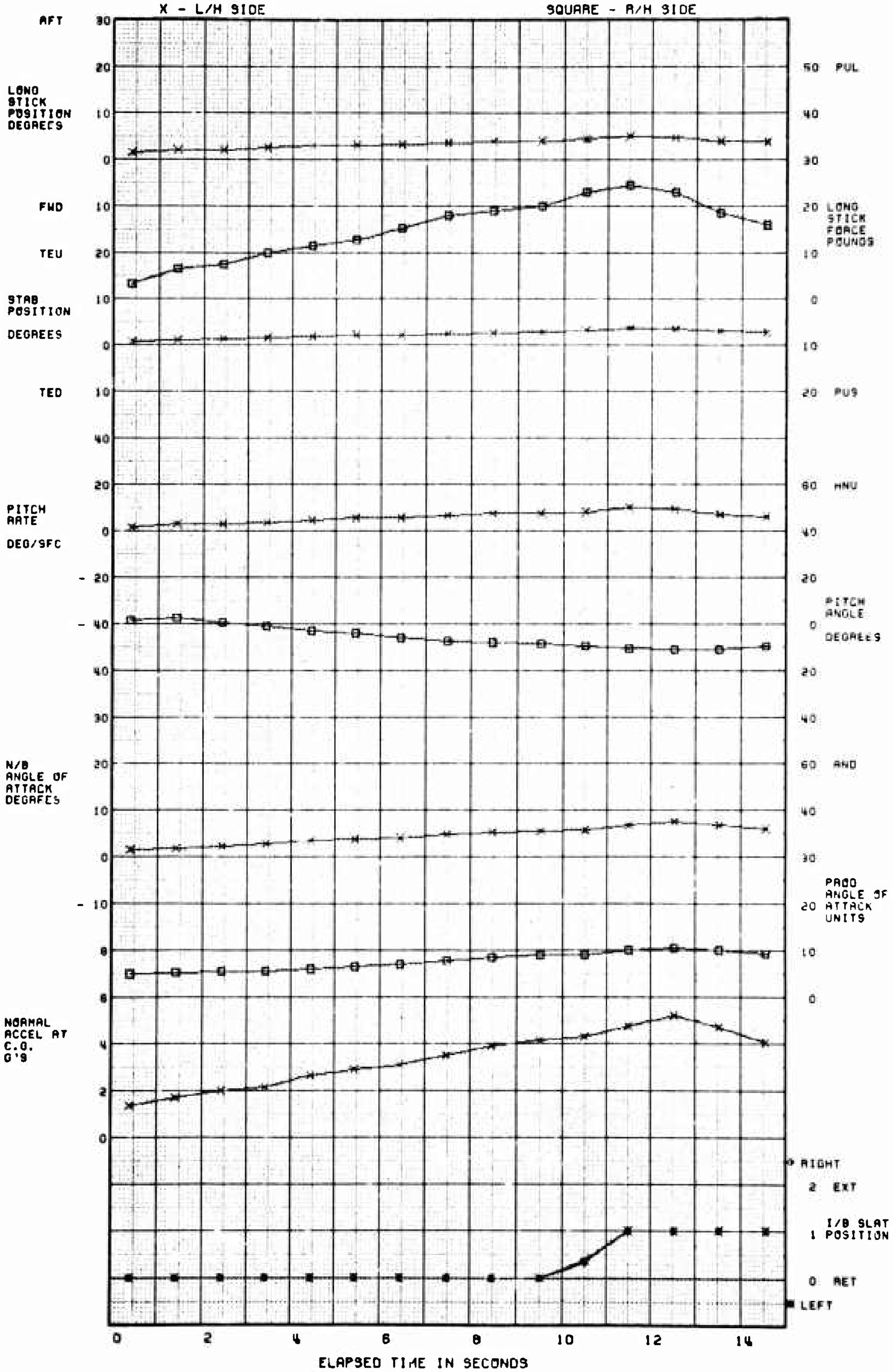

FIGURE 103 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-263 RUN 15 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

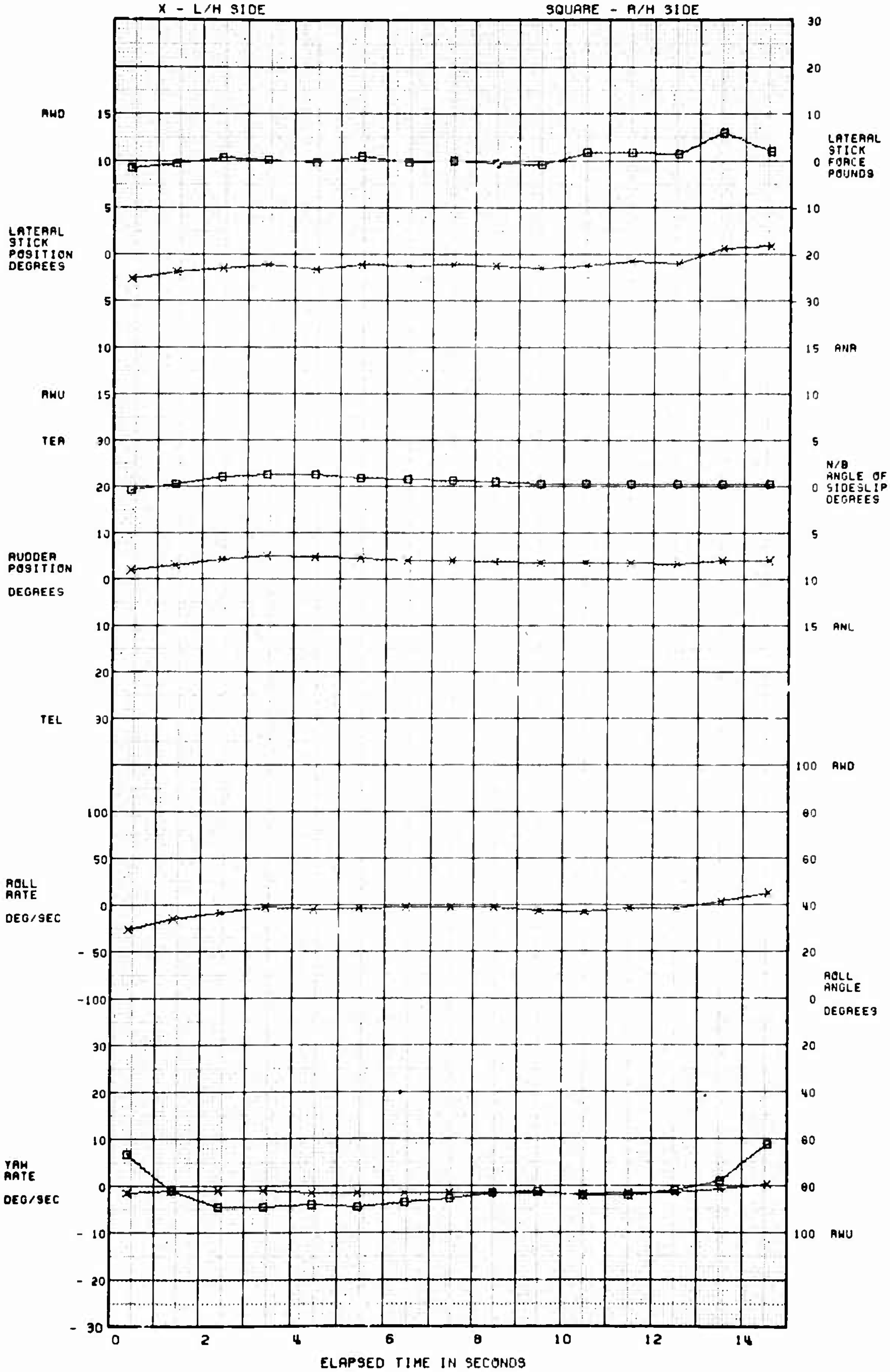

FIGURE 103 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 15 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

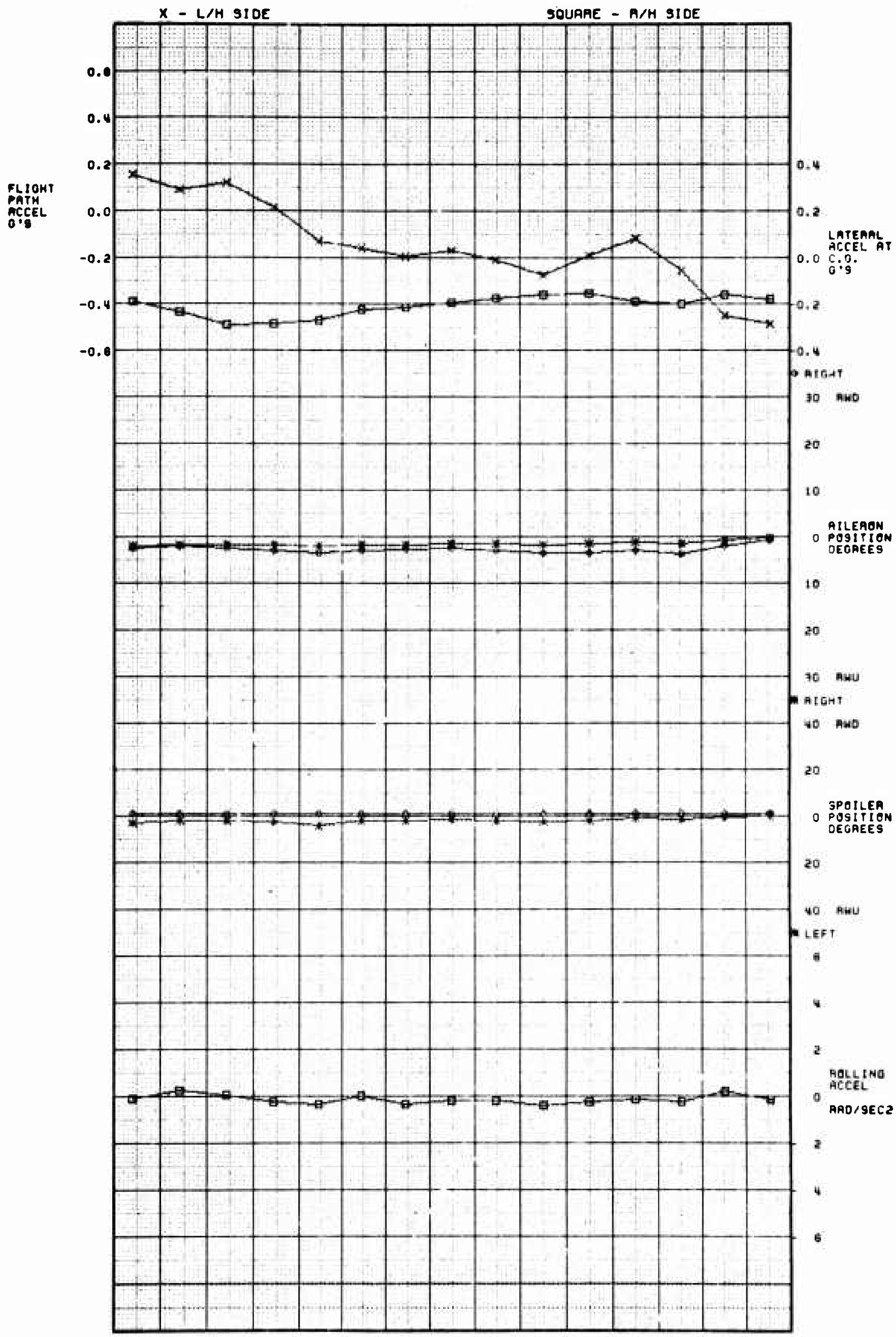

FIGURE 103 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 13 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

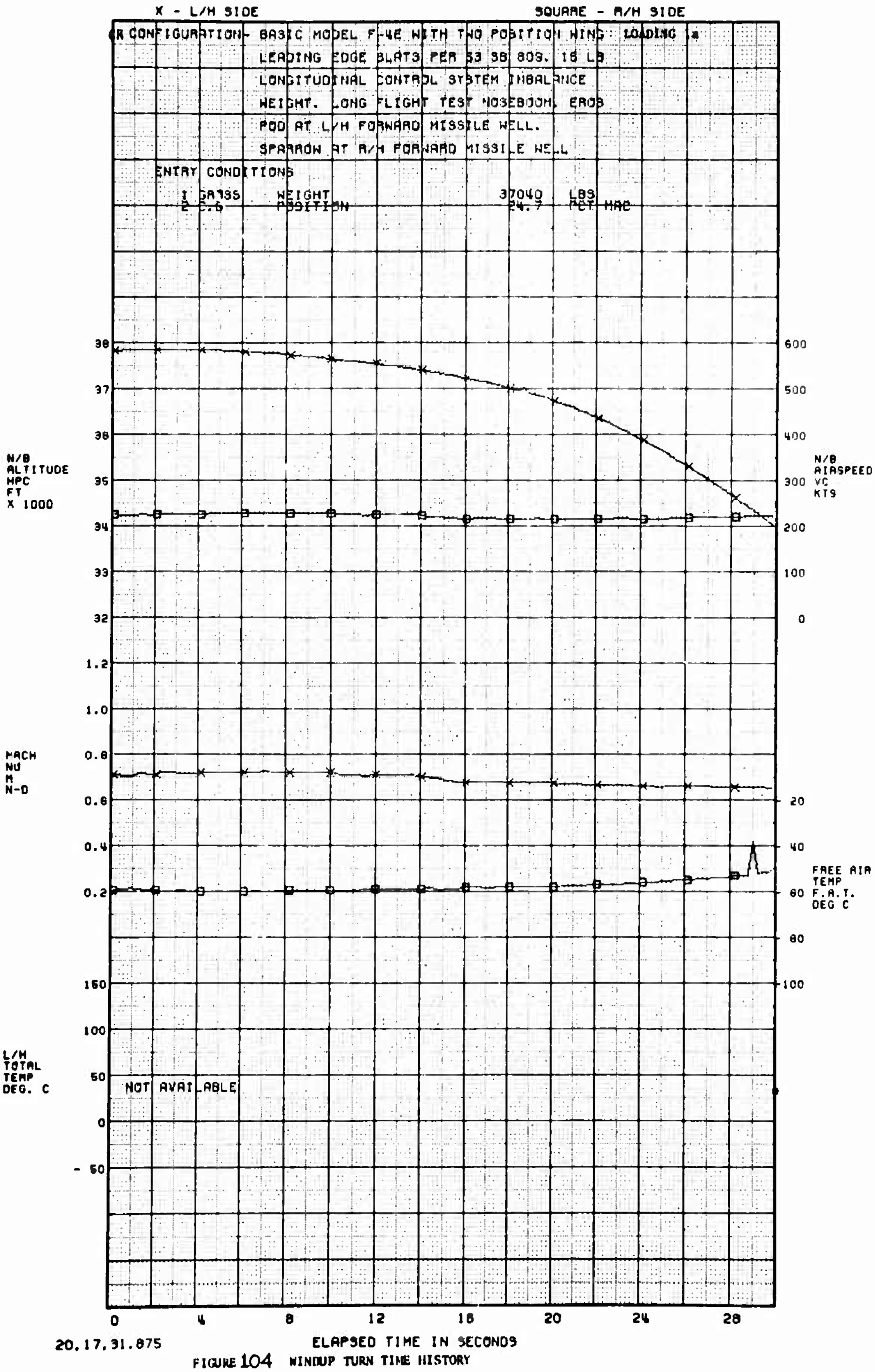

FIGURE 104 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-262 RUN 13 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

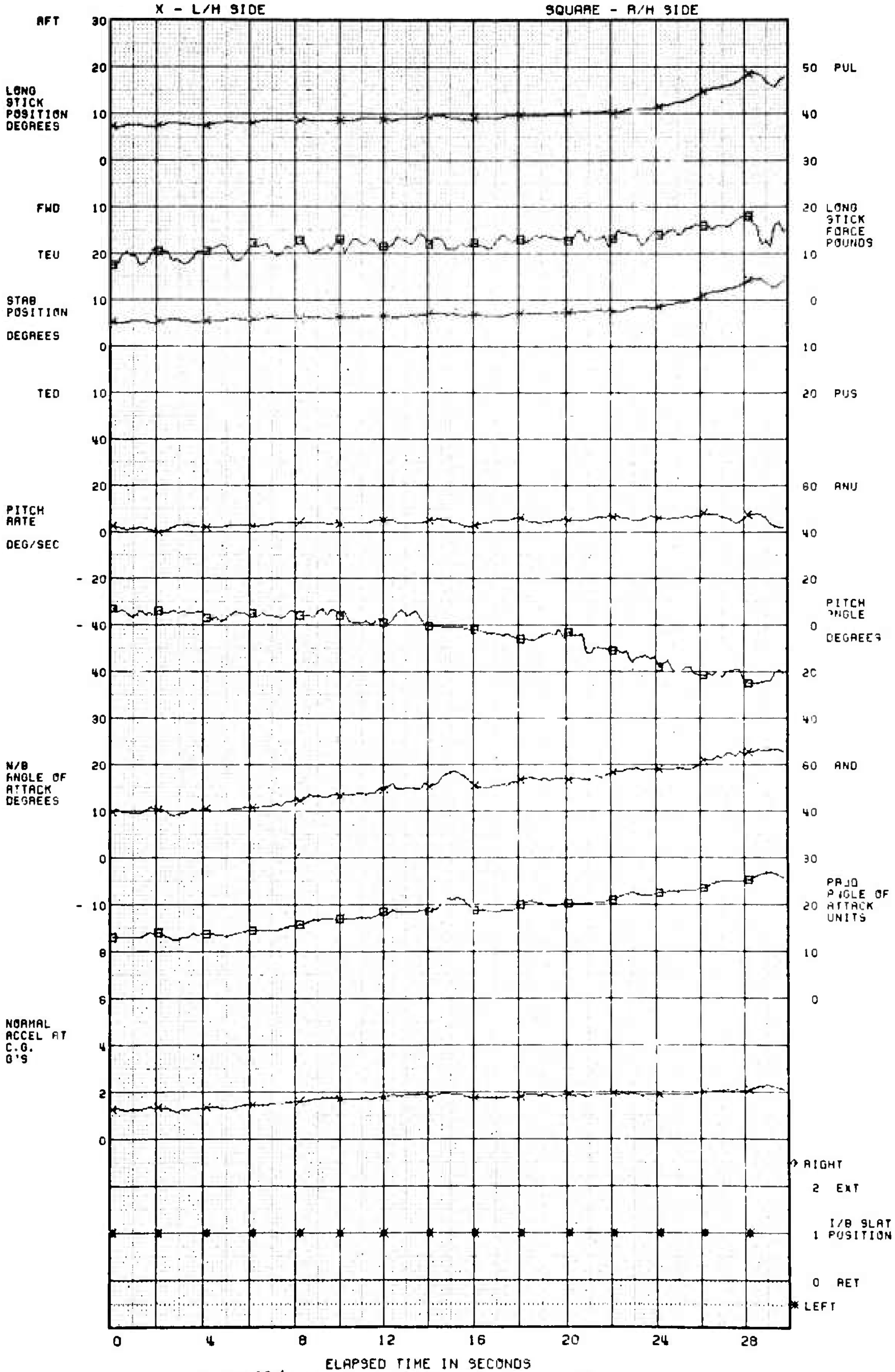

FIGURE 104 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 13 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

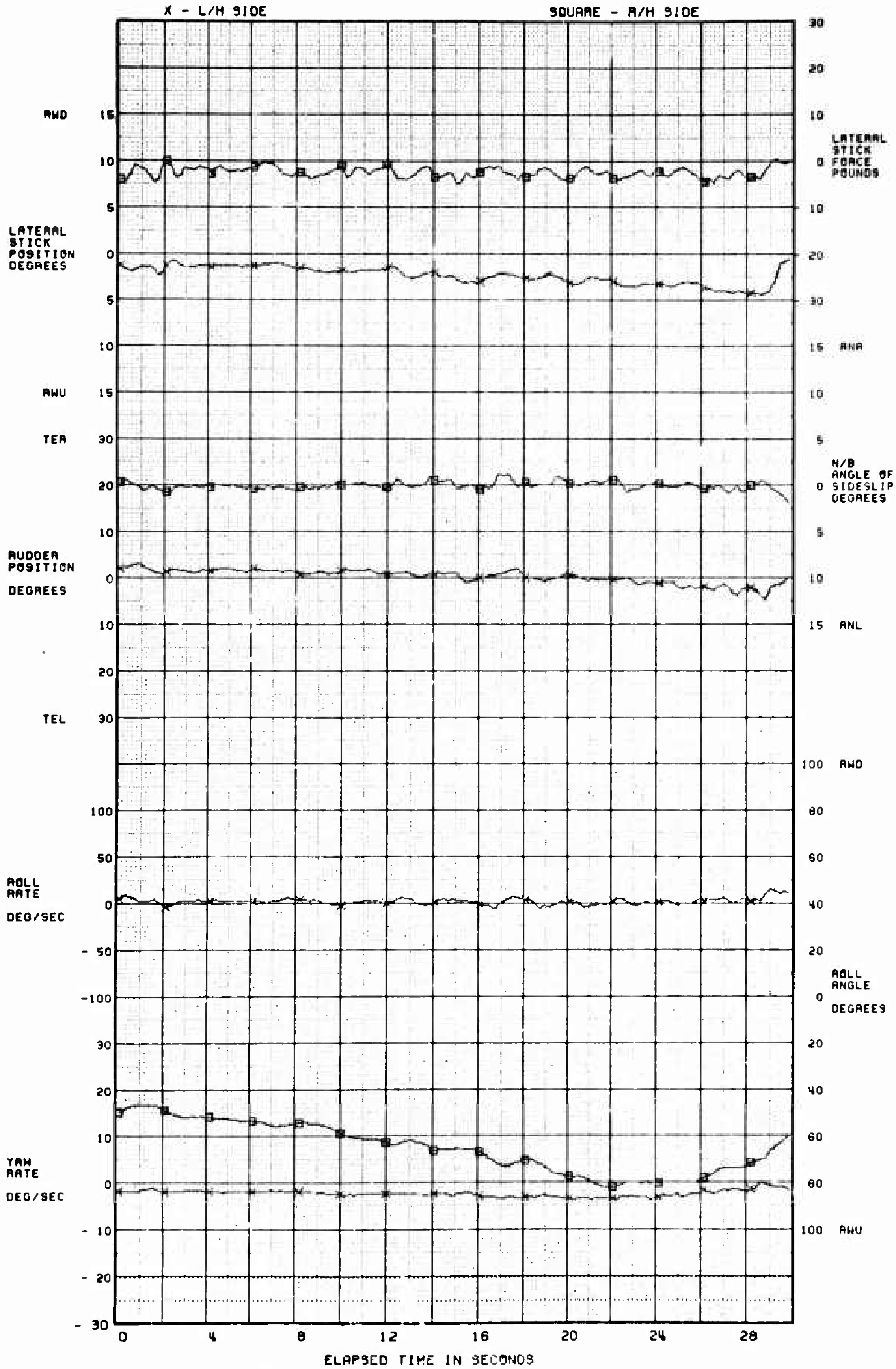

FIGURE 104 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 13 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

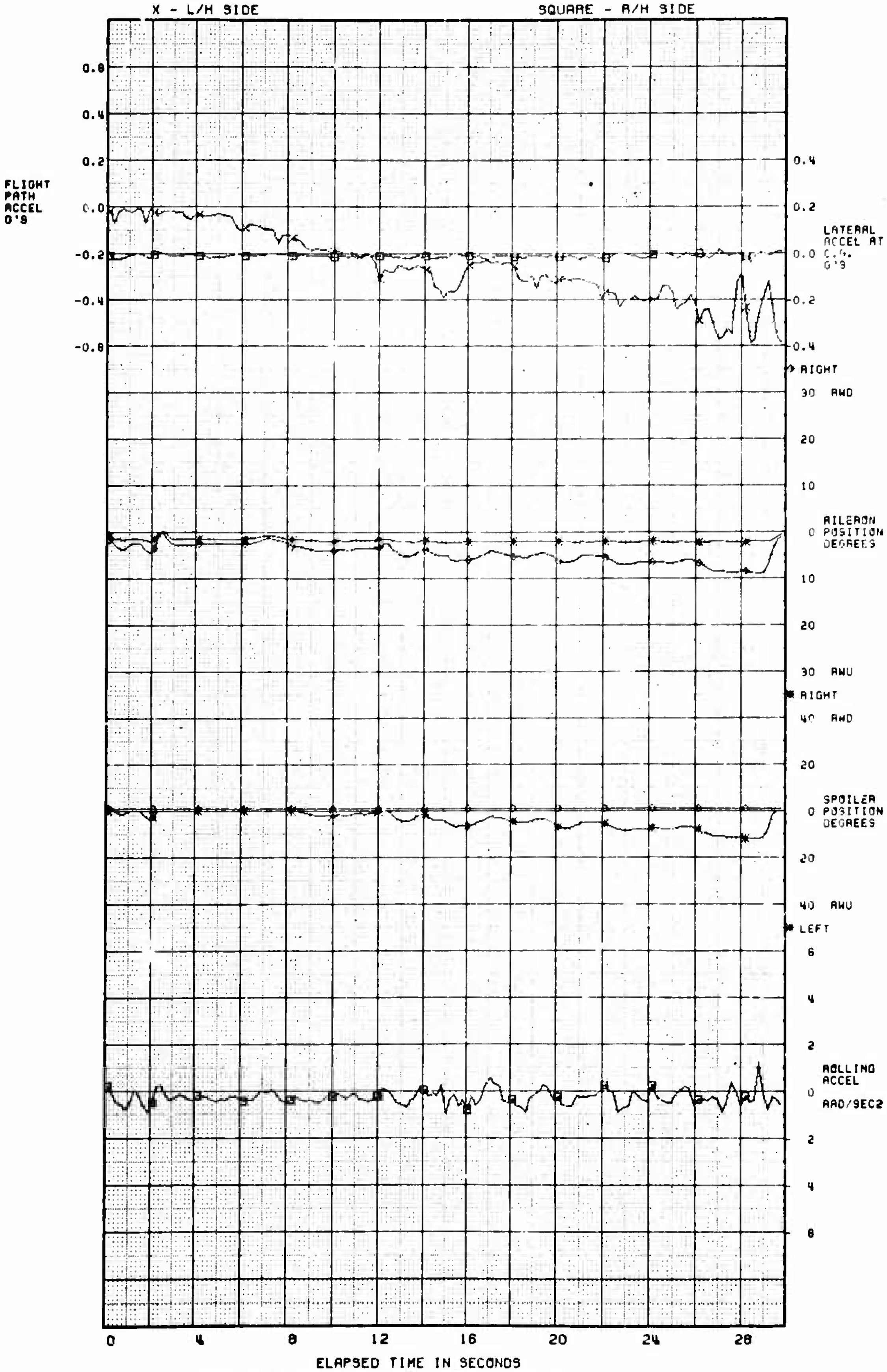

FIGURE 104 WINDUP TURN TIME HISTORY (CONCLUDED)

PAGE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 05 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

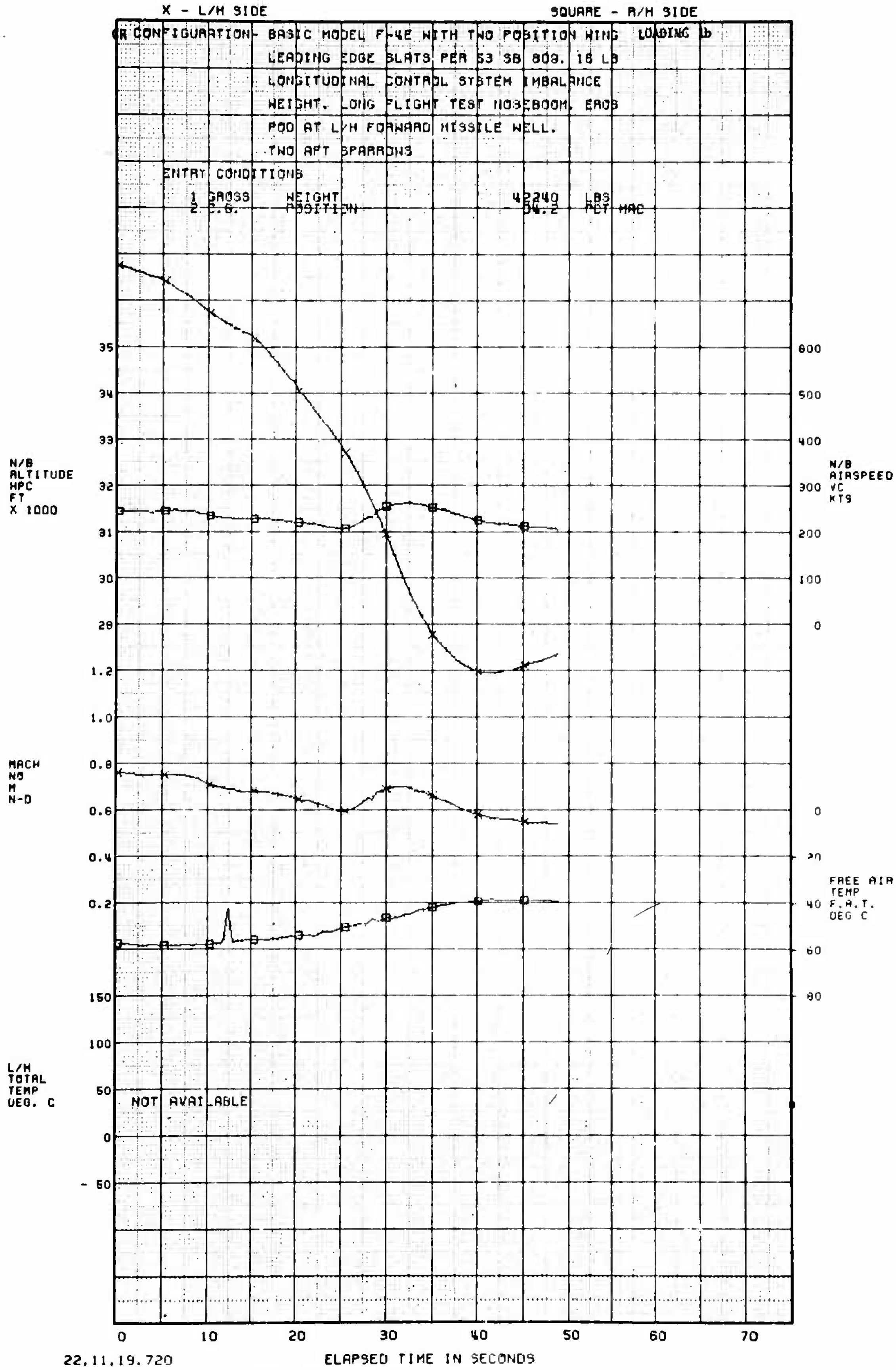

FIGURE 105 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 05 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

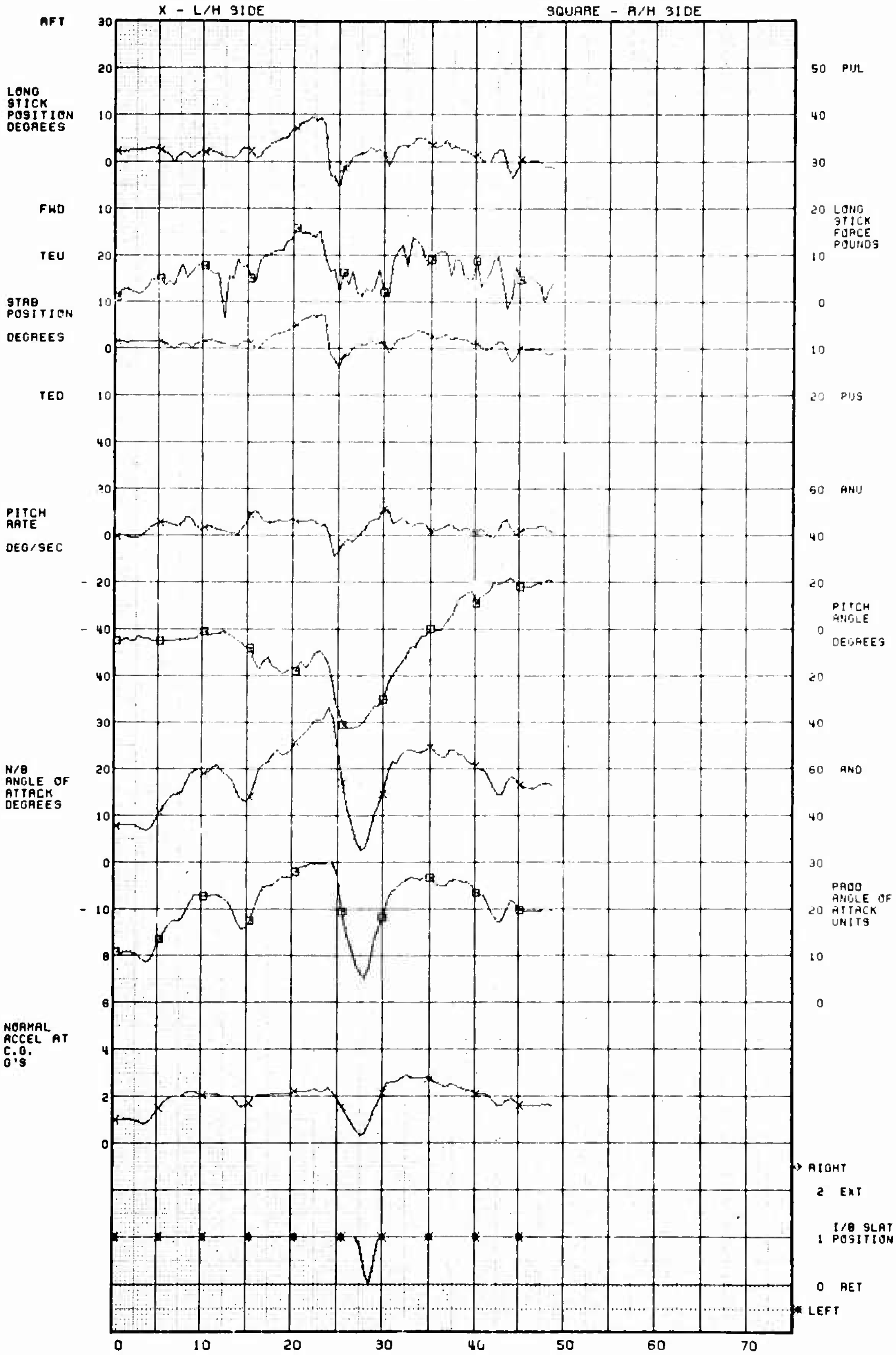

FIGURE 105 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 05 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

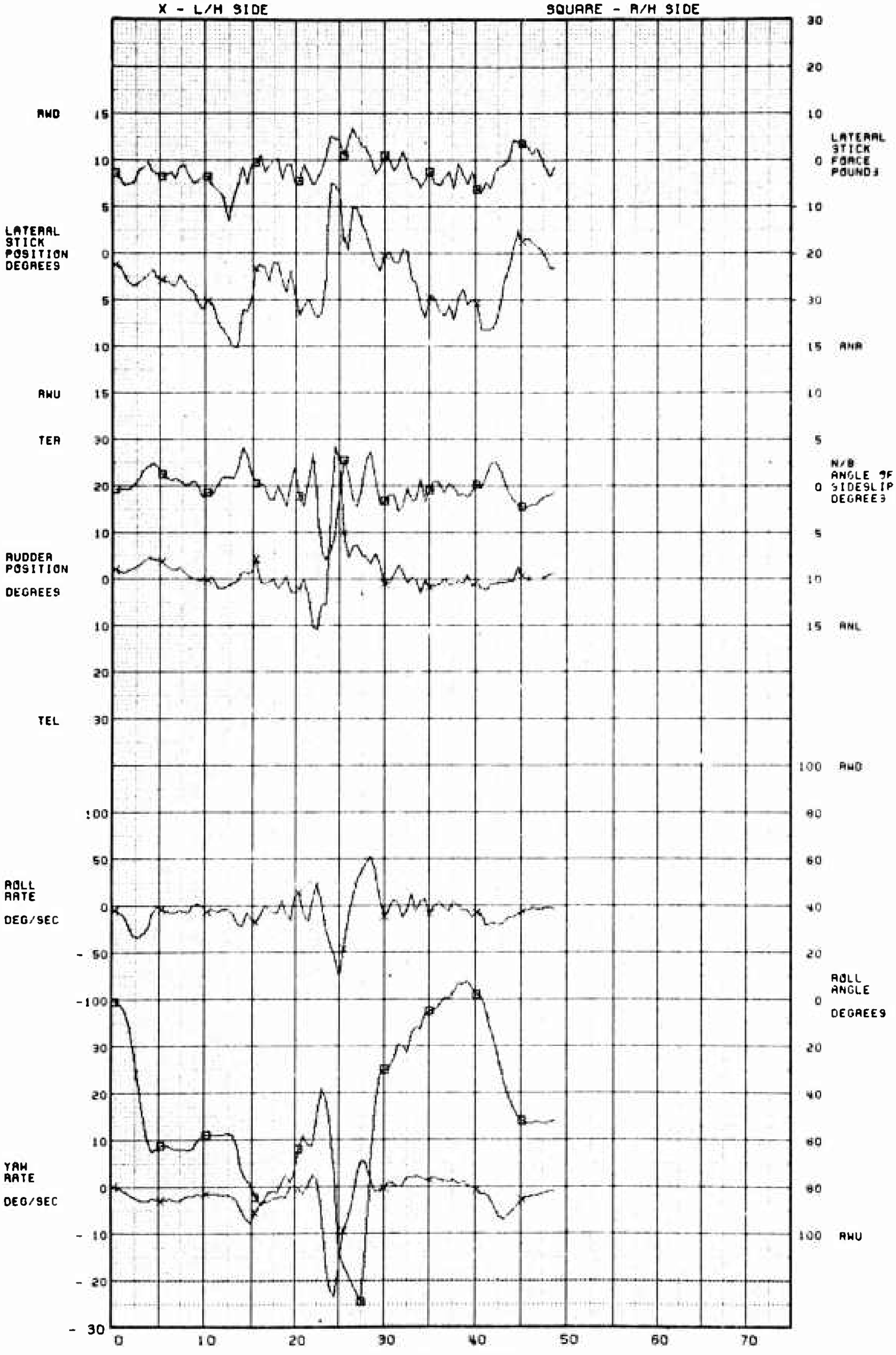

FIGURE 105 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-263 RUN 05 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

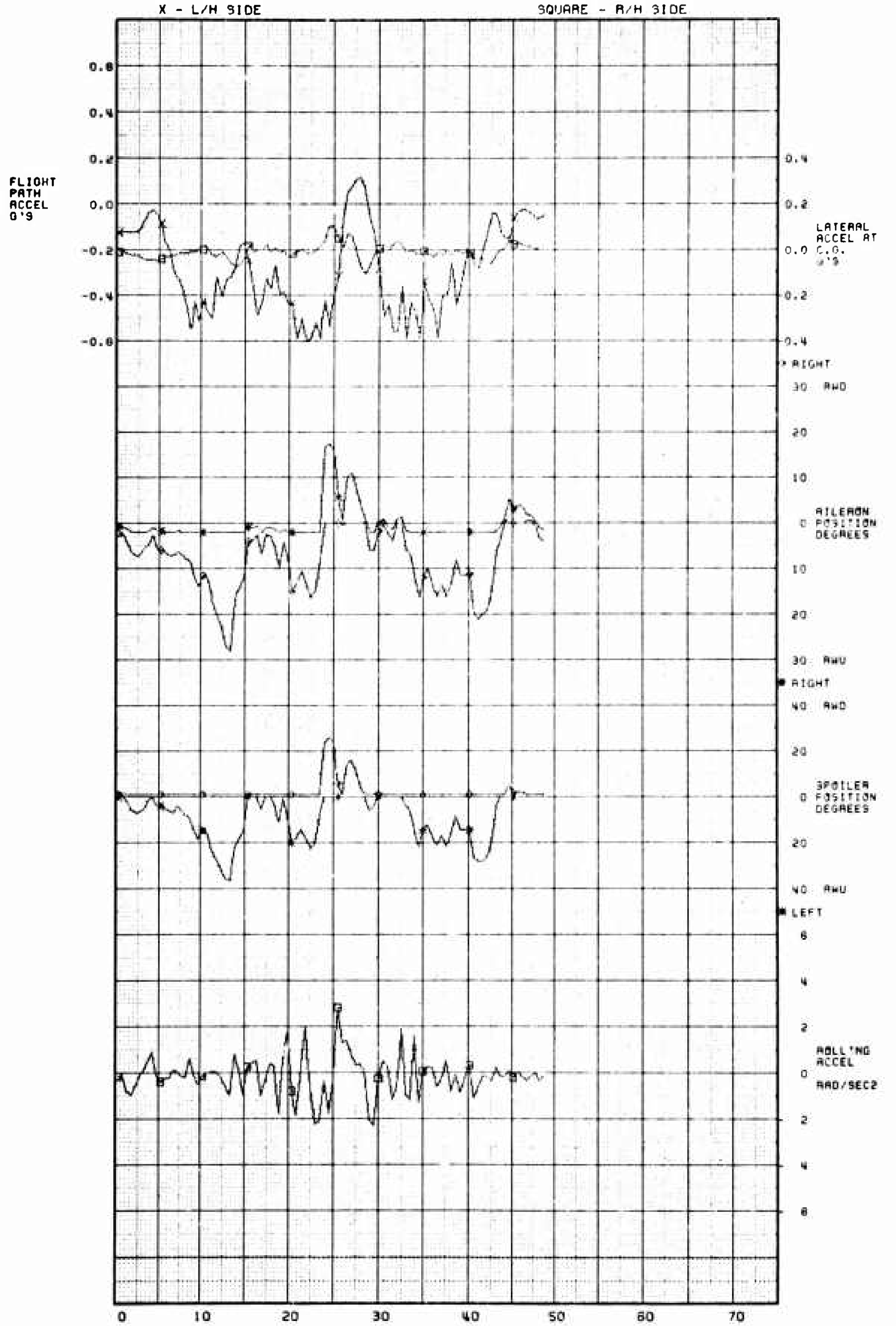

FIGURE 105 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

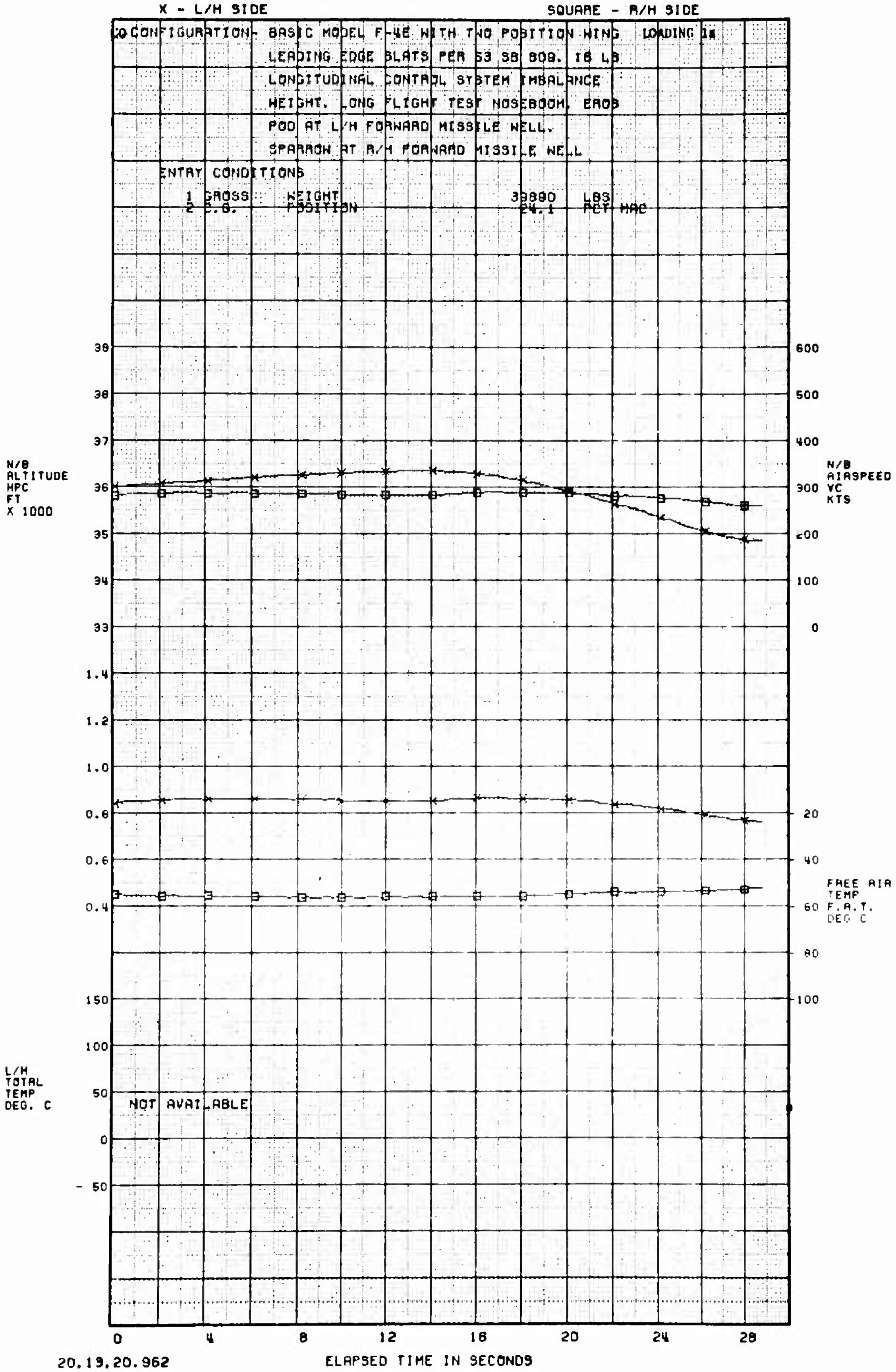

FIGURE 106 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

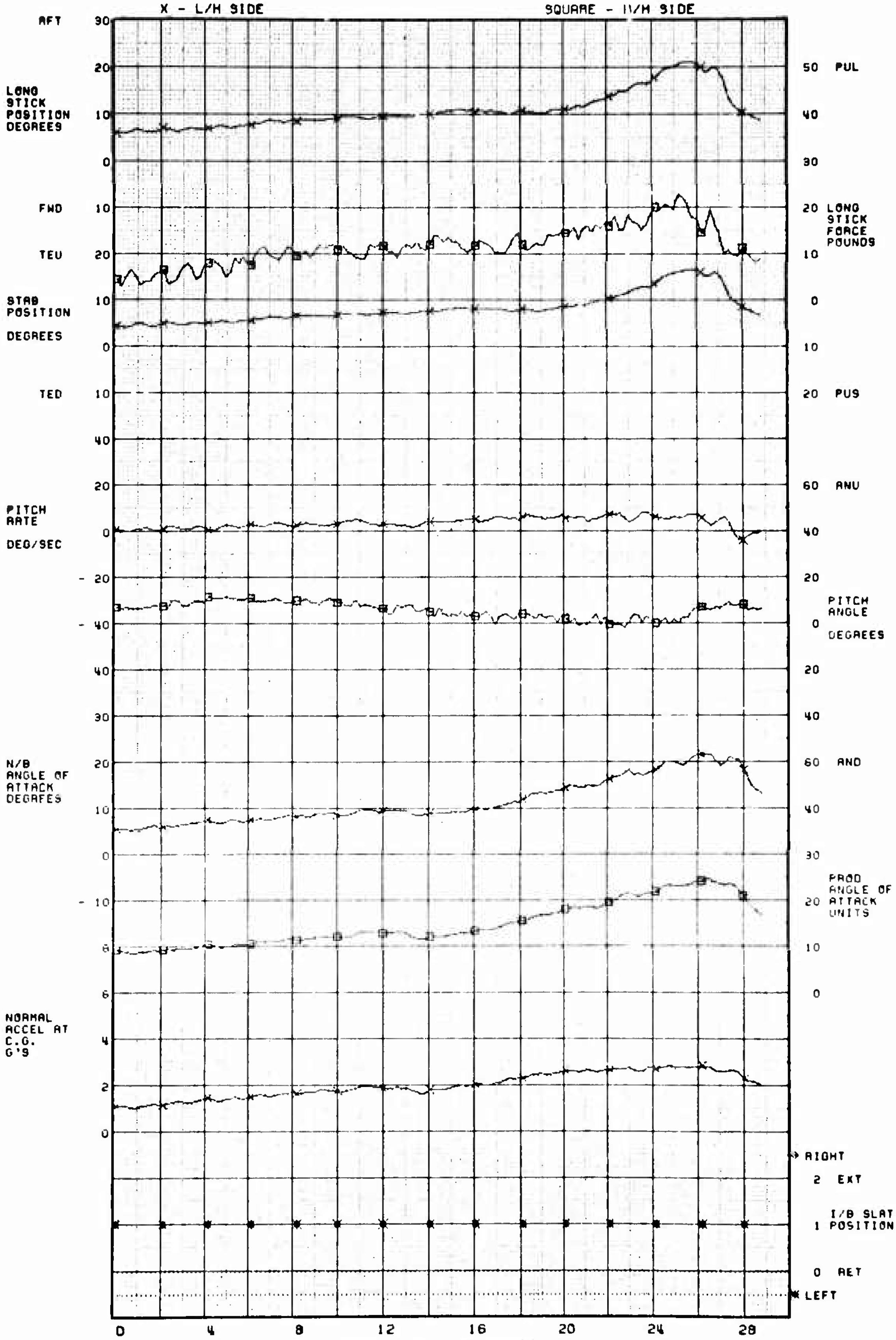

FIGURE 106 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

X - L/H SIDE SQUARE - R/H SIDE

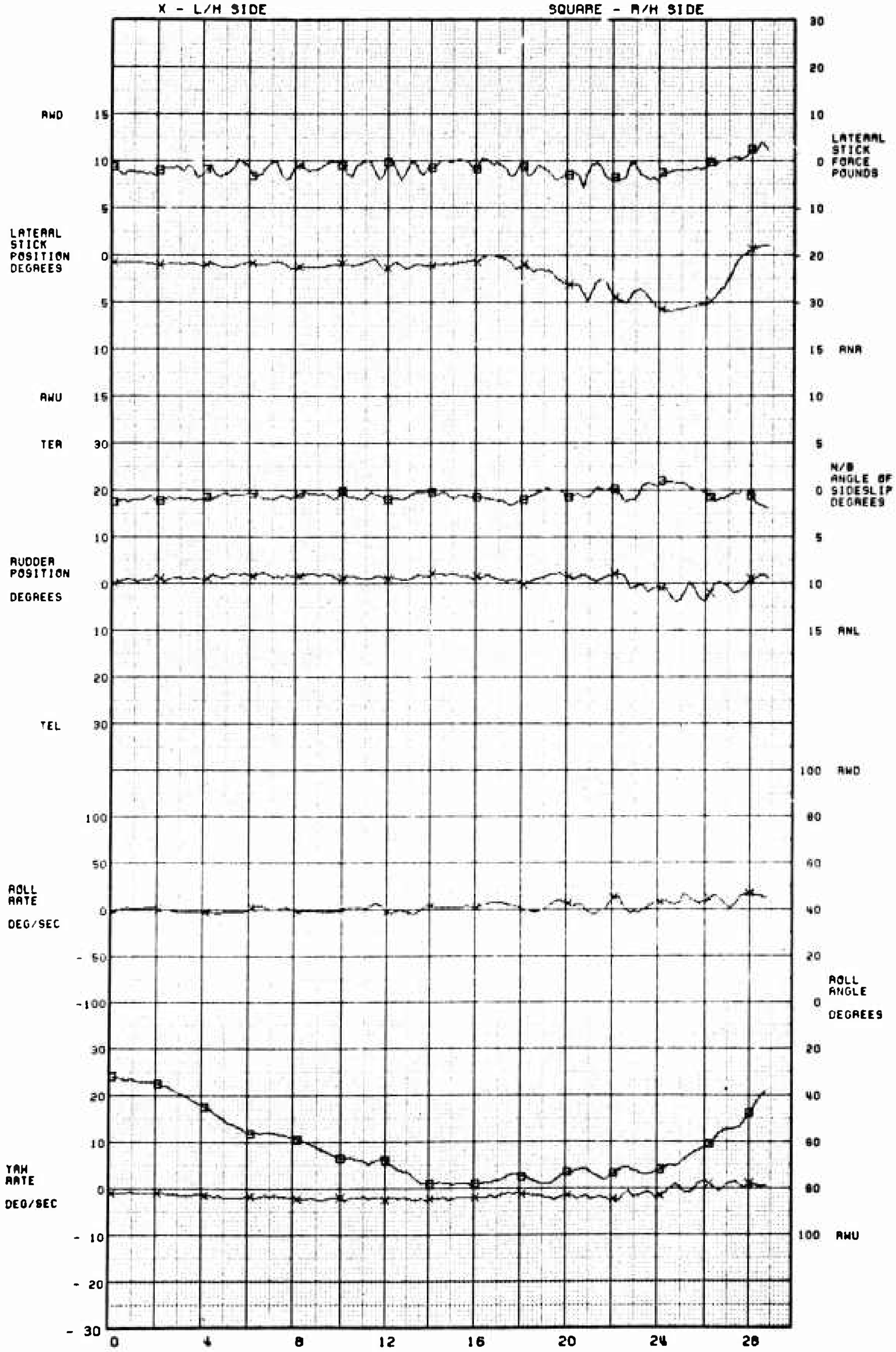

FIGURE 106 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 08 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

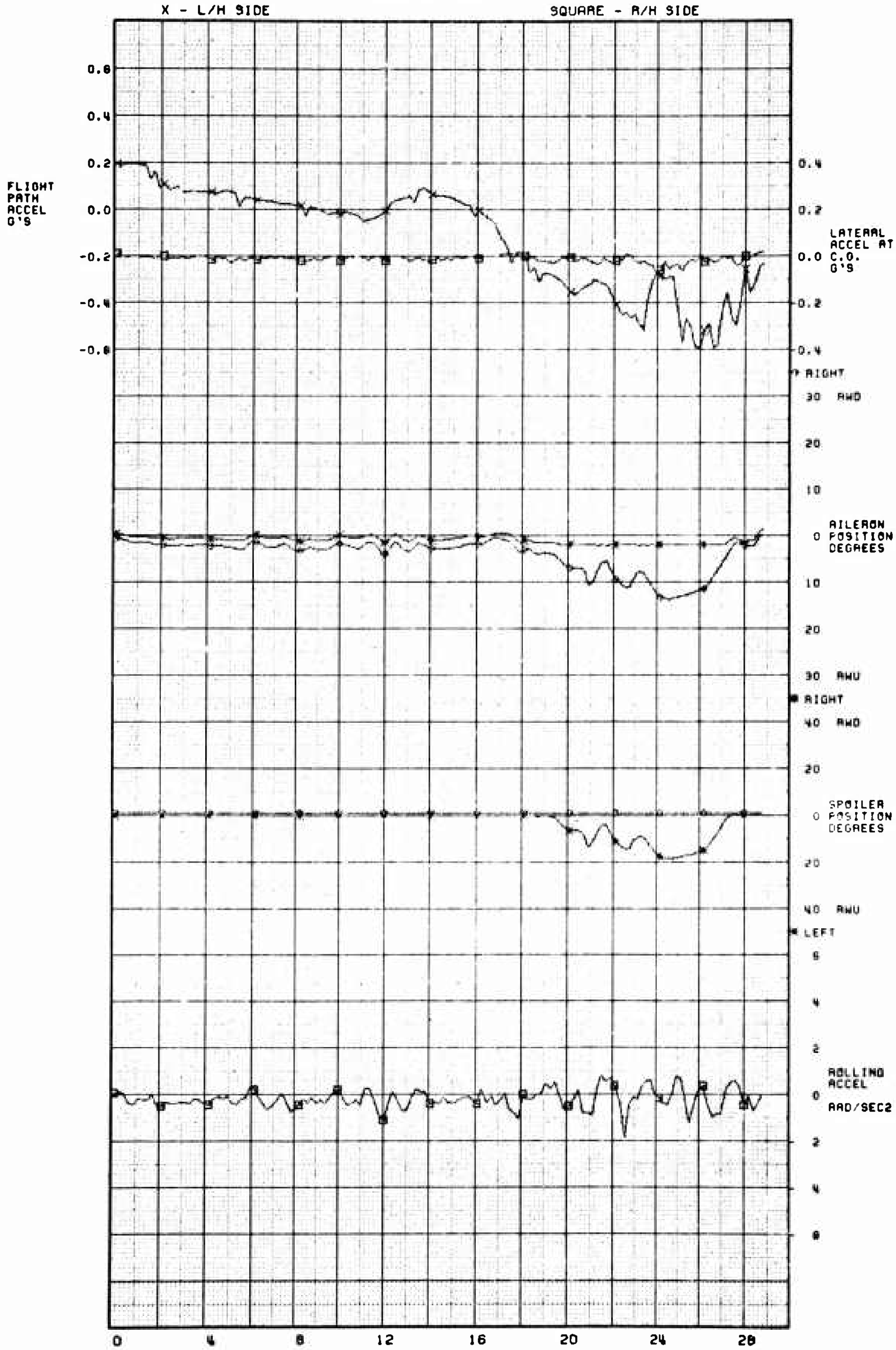

FIGURE 106 WINDUP TURN TIME HISTORY (CONCLUDED)

PAGE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 07 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

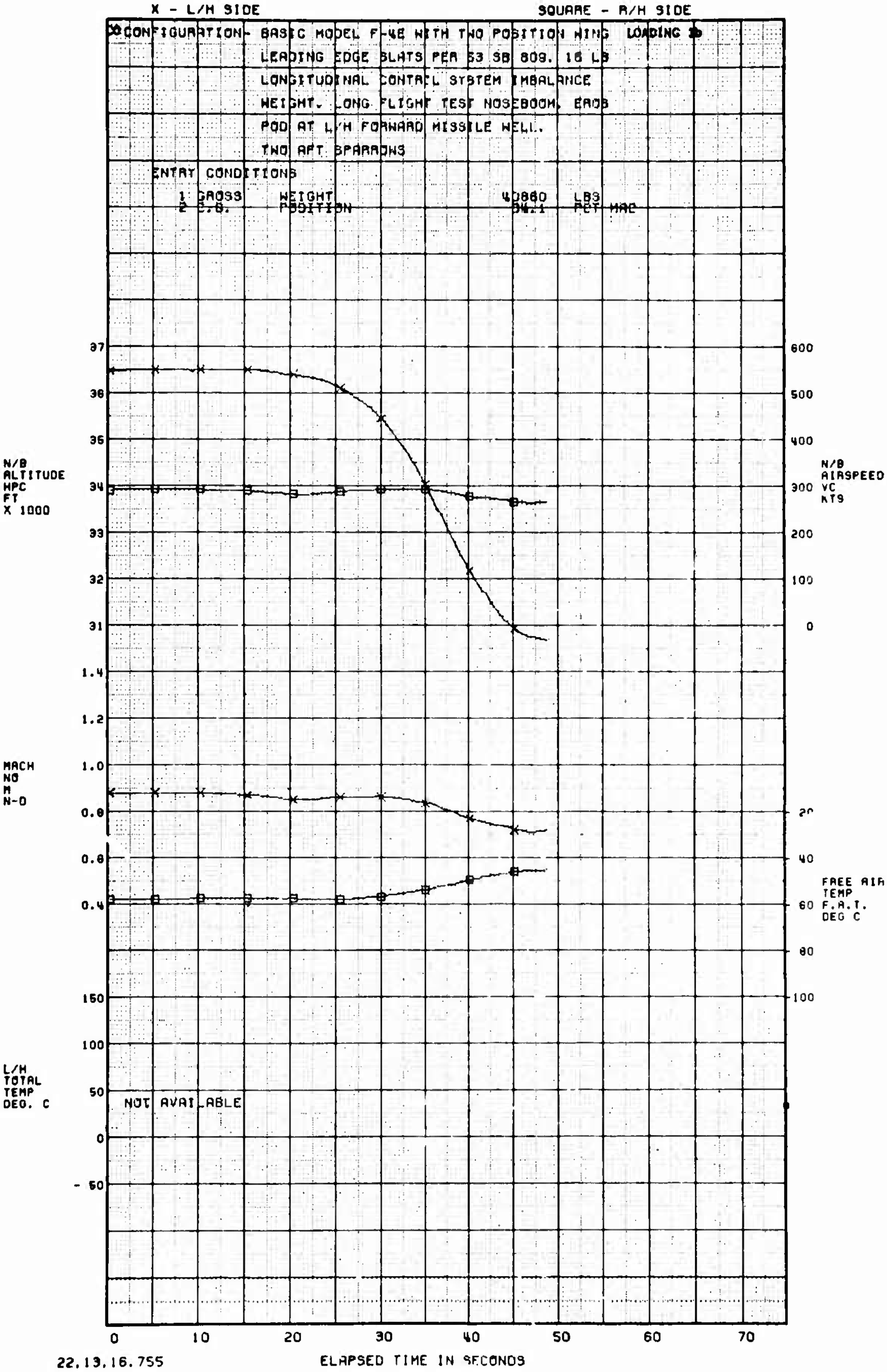

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FIGURE 107 WINDUP TURN TIME HISTORY

PAGE 02

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 07 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

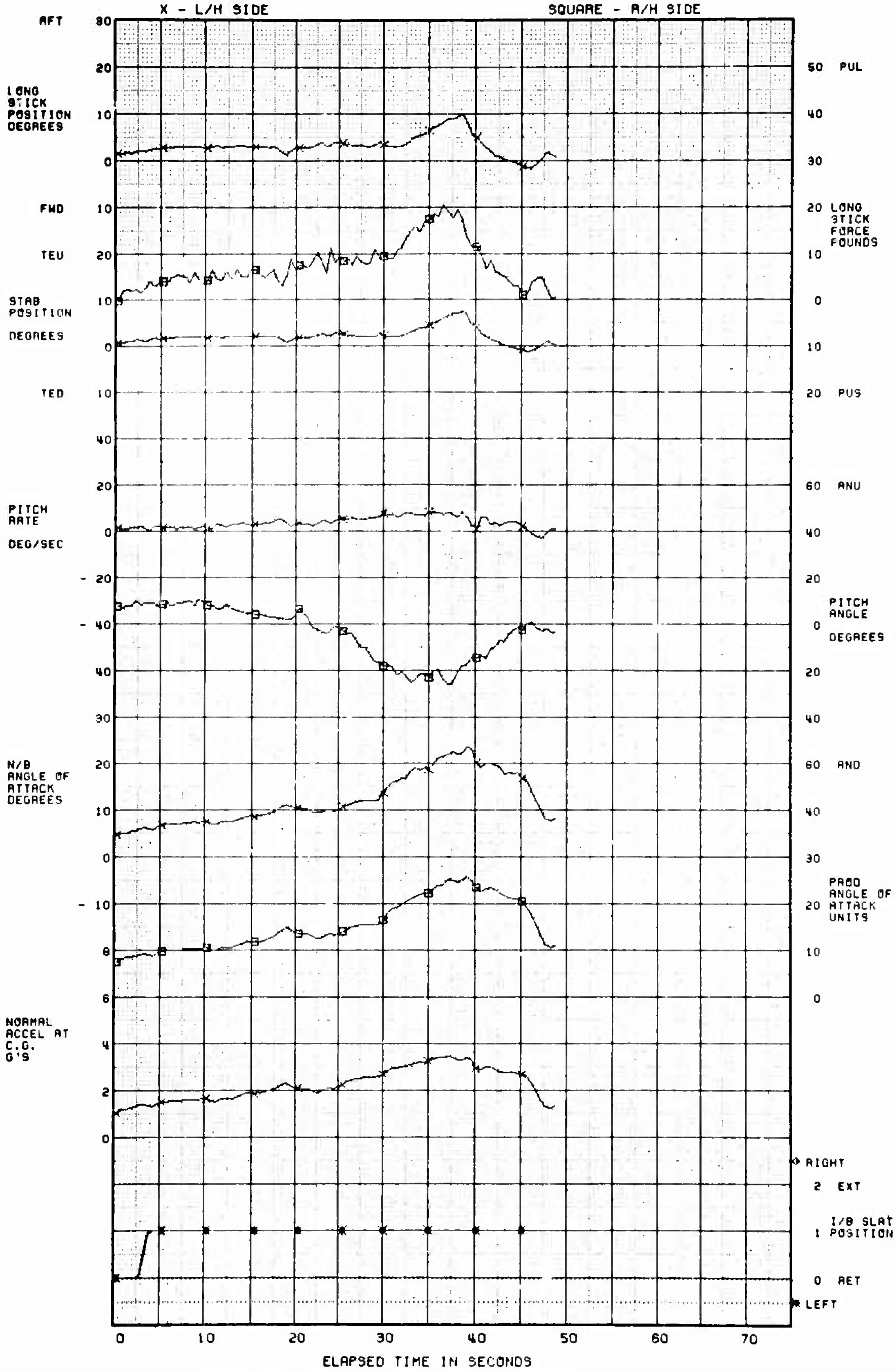


FIGURE 107 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 07 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

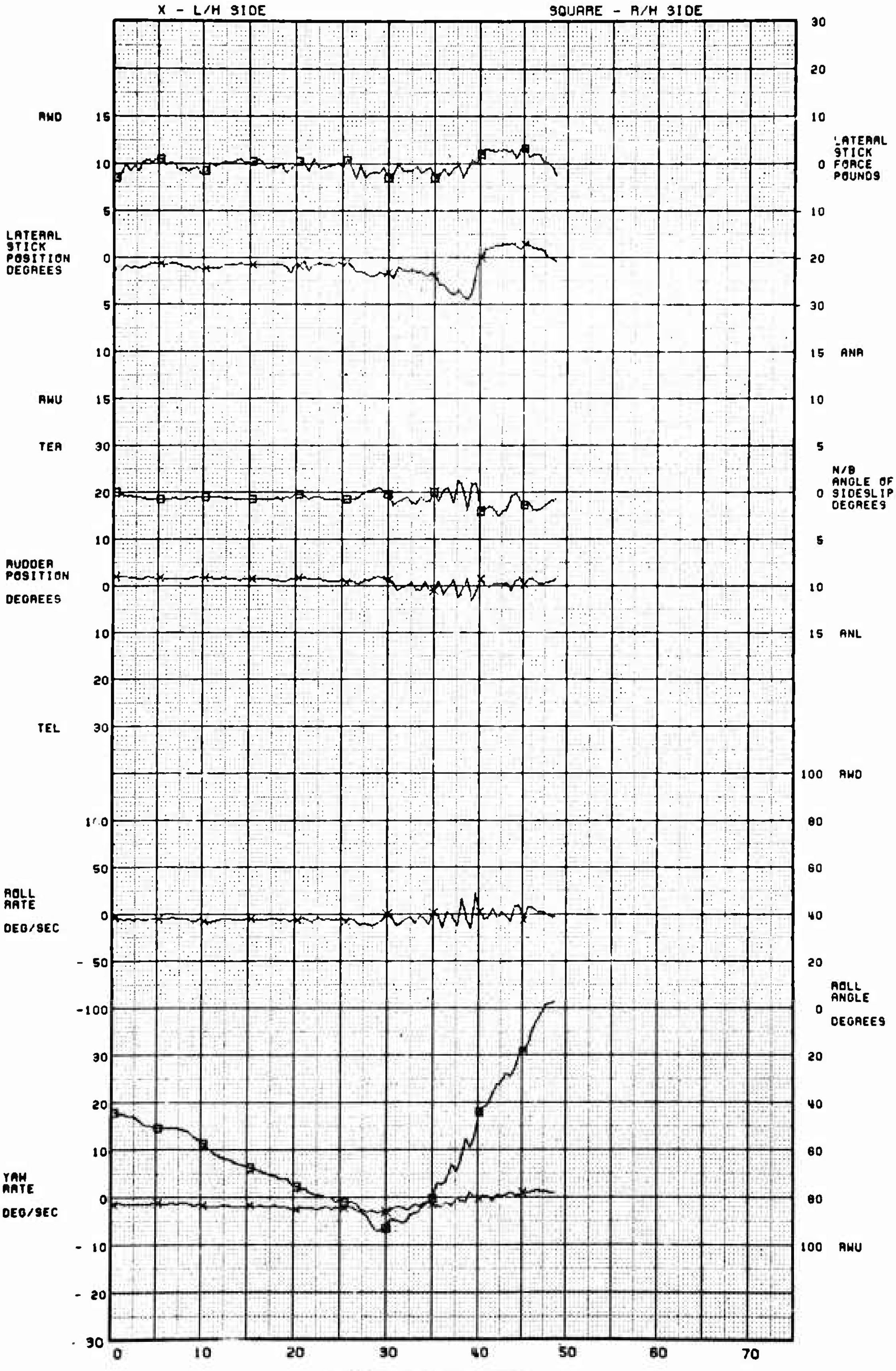


FIGURE 107 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-263 RUN 07 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

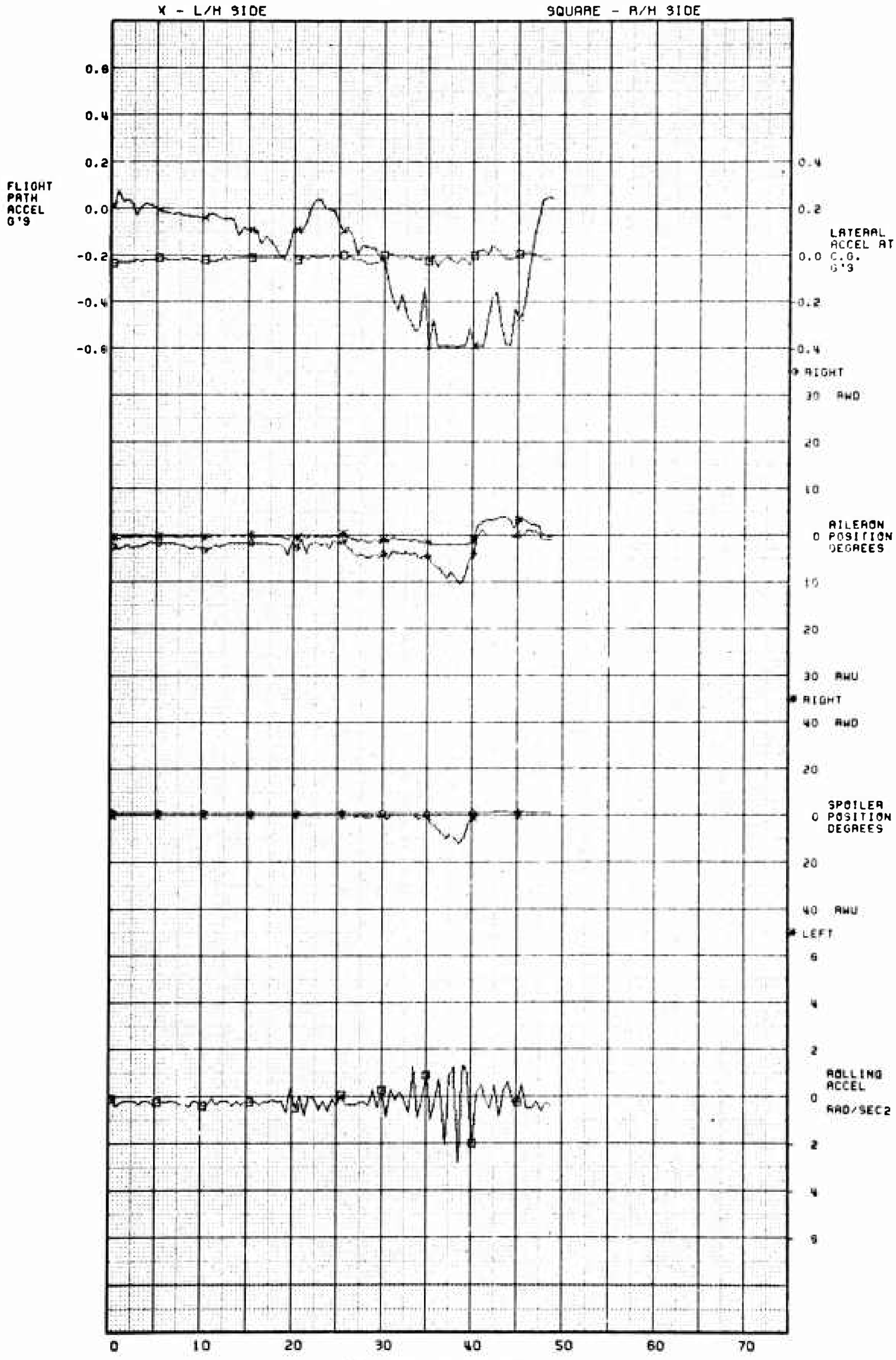


FIGURE 107 WINDUP TURN TIME HISTORY (CONCLUDED)

ADE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-262 RUN 09 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 68-0287
WIND-UP-TURN

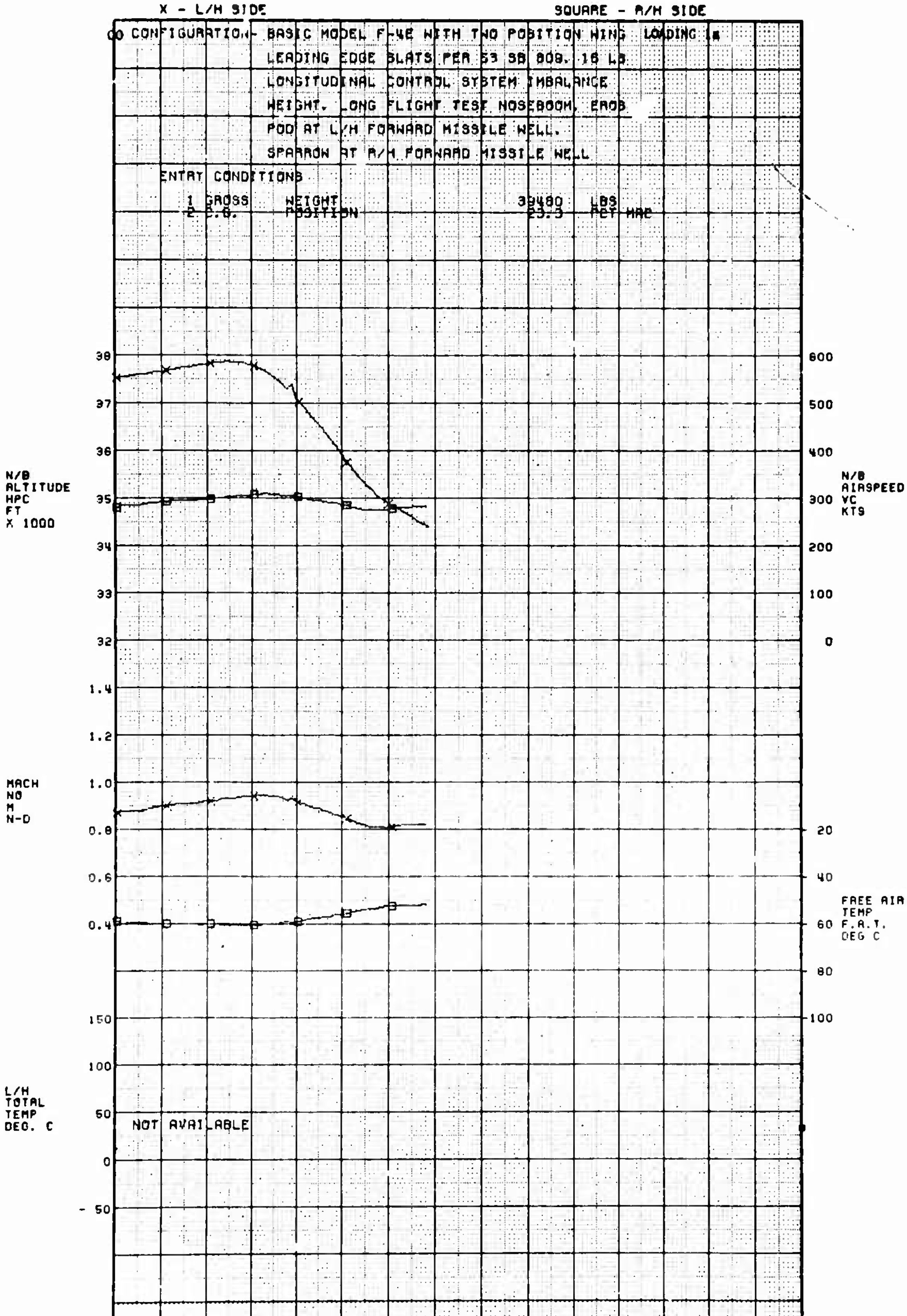


FIGURE 108 WINDUP TURN TIME HISTORY

PAGE 02

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 09 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

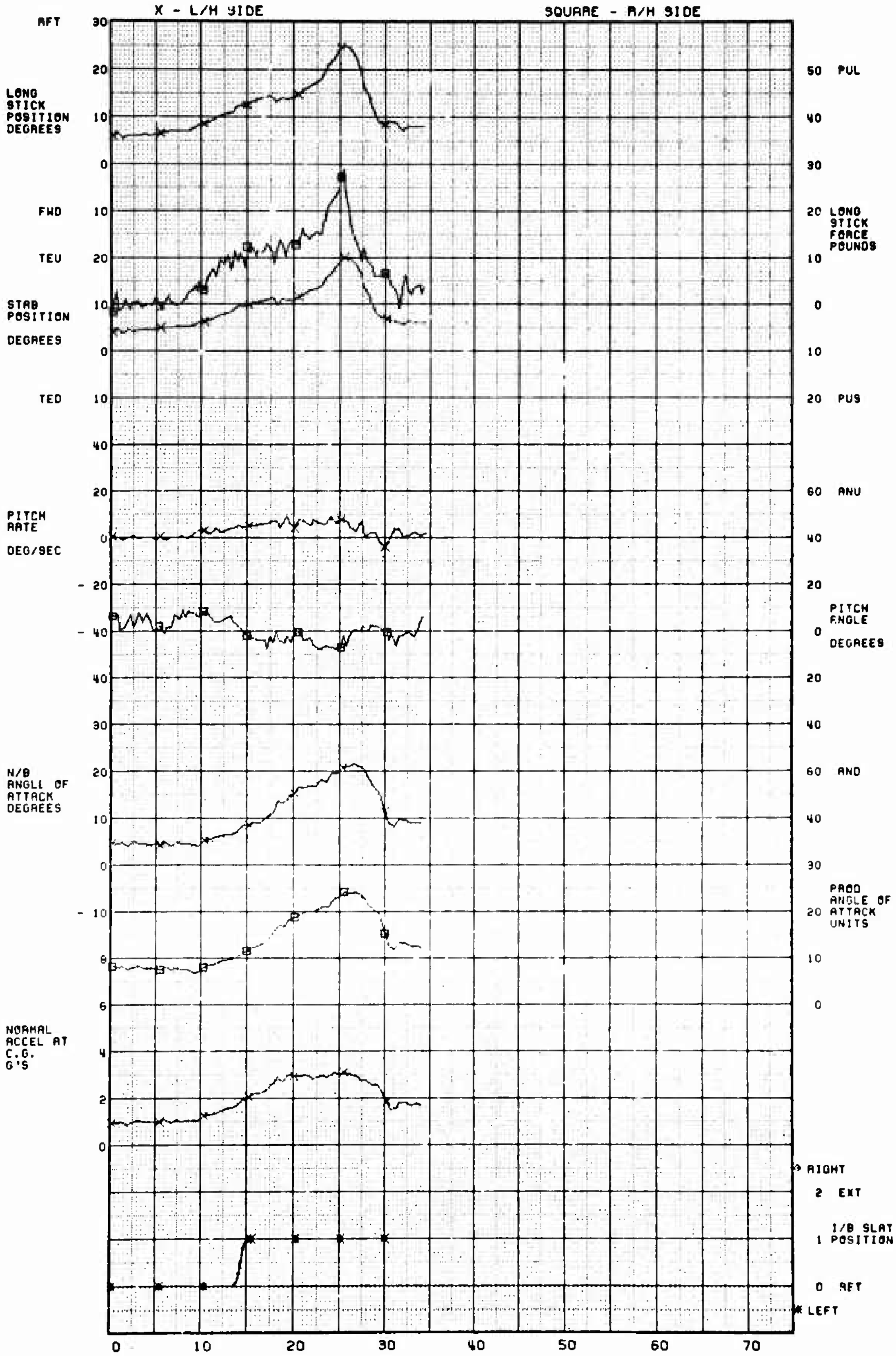


FIGURE 108 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E

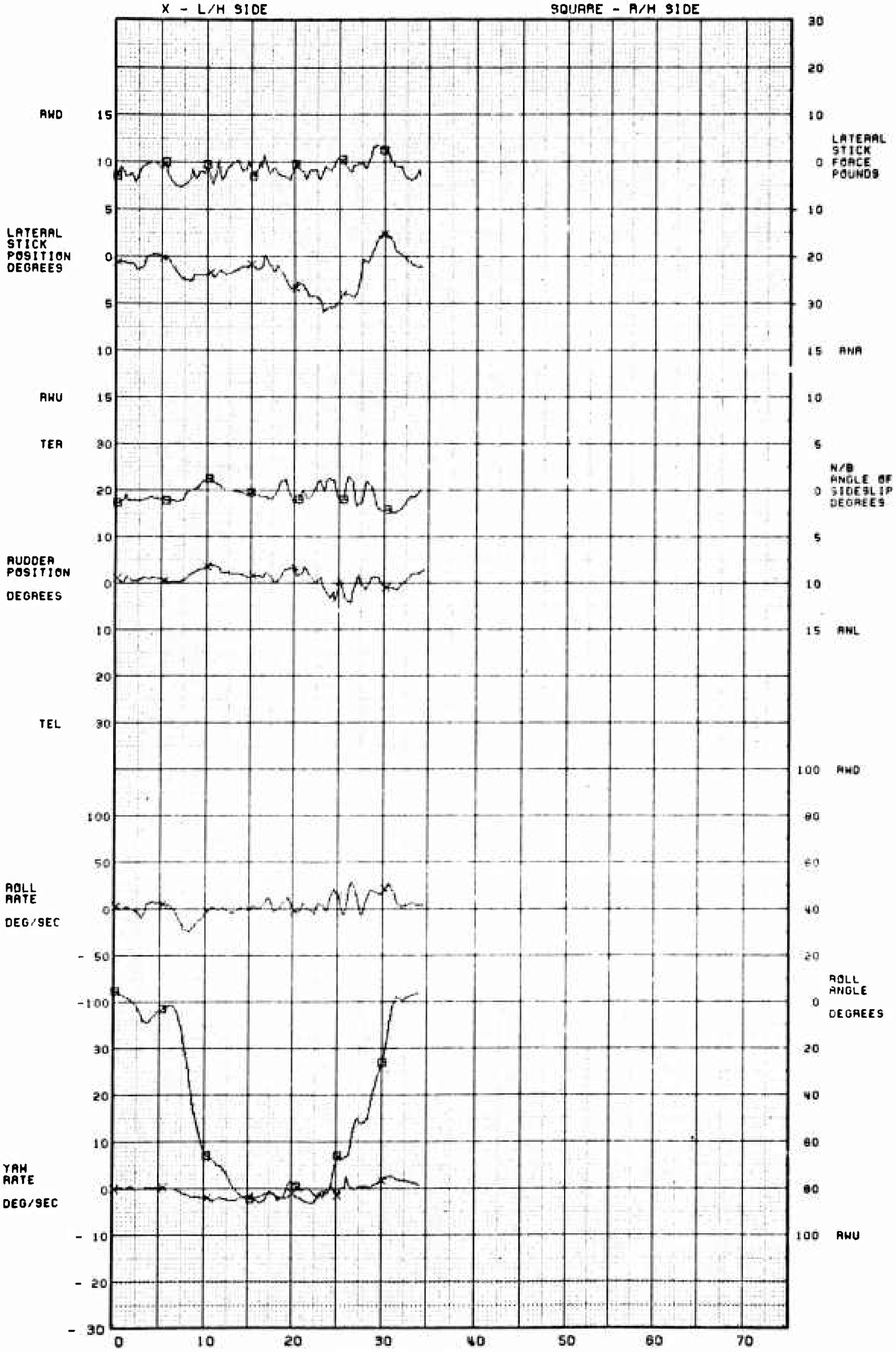
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 09 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

X - L/H SIDE SQUARE - R/H SIDE



ELAPSED TIME IN SECONDS

FIGURE 108 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 09 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

X - L/H SIDE SQUARE - R/H SIDE

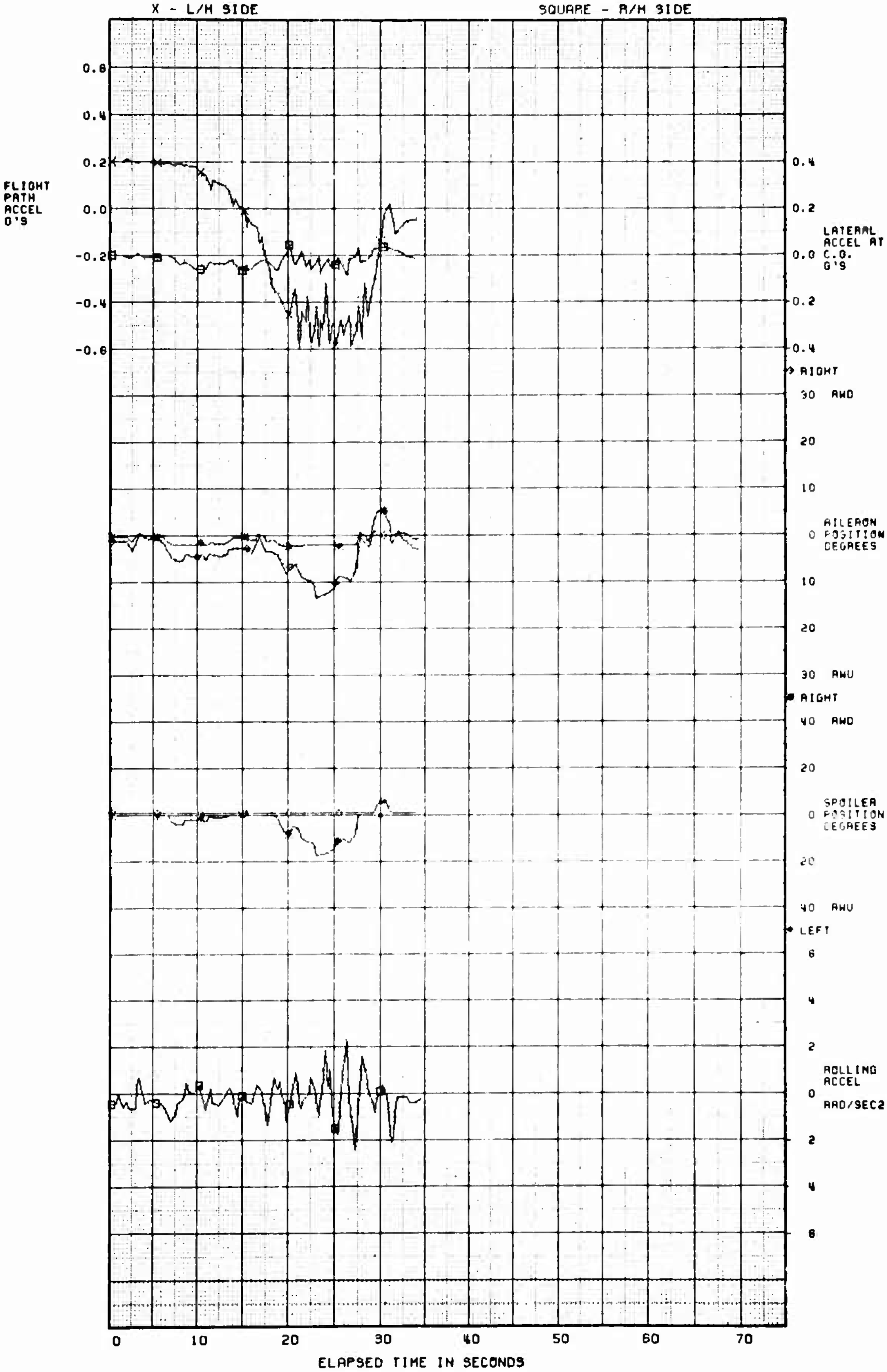


FIGURE 108 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 08 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

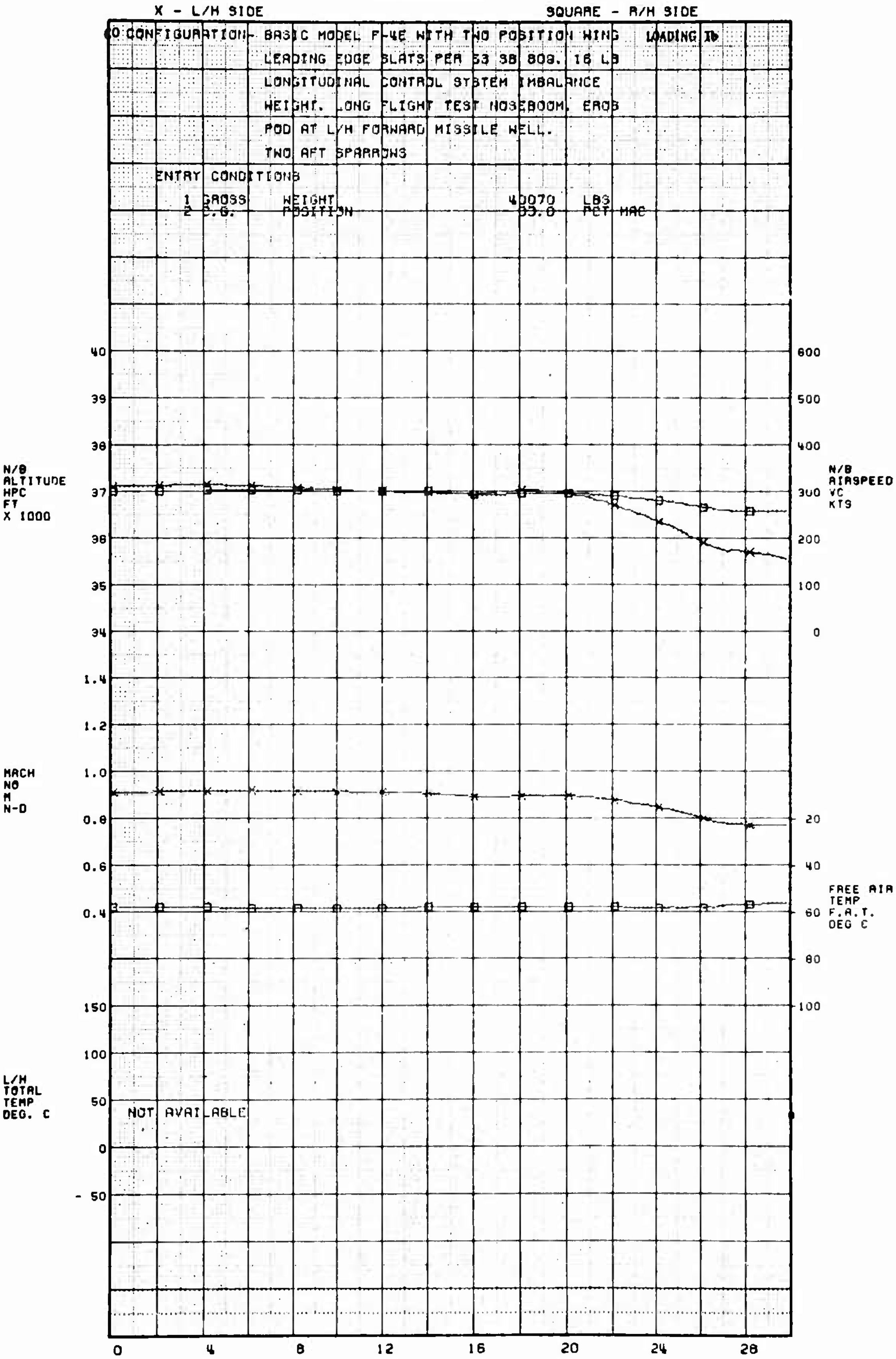


FIGURE 109 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 08 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

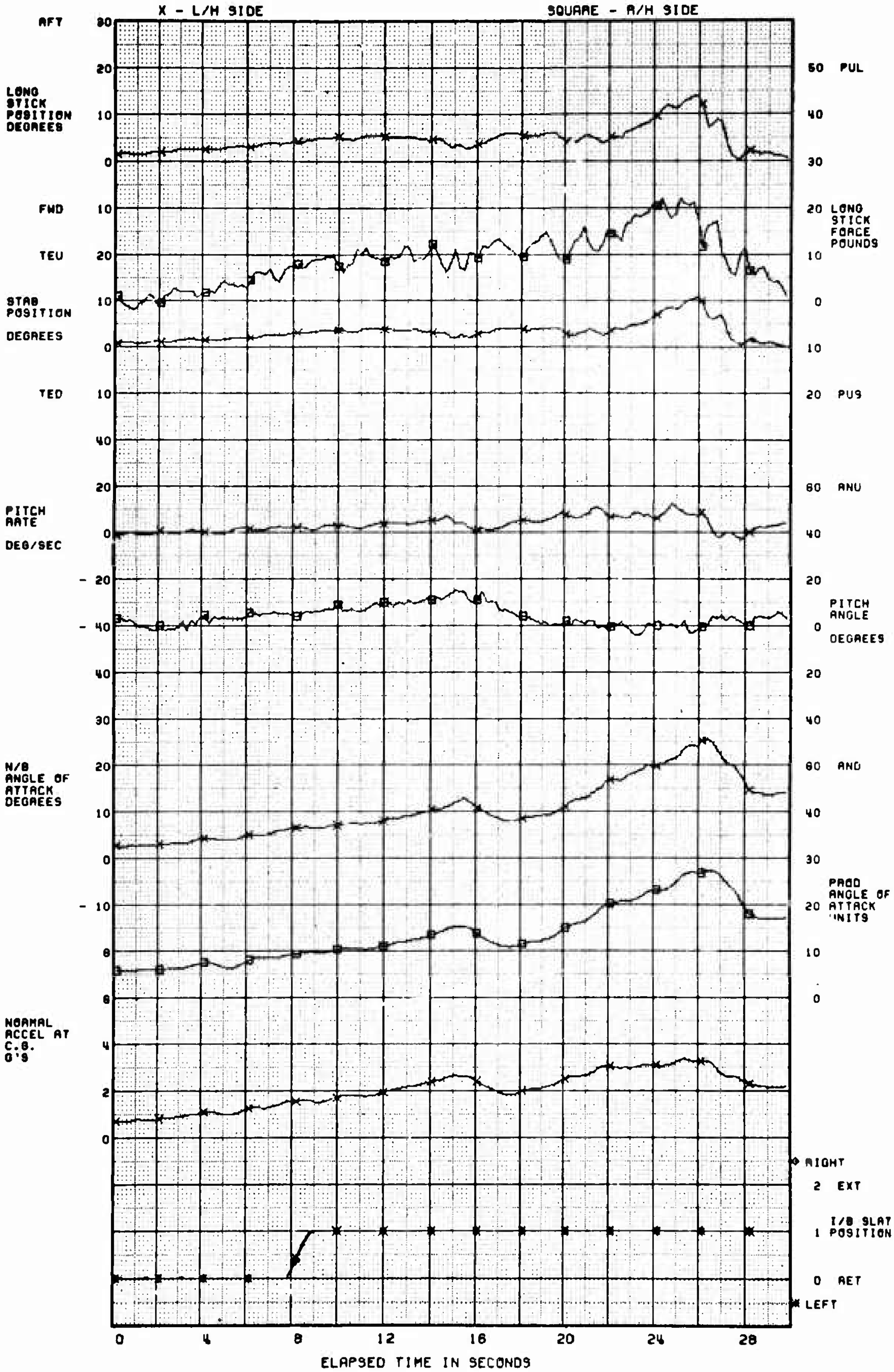


FIGURE 109 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-283 RUN 08 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

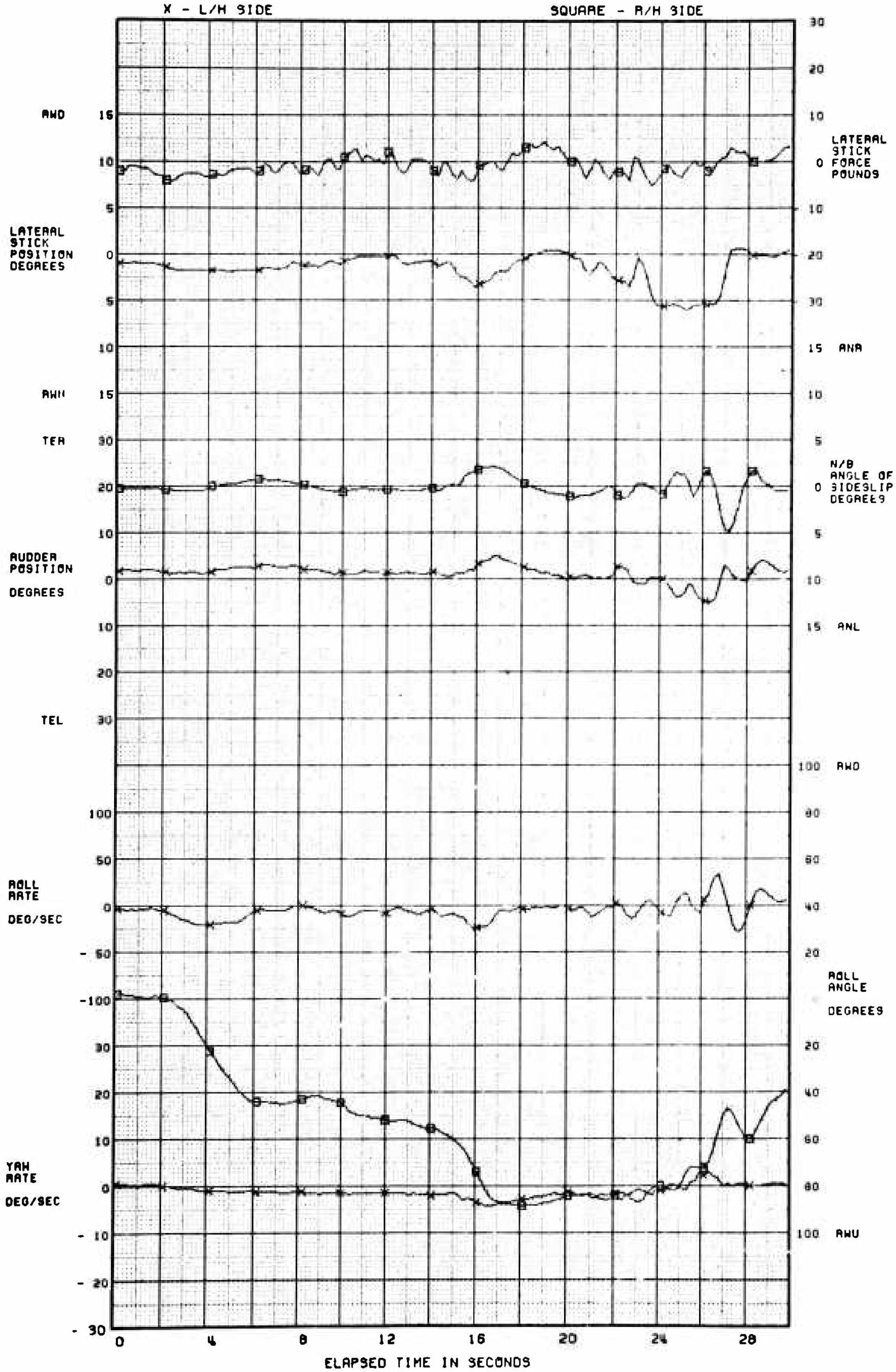


FIGURE 109 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 2A7-263 RUN 08 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

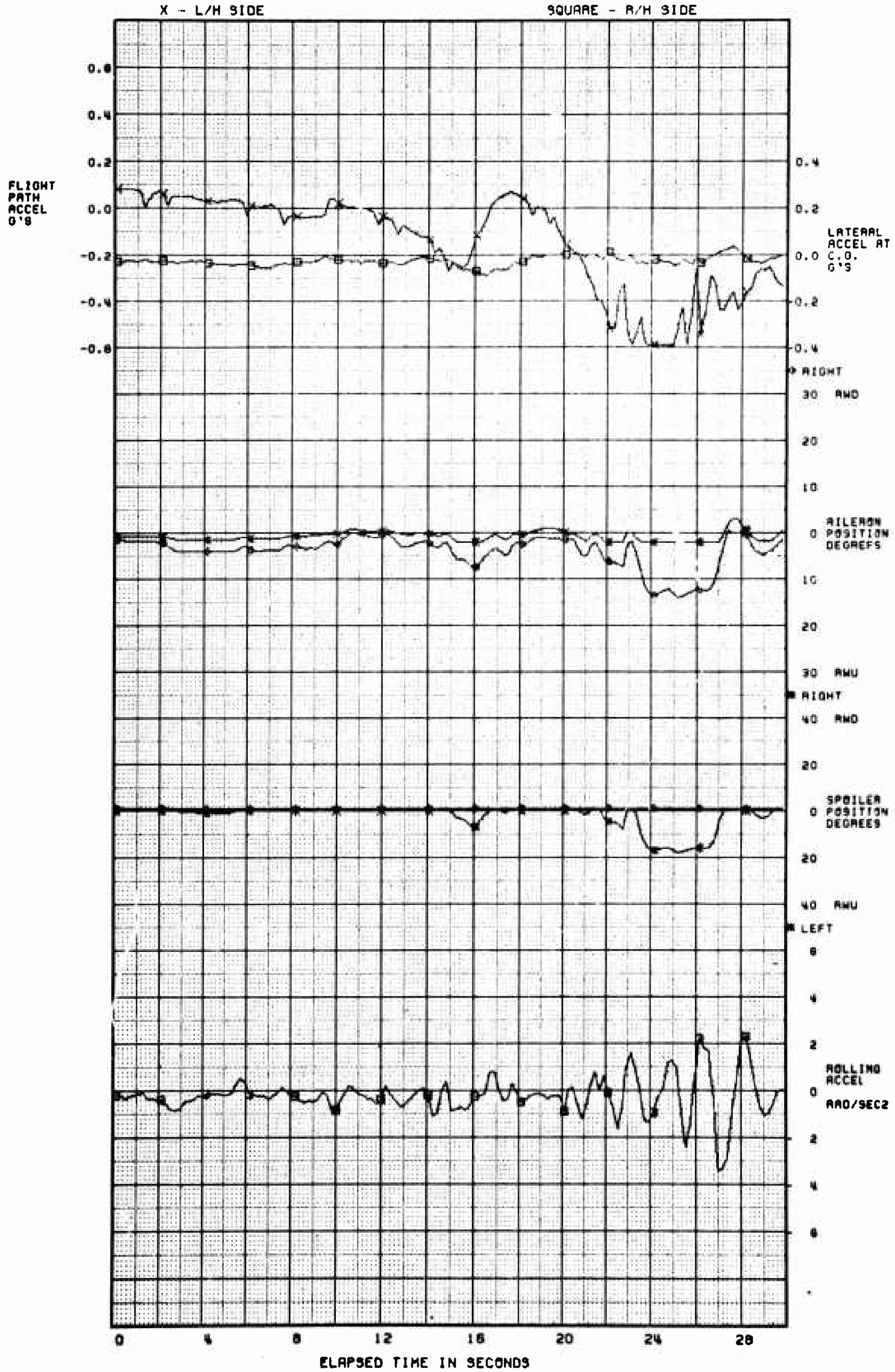


FIGURE 109 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 11 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

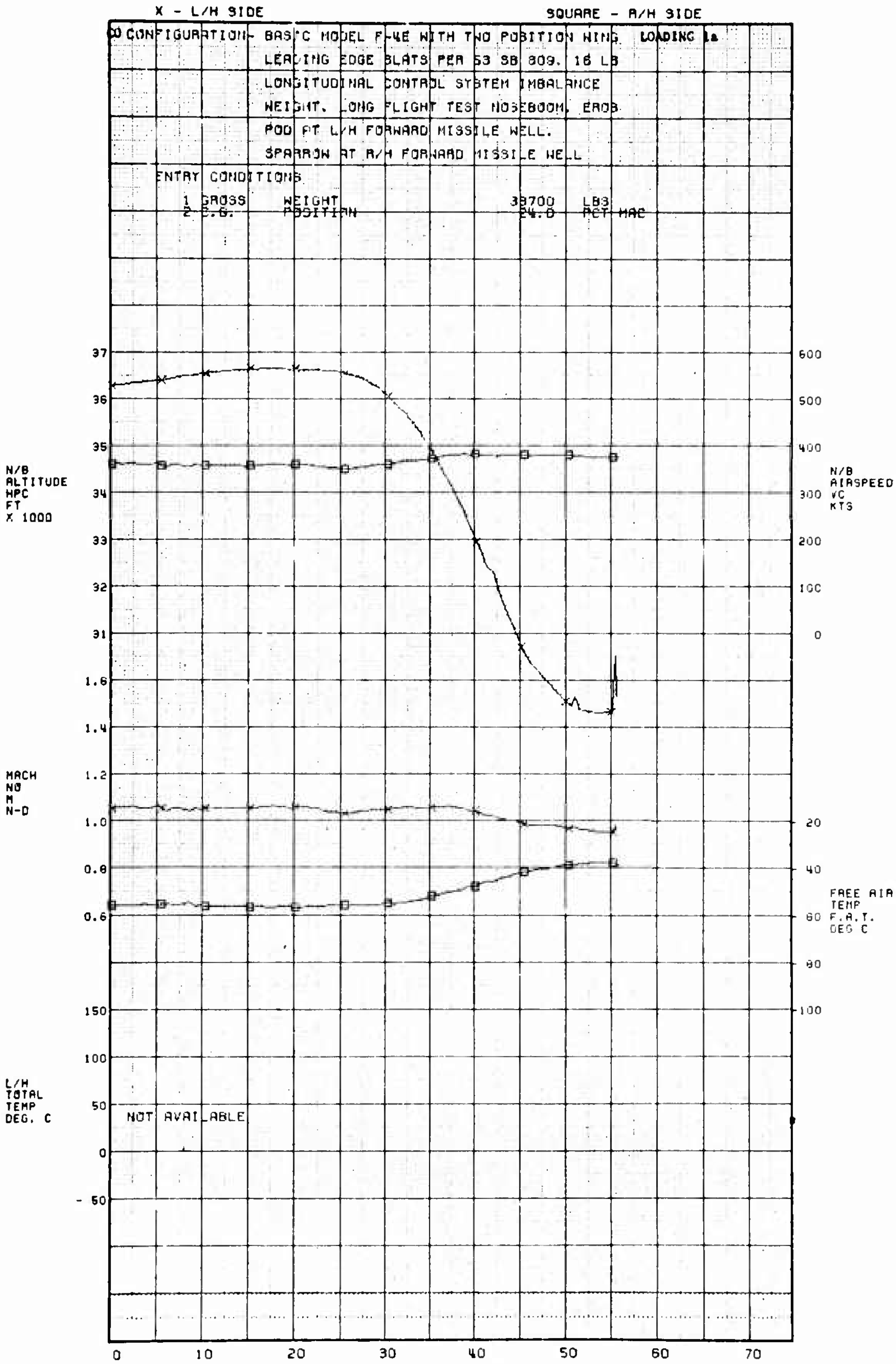


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FIGURE 110 WINDUP TURN TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-262 RUN 11 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

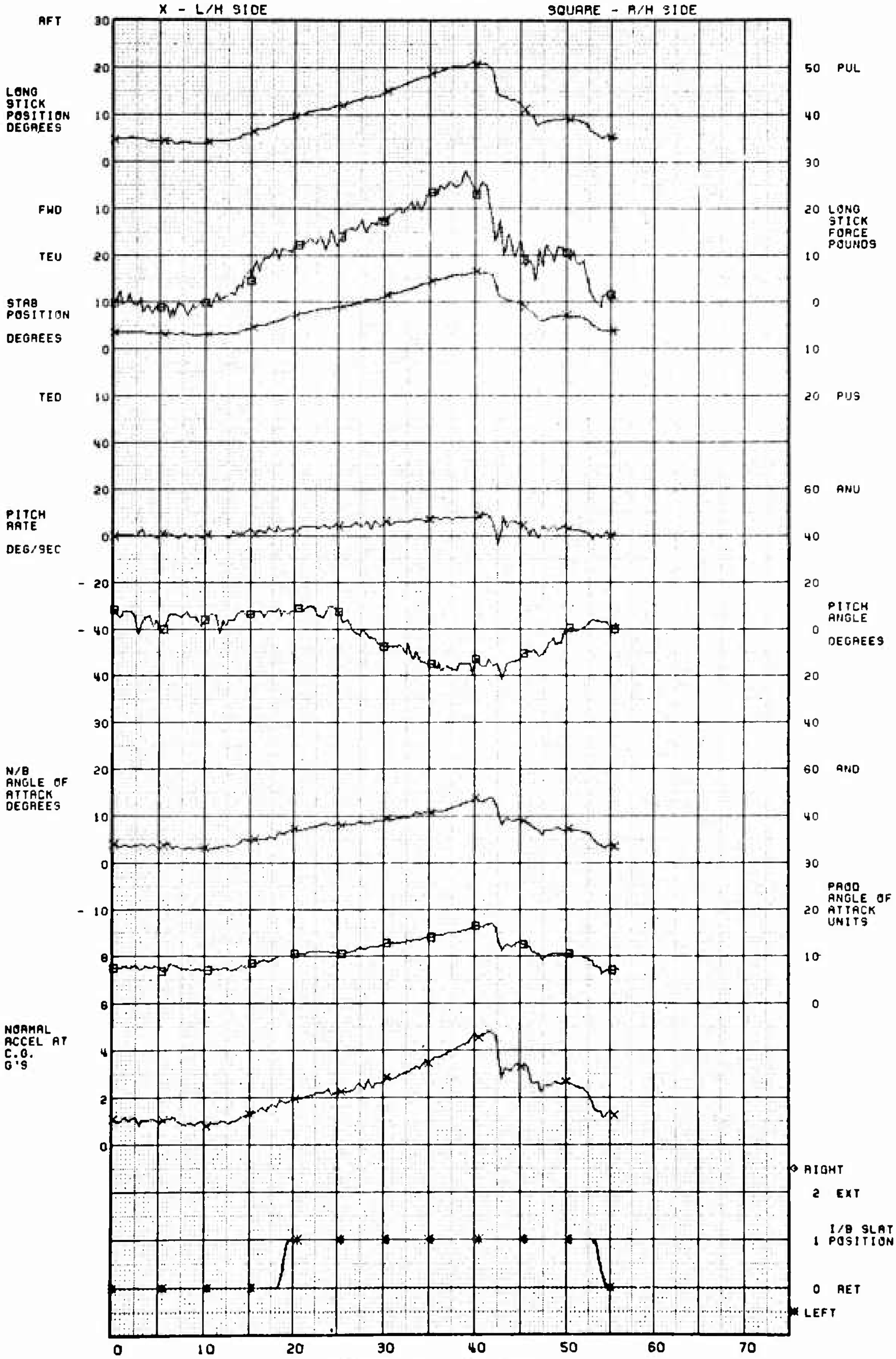


FIGURE 110 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 11 DATE 12 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

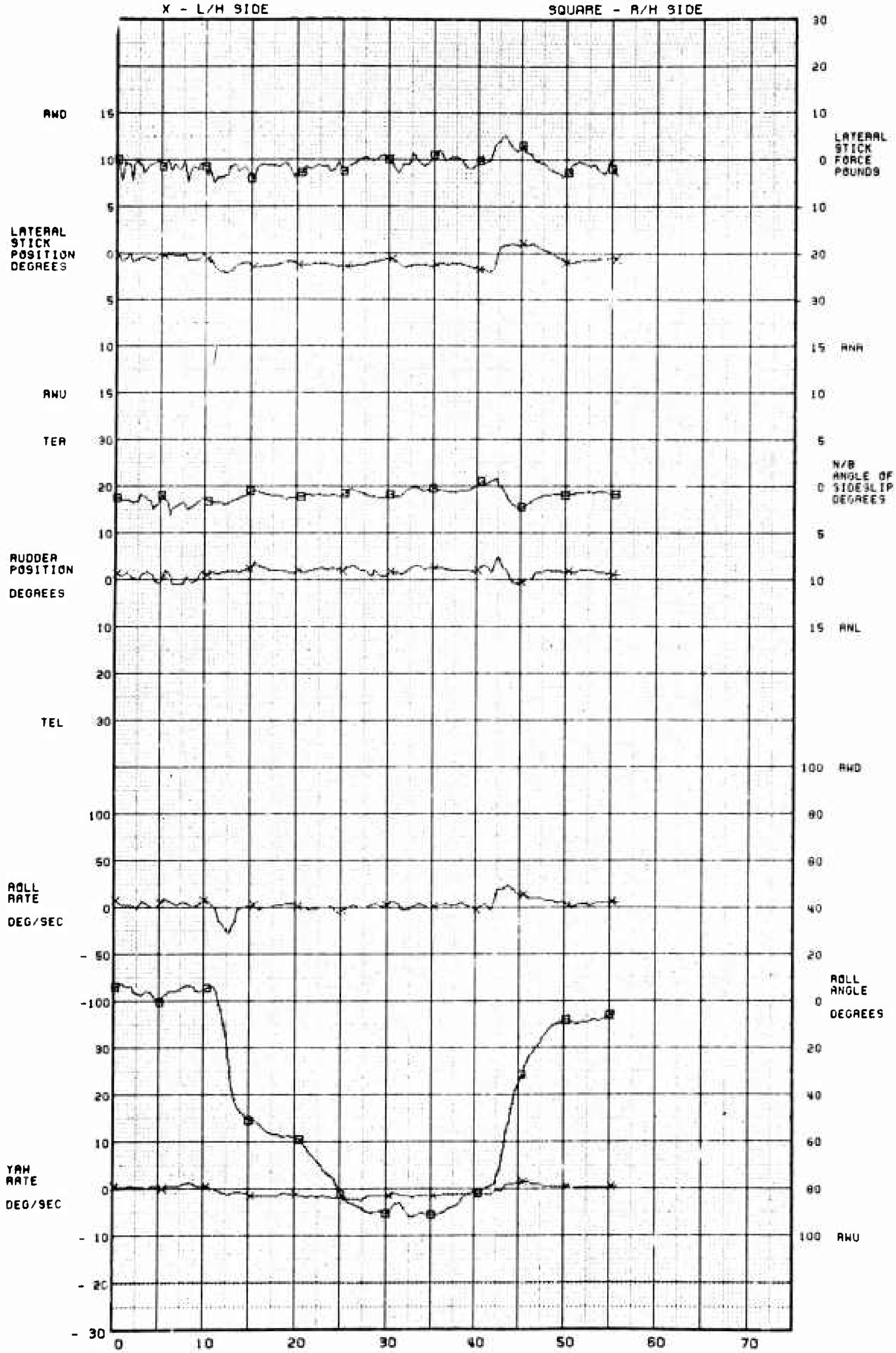


FIGURE 110 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-262 RUN 11 DATE 12 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

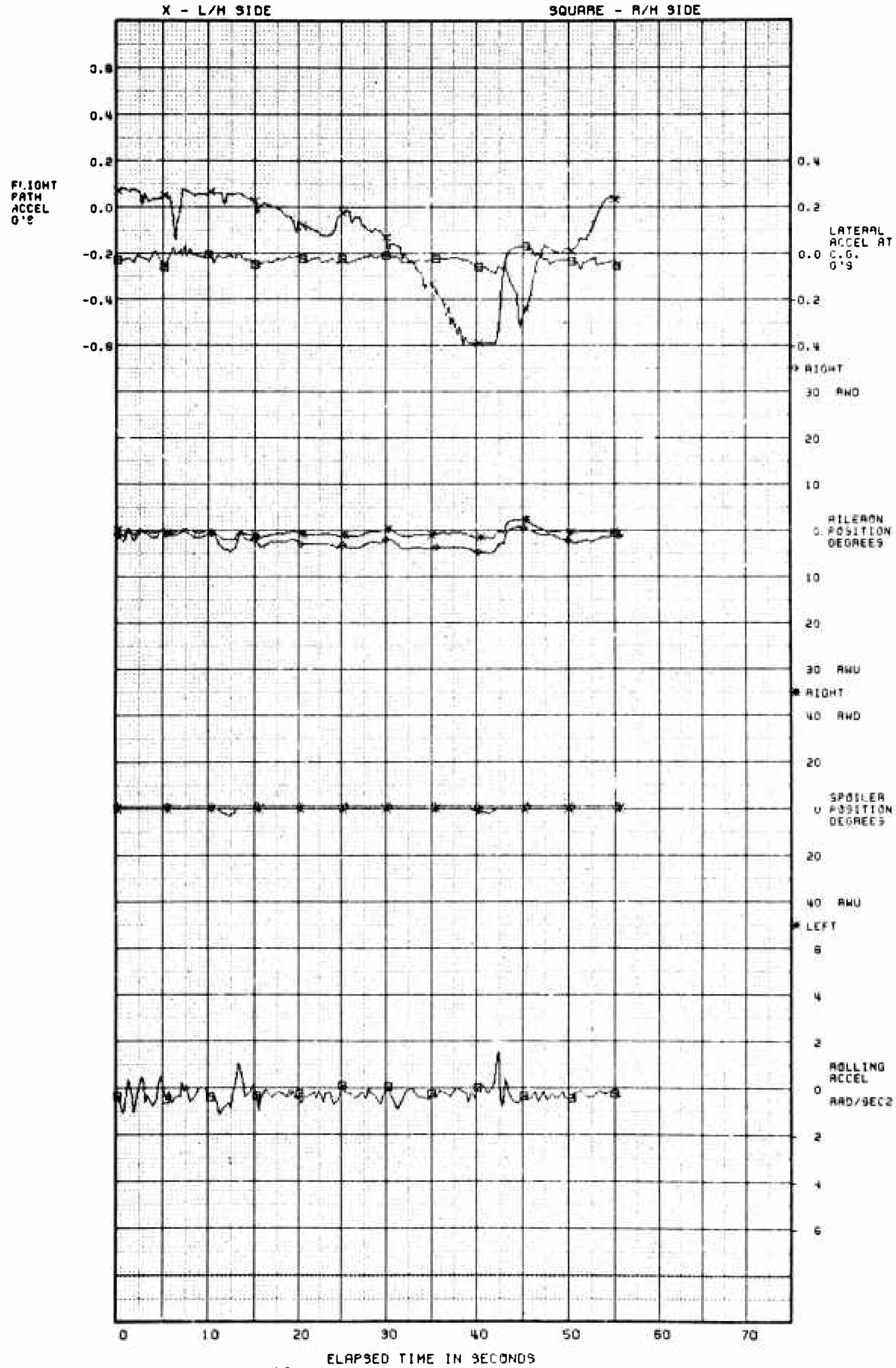


FIGURE 110 WINDUP TURN TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 10 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

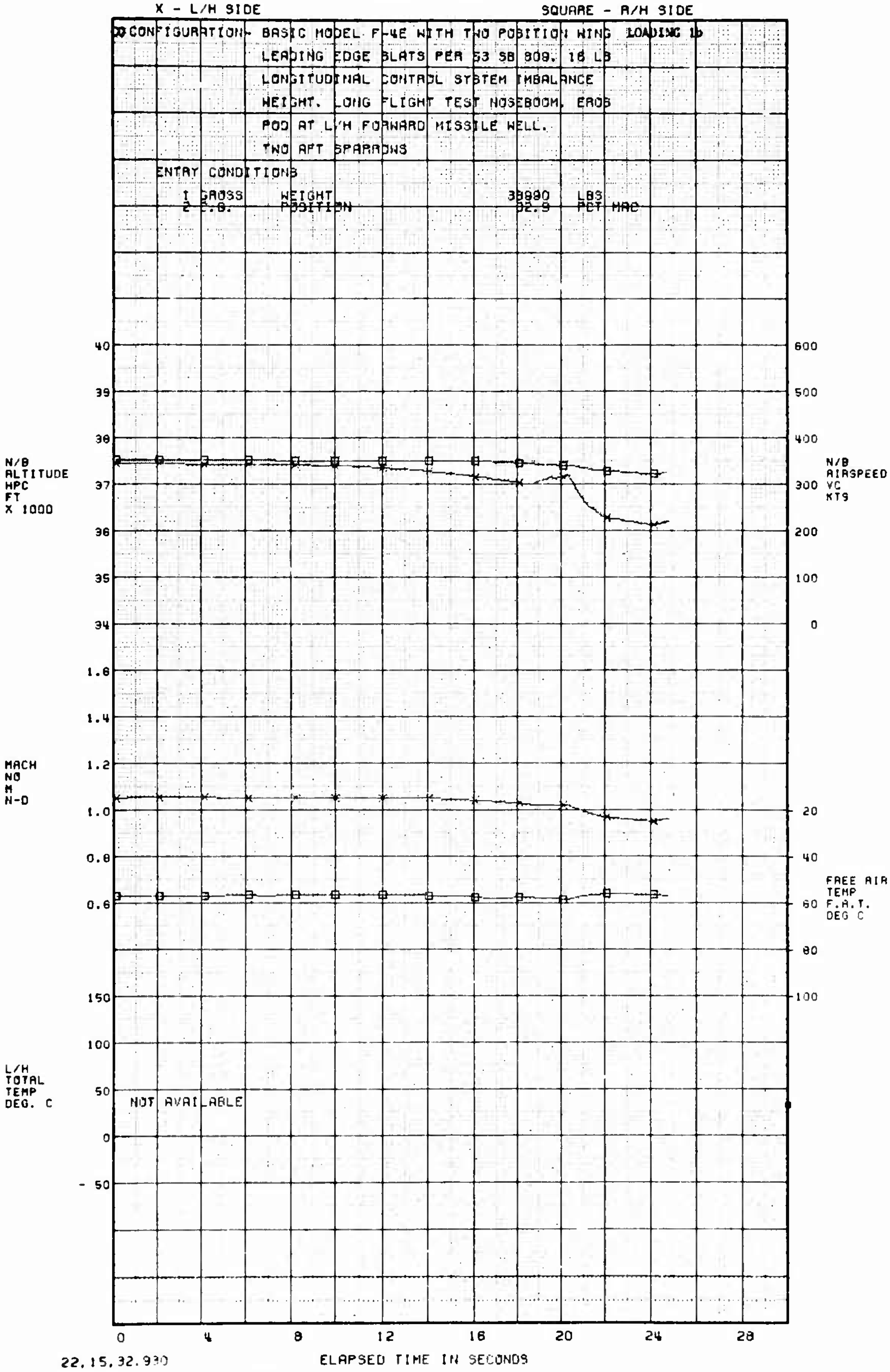


FIGURE 111 WINDUP TURN TIME HISTORY

PROF 02

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 10 DATE 15 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

WIND-UP-TURN

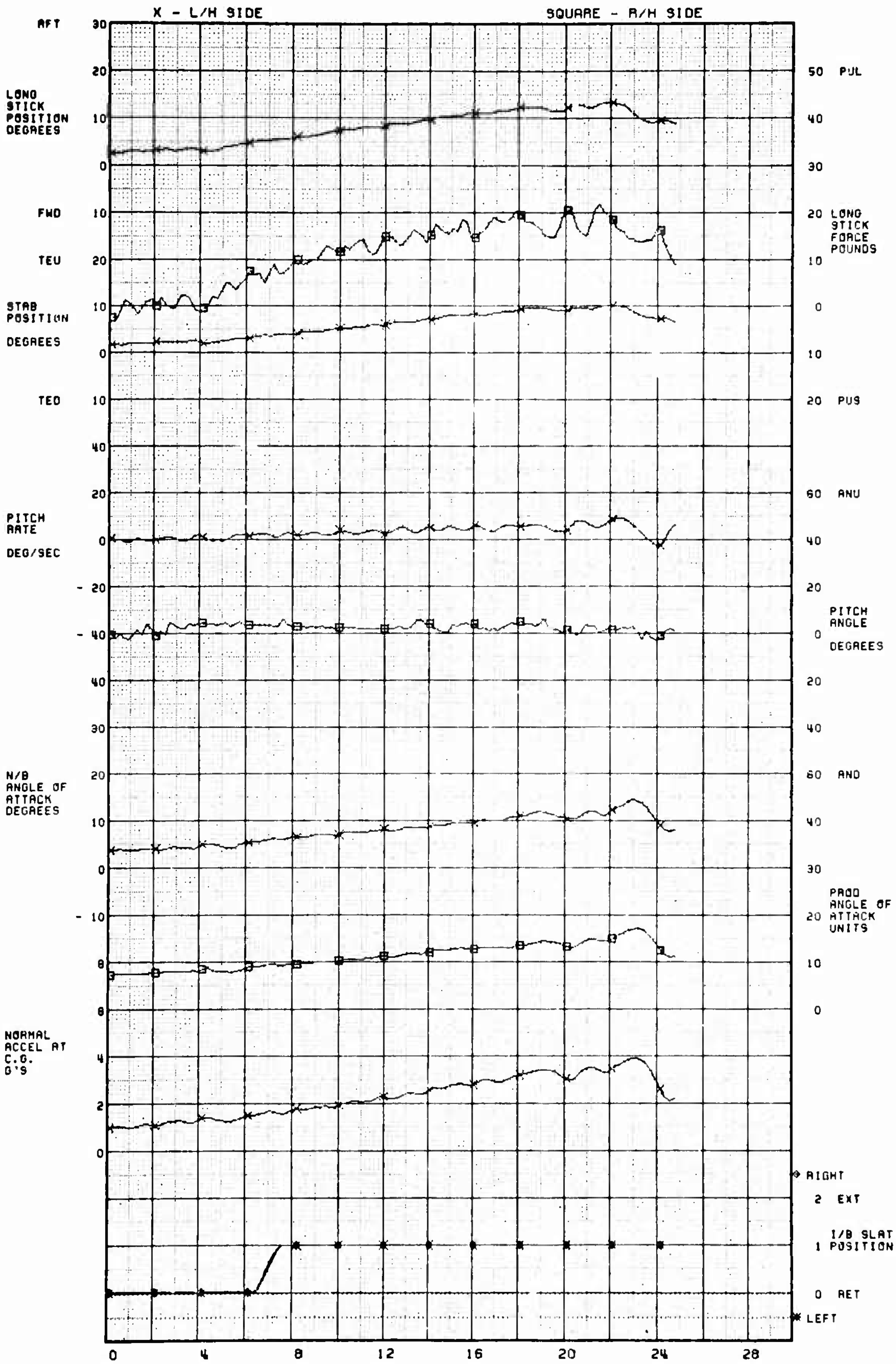


FIGURE 111 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-263 RUN 10 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

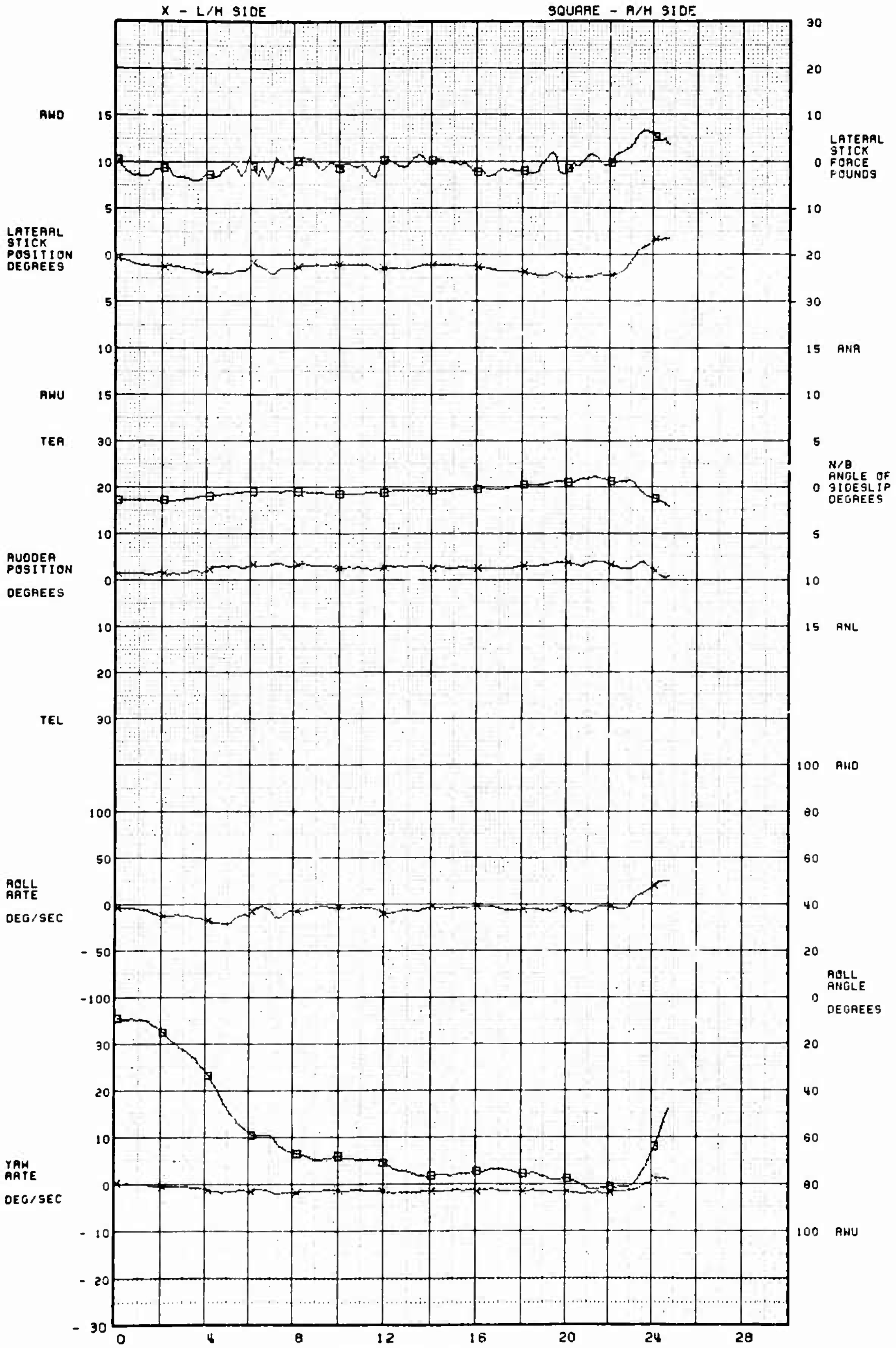


FIGURE 111 WINDUP TURN TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-269 RUN 10 DATE 15 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
WIND-UP-TURN

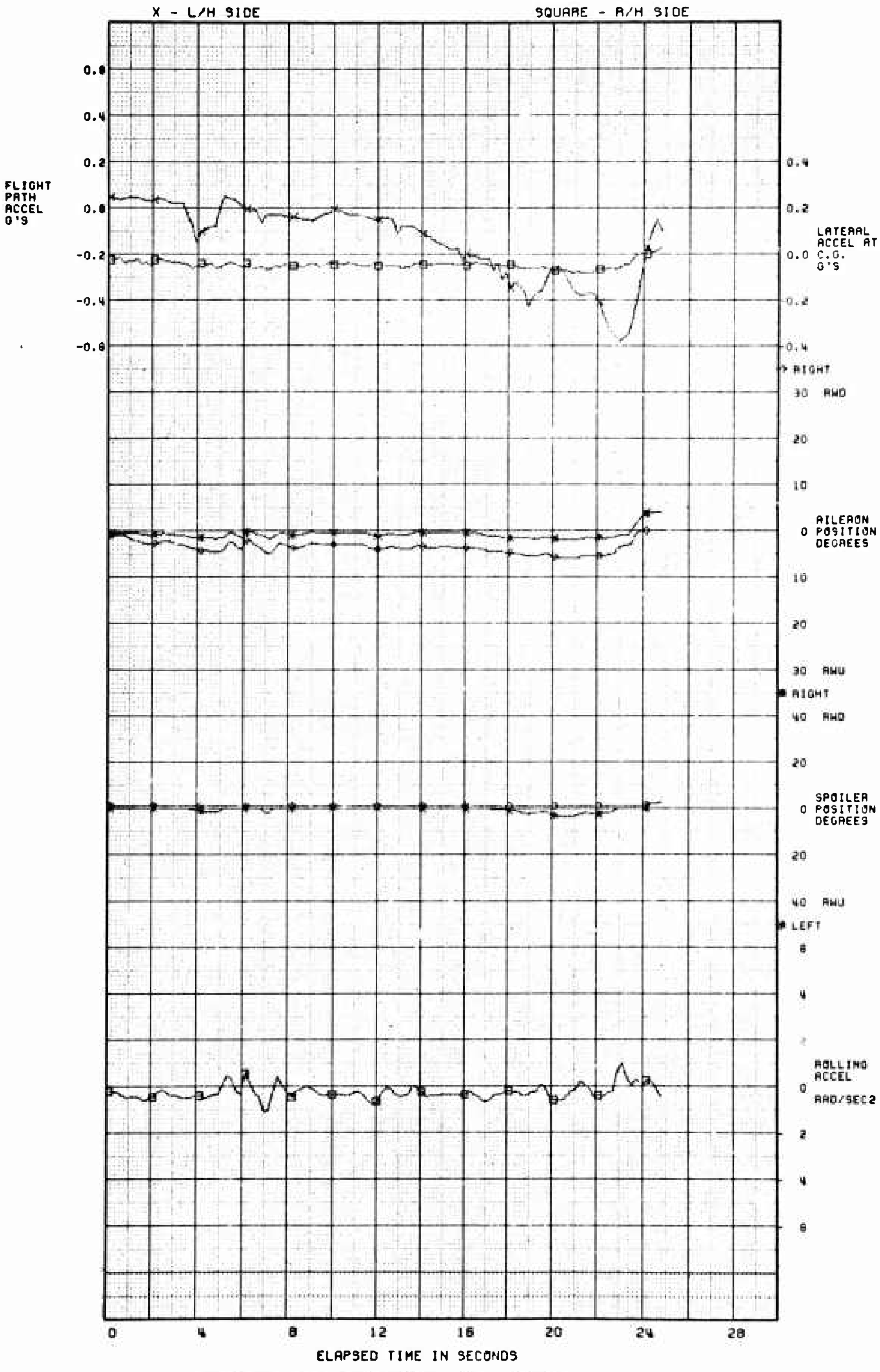


FIGURE 111 WINDUP TURN TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

LOADINGS: 1a AND 1b: FWD/AFT AIM-7'S CR CONFIGURATION

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	KCAS
○	10,300	36,900	24.4	398
●	10,100	42,700	31.8	406
□	10,500	36,700	24.3	451
■	10,500	43,000	32.0	440
◇	10,700	35,700	23.8	475
▽	10,800	36,300	23.9	511

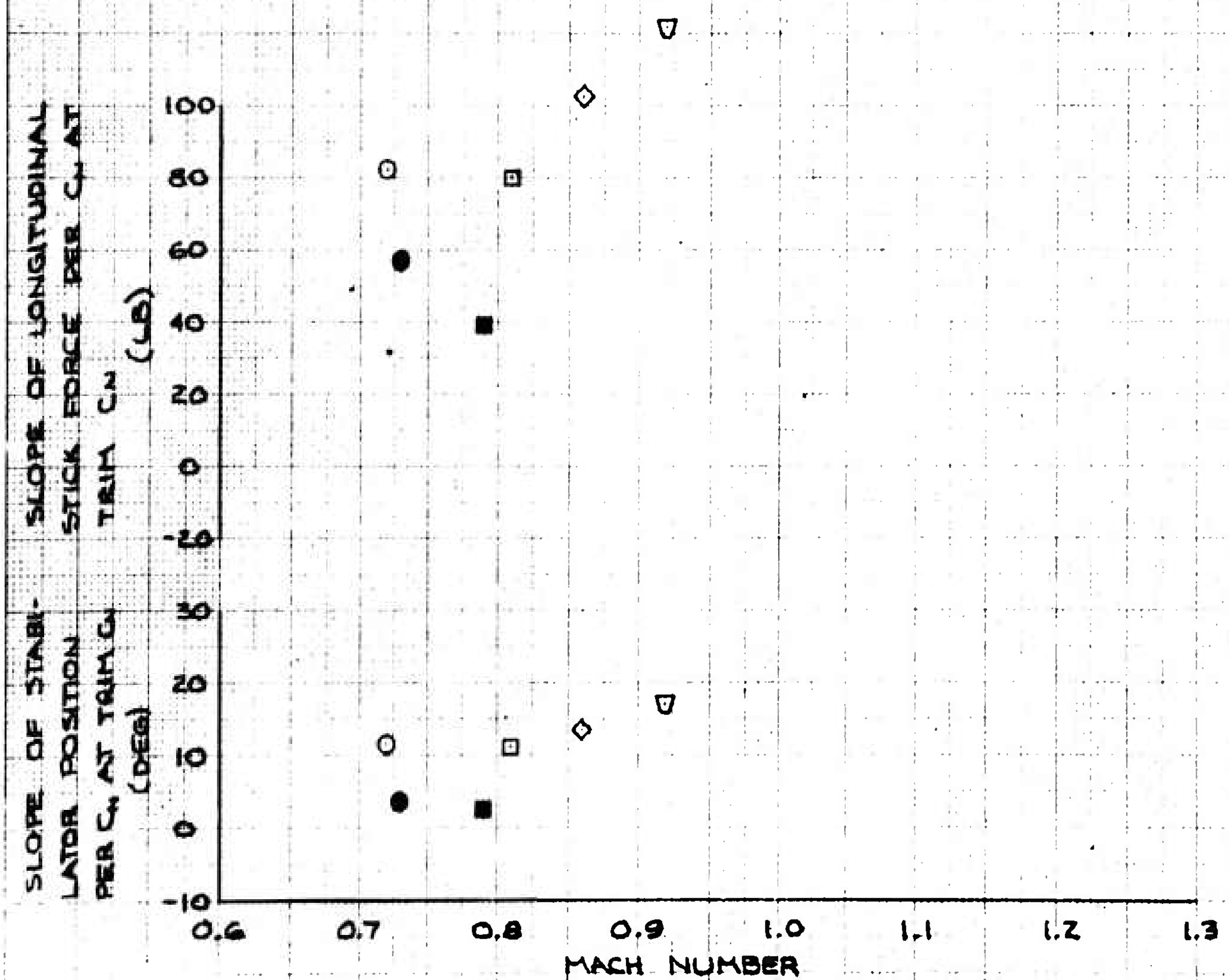


FIGURE 112 STATIC LONGITUDINAL STABILITY SUMMARY

F-4E USAF S/N 66-287A

LOADINGS: 1a AND 1b: FWD/AFT AIM-7'S — CR-00 CONFIGURATION

3 - 370-GAL TANKS AND LAU-10'S

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	KCAS
○	35,500	41,600	25.8	224
●	35,200	41,200	33.6	239
□	35,500	40,900	25.0	266
■	35,400	38,800	32.7	272
◇	35,400	40,500	24.1	287
◆	35,800	38,400	32.3	276
▽	35,600	37,300	25.4	314
▼	35,900	35,900	31.1	309
○	35,300	39,100	24.2	373
●	35,100	36,500	29.7	379
△	35,100	37,700	25.1	427
▲	35,400	35,400	27.7	438
●	35,000	43,200	32.2	229
■	35,400	47,100	32.3	259
◆	35,400	45,700	31.5	271
▼	35,000	41,900	31.9	285
●	35,600	44,400	30.3	307

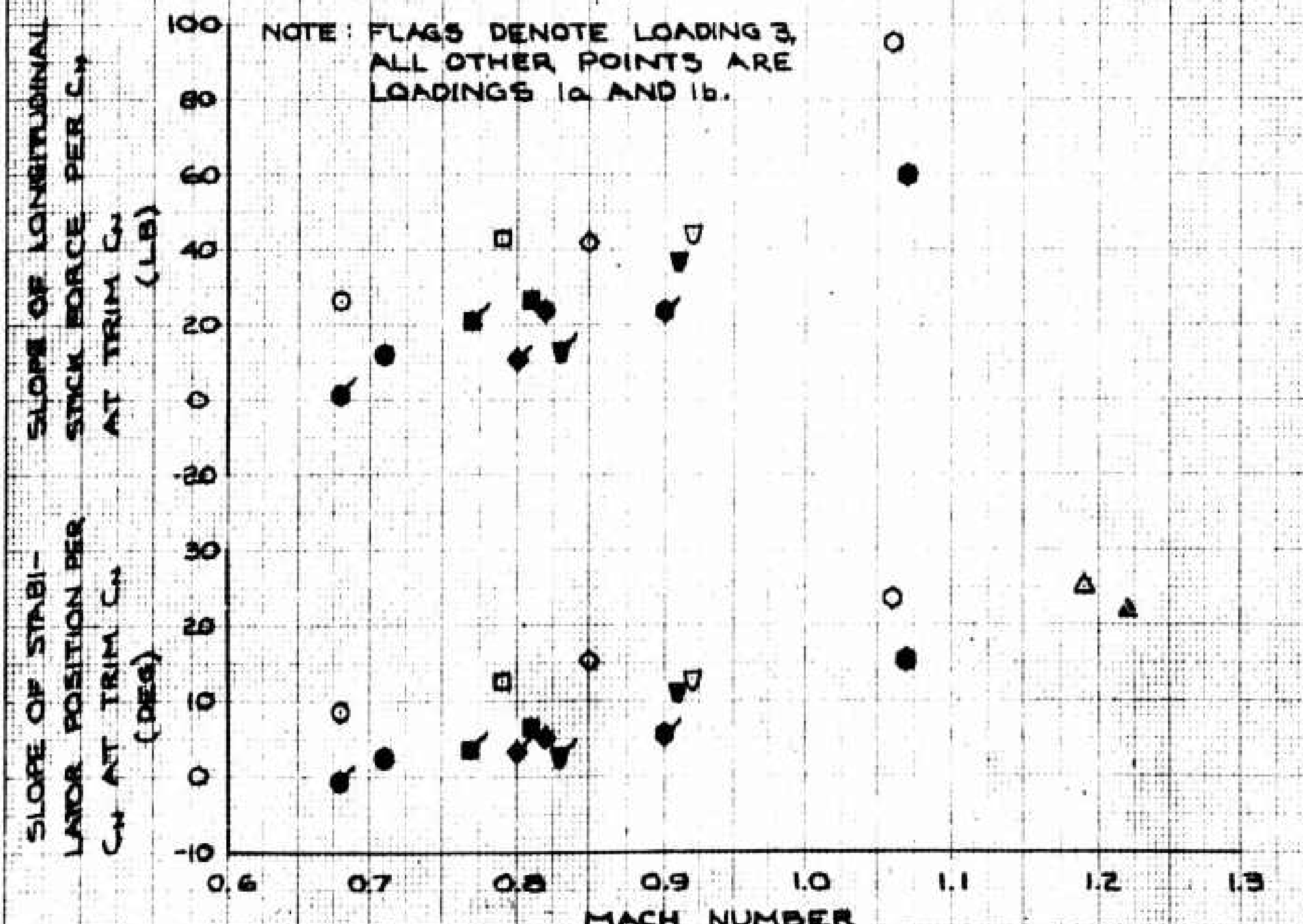


FIGURE 113 STATIC LONGITUDINAL STABILITY SUMMARY

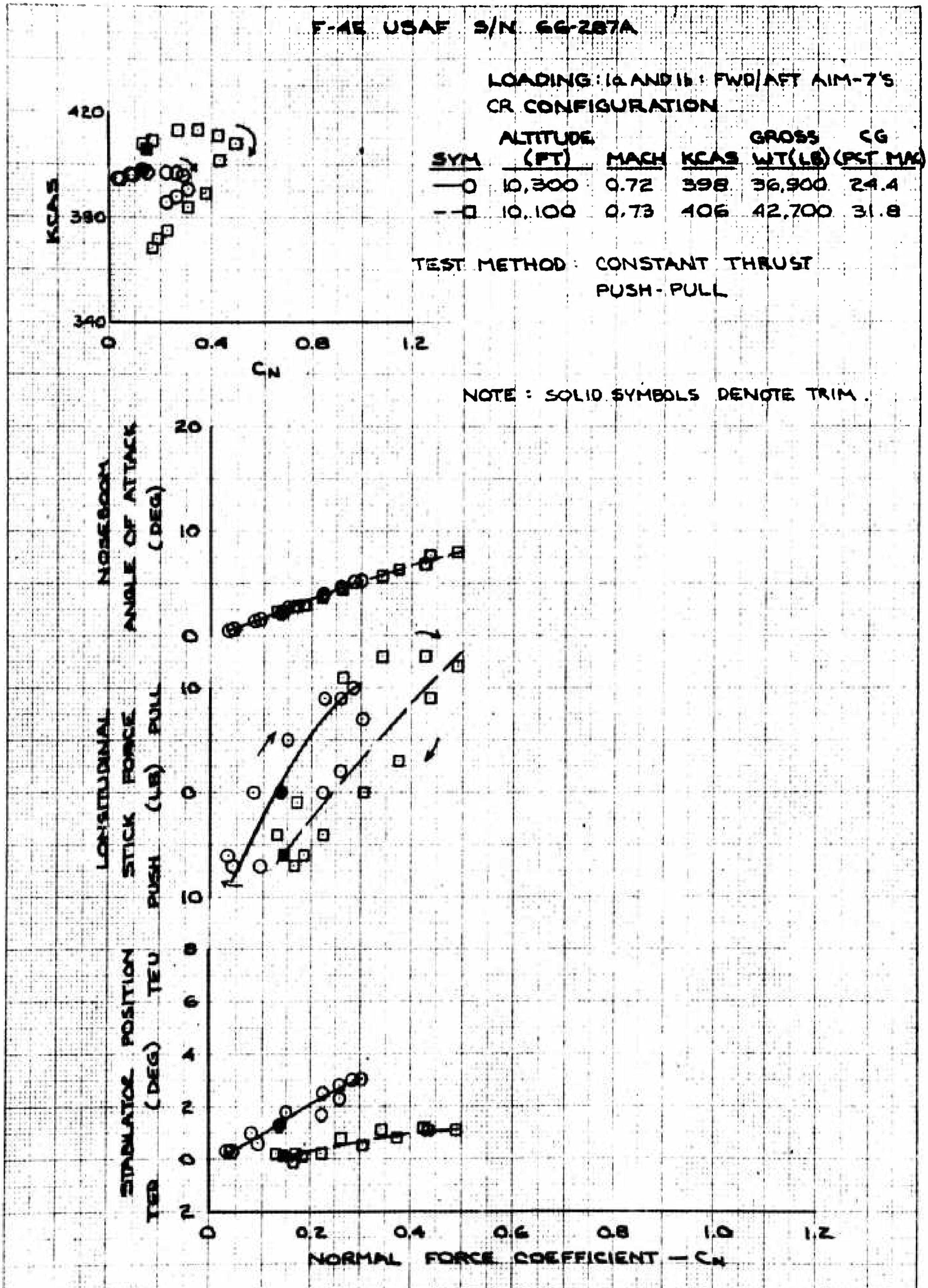


FIGURE 114 STATIC LONGITUDINAL STABILITY

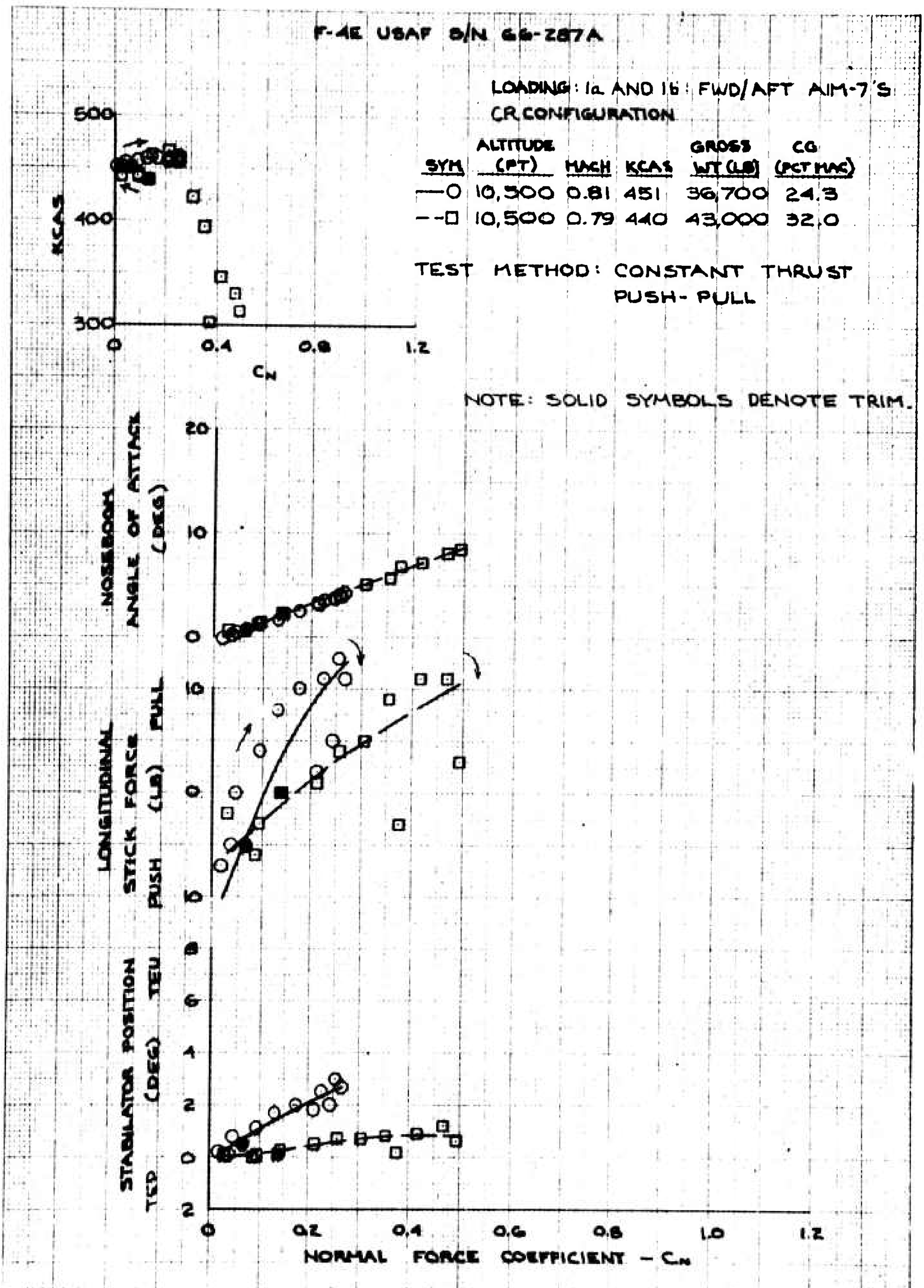


FIGURE 115 STATIC LONGITUDINAL STABILITY

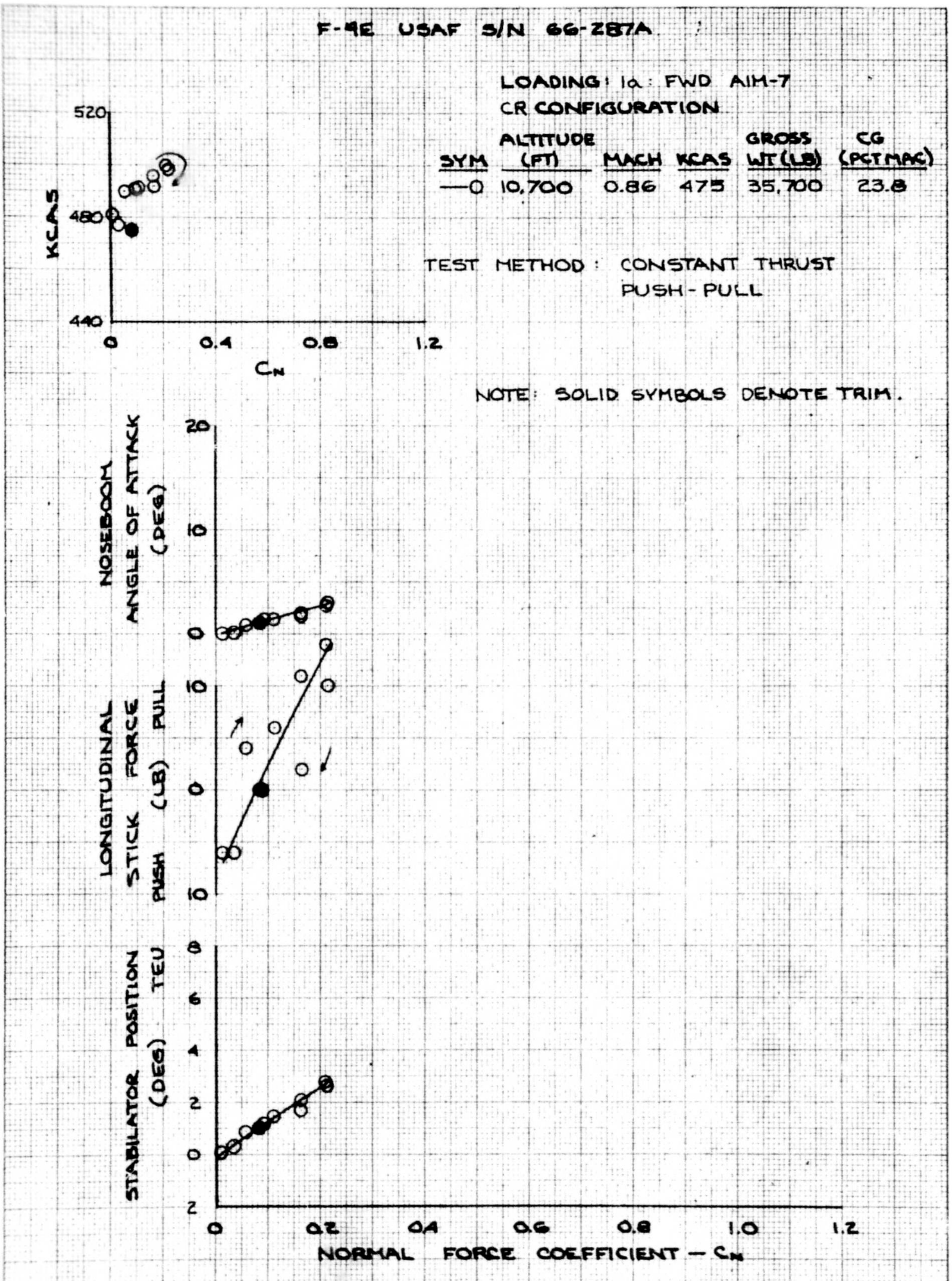


FIGURE 116 STATIC LONGITUDINAL STABILITY

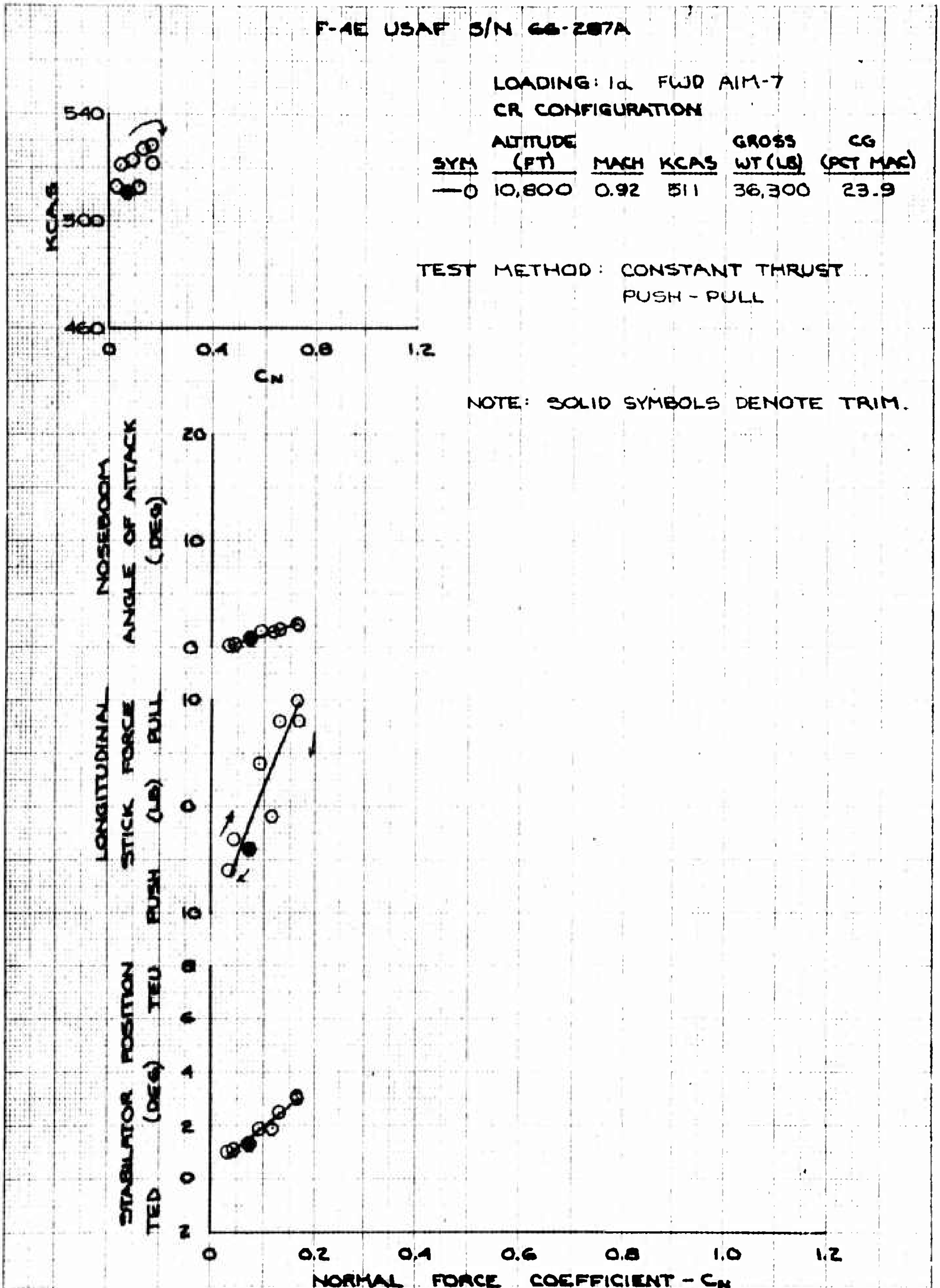


FIGURE 117 STATIC LONGITUDINAL STABILITY

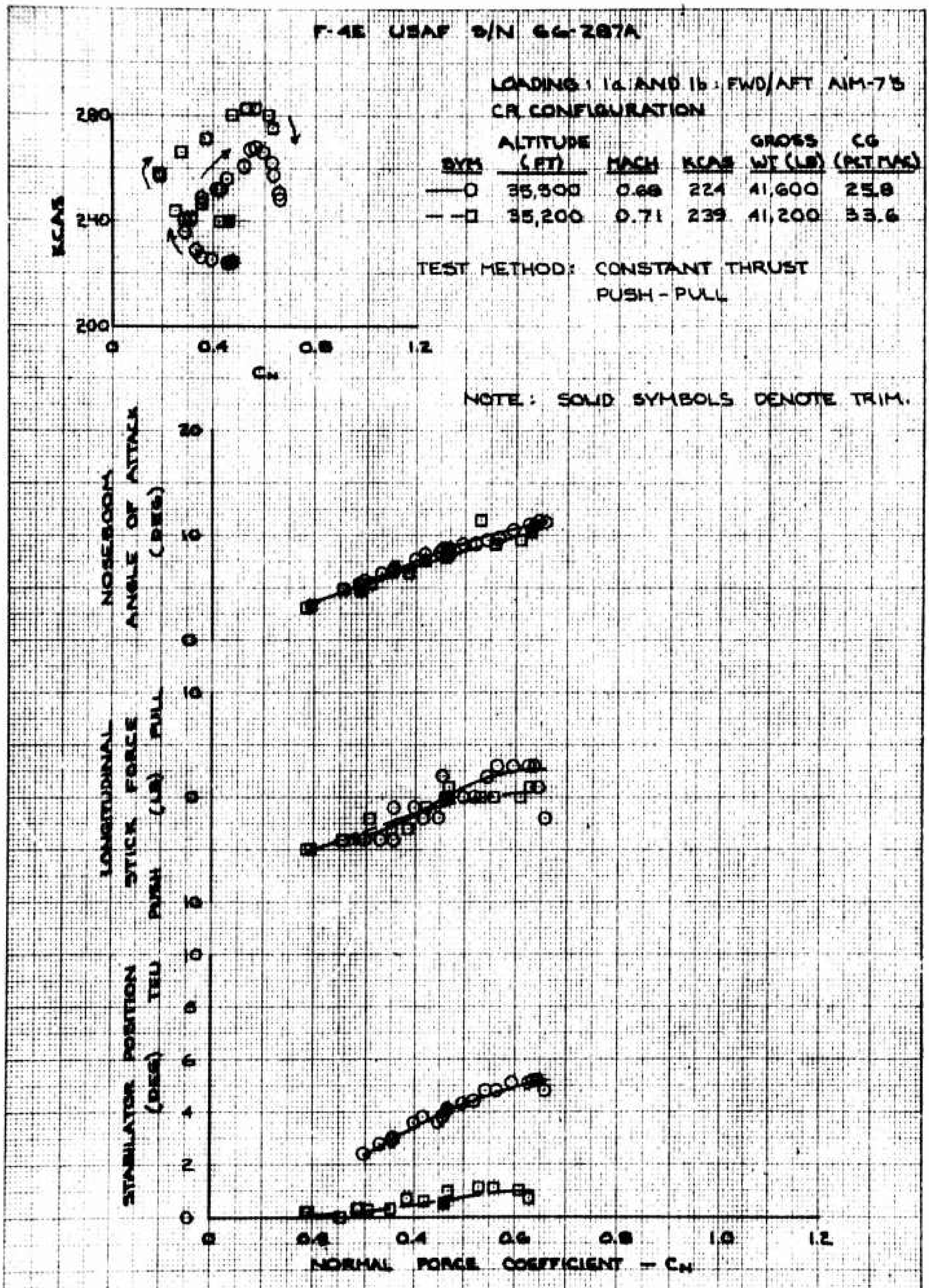


FIGURE 116 STATIC LONGITUDINAL STABILITY

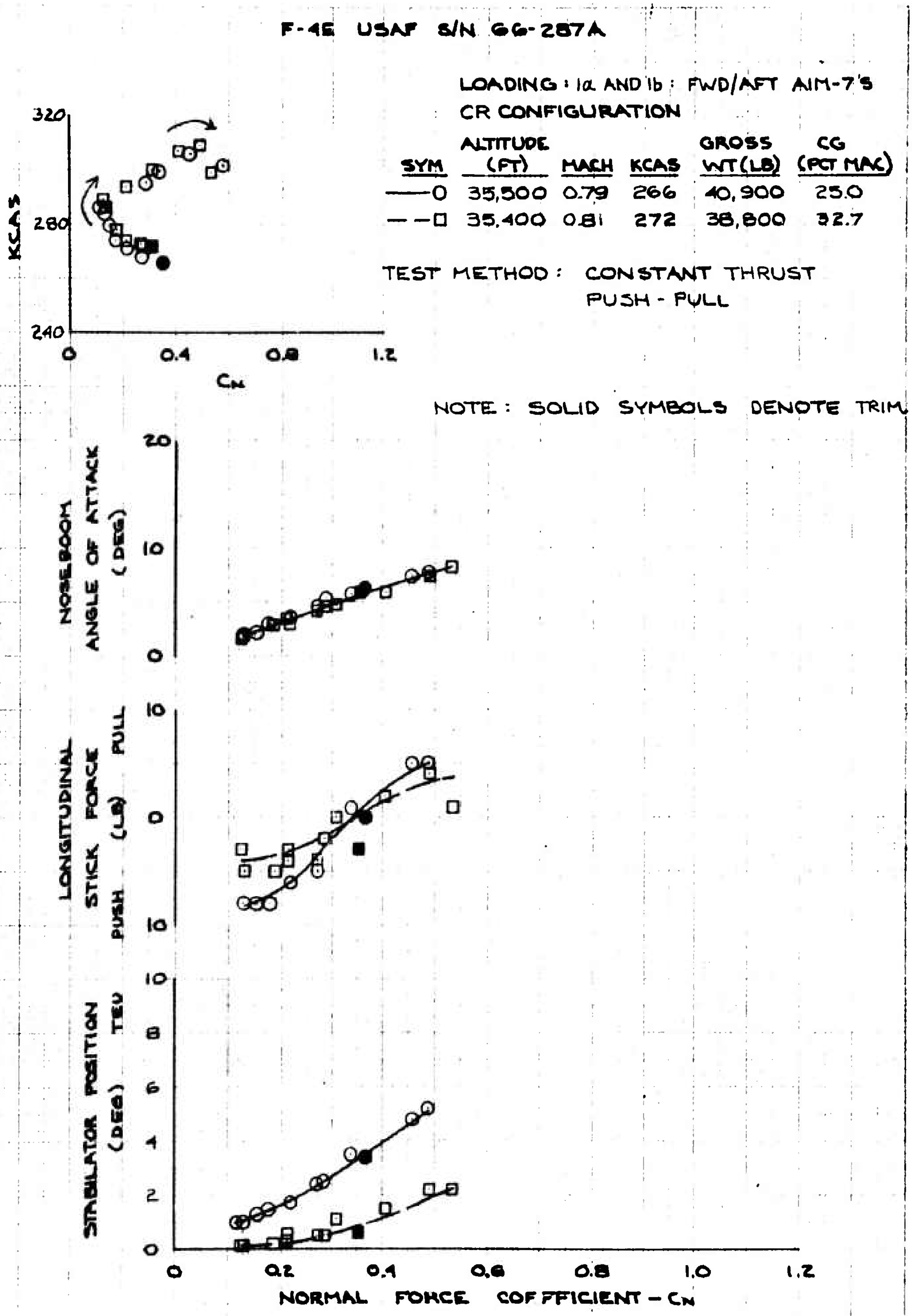


FIGURE 119 STATIC LONGITUDINAL STABILITY

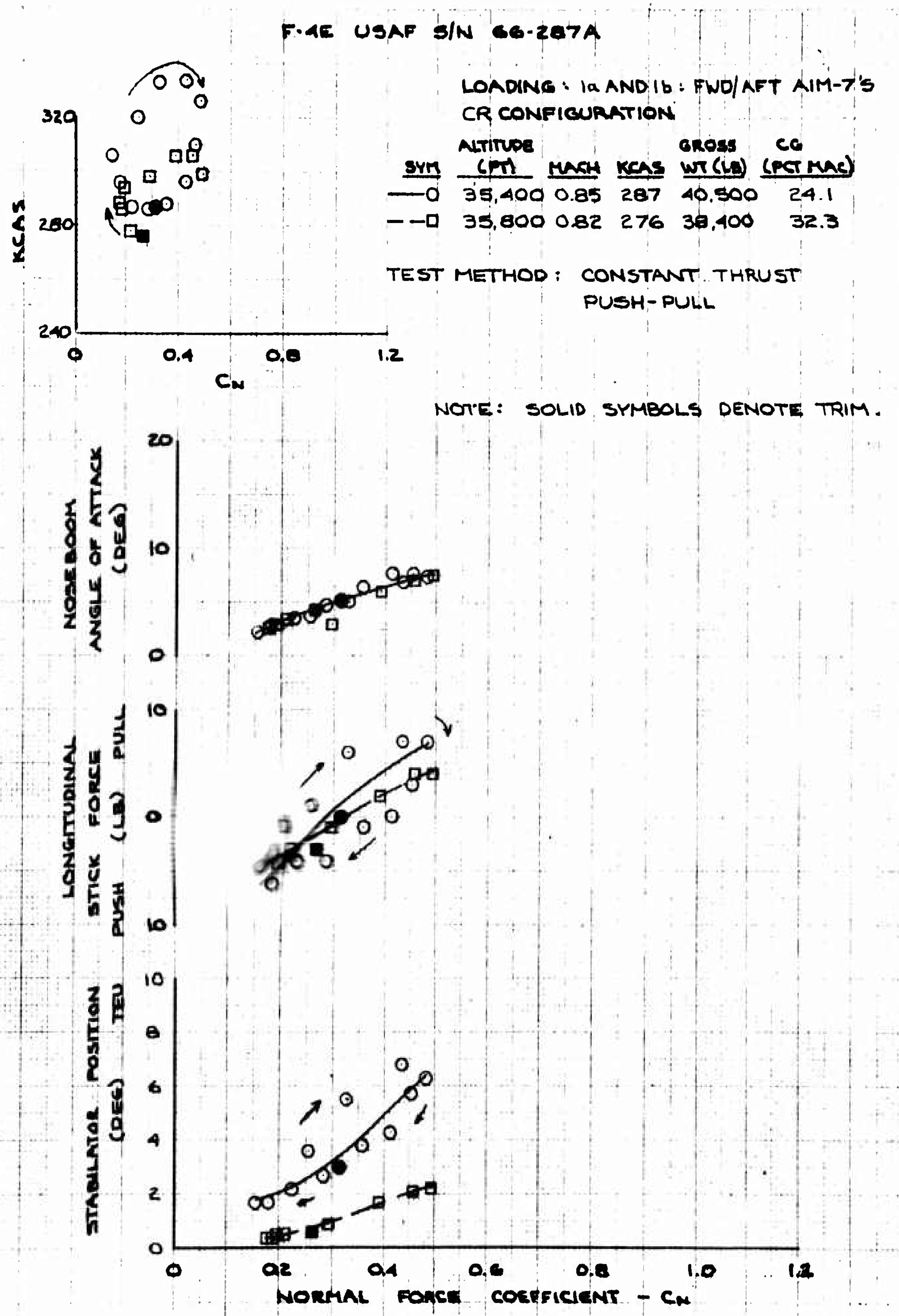


FIGURE 120 STATIC LONGITUDINAL STABILITY

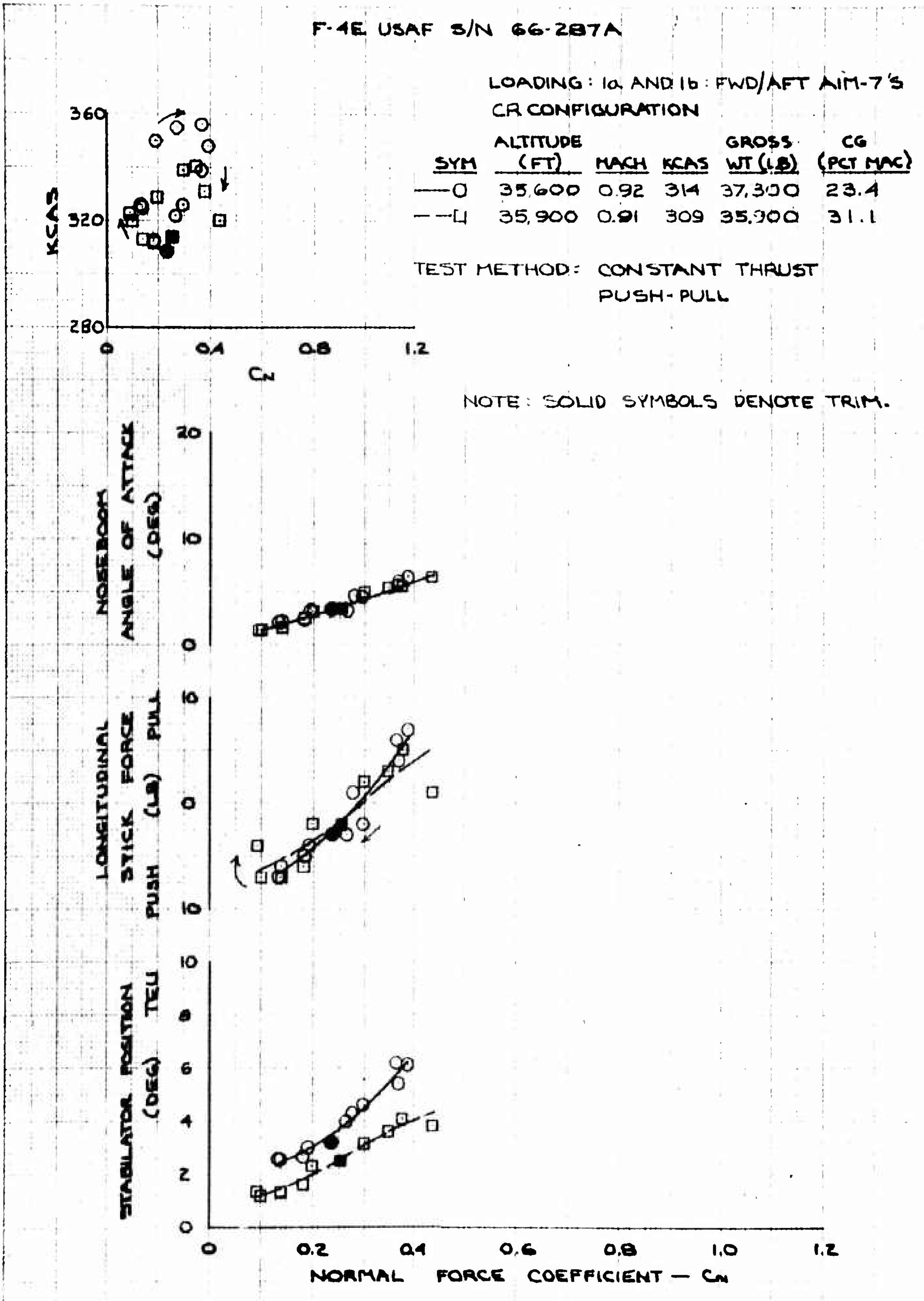


FIGURE 121 STATIC LONGITUDINAL STABILITY

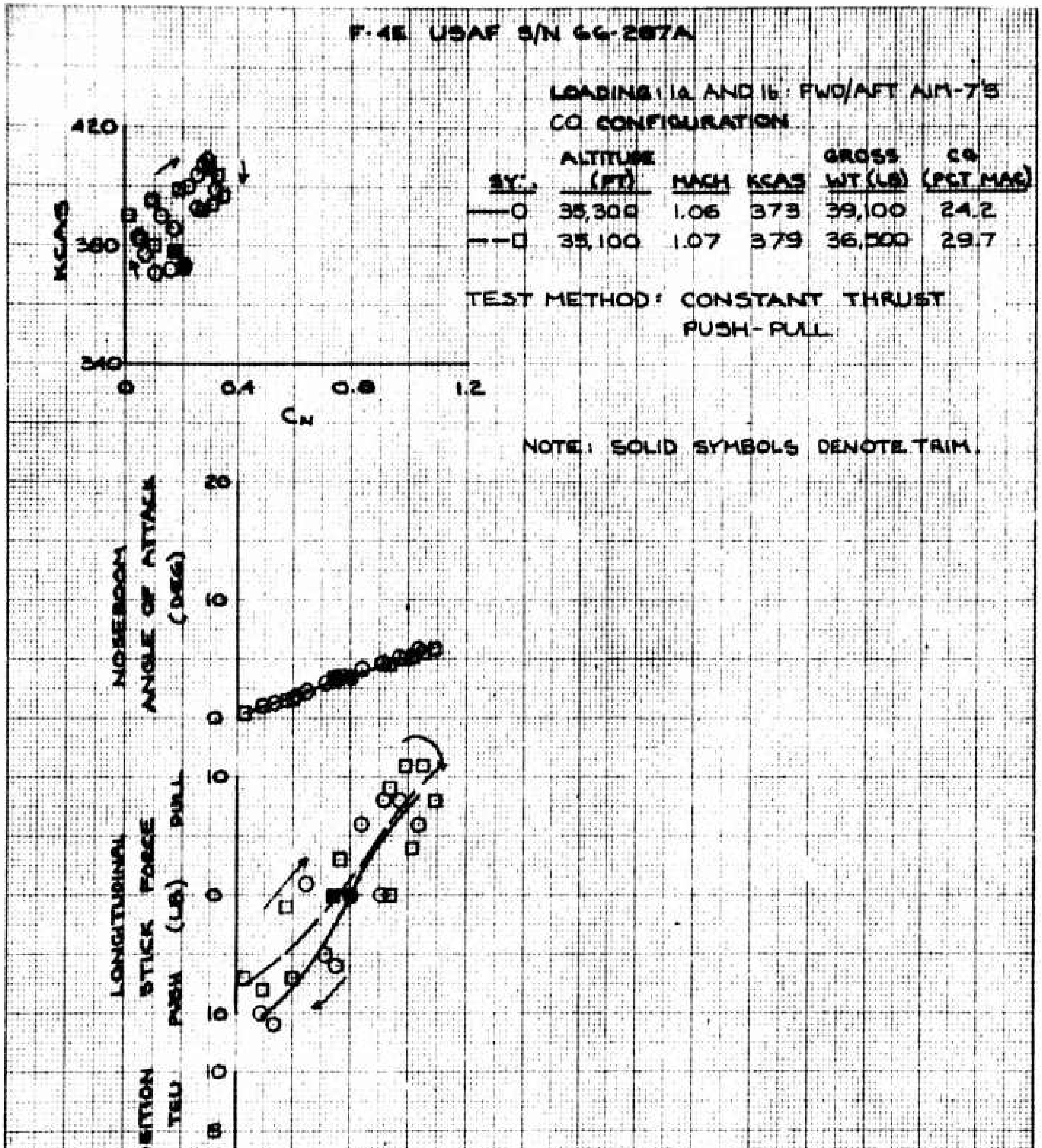


FIGURE 122. STATIC LONGITUDINAL STABILITY

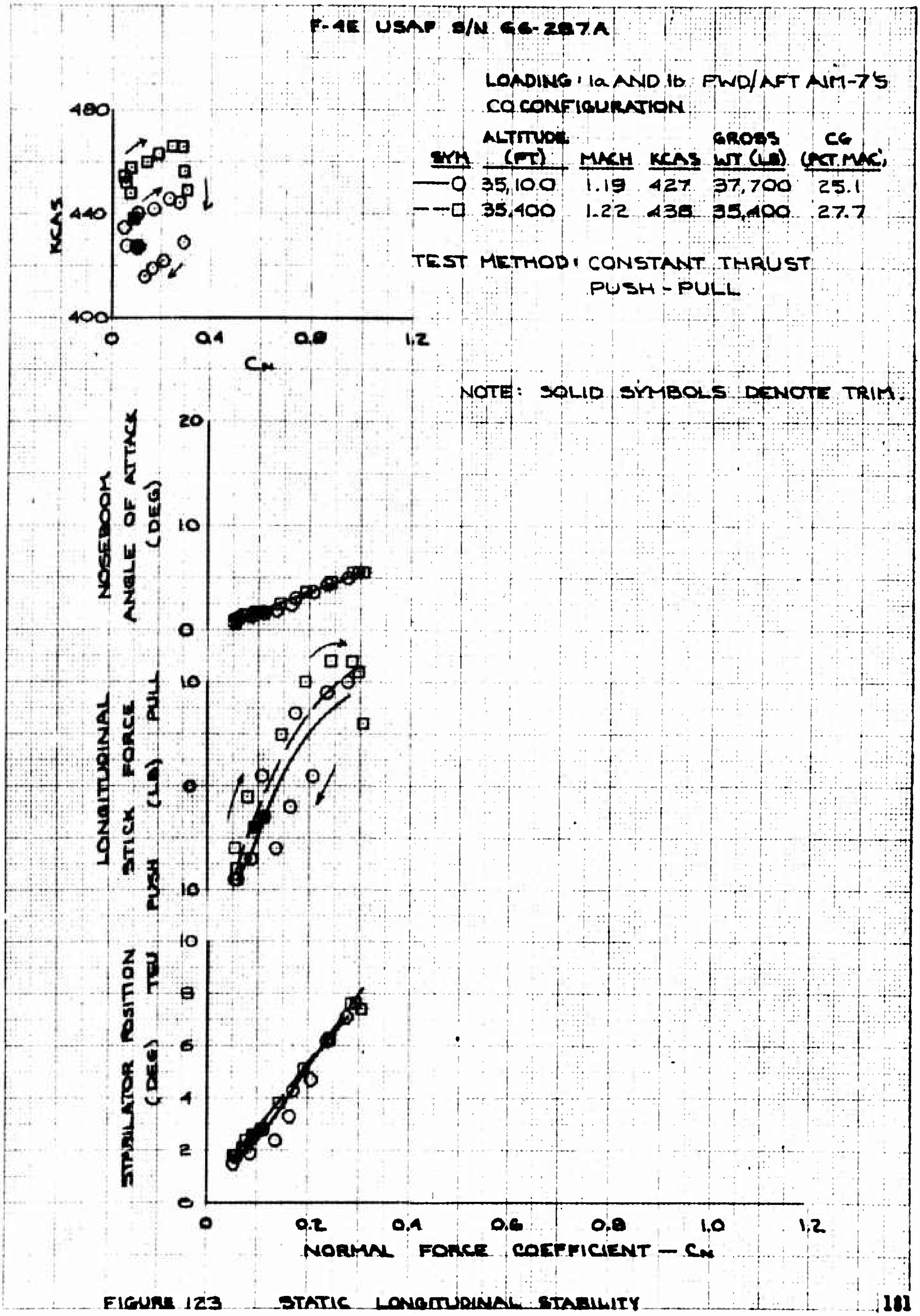
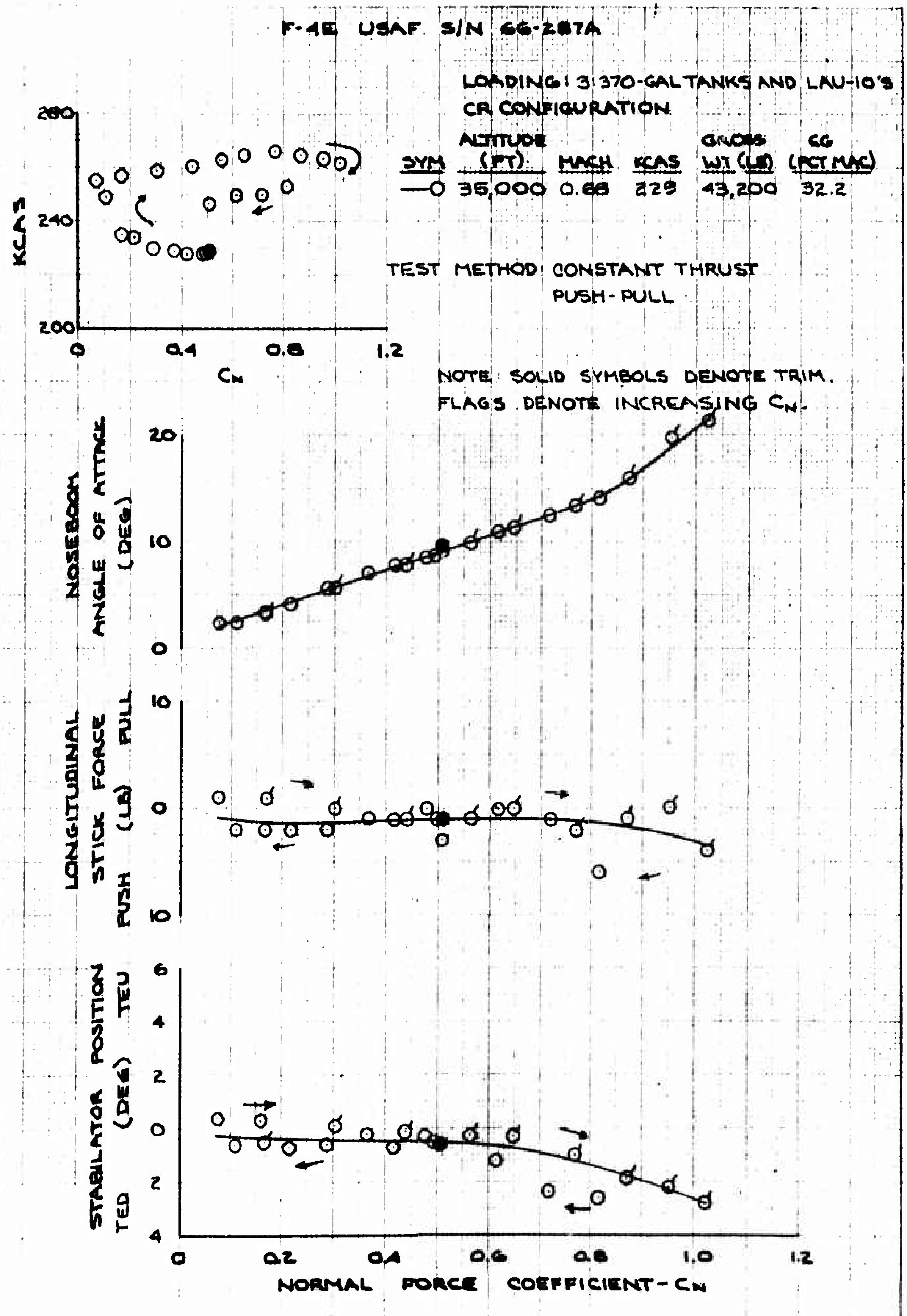


FIGURE 123 STATIC LONGITUDINAL STABILITY



182 FIGURE 124 STATIC LONGITUDINAL STABILITY

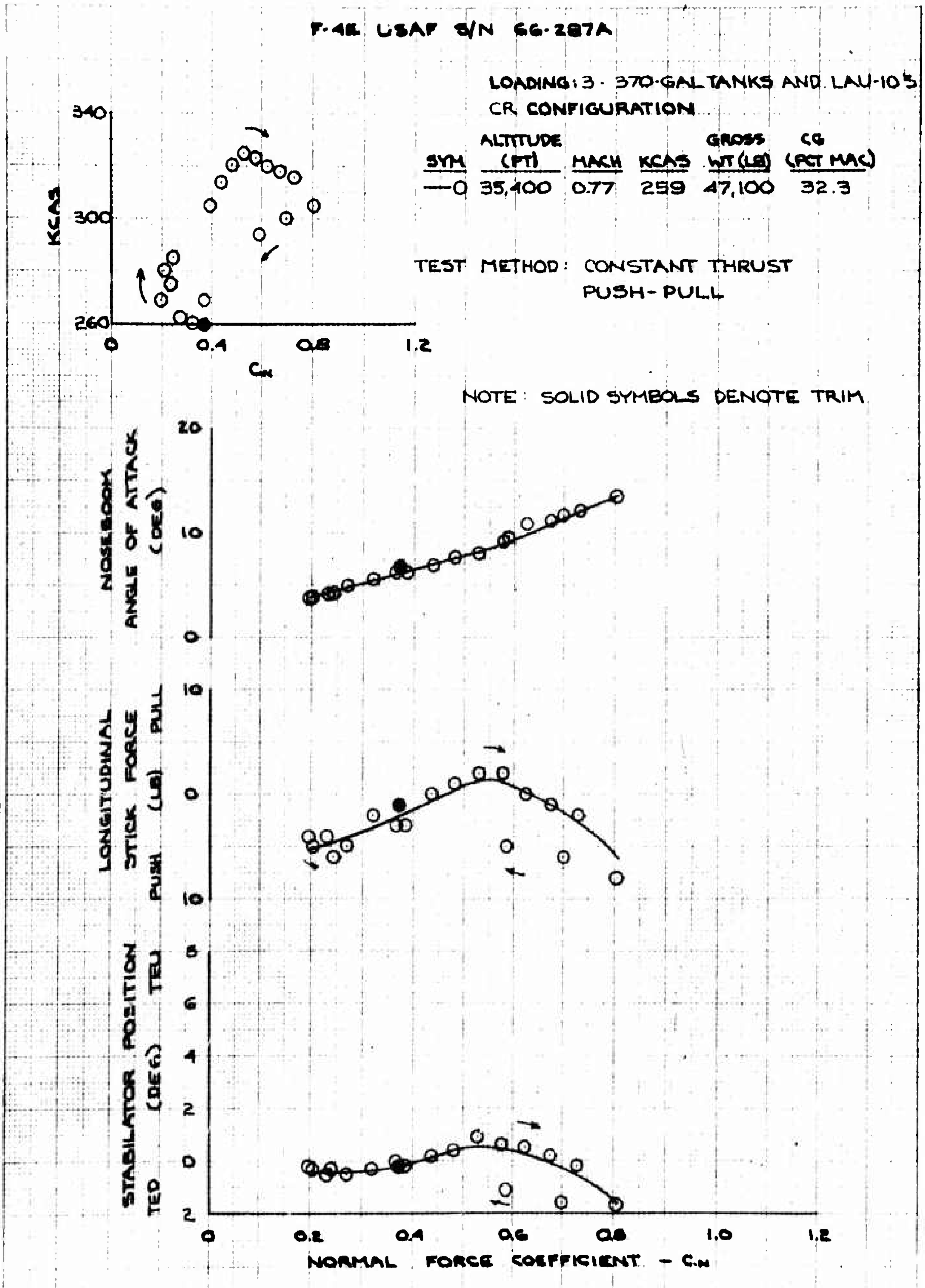


FIGURE 125 STATIC LONGITUDINAL STABILITY

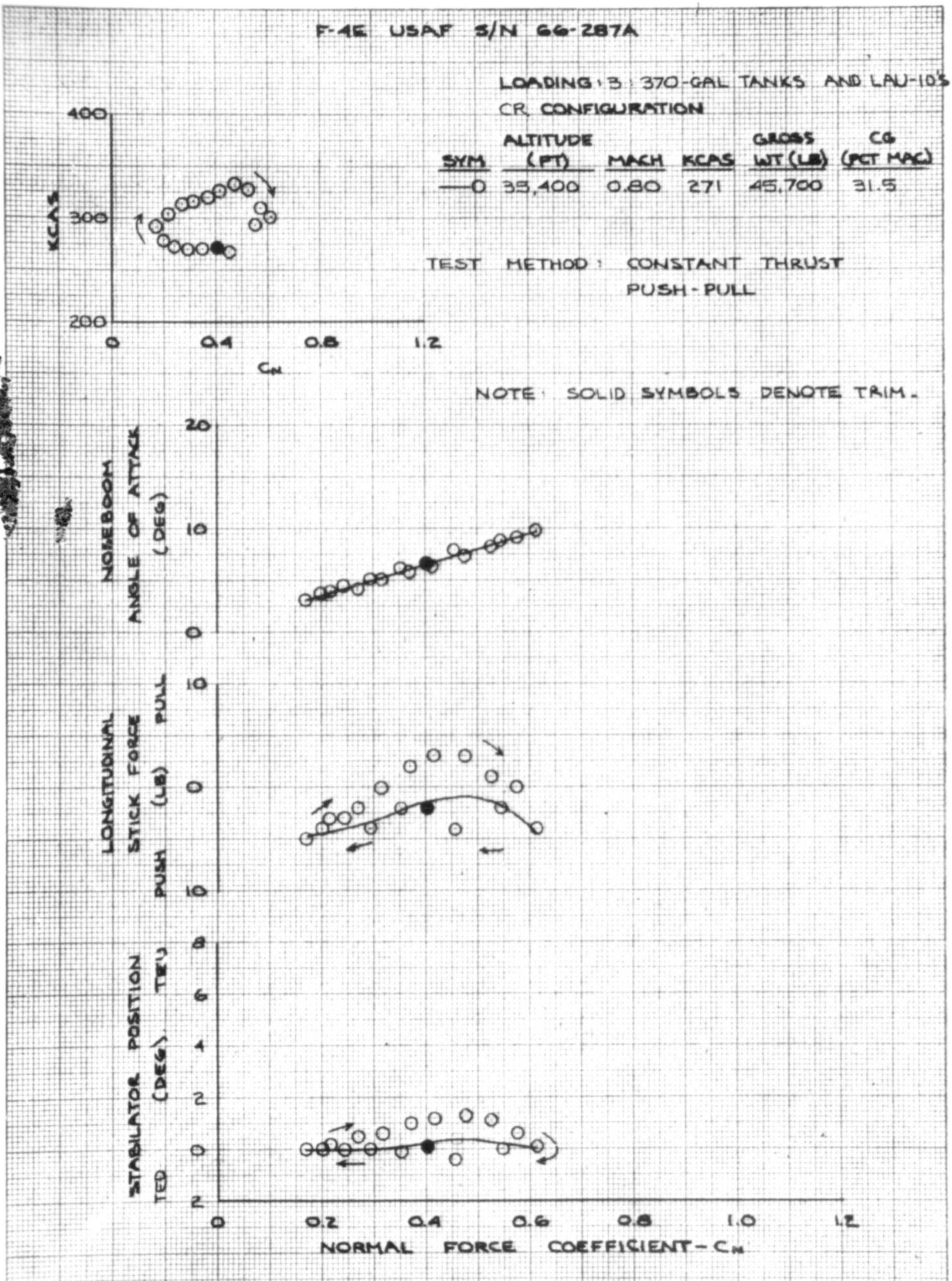


FIGURE 126 STATIC LONGITUDINAL STABILITY

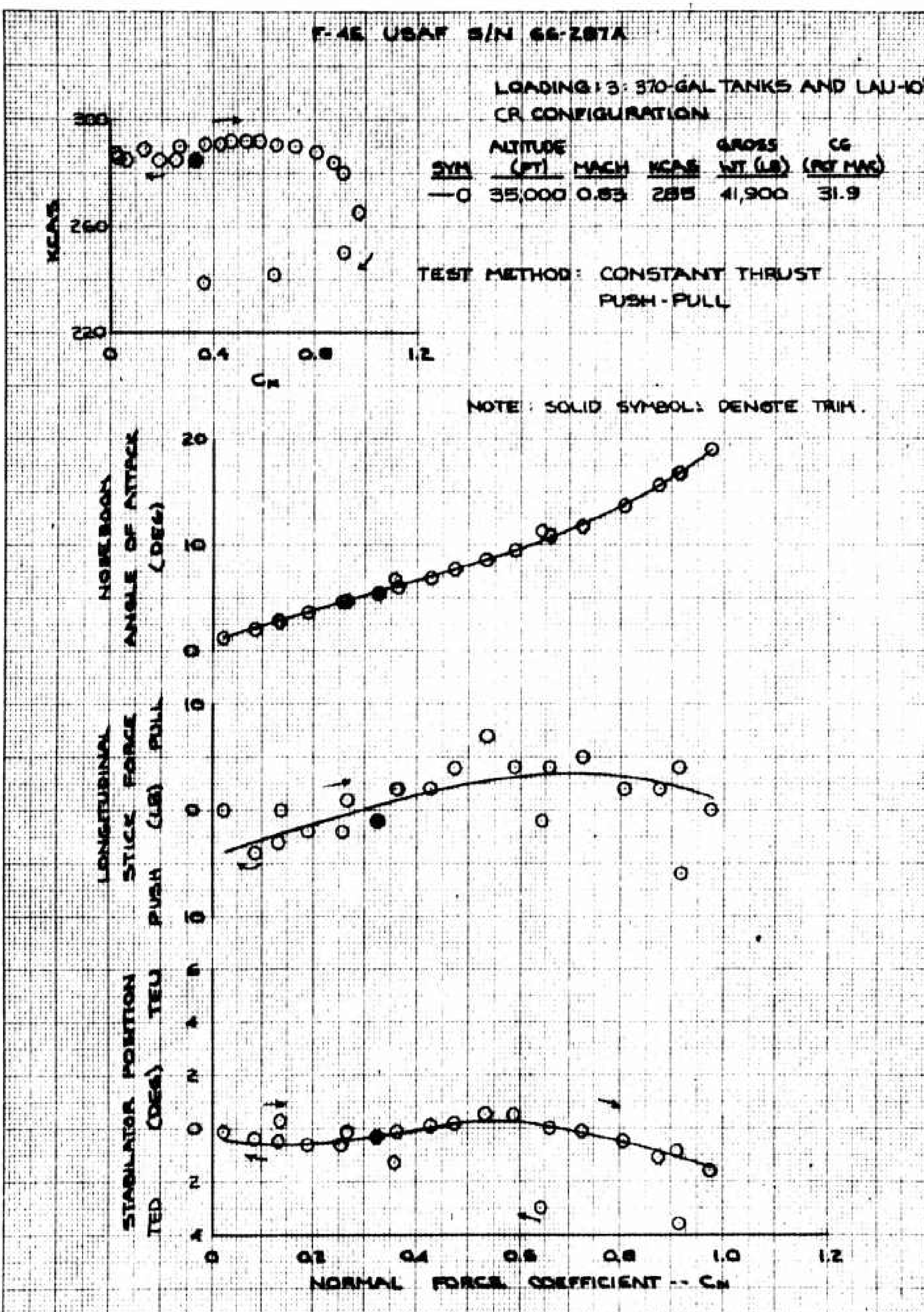
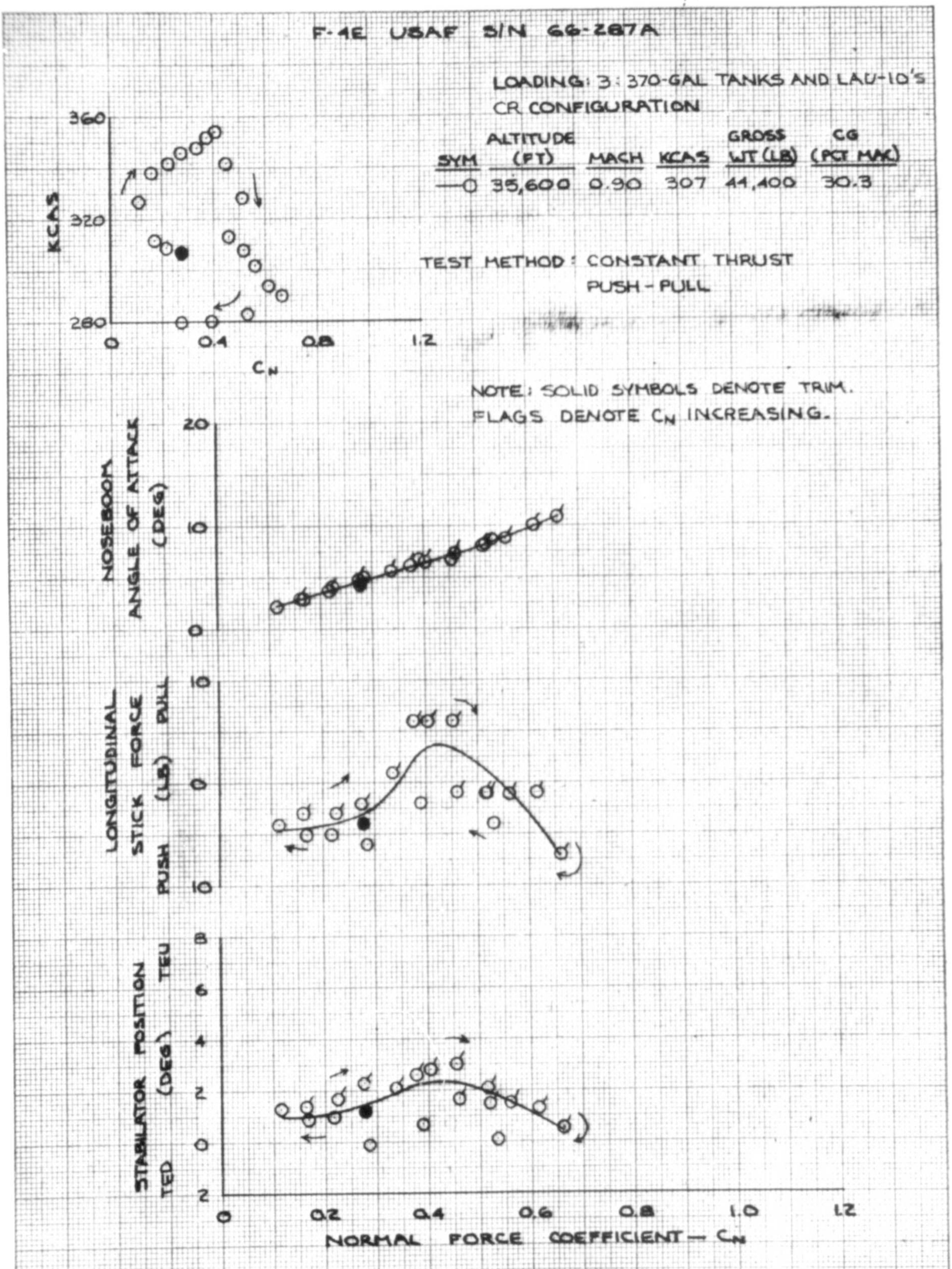


FIGURE 127 STATIC LONGITUDINAL STABILITY



186 FIGURE 128 STATIC LONGITUDINAL STABILITY

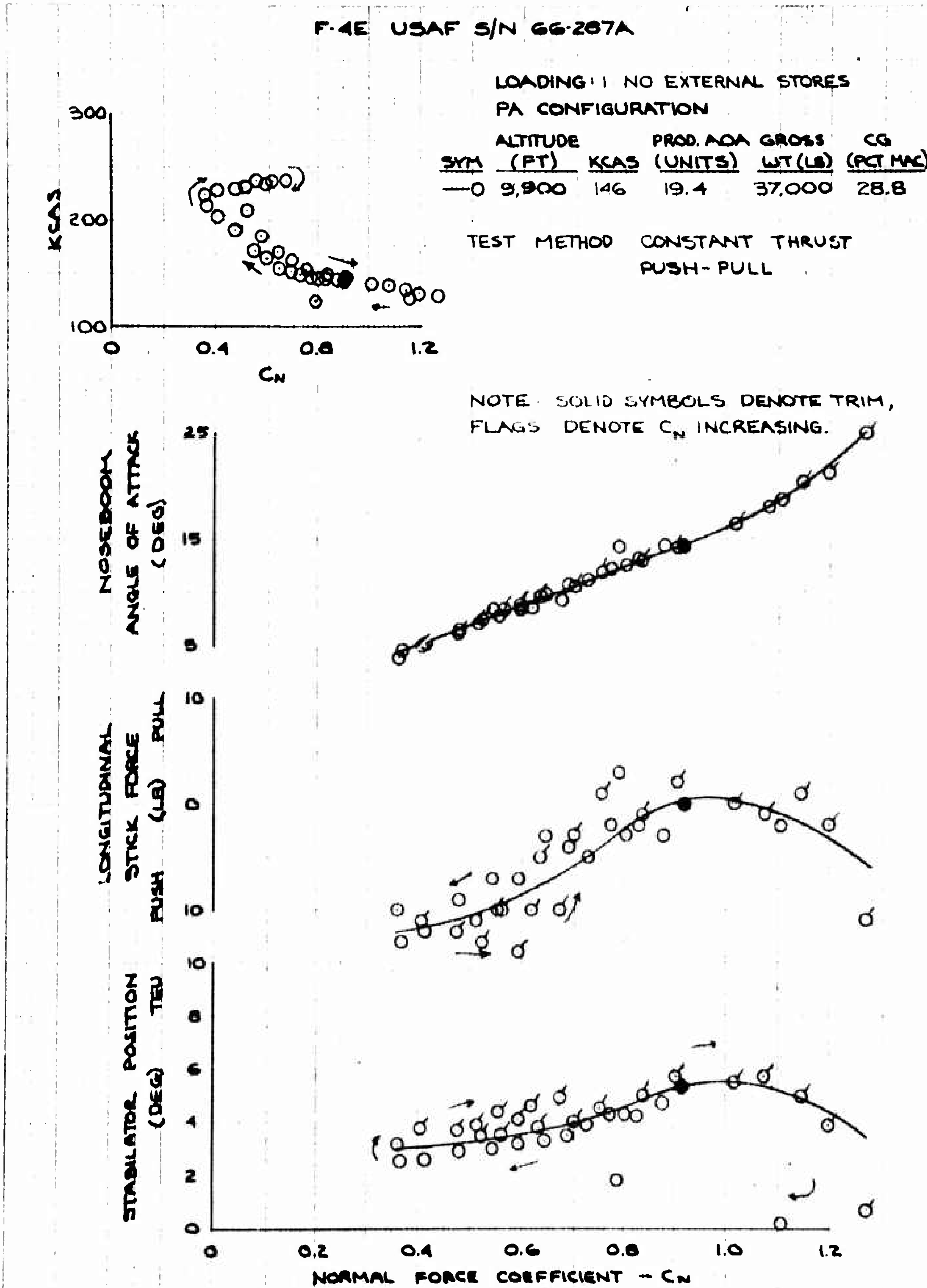


FIGURE 129 POWER APPROACH STATIC LONGITUDINAL STABILITY

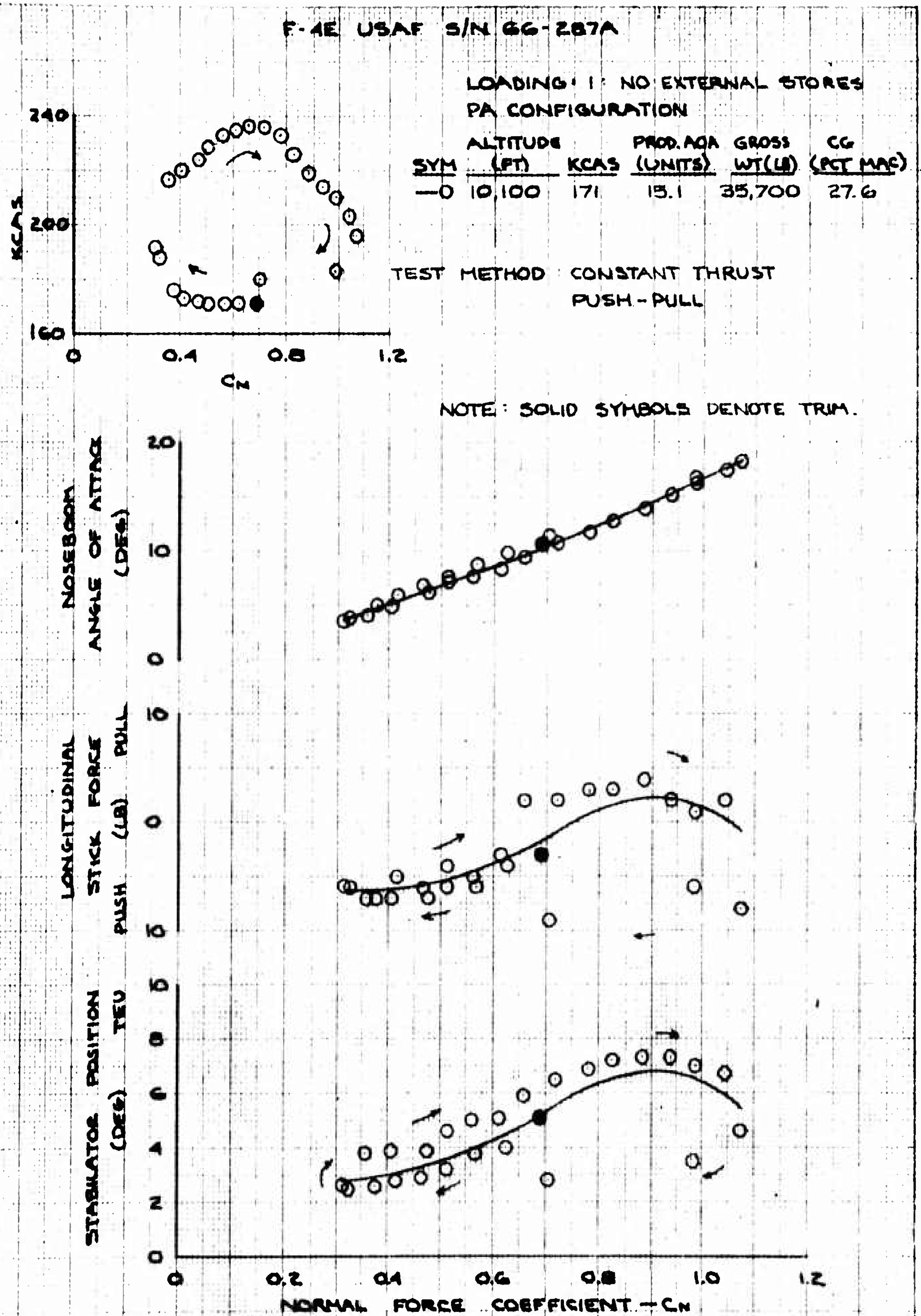


FIGURE 130 POWER APPROACH STATIC LONGITUDINAL STABILITY

F-4E USAF S/N 66-287A

LOADINGS: 1: NO EXTERNAL STORES
1a: FWD AIM-7

CR CONFIGURATION

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	SAS
○	10,500	46,200	29.5	ON
□	11,200	36,400	26.4	
◇	10,800	35,000	26.9	
▽	10,200	36,900	24.5	
▽	10,400	36,700	24.4	
○	10,800	35,900	23.7	
△	10,600	37,900	25.9	
●	9,900	46,900	29.5	OFF
■	10,300	36,900	24.5	
◆	10,500	36,600	24.0	

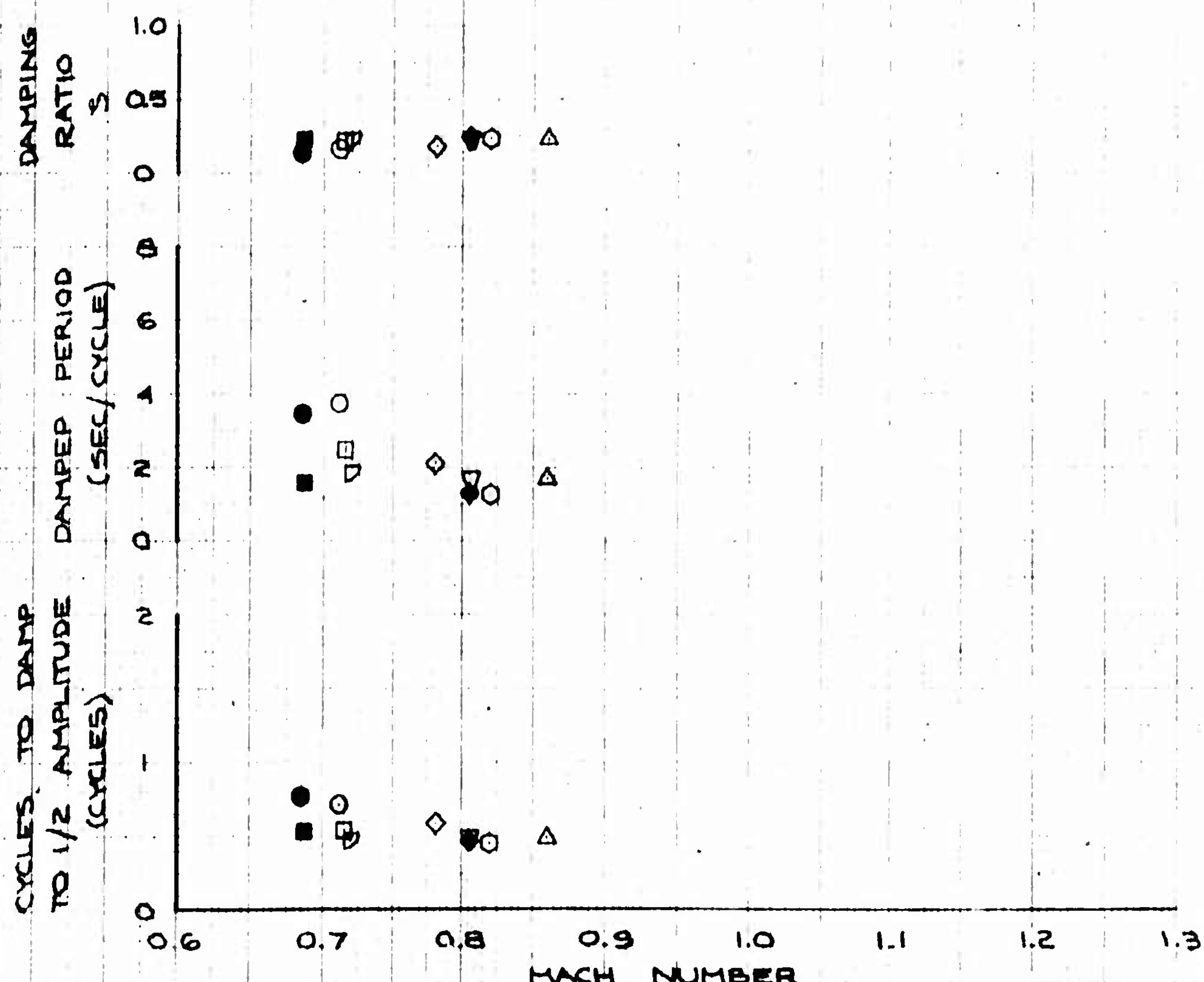


FIGURE 131 LONGITUDINAL SHORT PERIOD DAMPING

F-4E USAF S/N 66-287A

LOADINGS: 1 NO EXTERNAL STORES
3 370-GAL TANKS AND LAU-10'S

CR-CO CONFIGURATIONS

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	SYMBOL	ALTITUDE (FT)	GROSS WT(LB)	CG POSITION (PCT MAC)
○'	35,400	44,900	30.9	□	35,800	40,100	23.0
□'	35,900	48,700	29.9	◁	35,800	38,700	23.5
◇	35,100	41,200	33.6 {SEE NOTE 2	☆	35,700	38,000	25.1
▽'	35,900	38,600	32.6	▷	35,400	37,400	24.9
▽	35,400	37,700	31.5	●	35,700	38,700	32.7
⬡	36,600	37,200	30.9	■	35,700	37,200	30.9
△	35,400	38,300	29.9	◆	35,700	36,100	27.8
◺	36,300	36,200	27.0	▼'	35,900	38,600	23.5
△'	35,400	41,200	25.4	▼	34,800	38,700	24.0
▽	35,000	40,900	24.0	⬢	35,100	37,500	25.0

NOTES: 1. PLAIN SYMBOLS DENOTE SAS OFF AND LOADING 1. SOLID SYMBOLS DENOTE SAS ON ; FLAGS DENOTE LOADING 3.
2. STICK NOT RESTRAINED AFTER DOUBLET INPUT.

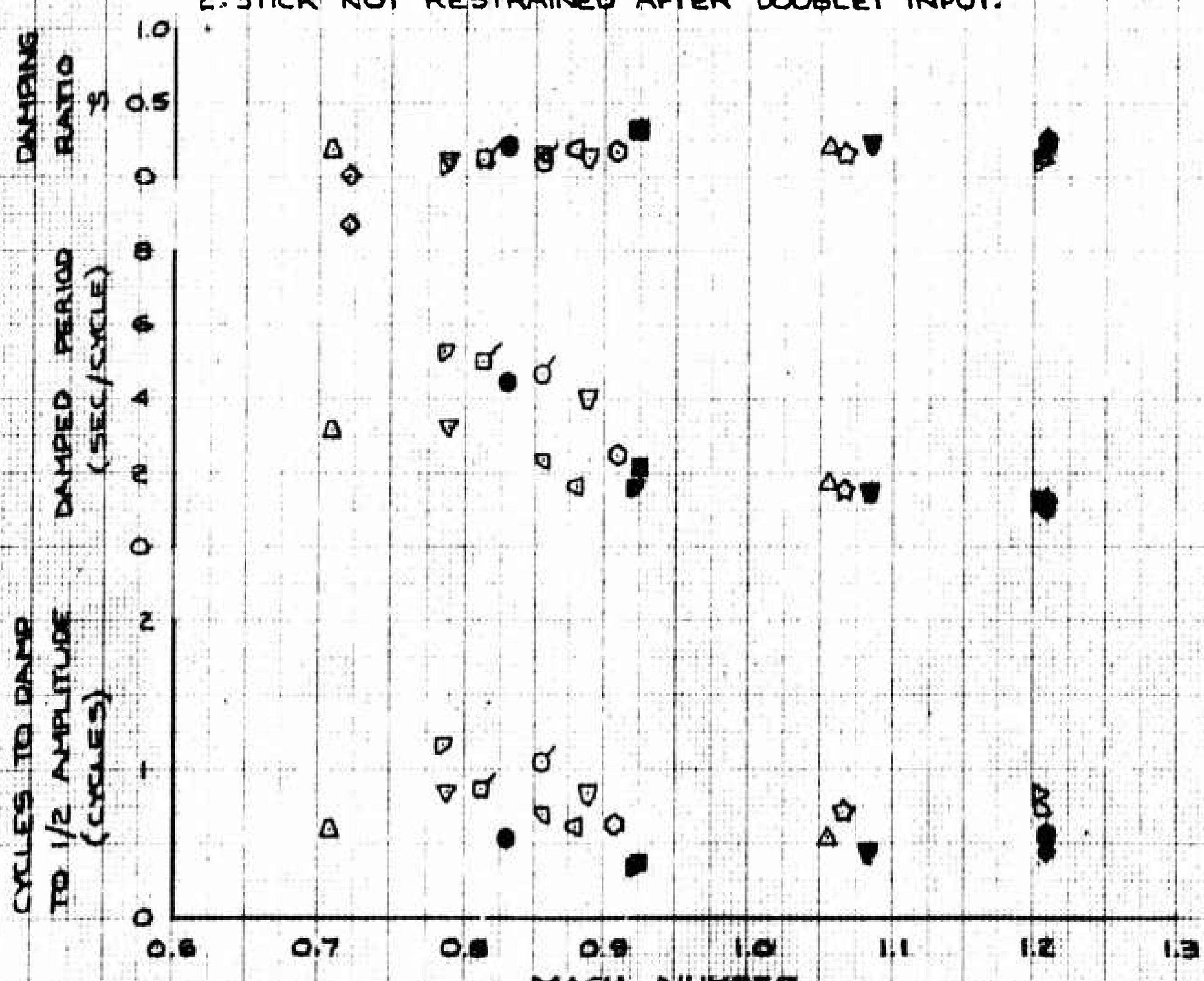


FIGURE 132 LONGITUDINAL SHORT PERIOD DAMPING

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-256 RUN 13 DATE 10 MAY 1972

F-4E MCAIR NO. 2?8J USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS ON)

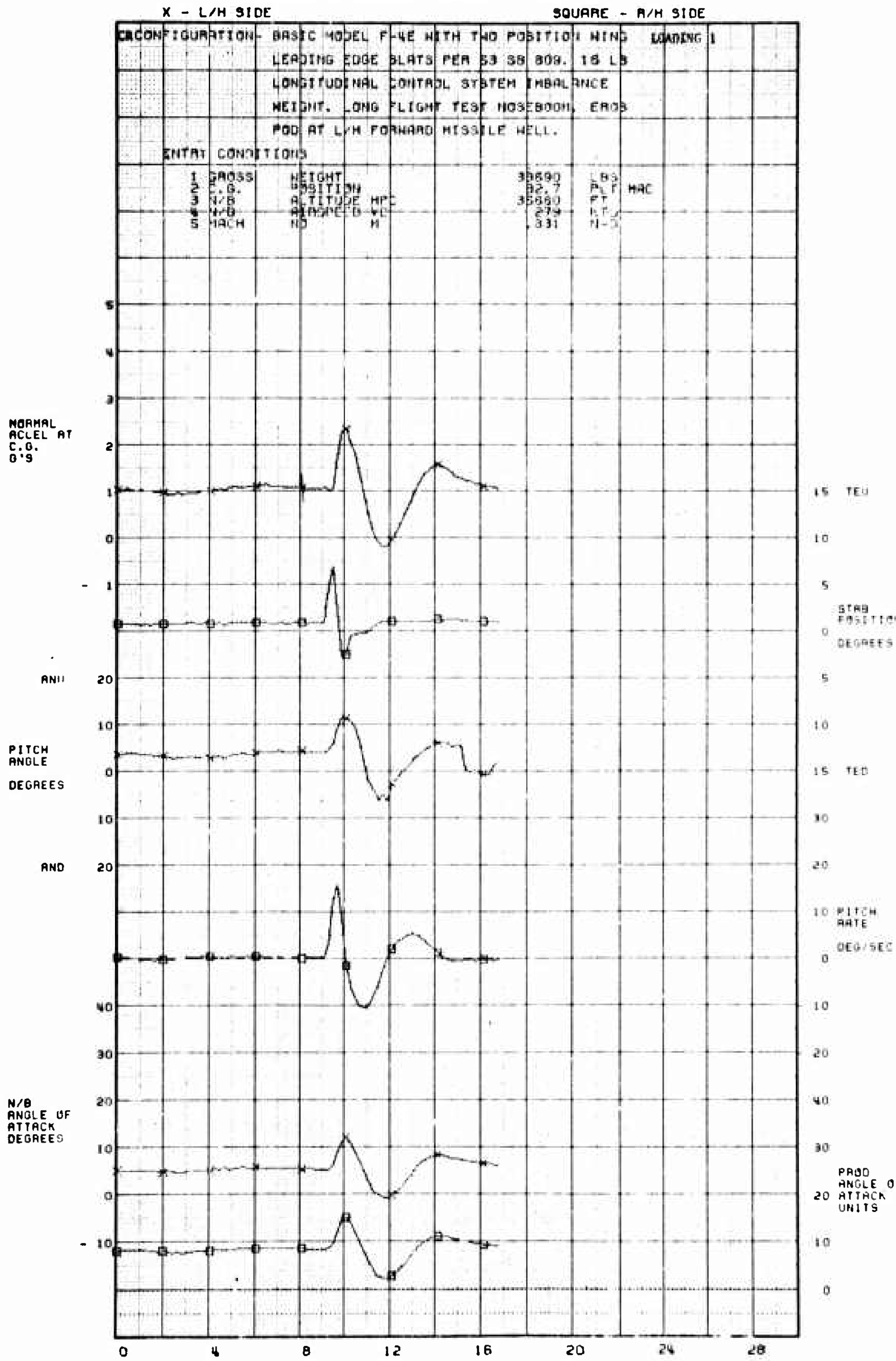


FIGURE 133 DYNAMIC LONGITUDINAL STABILITY

APPROVAL, DATE DE SDE SFTE

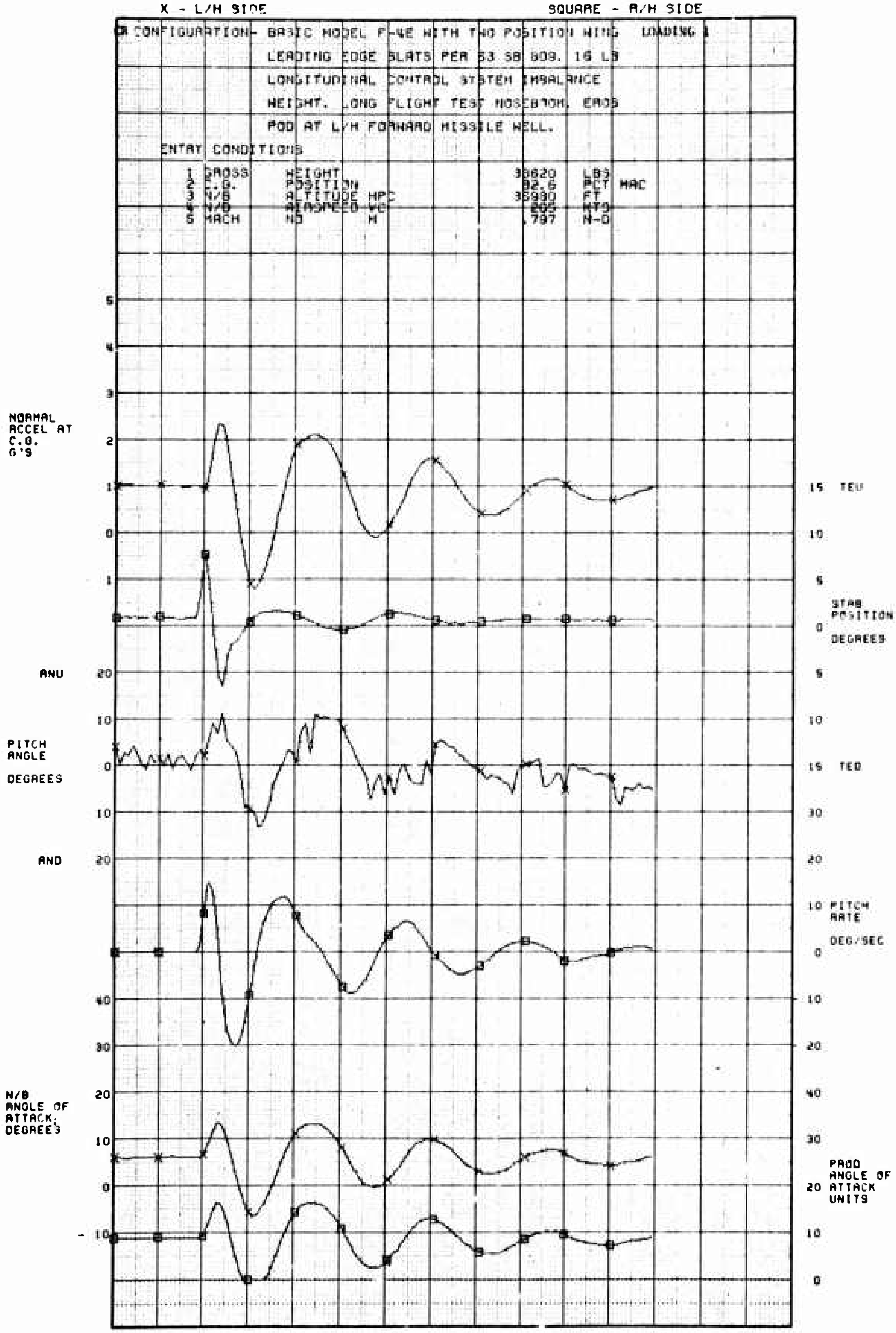
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-256 RUN 14 DATE 10 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS OFF)

X - L/H SIDE SQUARE - R/H SIDE



22,14,16.717 ELAPSED TIME IN SECONDS

FIGURE 134 DYNAMIC LONGITUDINAL STABILITY

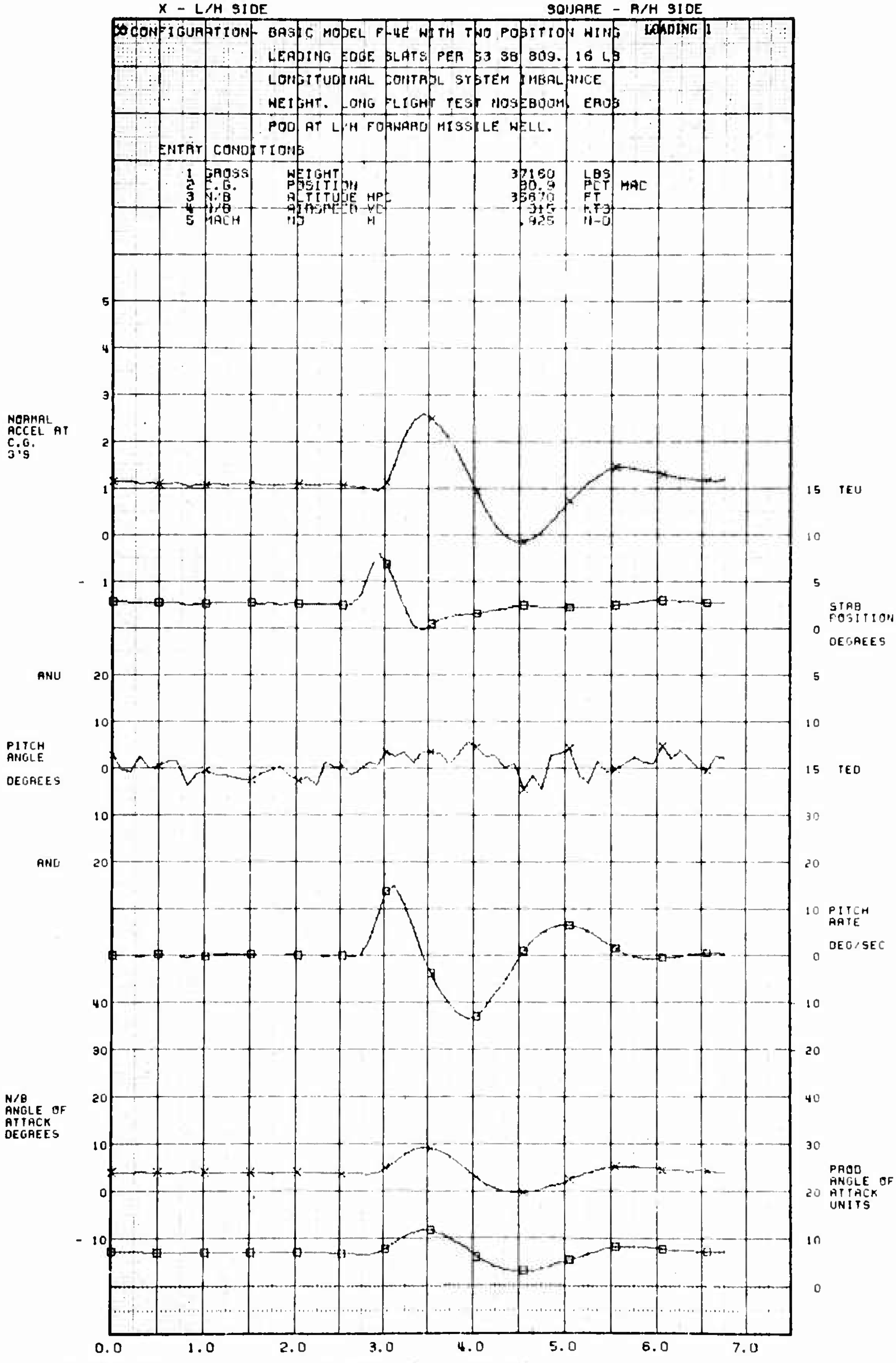
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-256 RUN 23 DATE 10 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS ON)

X - L/H SIDE SQUARE - R/H SIDE



22.18.43.461

FIGURE 135 DYNAMIC LONGITUDINAL STABILITY

APPROVAL, DATE   DE   SDE   SFTE   PAGE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-256   RUN 24   DATE 1C MAY 1972

F-4E   MCAIR NO. 2280   USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS OFF)

X - L/H SIDE   SQUARE - R/H SIDE

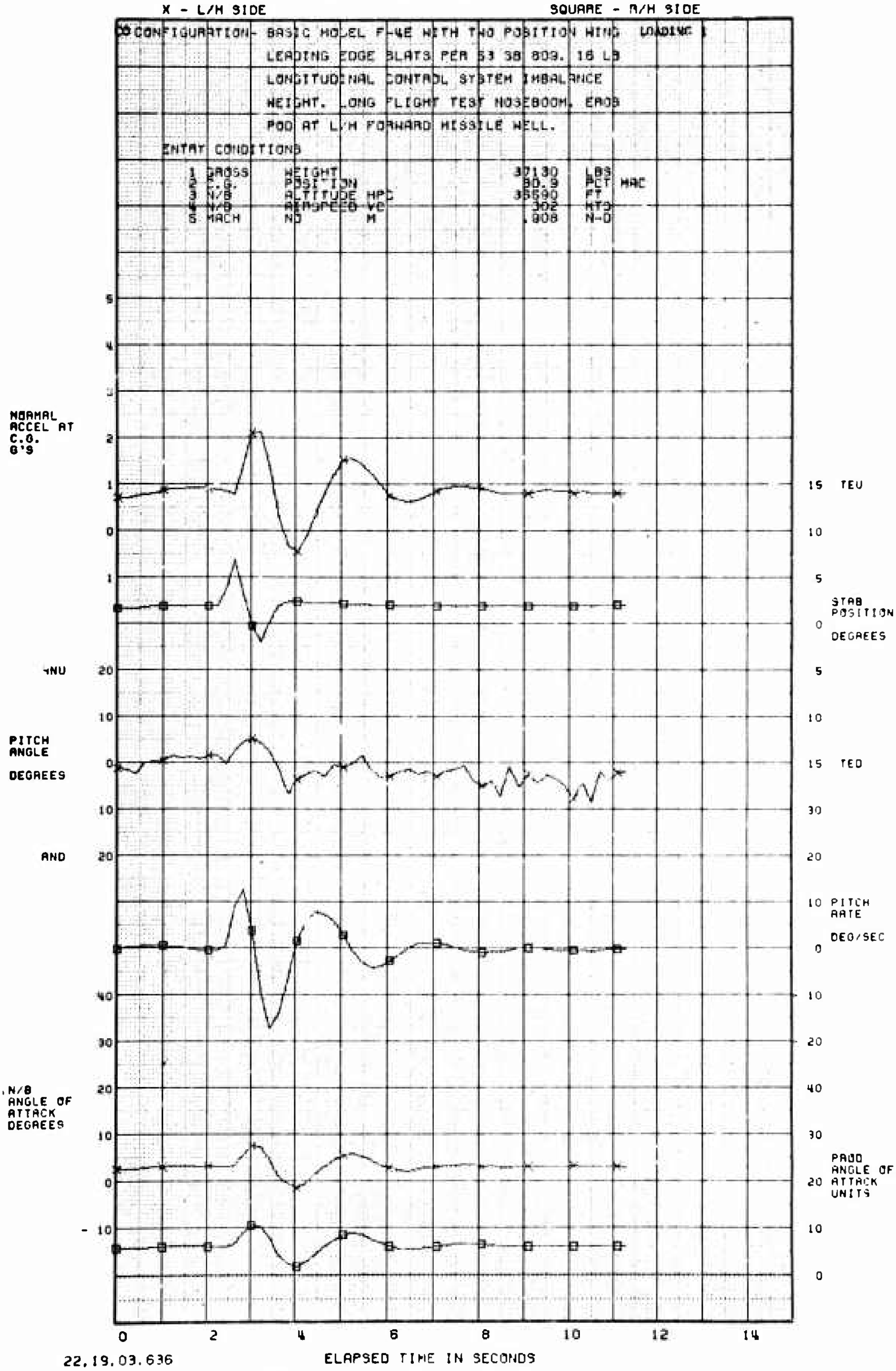


FIGURE 136 DYNAMIC LONGITUDINAL STABILITY

FLIGHT TEST EVALUATION OF THE MODEL F-4E

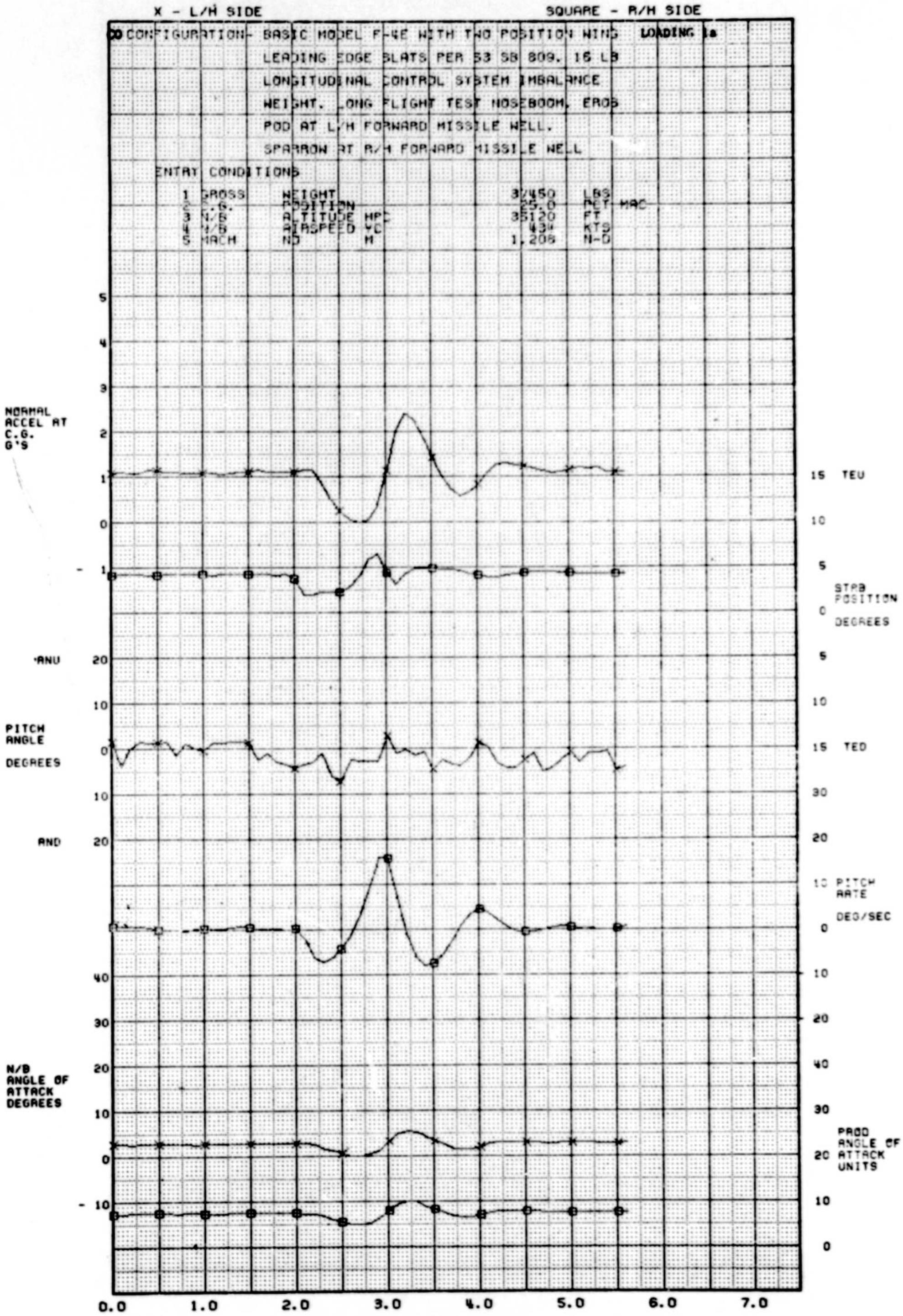
WITH TWO POSITION MANEUVERING SLATS

FLT 287-258 RUN 27 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS ON)

X - L/H SIDE SQUARE - R/H SIDE



17.21.15.073

FIGURE 137 DYNAMIC LONGITUDINAL STABILITY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-258 RUN 28 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS OFF)

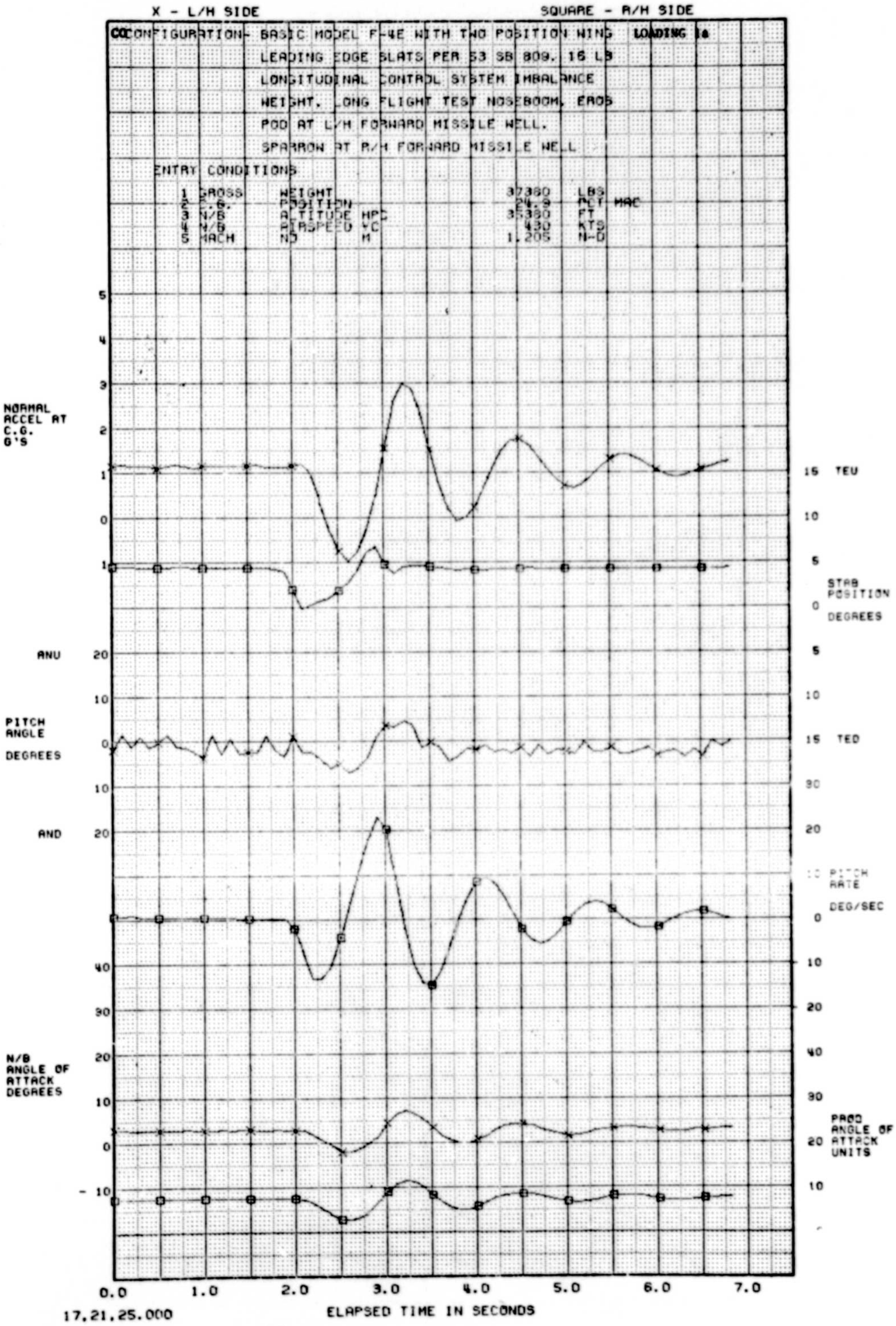


FIGURE 138 DYNAMIC LONGITUDINAL STABILITY

APPROVAL, DATE DE SDE SFTE

FLIGHT TEST EVALUATION OF THE MODEL F-4E

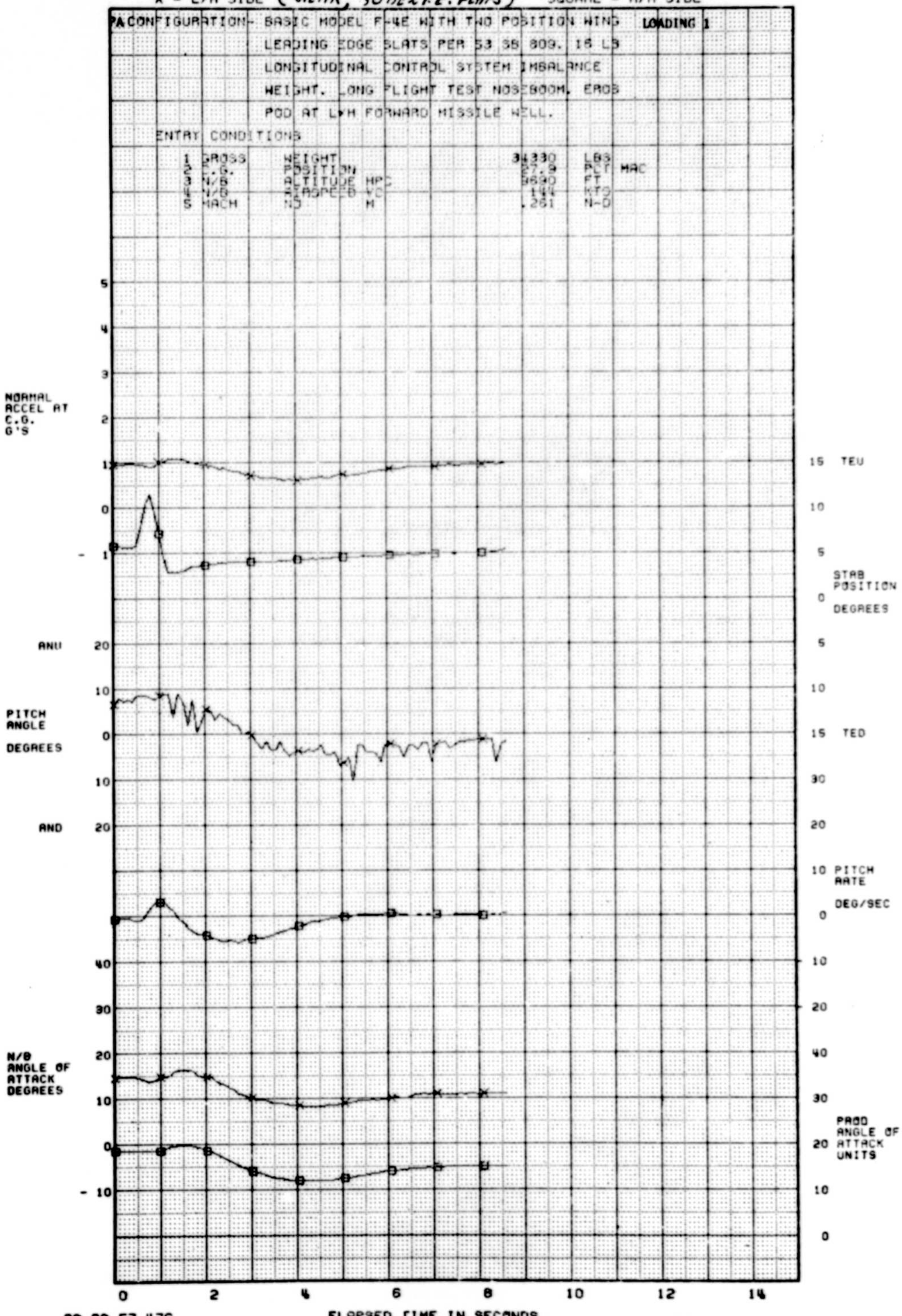
WITH TWO POSITION MANEUVERING SLATS

FLT 287-254 RUN 17 DATE 9 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS ON)

X - L/H SIDE (GEMH, 30 DEG T.E. FLAPS) SQUARE - R/H SIDE

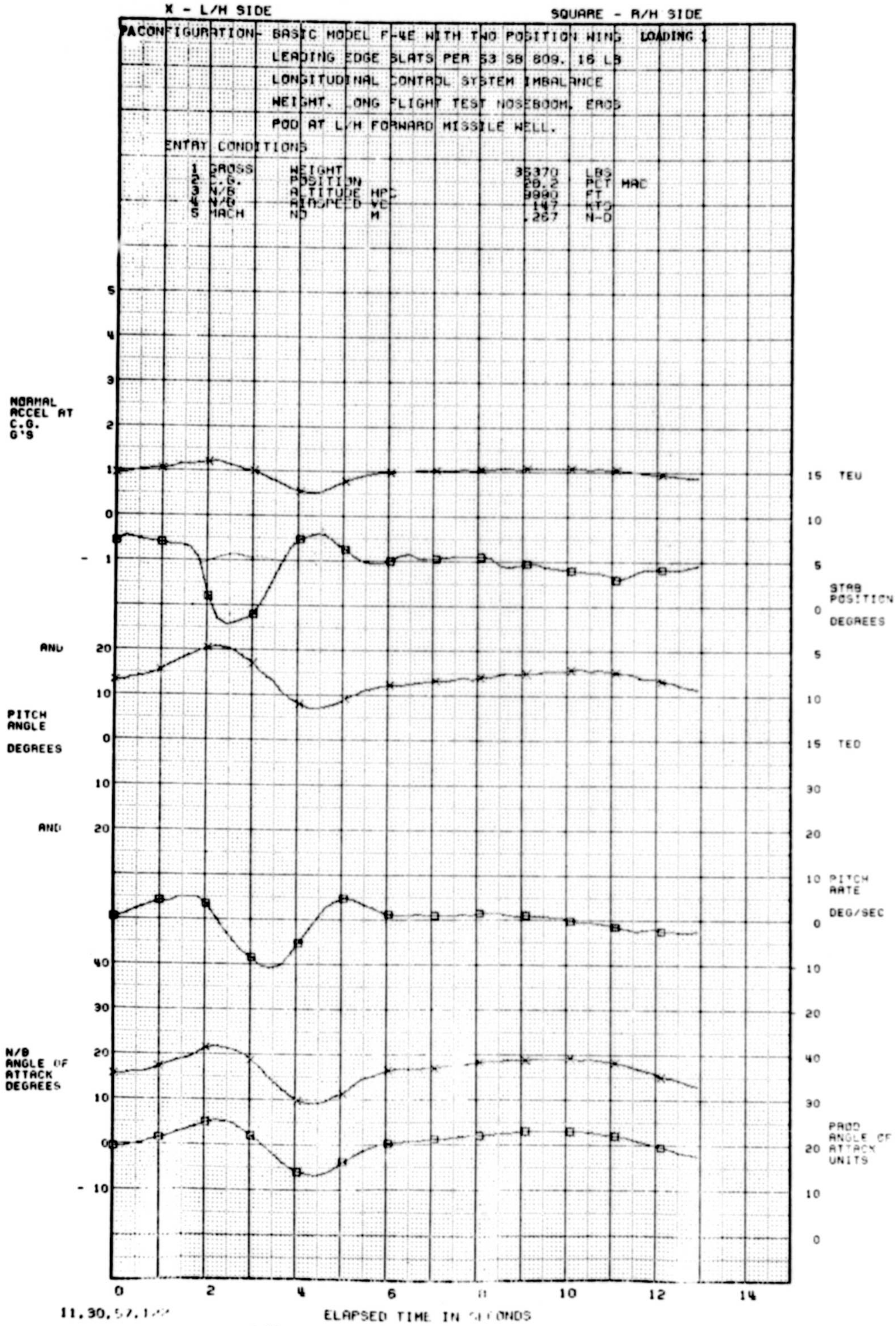


20.20.57.476

FIGURE 139 DYNAMIC LONGITUDINAL STABILITY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-252 RUN 33 DATE 2 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
"PA" DYNAMIC LONGITUDINAL STABILITY (SAS OFF)



11.30.57.1

FIGURE 140 DYNAMIC LONGITUDINAL STABILITY

APPROVAL, DATE DE SDE SFTE PAGE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-252 RUN 35 DATE 2 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

DYNAMIC LONGITUDINAL STABILITY (SAS OFF)

X - L/H SIDE SQUARE - R/H SIDE

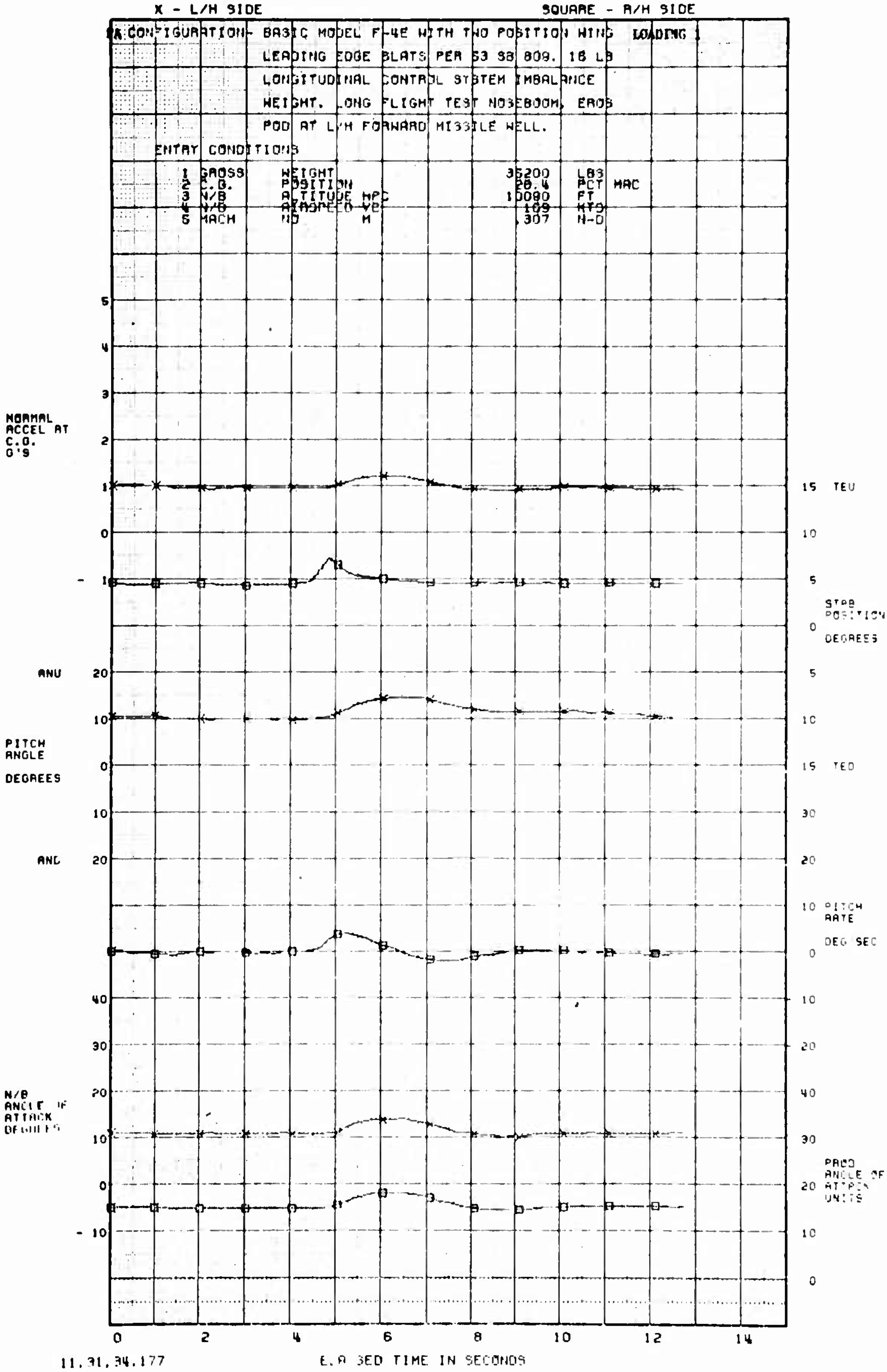


FIGURE 141 DYNAMIC LONGITUDINAL STABILITY

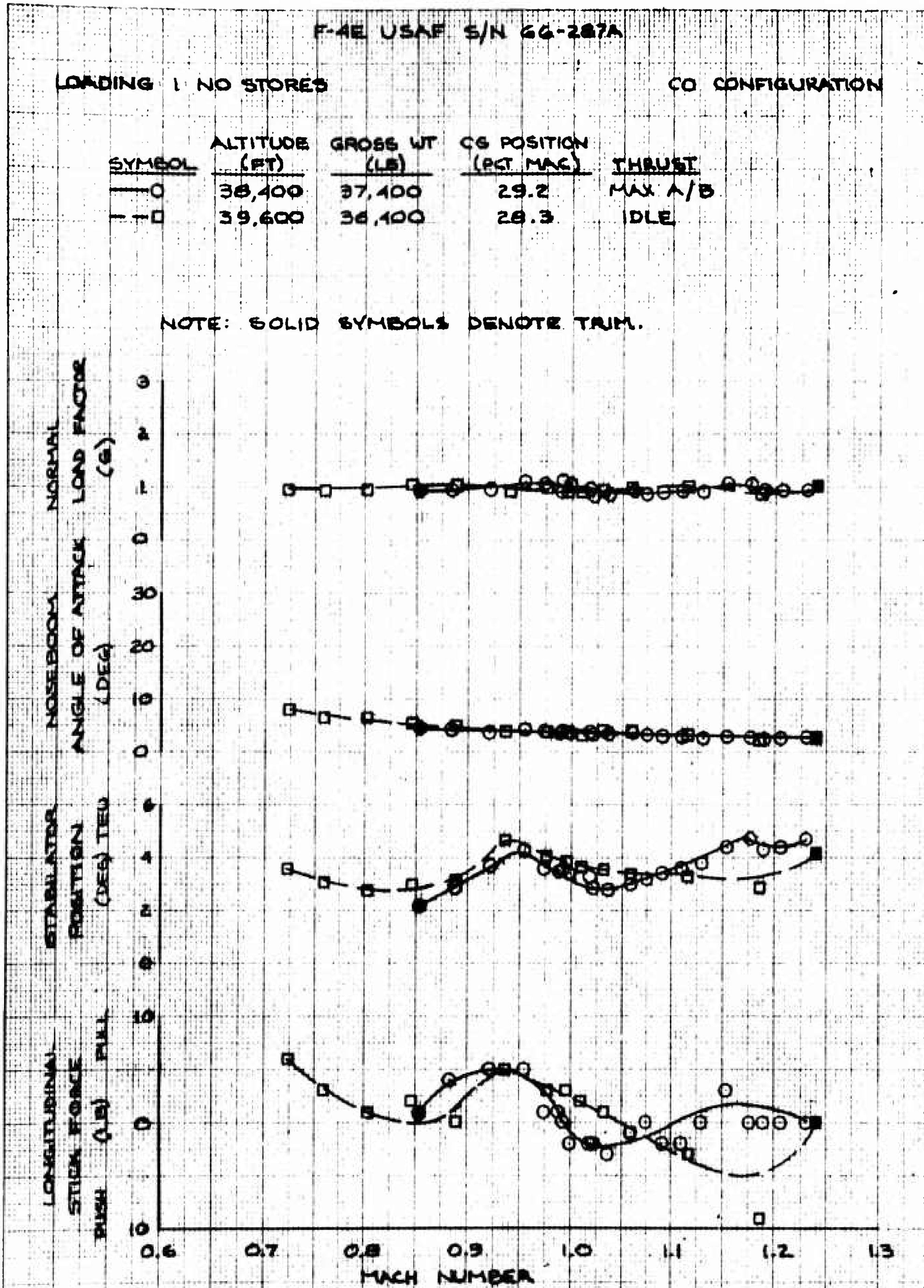


FIGURE 142 TRANSONIC SPEED STABILITY

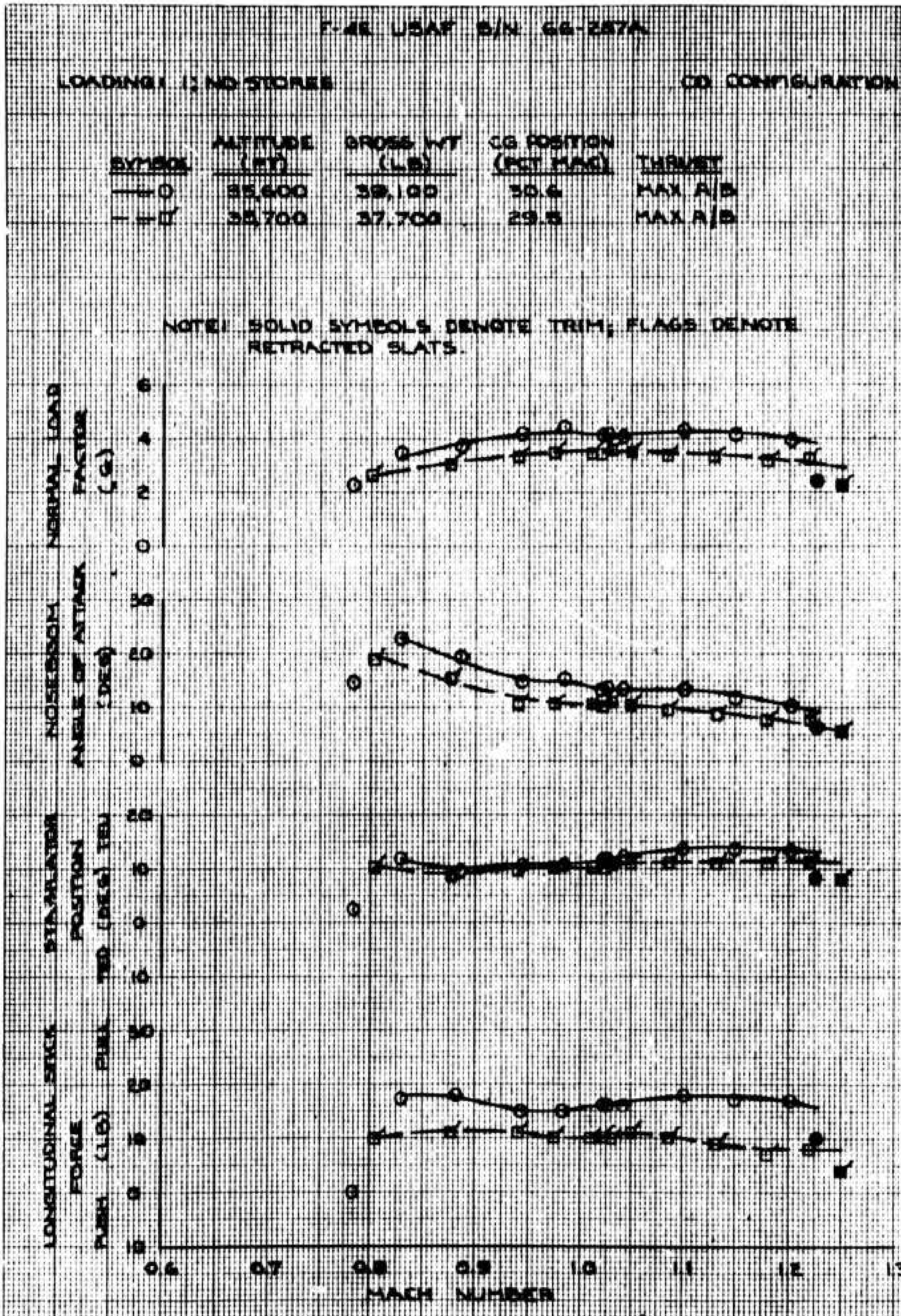


FIGURE 143 TRANSONIC DECELERATING TURN

PAGE 01

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-273 RUN 18 DATE 24 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

A/B POWER ACCELERATION

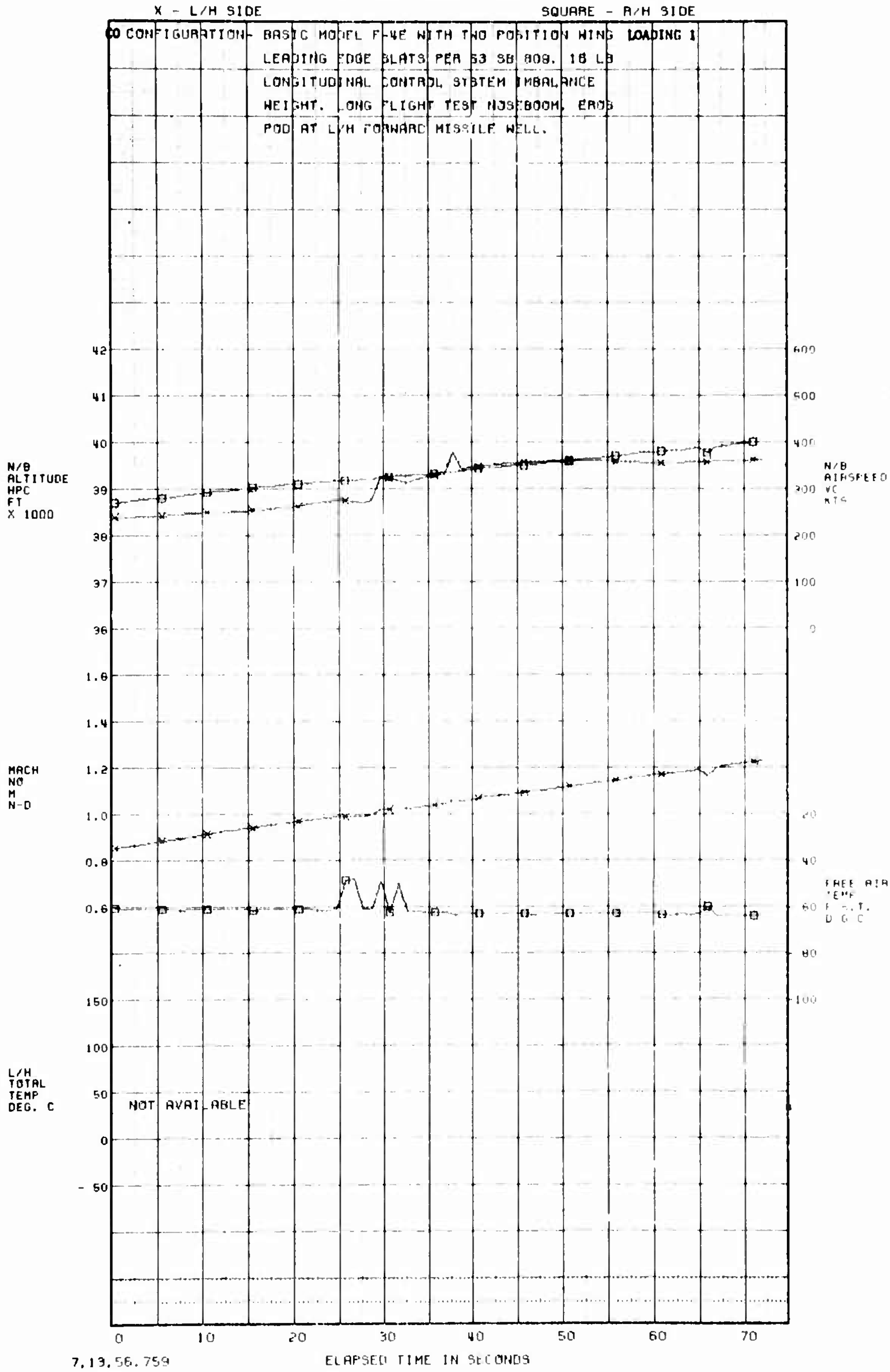


FIGURE 144 MAX A/B THRUST ACCELERATION TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-273 RUN 18 DATE 24 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

A/B POWER ACCELERATION

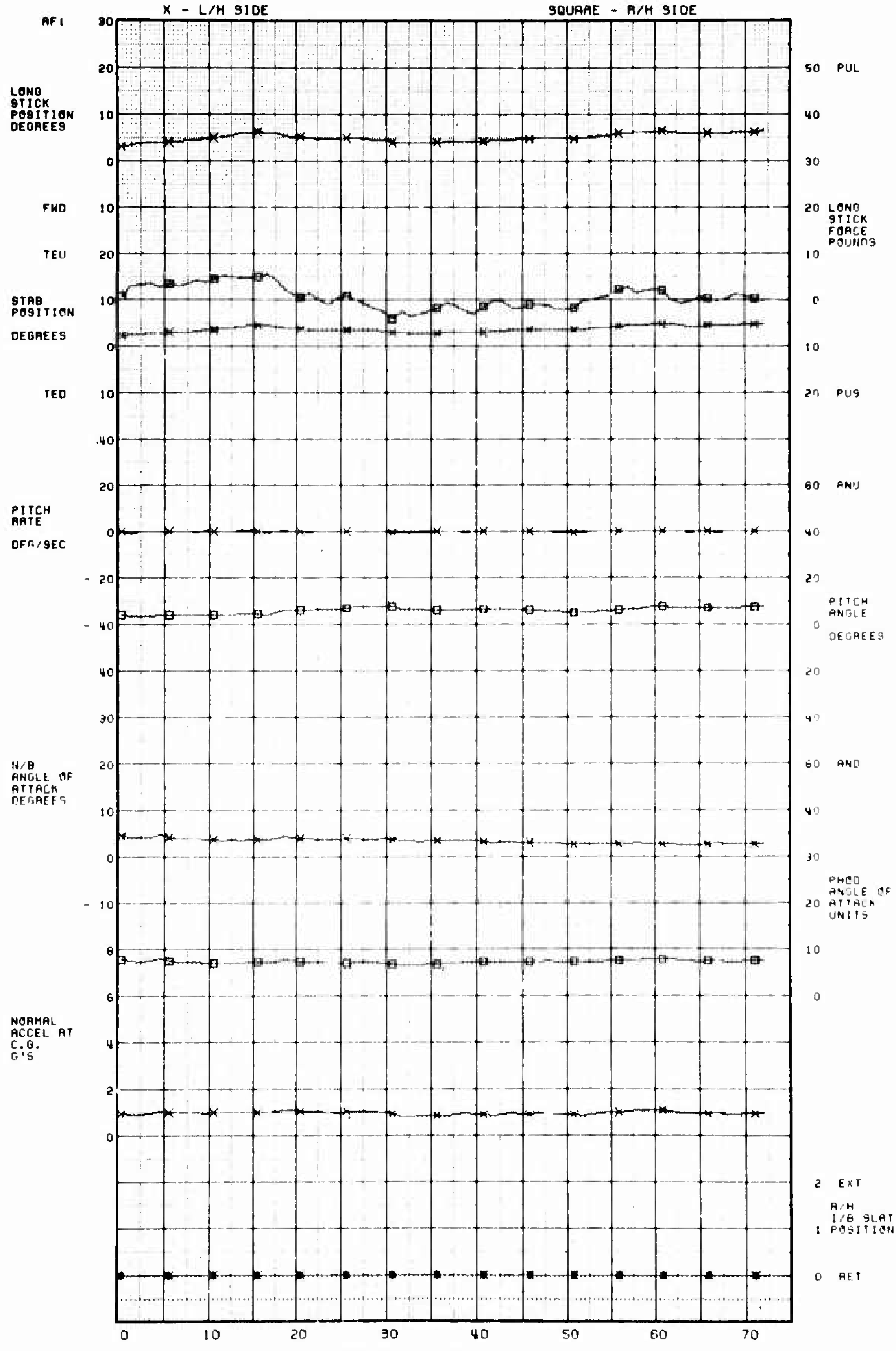


FIGURE 144 MAX A/B THRUST ACCELERATION TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 21 DATE 24 MAY 1972

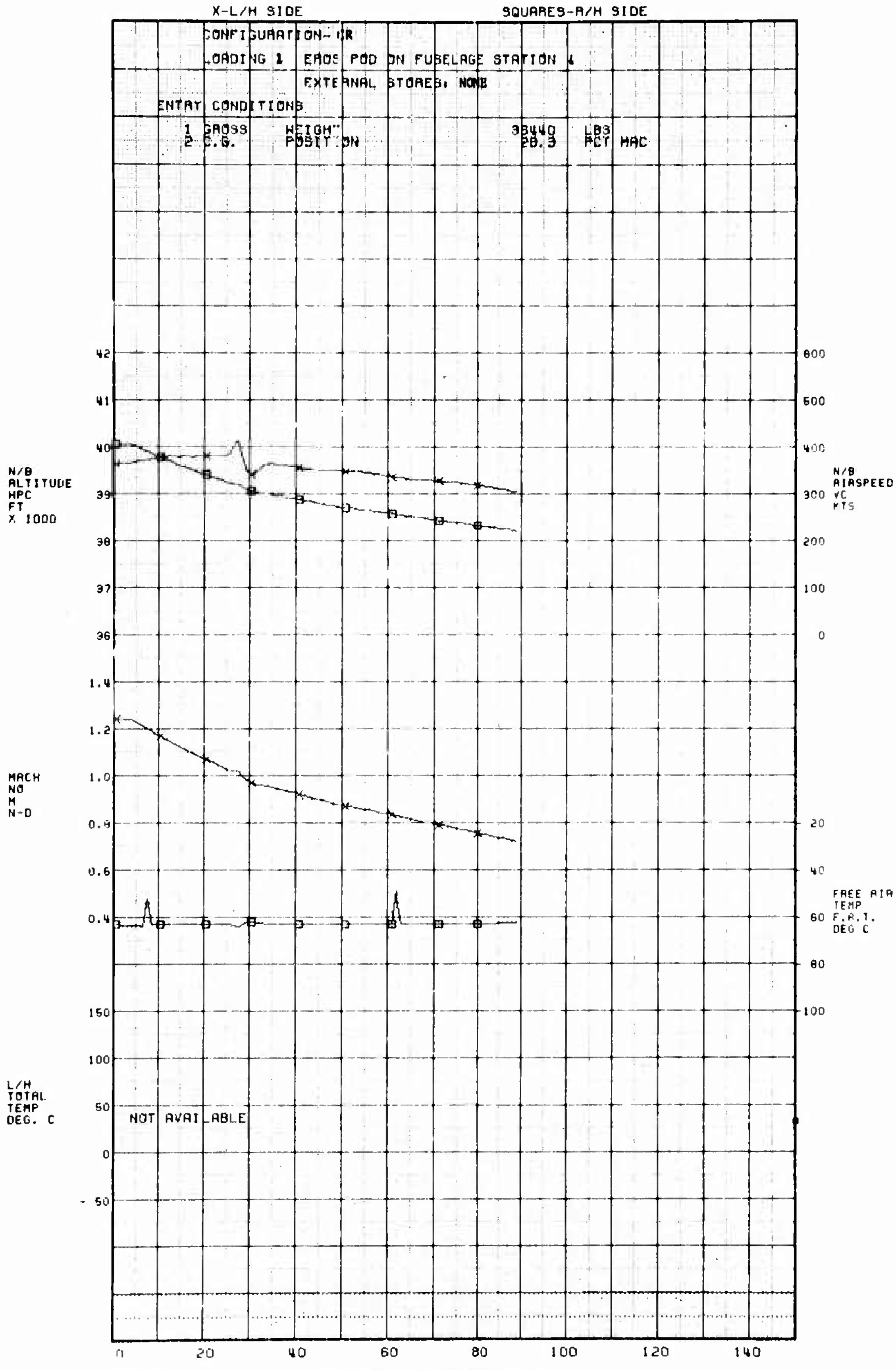


FIGURE 145 IDLE THRUST DECELERATION TIME HISTORY

F-4E USAF S/N 66-287A

FLT 287-273 RUN 21 DATE 24 MAY 1972

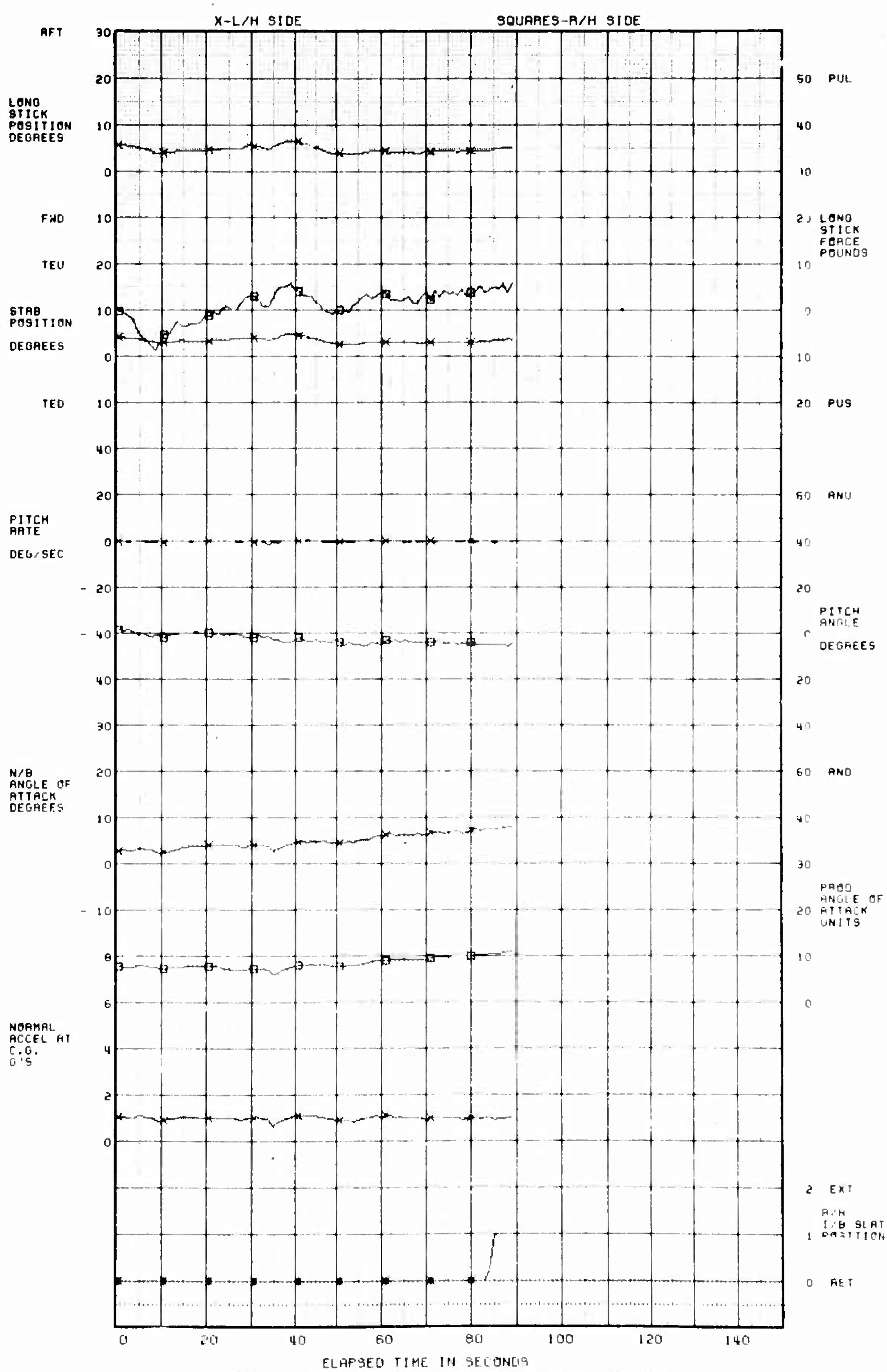


FIGURE 145 IDLE THRUST DECELERATION TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

LOADINGS: 1: NO EXTERNAL STORES
1b: AFT AIM-7'S

CR-CO CONFIGURATIONS
SAS ON

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	PRODUCTION AOA (UNITS)
○	10,400	35,300	26.9	6
□	10,500	35,100	26.6	5
◇	10,200	36,000	29.9	5
⬡	10,600	35,400	26.2	5
△	10,300	35,600	27.7	5
▽	10,700	36,100	26.0	3
▽	10,400	34,700	26.0	5
△	11,500	36,300	29.4	5
D	11,900	37,700	25.3	12
▷	10,700	37,300	24.0	7
◸	10,000	37,100	24.3	10
◹	11,500	35,500	24.0	5
0	10,100	35,900	27.8	10
◁	9,900	35,600	28.0	21
⬭	10,400	35,100	28.4	10
◿	12,400	35,400	24.1	10
▷	9,900	35,500	29.1	5

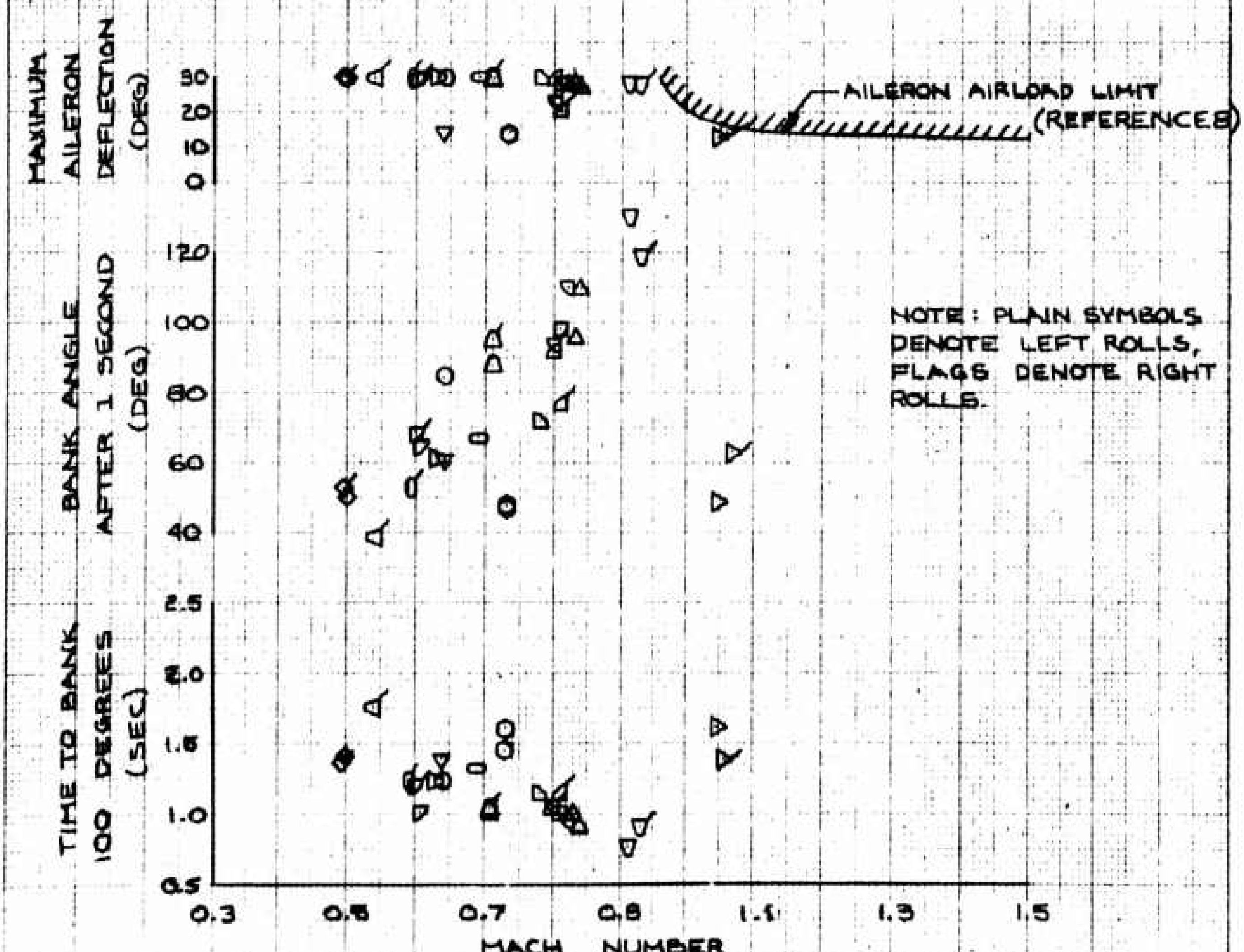


FIGURE 146 ROLL CAPABILITY-10,000 FEET ALTITUDE

F-4E USAF S/N 66-287A

LOADINGS: 2: 370-GAL TANKS
3: TANKS AND LAU-10'S

CR CONFIGURATION
SAS ON

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	PRODUCTION AOA (UNITS)	LOADING	
Δ	10,400	36,900	26.4	8	3	SEE NOTE 2
◇	10,400	39,800	26.7	10	A2	SEE NOTE 3
▷	10,300	39,600	28.5	7	↓	↓
▽	10,400	39,100	28.0	5	↓	↓
O	10,900	38,500	27.7	5	↓	↓
▽	9,800	45,500	29.2	7	↓	↓

NOTES: 1. PLAIN SYMBOLS DENOTE LEFT ROLLS, FLAGS DENOTE RIGHT ROLLS.
2. EXTERNAL FUEL TANKS EMPTY.
3. ASYMMETRIC FUEL LOAD AS FOLLOWS: RIGHT 370-GAL TANK HALF FULL, LEFT 370-GAL TANK EMPTY.

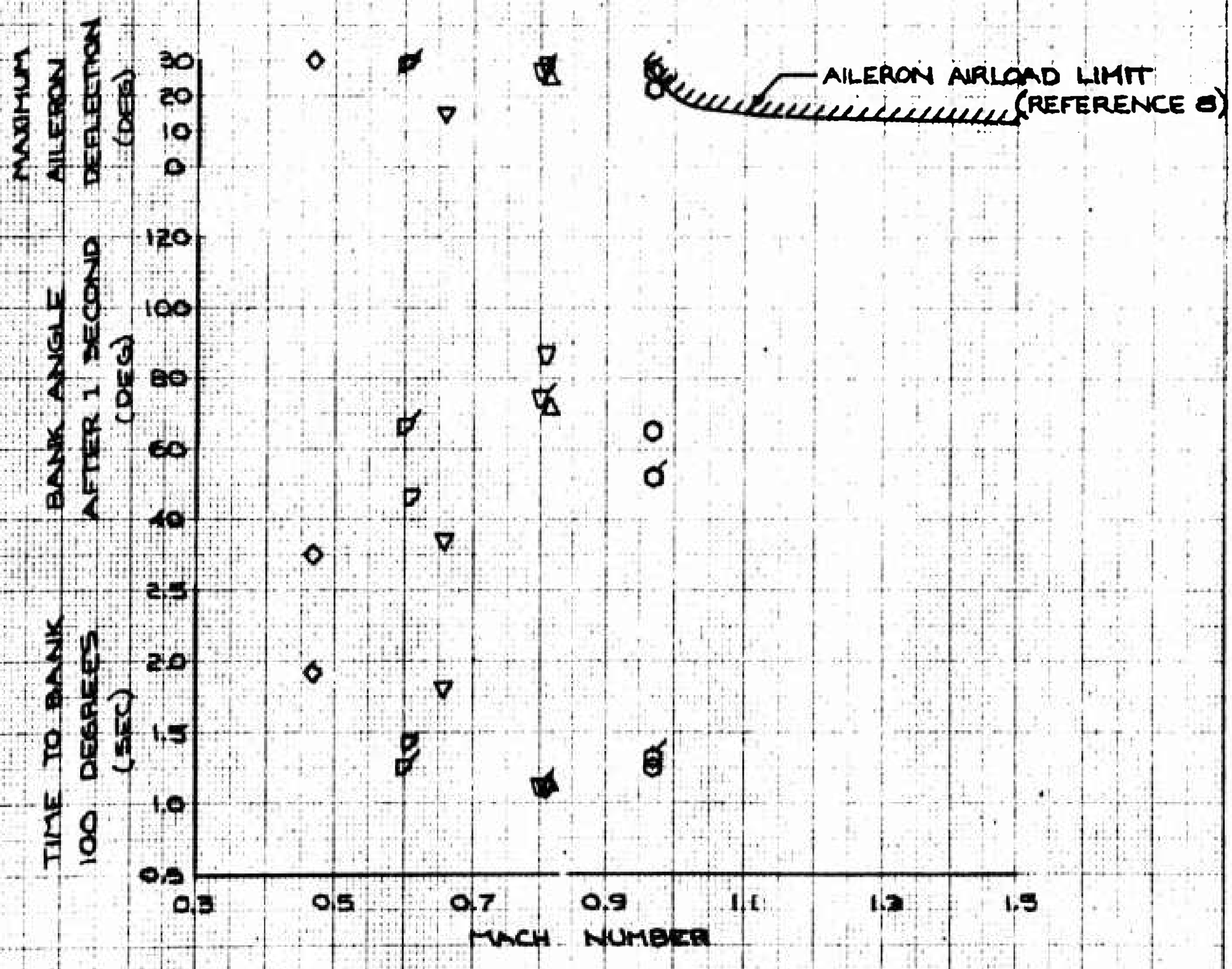


FIGURE 146 ROLL CAPABILITY - 10,000 FEET ALTITUDE (CONCLUDED)

F-4E USAF S/N 66-287A

LOADINGS: 1: NO STORES
1a: FWD AIM-7

CR,CO CONFIGURATION
SAS ON

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	PRODUCTION AOA (UNITS)
○	39,700	36,600	28.4	8
□	35,700	36,000	27.8	6
◇	35,000	36,800	28.7	16
△	35,200	36,400	28.2	5
▽	35,600	41,600	27.8	15
⬡	36,900	40,600	27.1	18
▼	34,300	39,700	26.5	25
◢	35,800	38,200	25.6	28
○	35,300	37,100	24.3	11
▽	34,300	36,600	24.3	20
▷	34,400	36,300	24.0	11
△	35,500	35,000	28.6	11
◁	35,400	34,800	28.5	12
△	35,500	34,700	27.7	12

NOTES: PLAIN SYMBOLS DENOTE LEFT AILERON ROLLS, FLAGS DENOTE RIGHT ROLLS. SOLID SYMBOLS DENOTE RUDDER ROLLS.

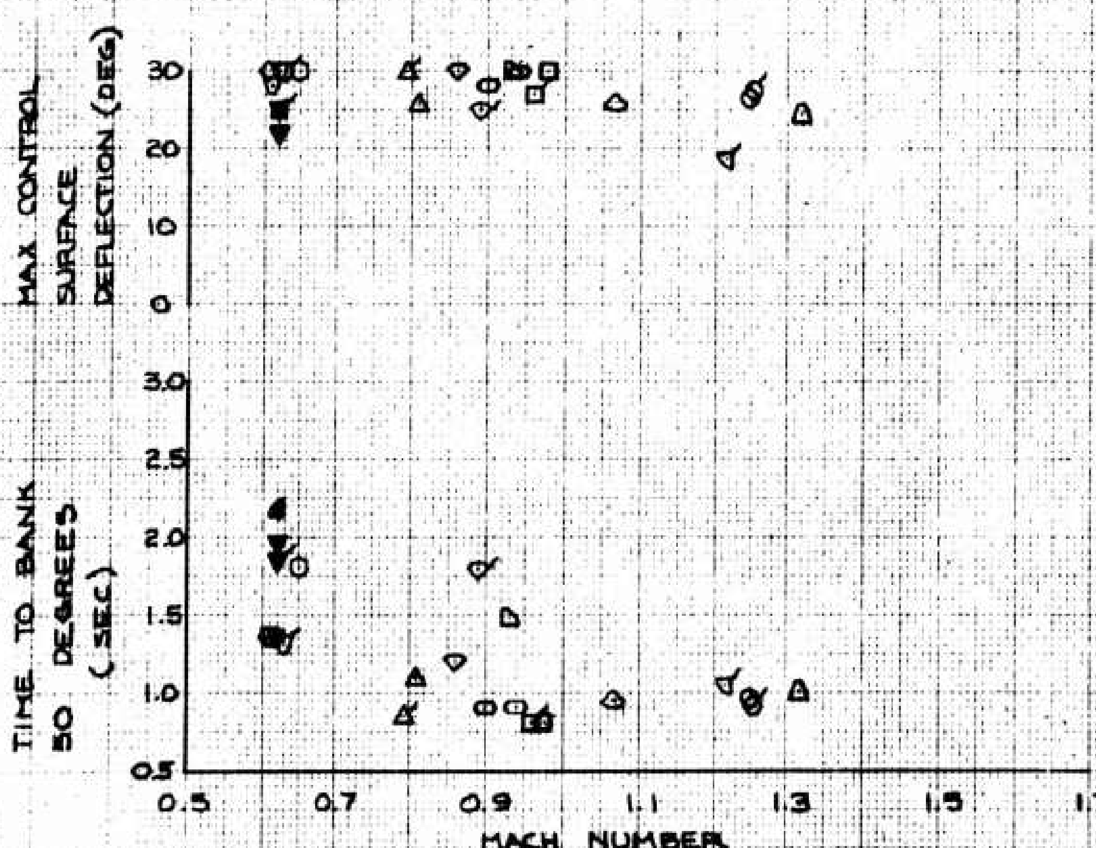


FIGURE 147 ROLL CAPABILITY - 35,000 FEET ALTITUDE

F-4E USAF S/N 66-287A

LOADINGS: 2: 370-GAL TANKS,
3: TANKS AND LAU-10'S

CR CONFIGURATION
SAS ON

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	PRODUCTION AOA (UNITS)	LOADING
○	34,900	42,600	27.7	13-17	3 SEE NOTE 2
□	35,100	42,100	27.0	10	3 "
◇	34,600	42,000	27.7	23	3 "
▽	35,100	40,500	26.8	7	3 "
▽	35,300	40,200	26.7	21	3 "
○	34,700	40,000	26.6	11	3 "
△	35,200	41,000	29.4	12	A2 SEE NOTE 3
▽	35,200	40,500	29.3	10	A2 "
△	35,900	40,100	29.0	8	A2 "
●	35,200	39,000	27.2	26	3 SEE NOTE 4
■	32,400	38,800	27.0	29	3 "

NOTES: 1. PLAIN SYMBOLS DENOTE LEFT AILERON ROLLS, FLAGS DENOTE RIGHT ROLLS, SOLID SYMBOLS DENOTE RUDDER ROLLS.
2. EXTERNAL FUEL TANKS FULL. 3. ASYMMETRIC FUEL LOAD AS FOLLOWS: RIGHT 370-GAL TANK HALF FULL, LEFT 370-GAL TANK EMPTY. 4. EXTERNAL FUEL TANKS EMPTY.

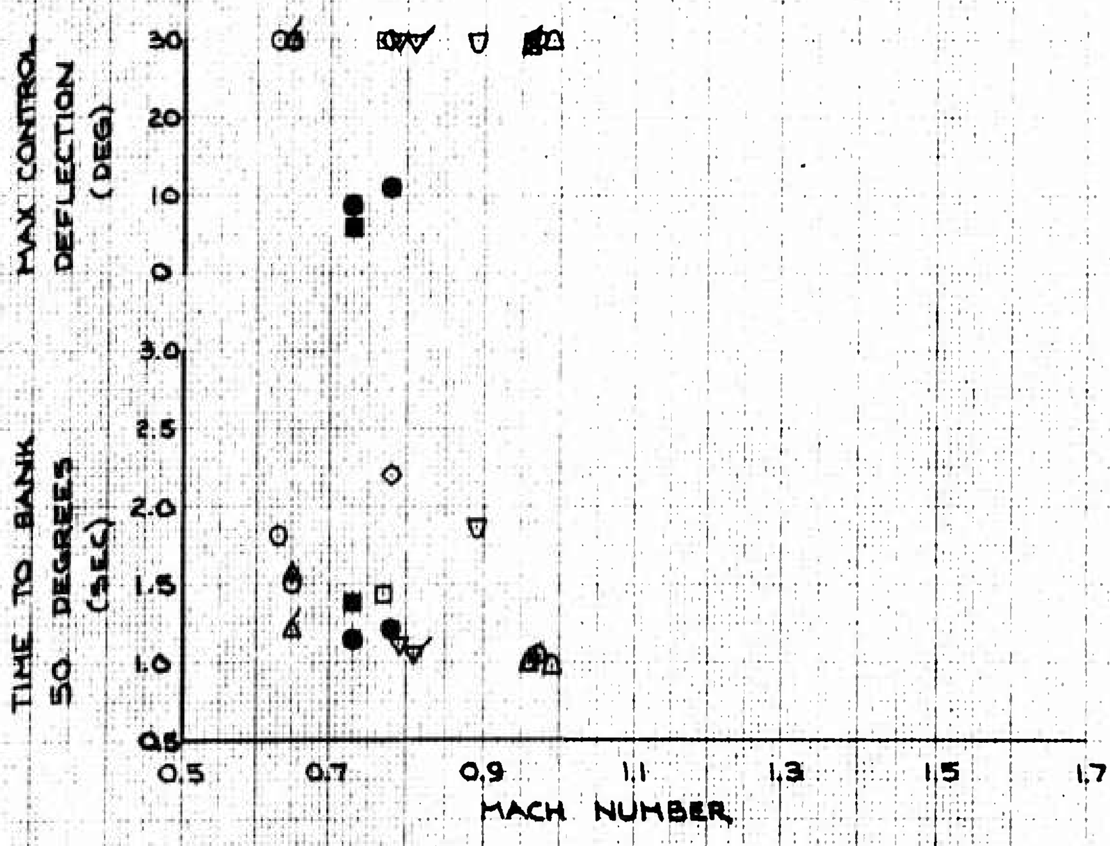


FIGURE 147 ROLL CAPABILITY - 35,000 FEET ALTITUDE (CONCLUDED)

F-4E USAF S/N 66-287A
SAS ON

LOADINGS: 1:NO STORES; 2:370-GAL TANKS

PA CONFIGURATION

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG (PCT MAC)	PRODUCTION AOA (UNITS)	LOADING
○	6,500	36,000	26.3	18	1
□	10,000	35,000	25.6	10	1
◇ (flagged)	9,100	37,700	26.8	17	A2 } SEE NOTE 2
○ (flagged)	10,100	38,200	27.1	18	A2 } SEE NOTE 2
▽	10,000	35,700	26.1	14	1
△	9,900	37,500	29.3	11	1
▼	10,100	37,200	29.0	13	1
▲	10,000	36,700	28.4	15	1

NOTE 1: PLAIN SYMBOLS DENOTE AILERON ROLLS AND AILERON POSITION; SOLID SYMBOLS DENOTE RUDDER ROLLS AND RUDDER POSITION.

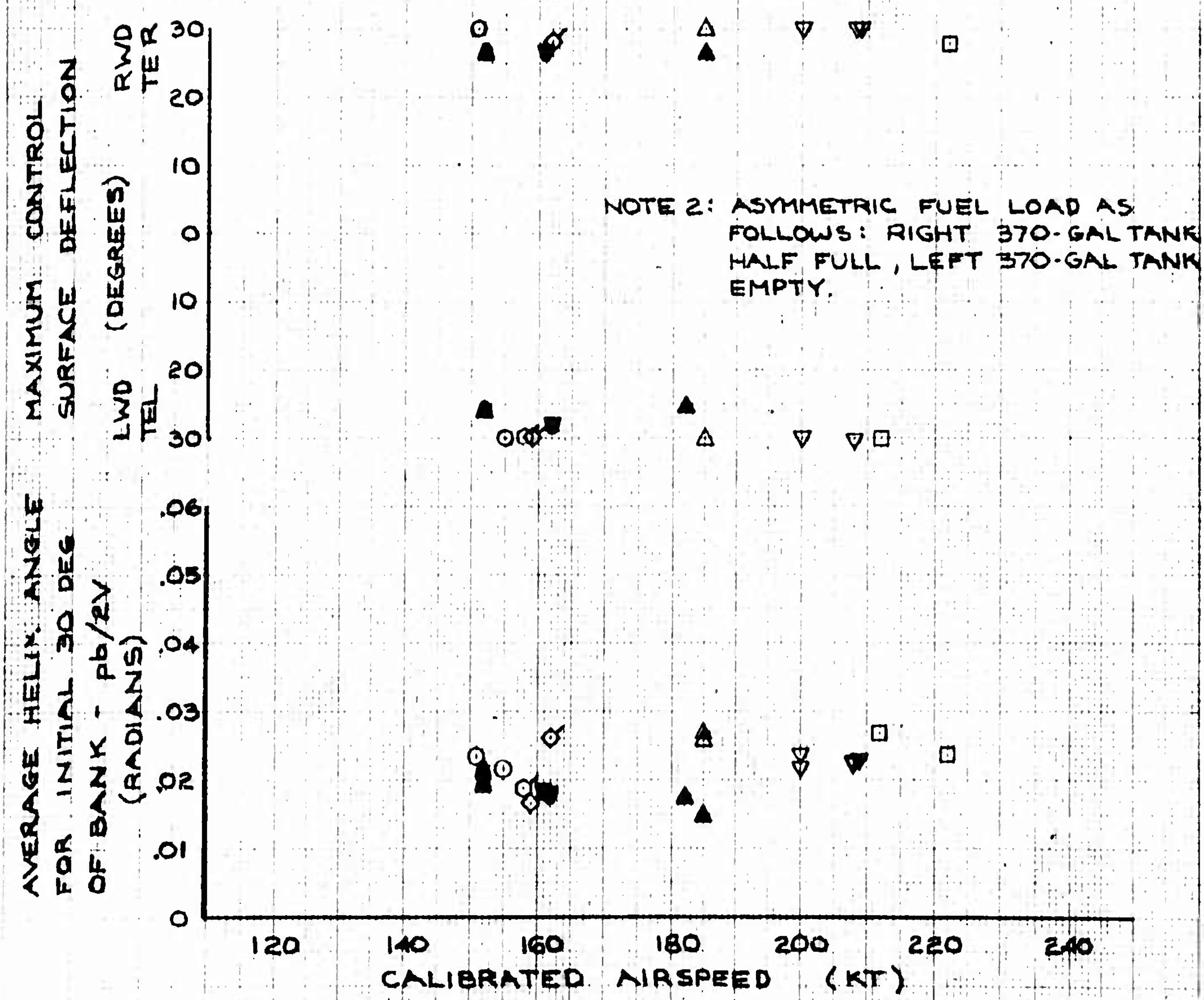


FIGURE 148 LOW SPEED ROLL CAPABILITY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-280 RUN 22 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

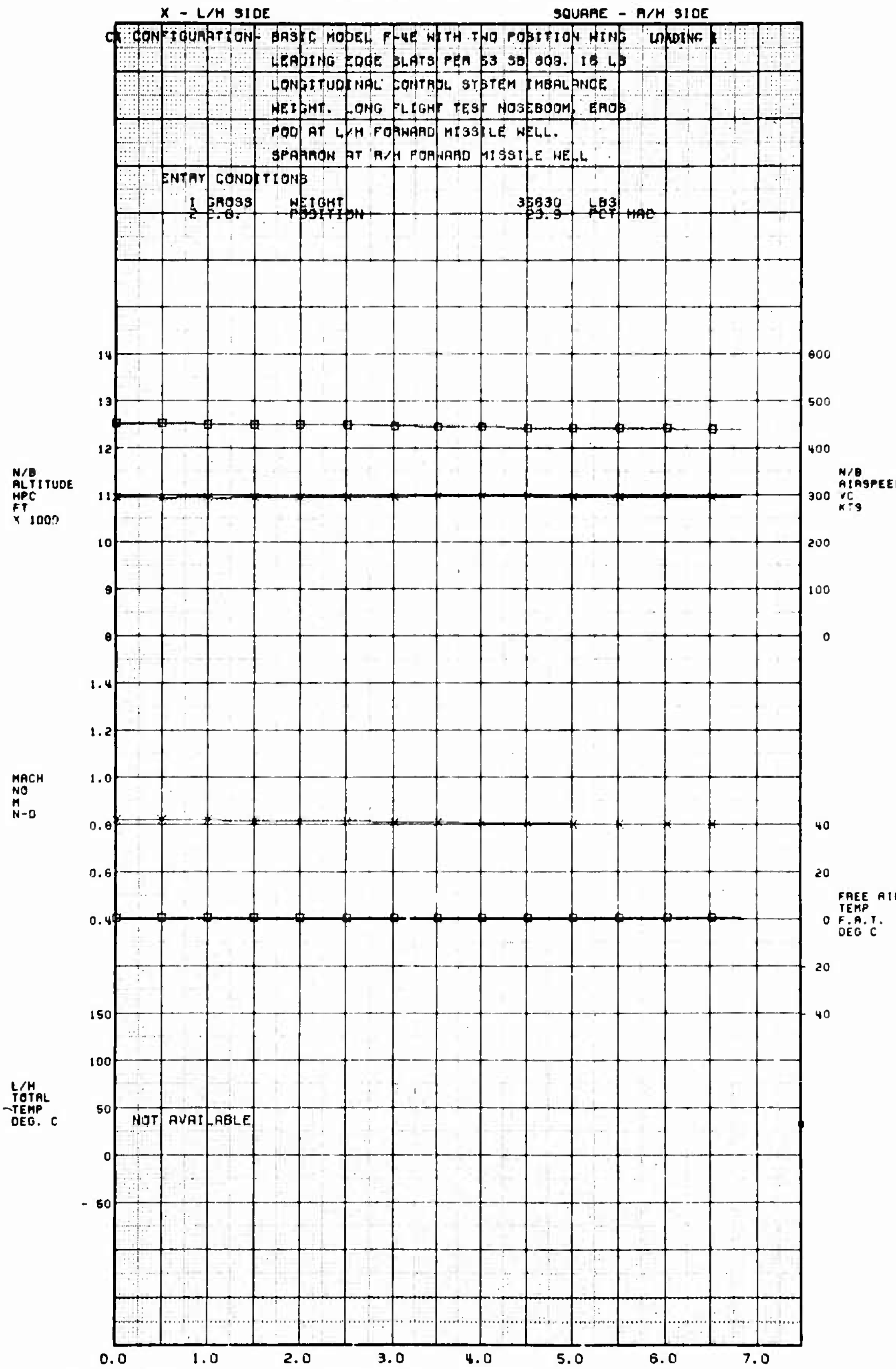


FIGURE 149 AILERON ROLL TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 22 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

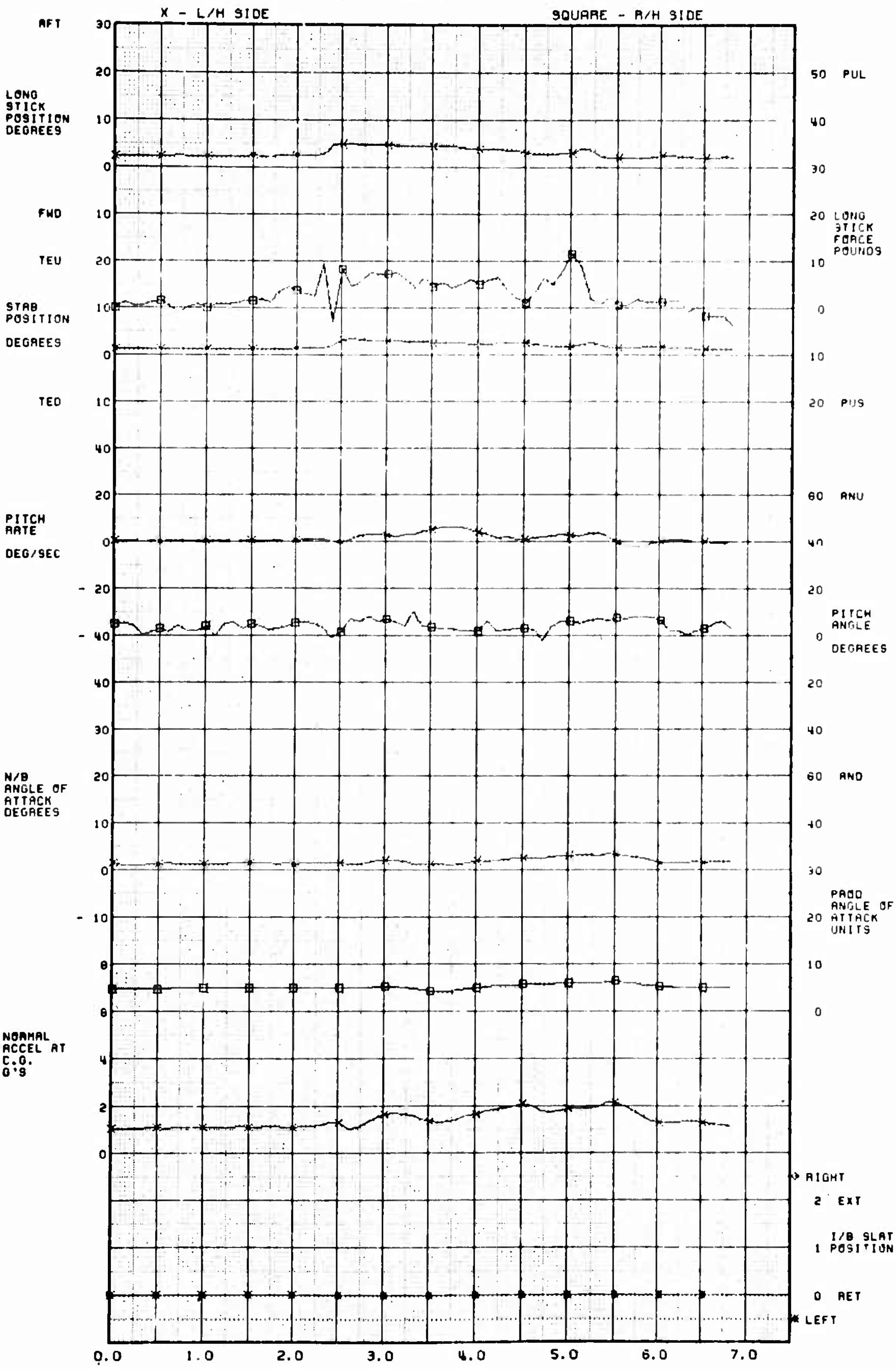


FIGURE 149 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 22 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

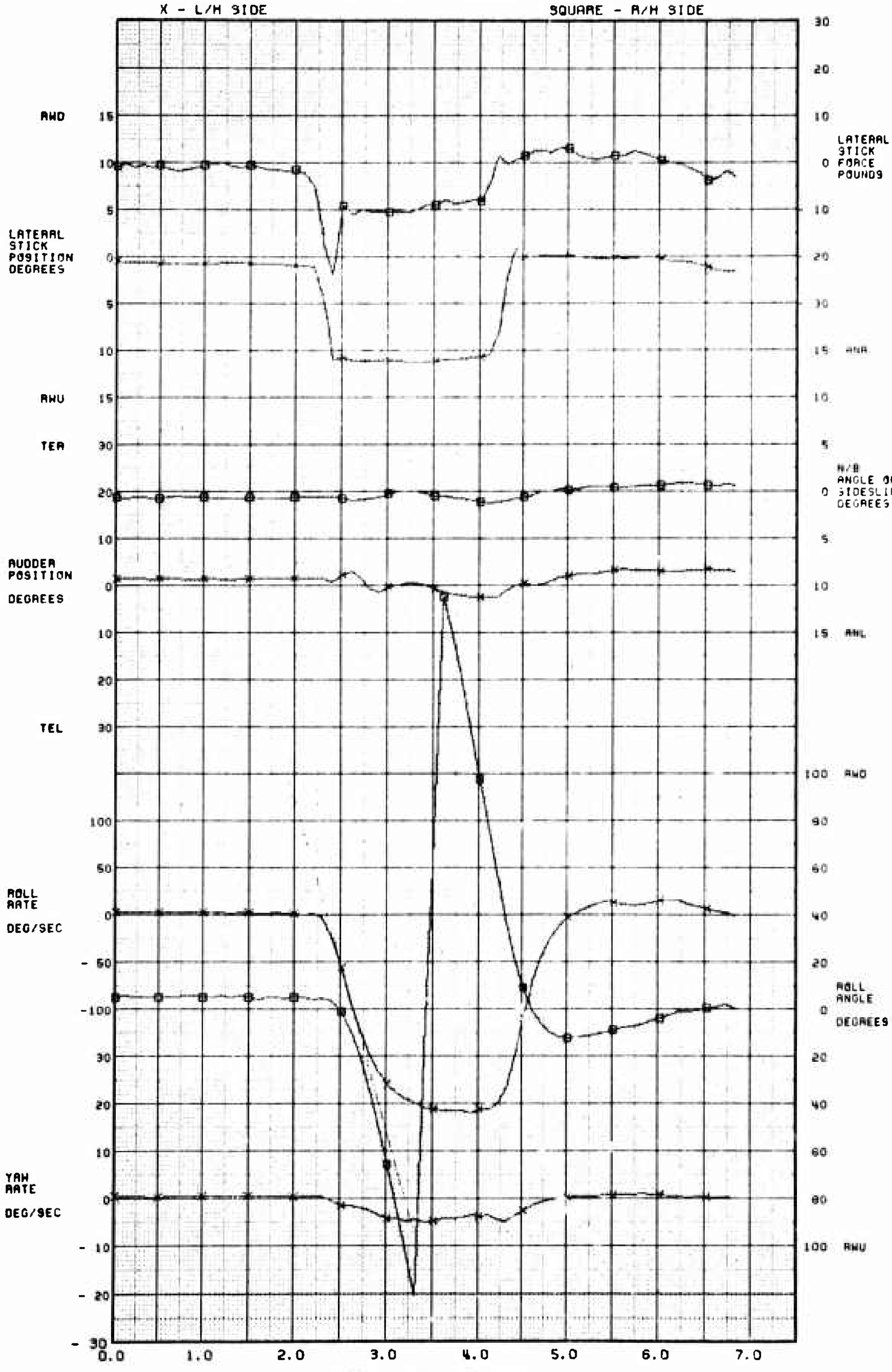


FIGURE 149 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 22 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

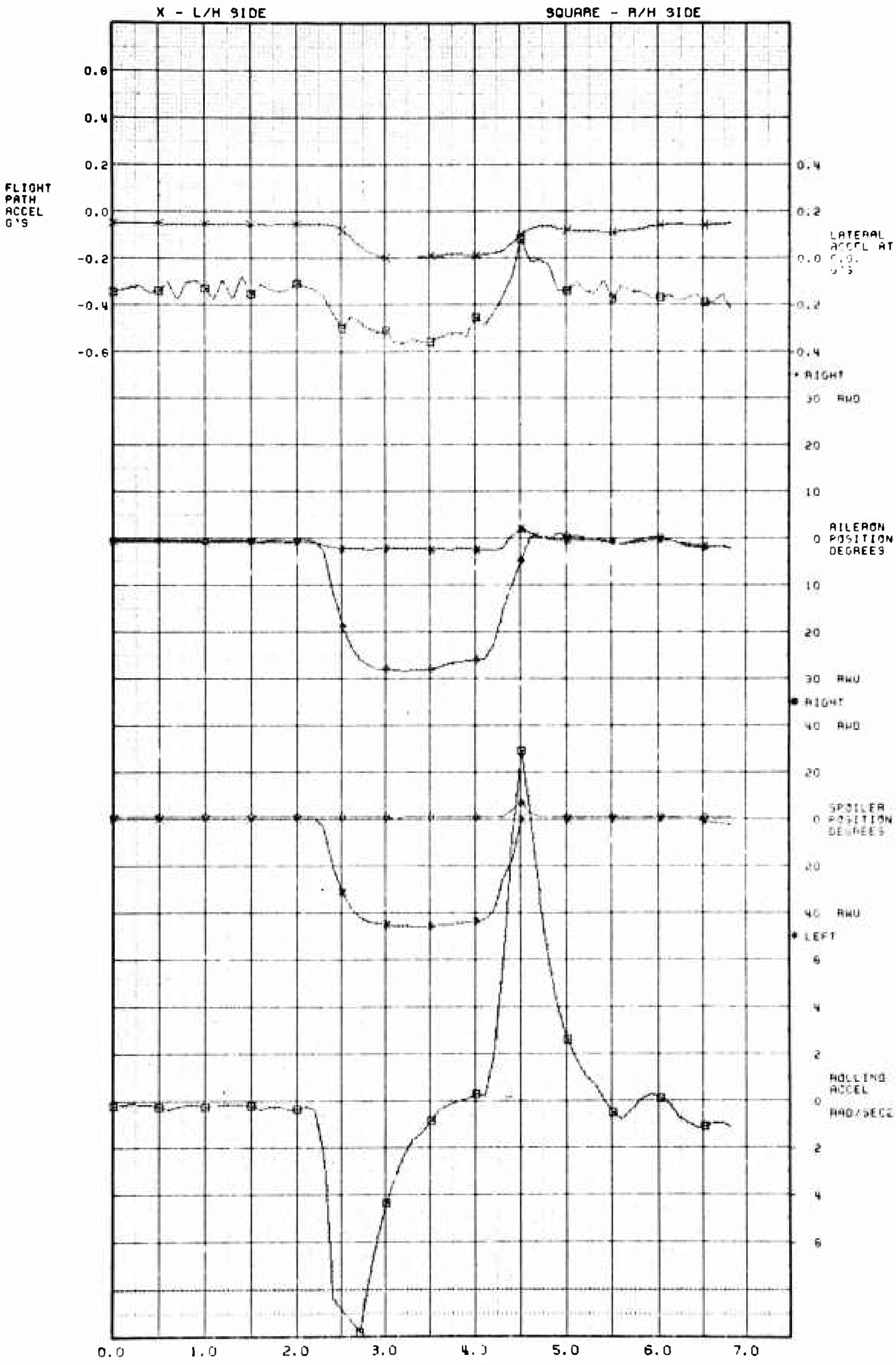


FIGURE 149 AILERON ROLL TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-269 RUN 27 DATE 22 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

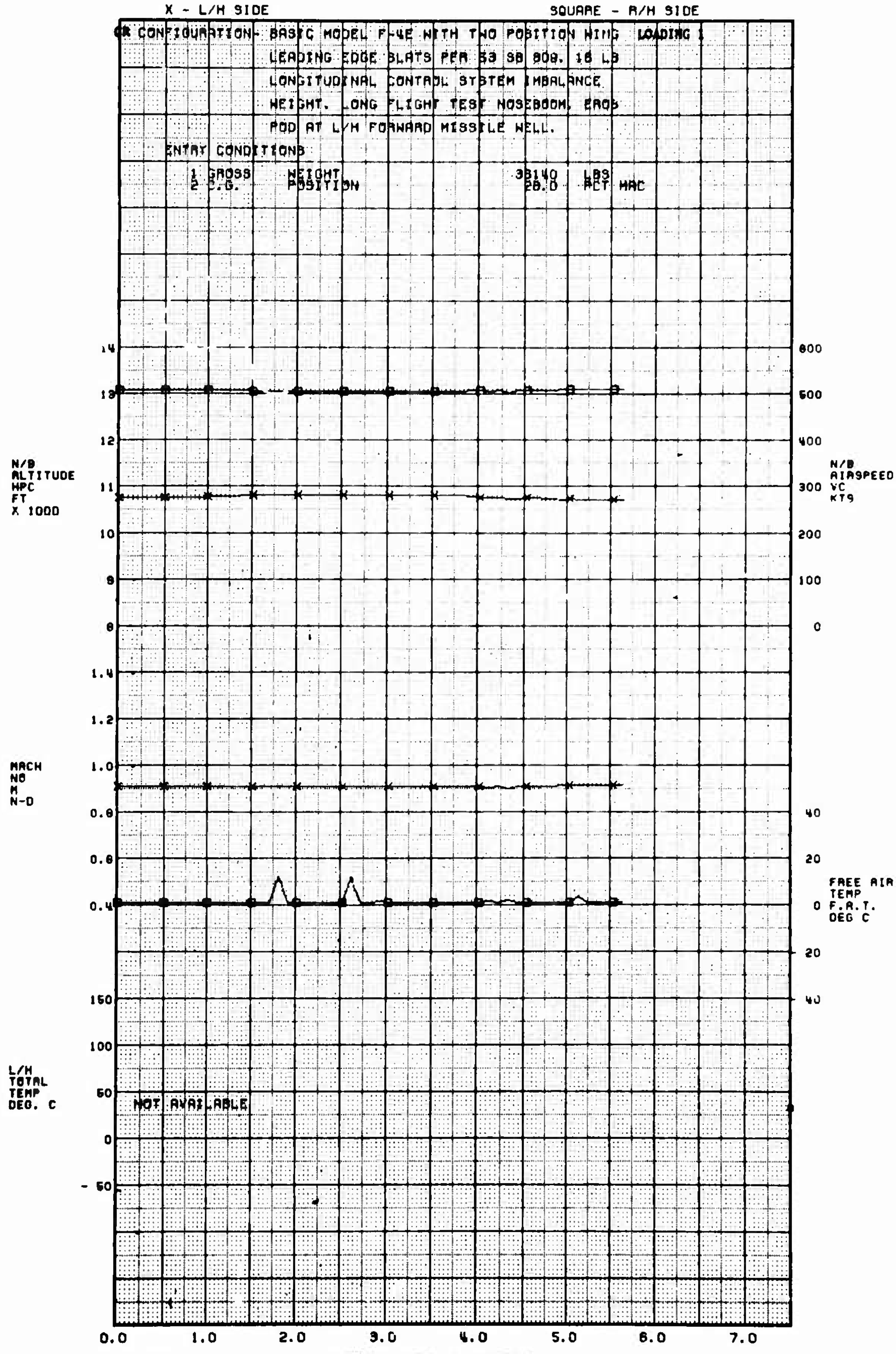


FIGURE 150 AILERON ROLL TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-269 RUN 27 DATE 22 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

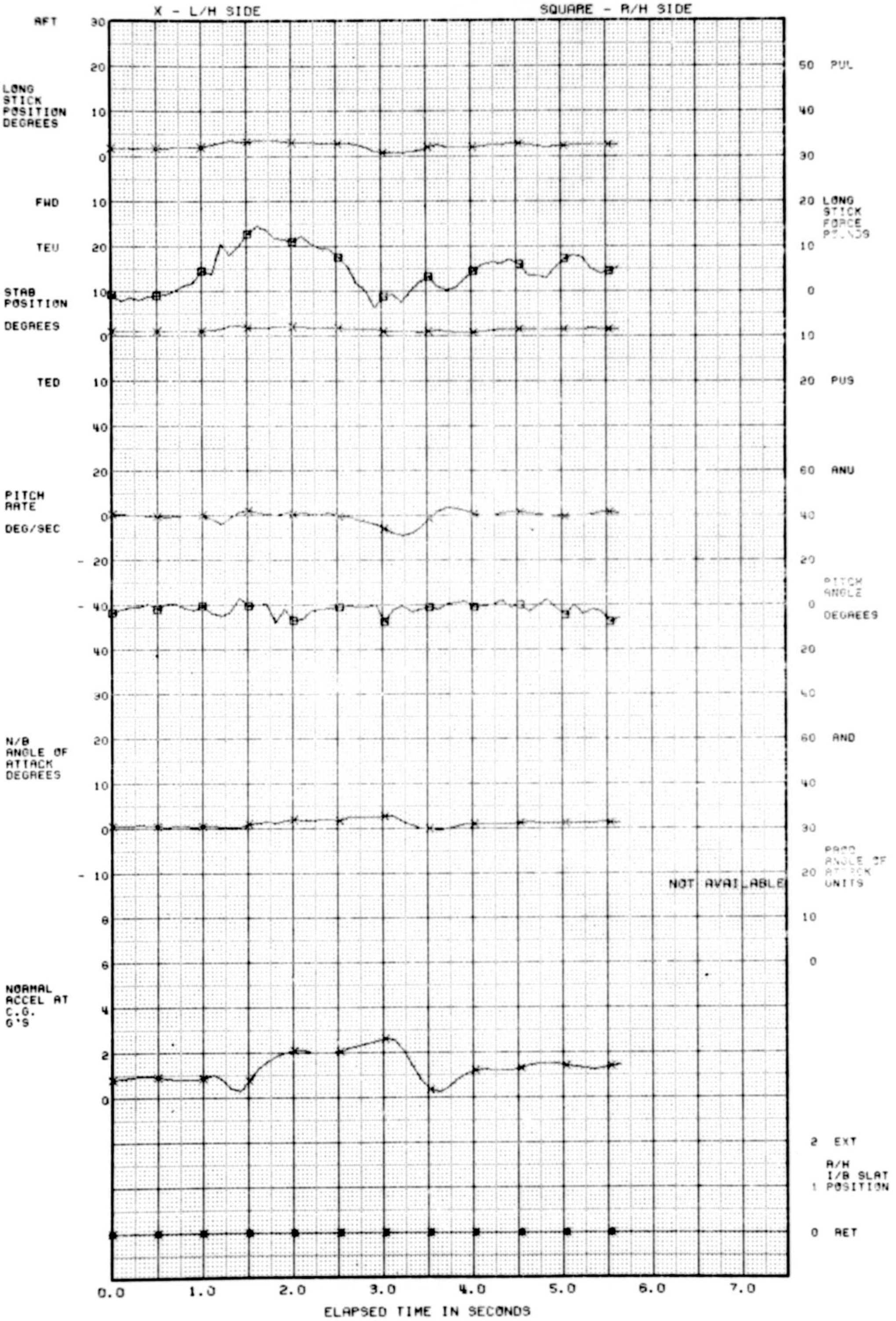


FIGURE 150 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-269 RUN 27 DATE 22 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

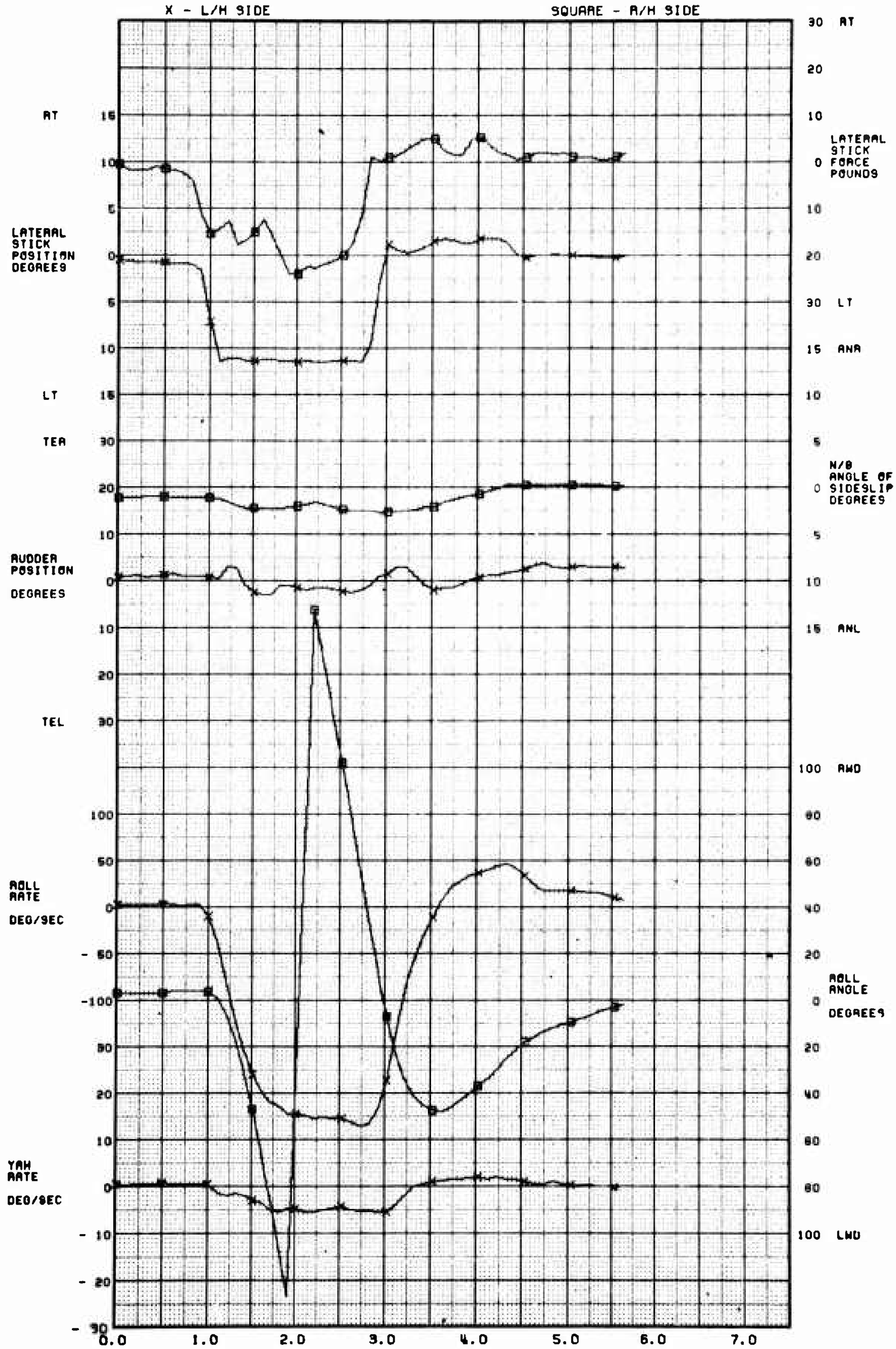


FIGURE 150 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-269 RUN 27 DATE 22 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

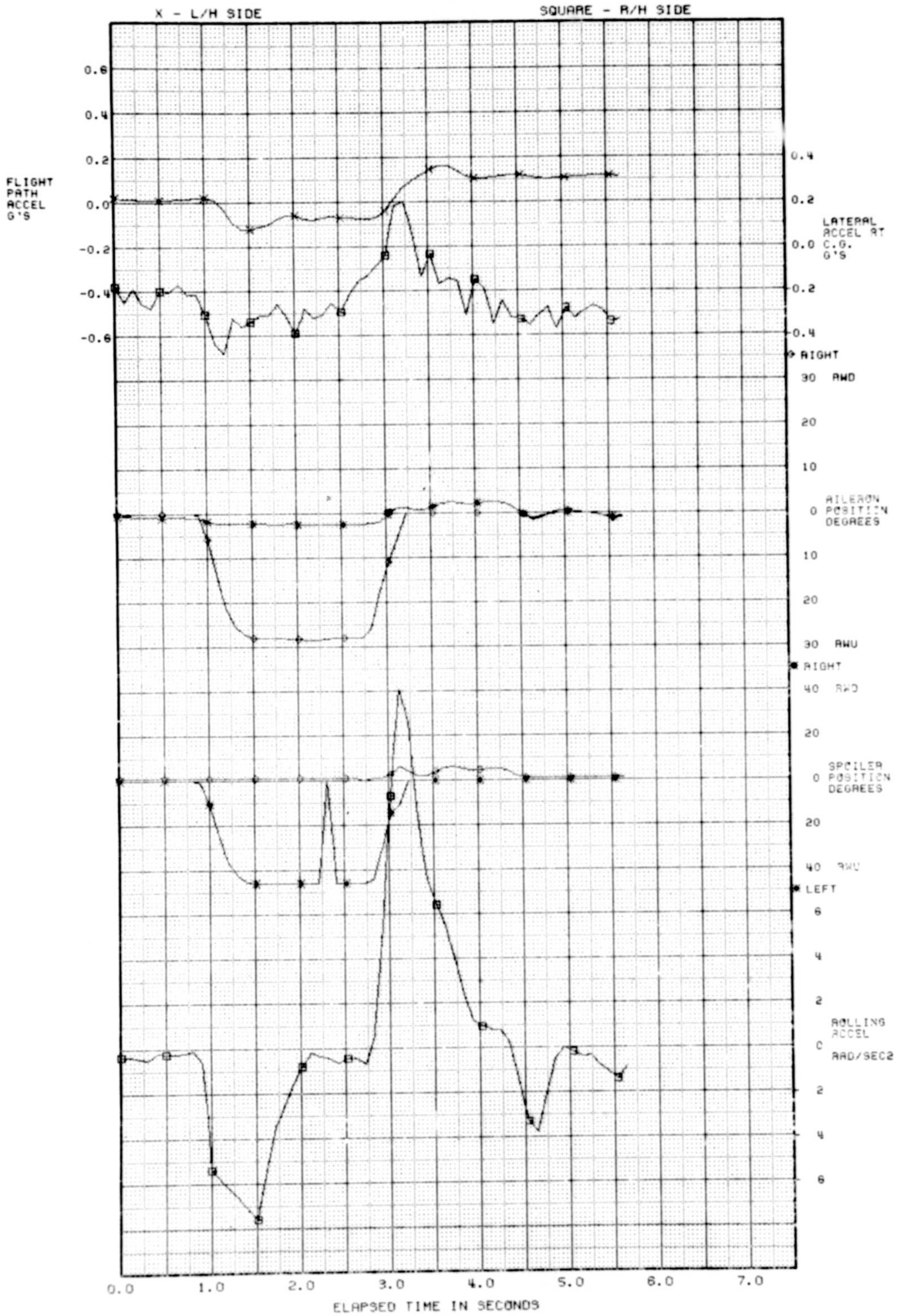


FIGURE 150 AILERON ROLL TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 09 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

X - L/H SIDE SQUARE - R/H SIDE

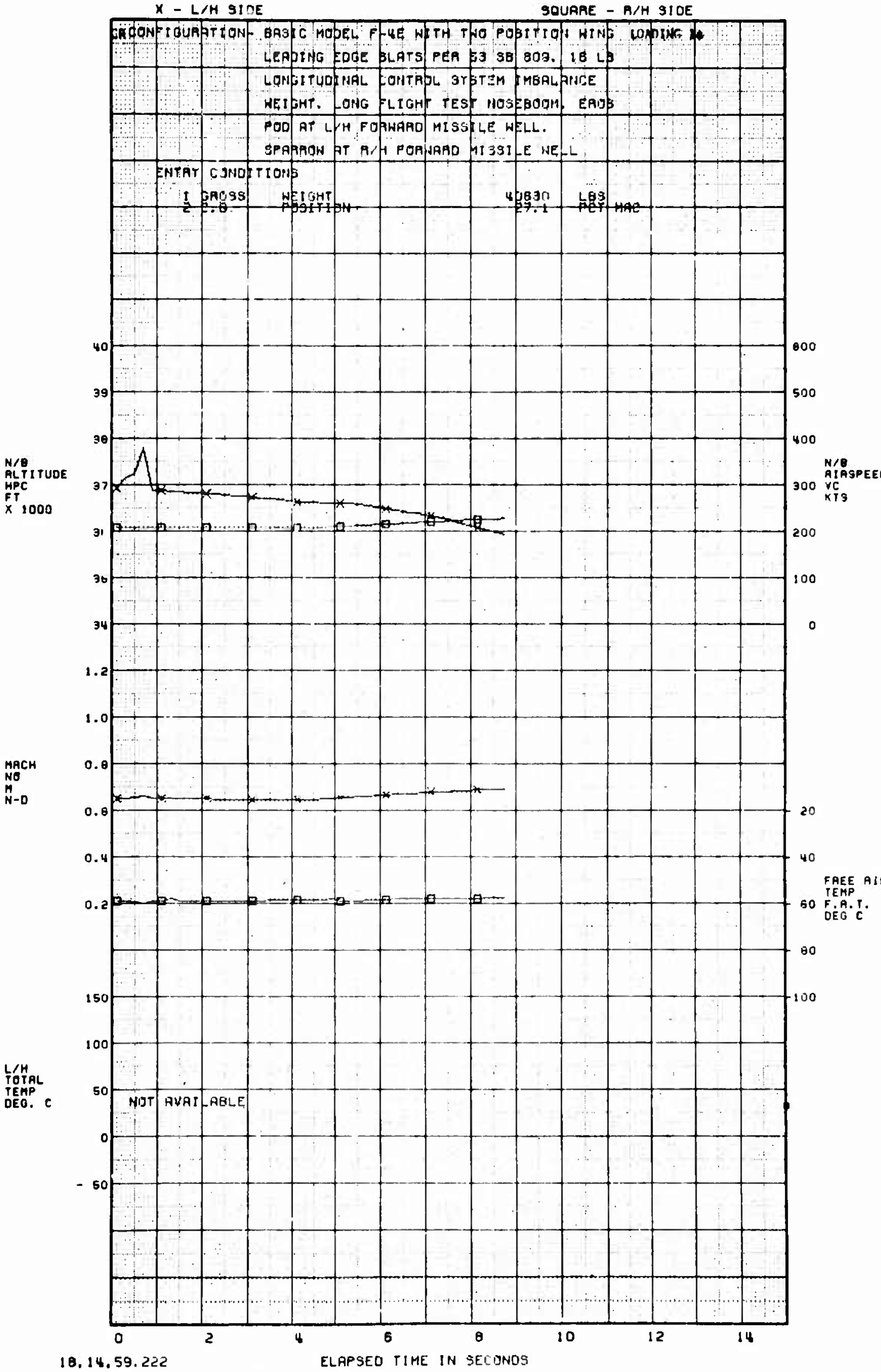


FIGURE 151 AILERON ROLL TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 09 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

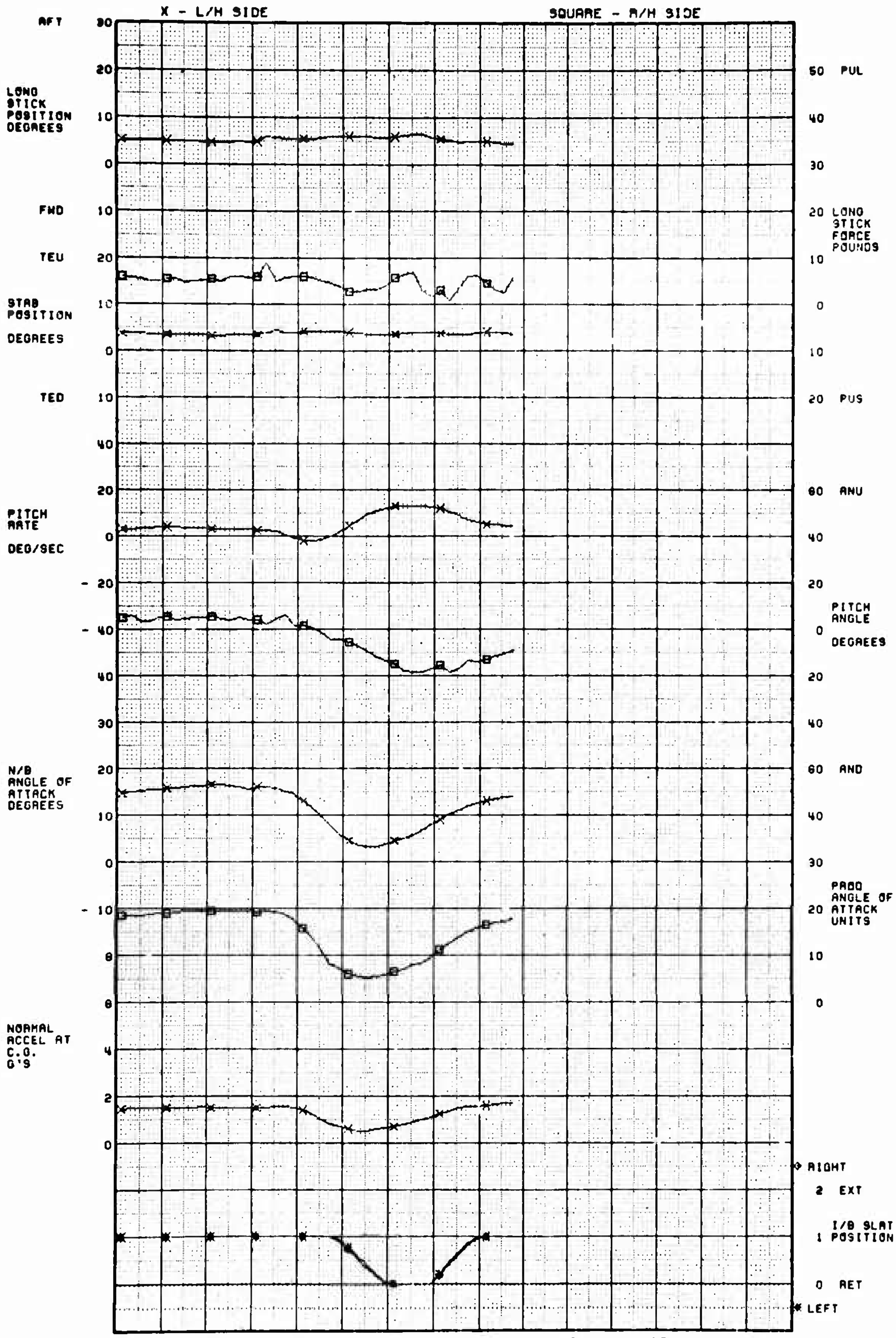


FIGURE 151 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-260 RUN 09 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
ROLLING PERFORMANCE

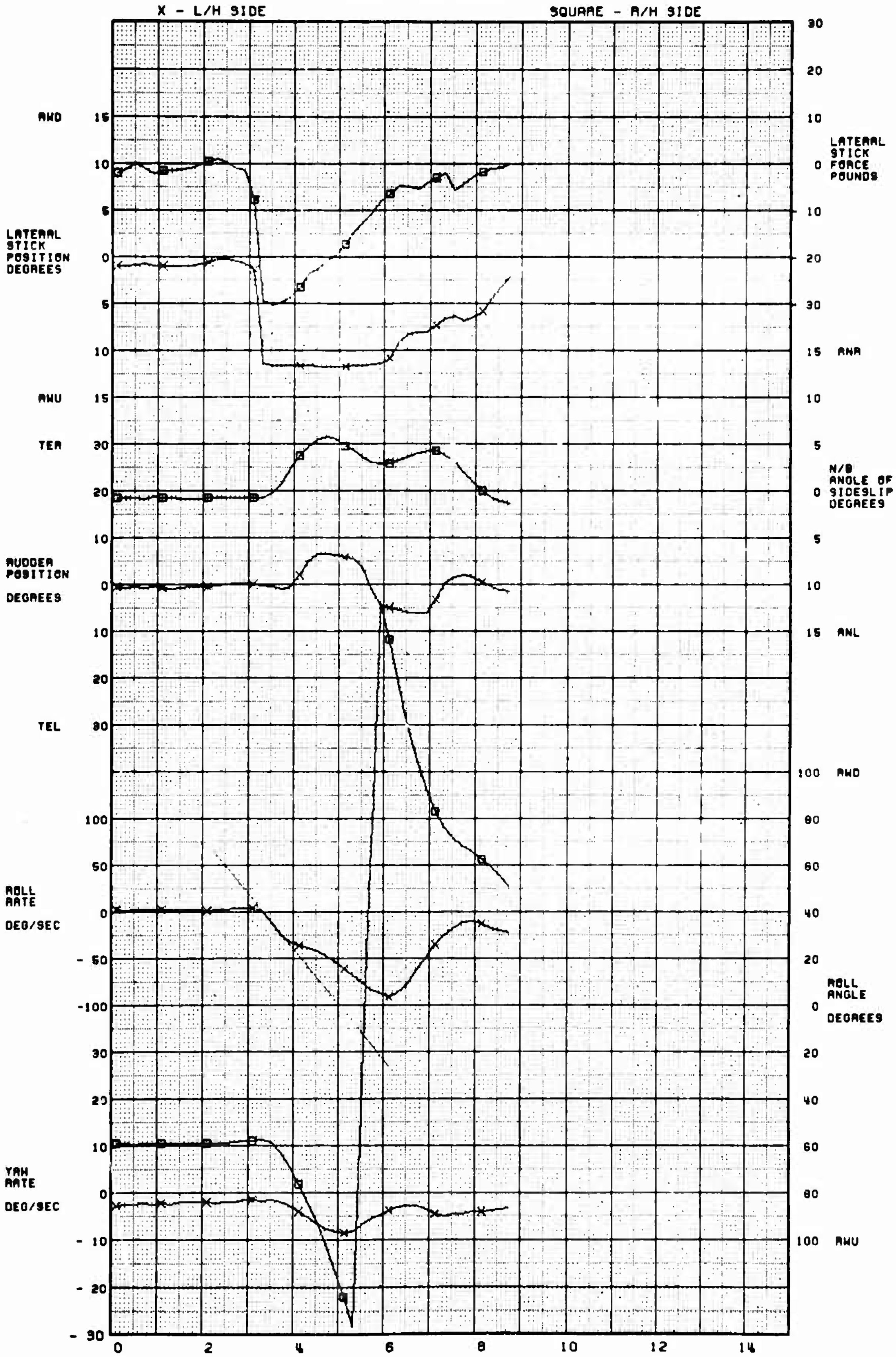


FIGURE 151 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-260 RUN 09 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE

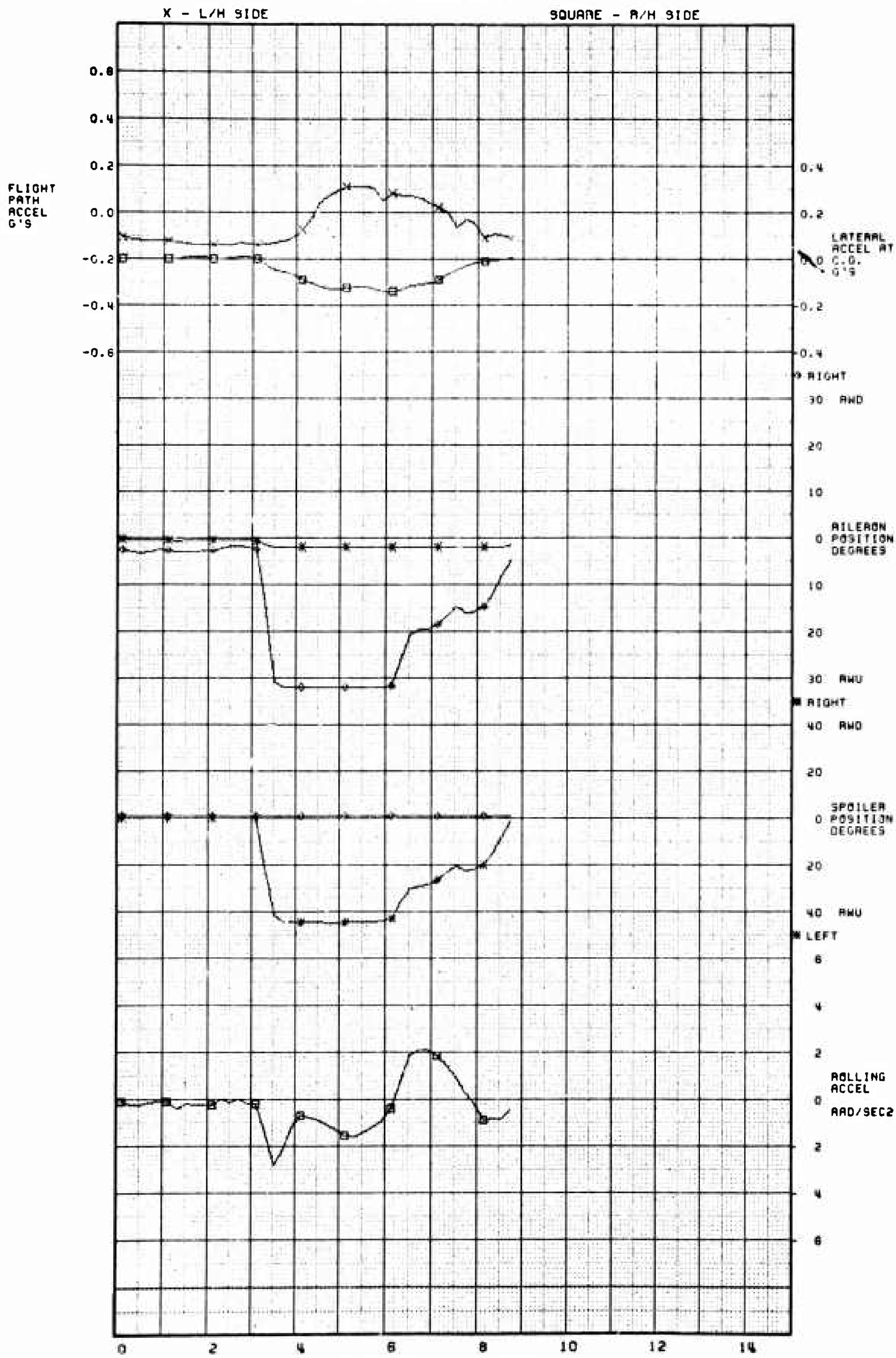


FIGURE 151 AILERON ROLL TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 23 DATE 24 MAY 1972

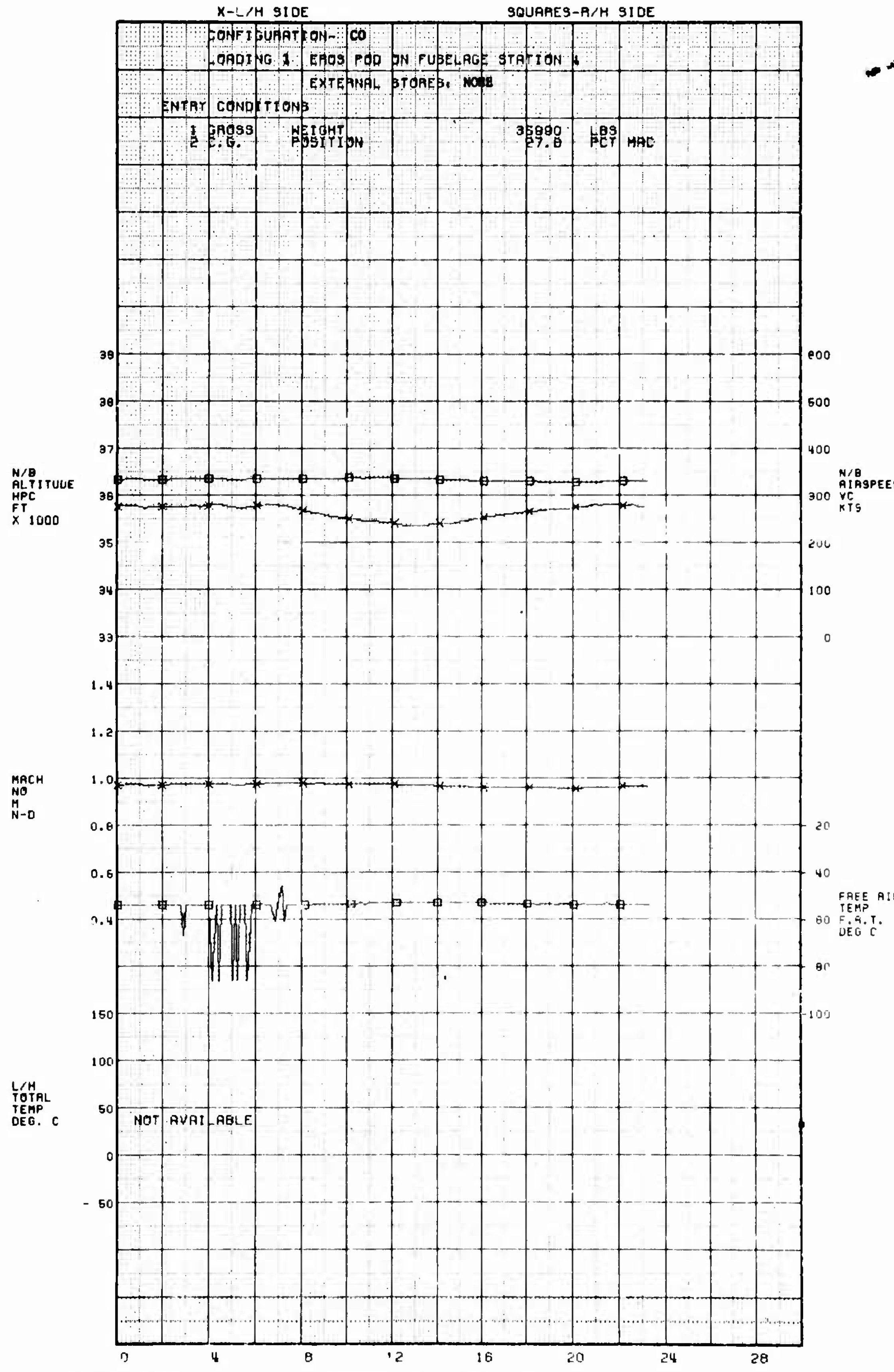


FIGURE 152 AILERON ROLL TIME HISTORY

F-4E USAF S/N 66-287A

FLT 287-273 RUN 23 DATE 24 MAY 1972

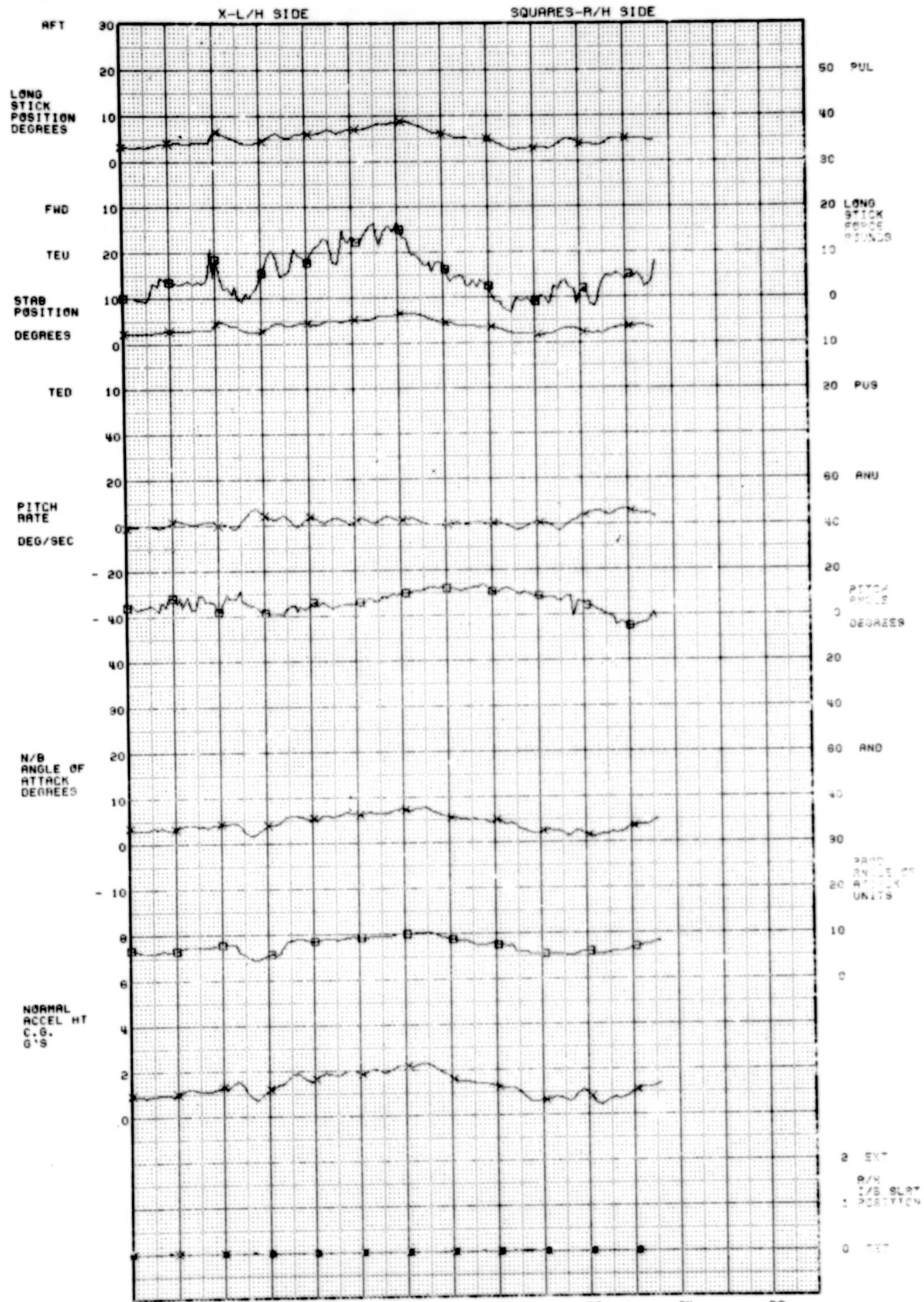


FIGURE 152 AILERON ROLL TIME HISTORY (CONTINUED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 23 DATE 24 MAY 1972

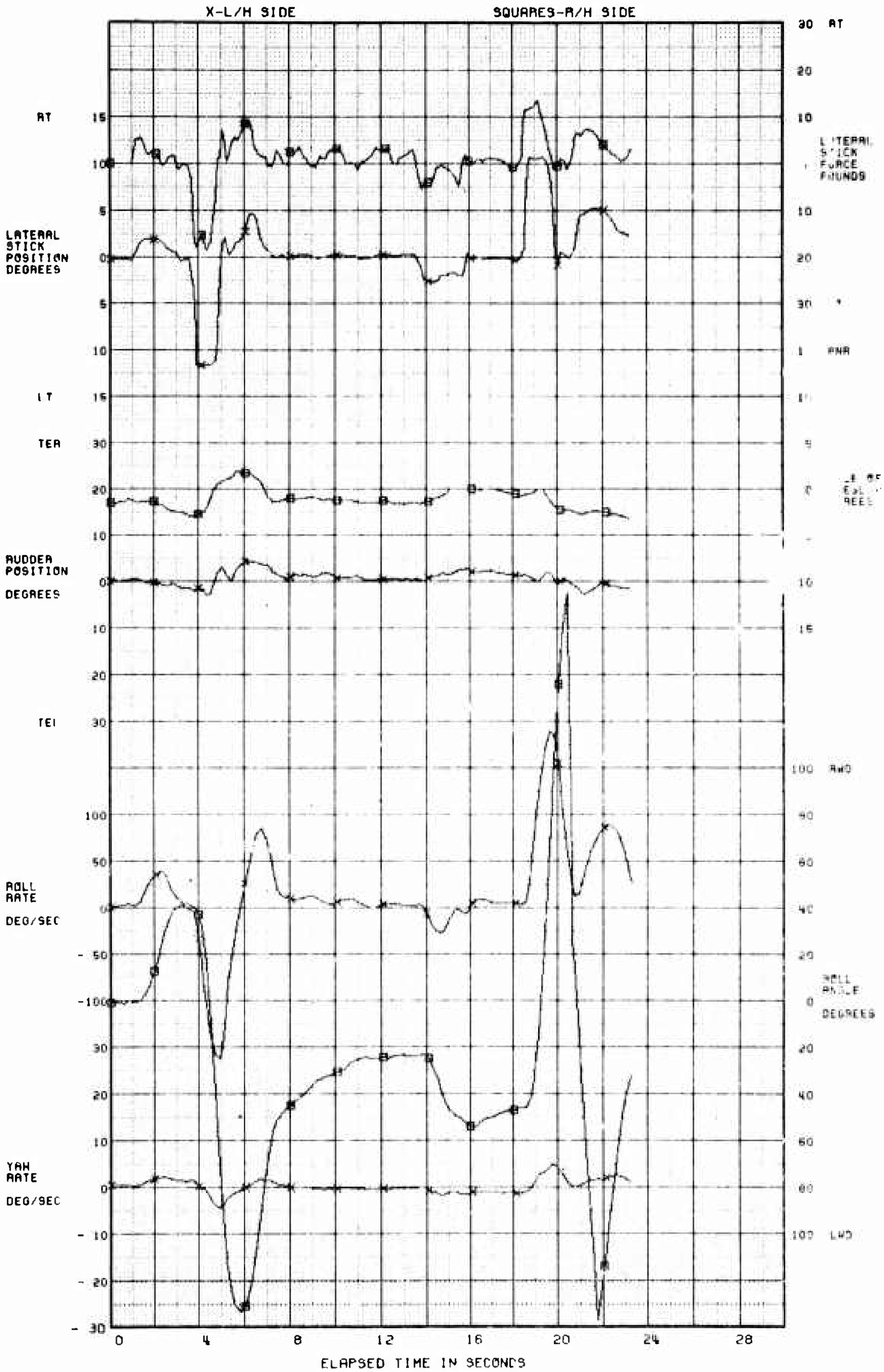


FIGURE 152 AILERON ROLL TIME HISTORY (CONTINUED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 23 DATE 24 MAY 1972

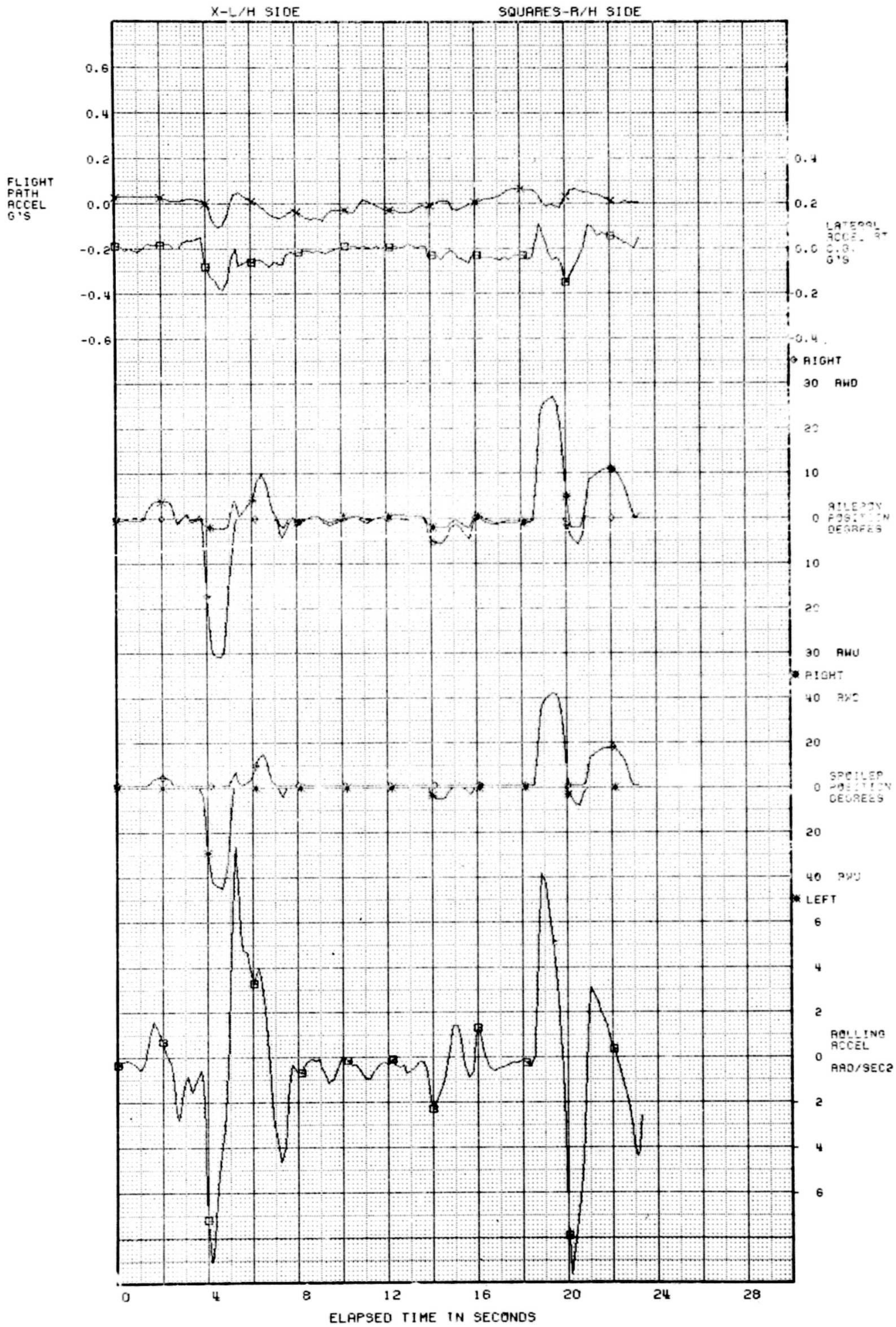
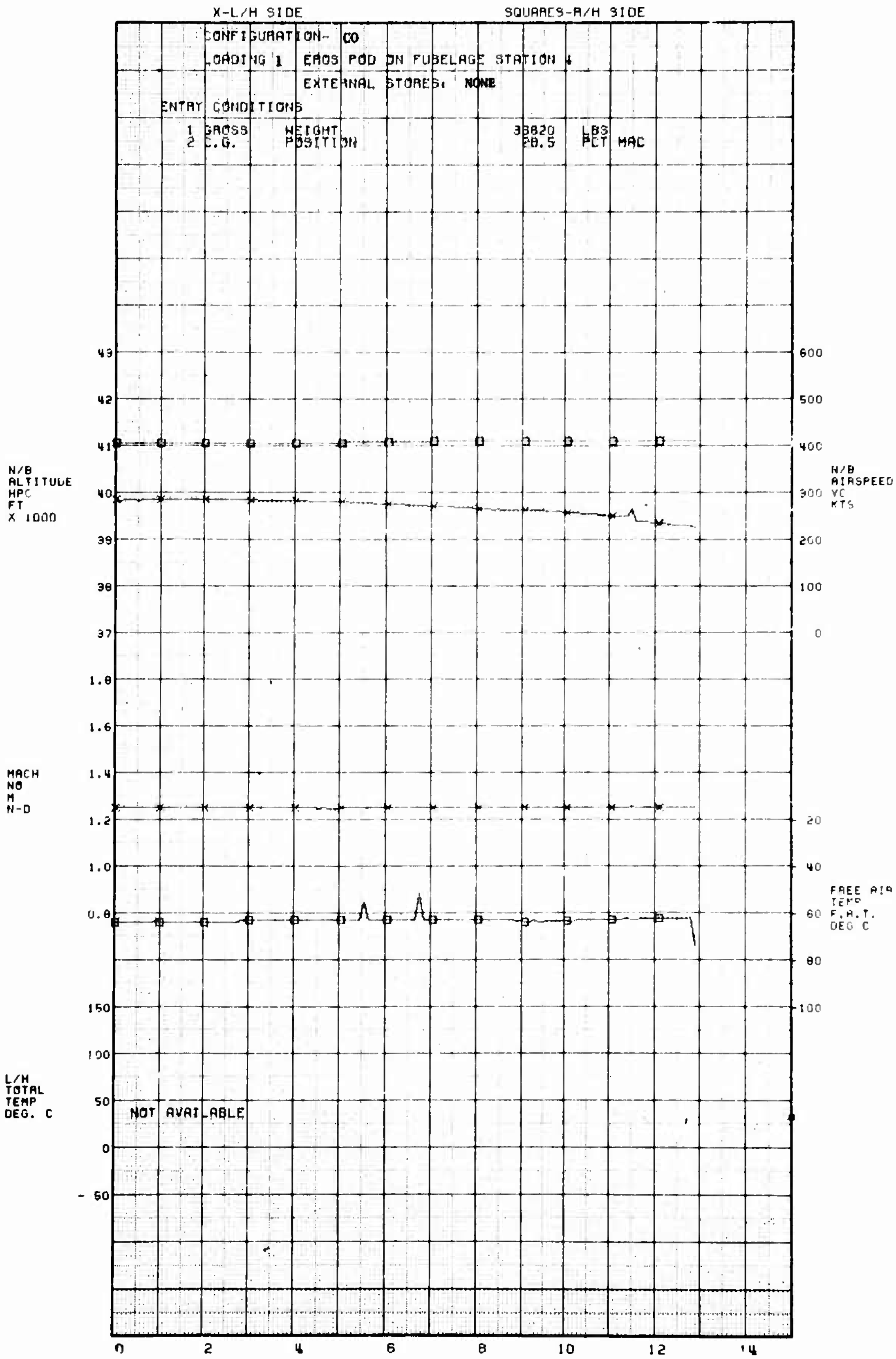


FIGURE 152 AILERON ROLL TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 20 DATE 24 MAR 1972



7.15.27.815

FIGURE 153 AILERON ROLL TIME HISTORY

F-4E USAF S/N 66-287A

FLT 287-273 RUN 20 DATE 24 MAY 1972

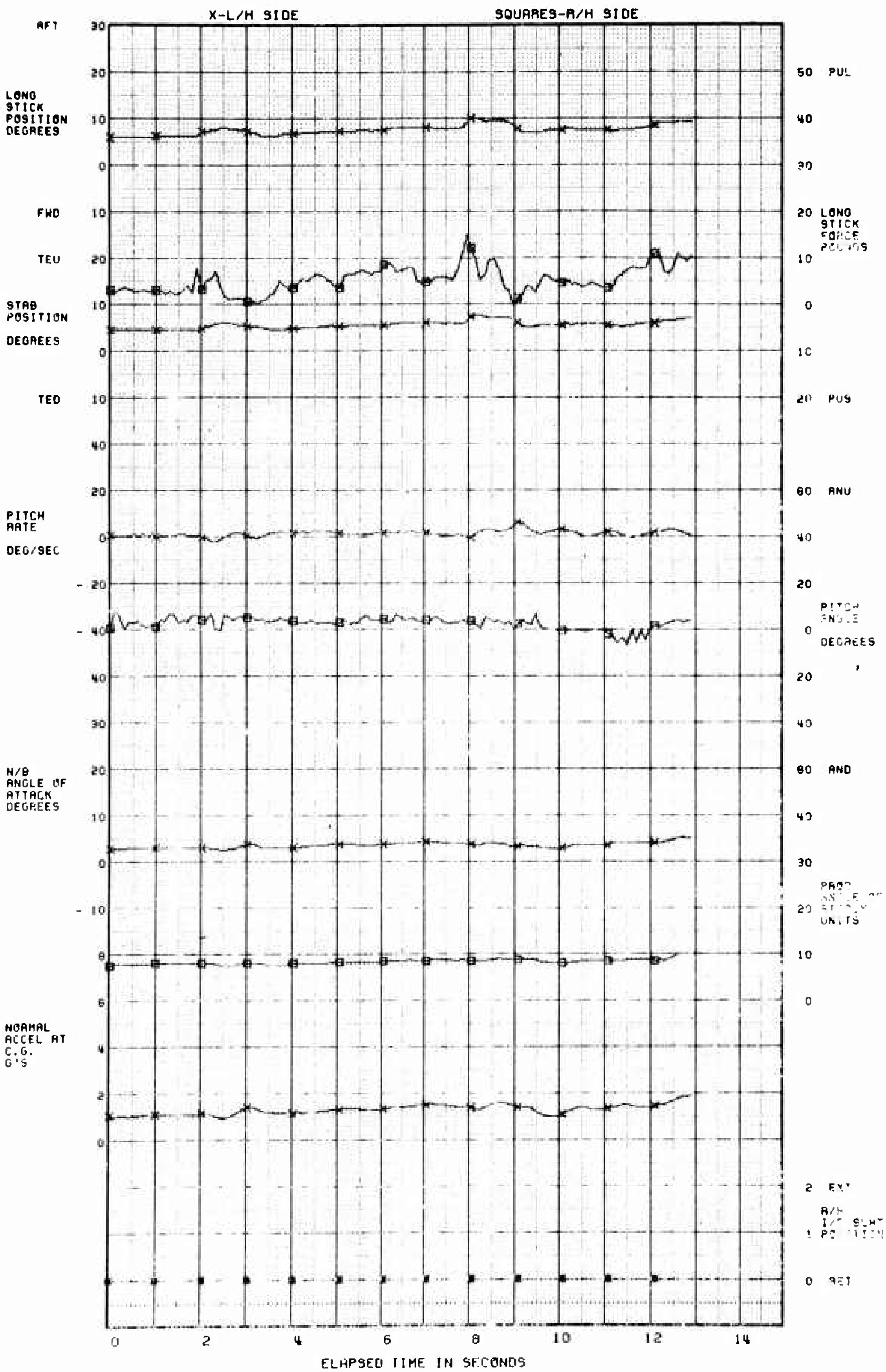


FIGURE 153 AILERON ROLL TIME HISTORY (CONTINUED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 20 DATE 24 MAY 1972

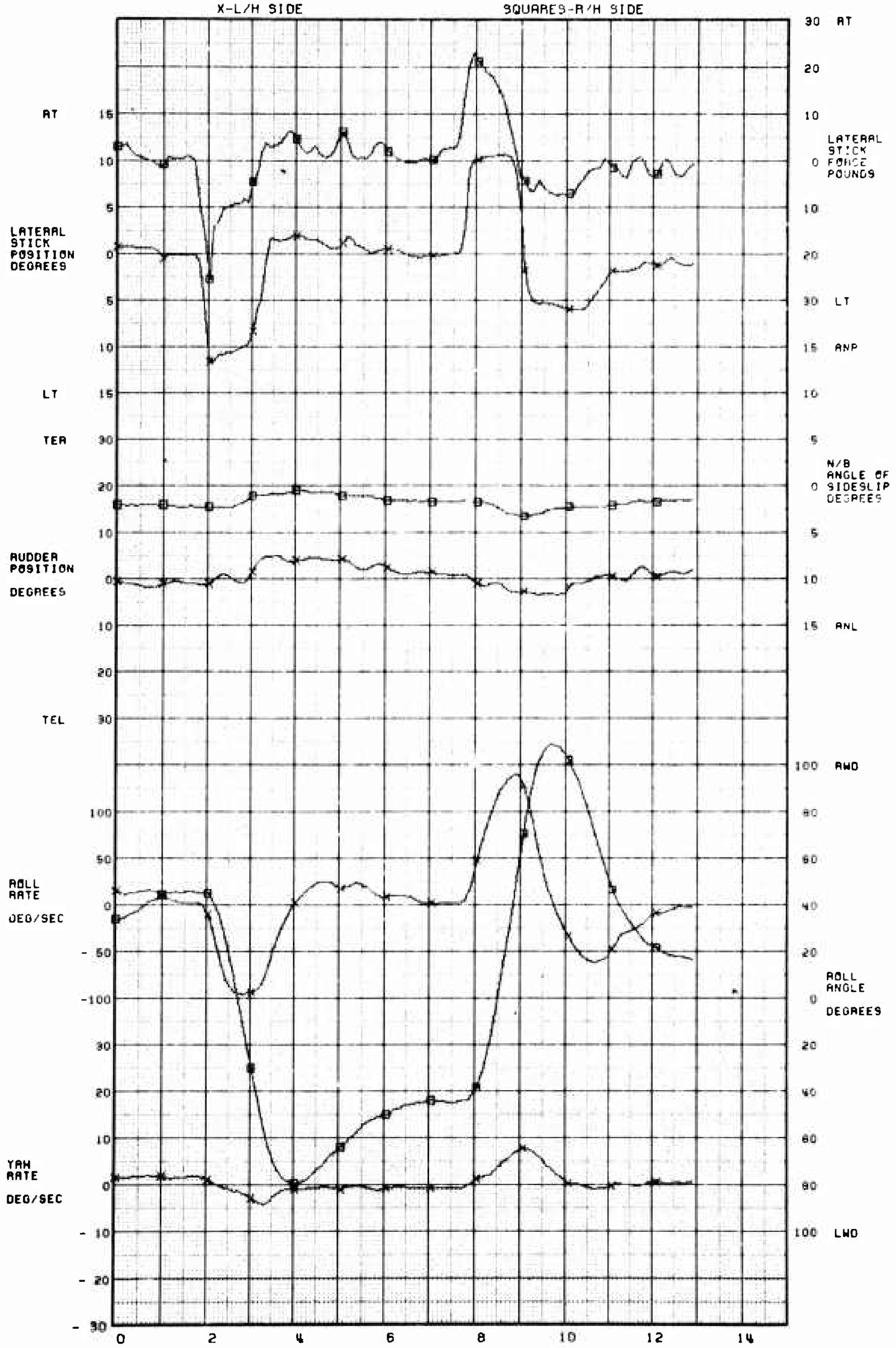


FIGURE 153 AILERON ROLL TIME HISTORY (CONTINUED)

F-4E USAF S/N 66-287A

FLT 287-273 RUN 20 DATE 24 MAY 1972

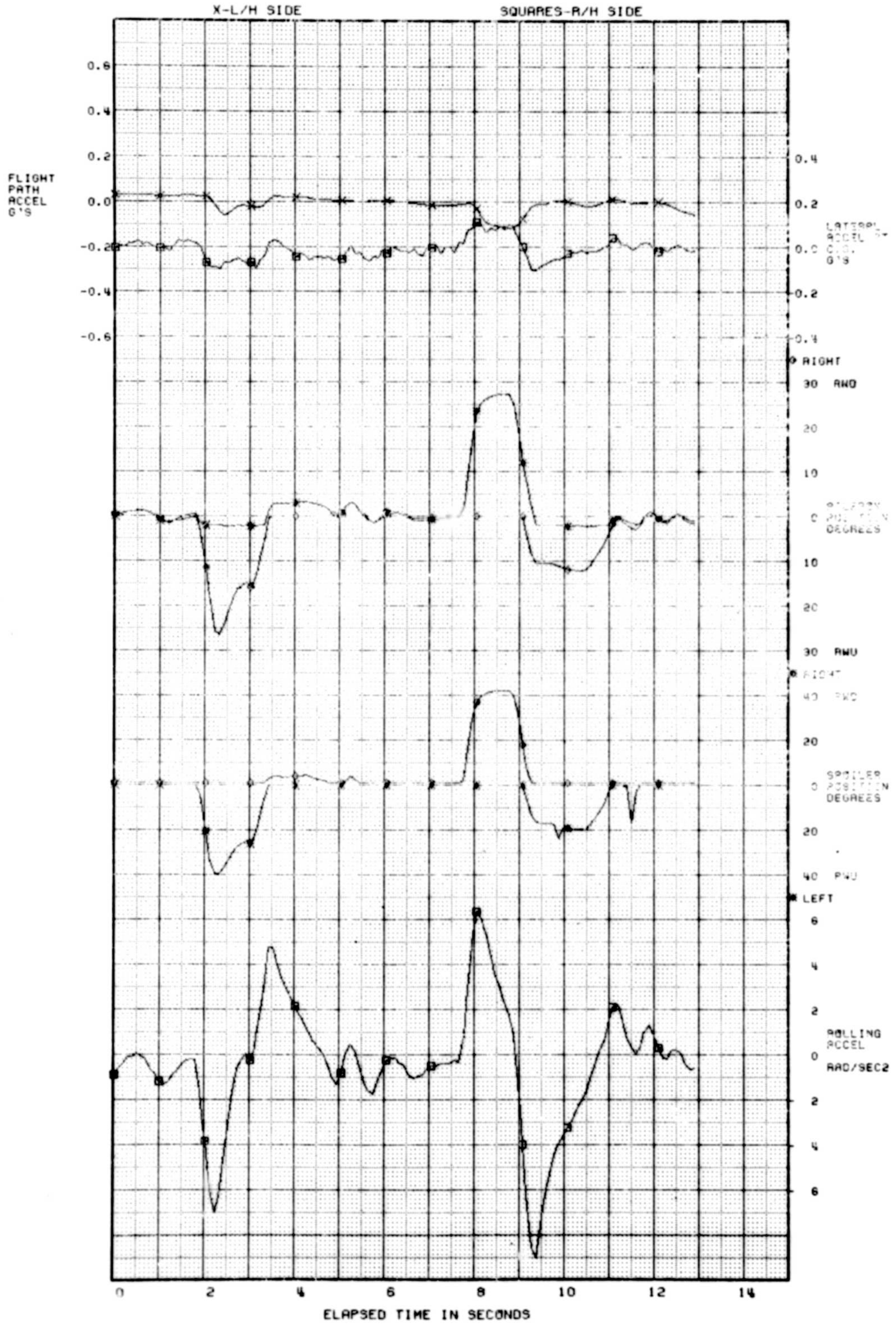
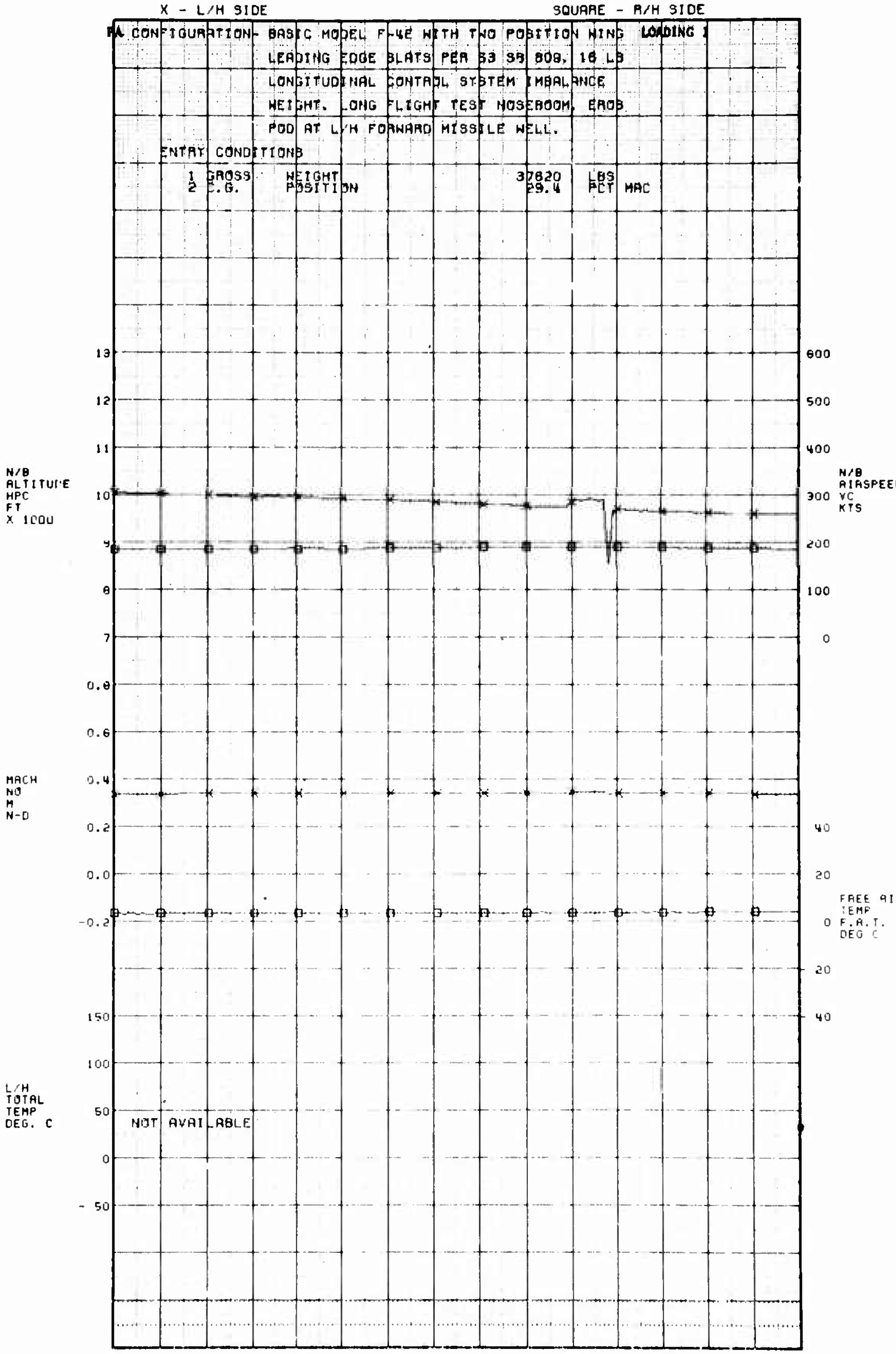


FIGURE 153 AILERON ROLL TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 18 DATE 23 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE



5,11,32.565 ELAPSED TIME IN SECONDS

FIGURE 154 AILERON ROLL TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-272 RUN 16 DATE 23 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

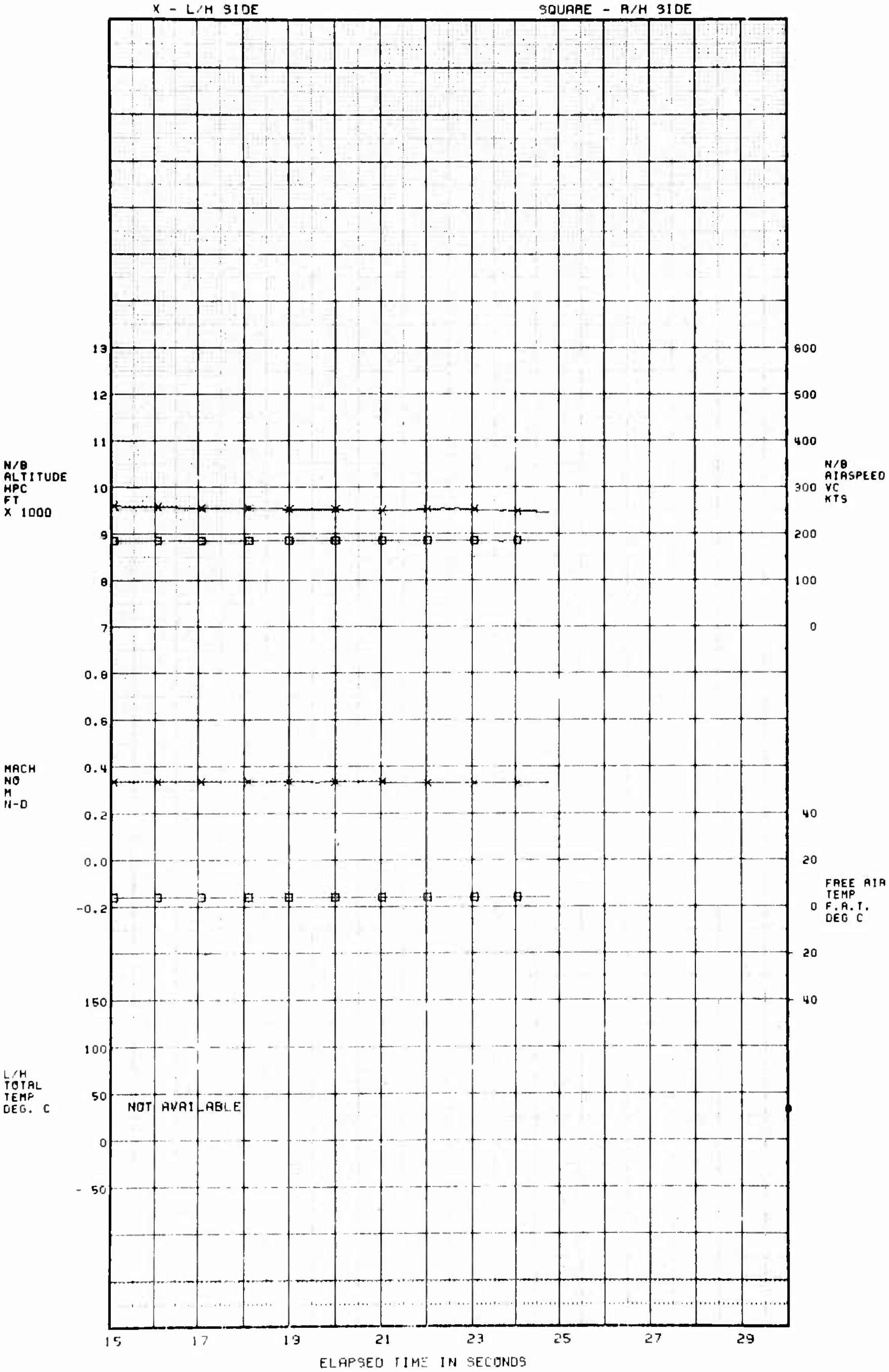


FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 16 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

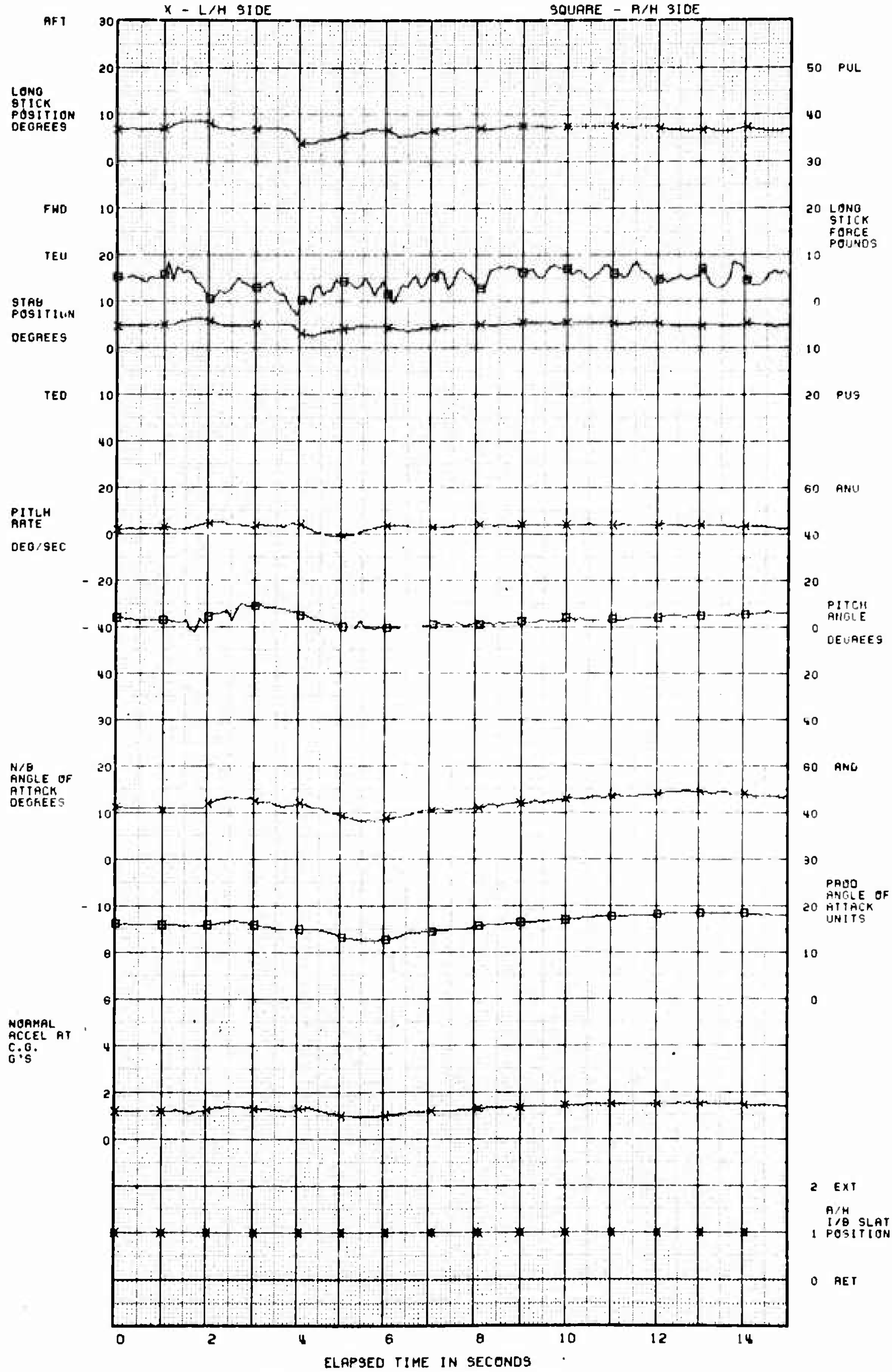


FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 16 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

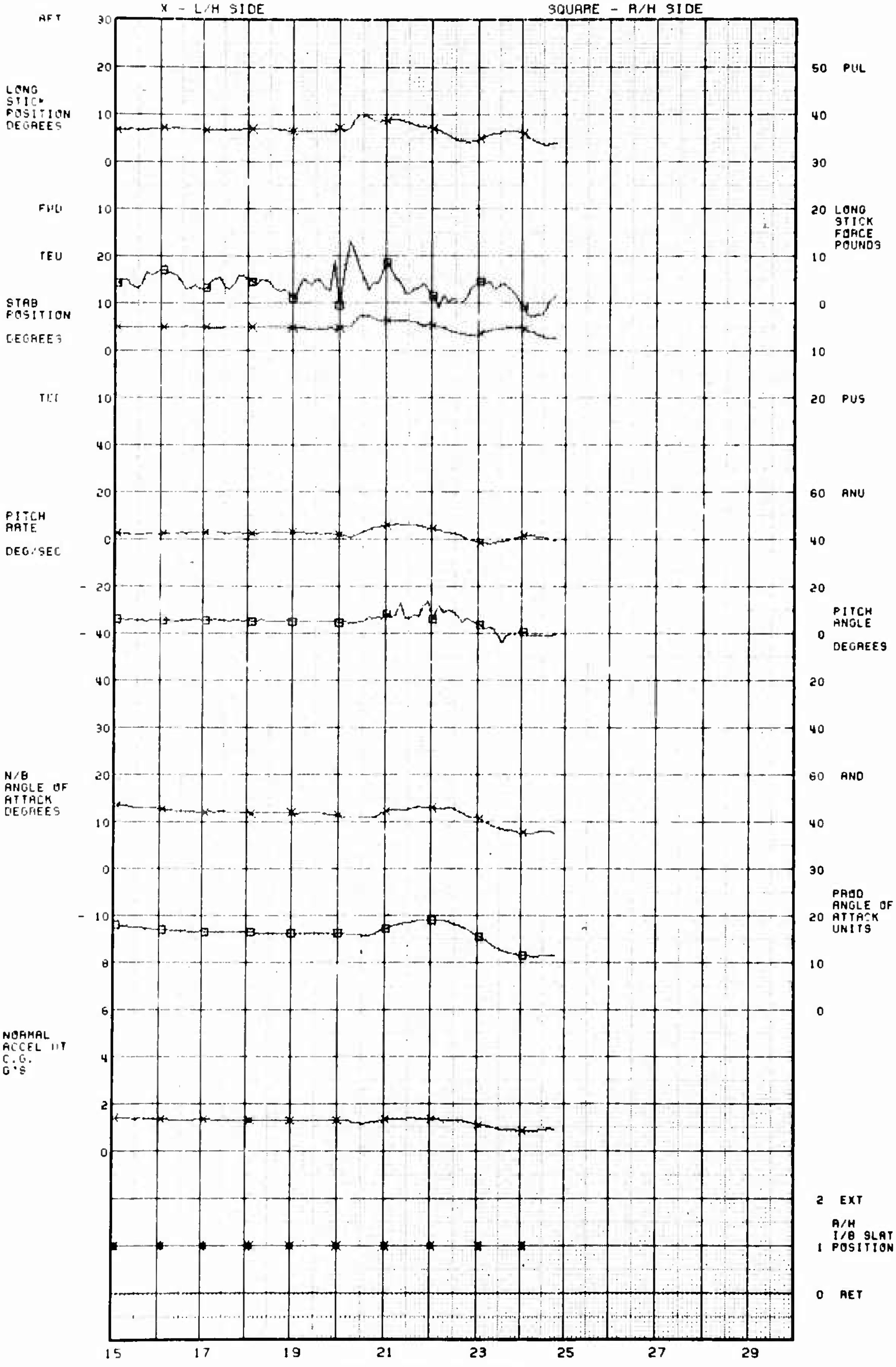


FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 16 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

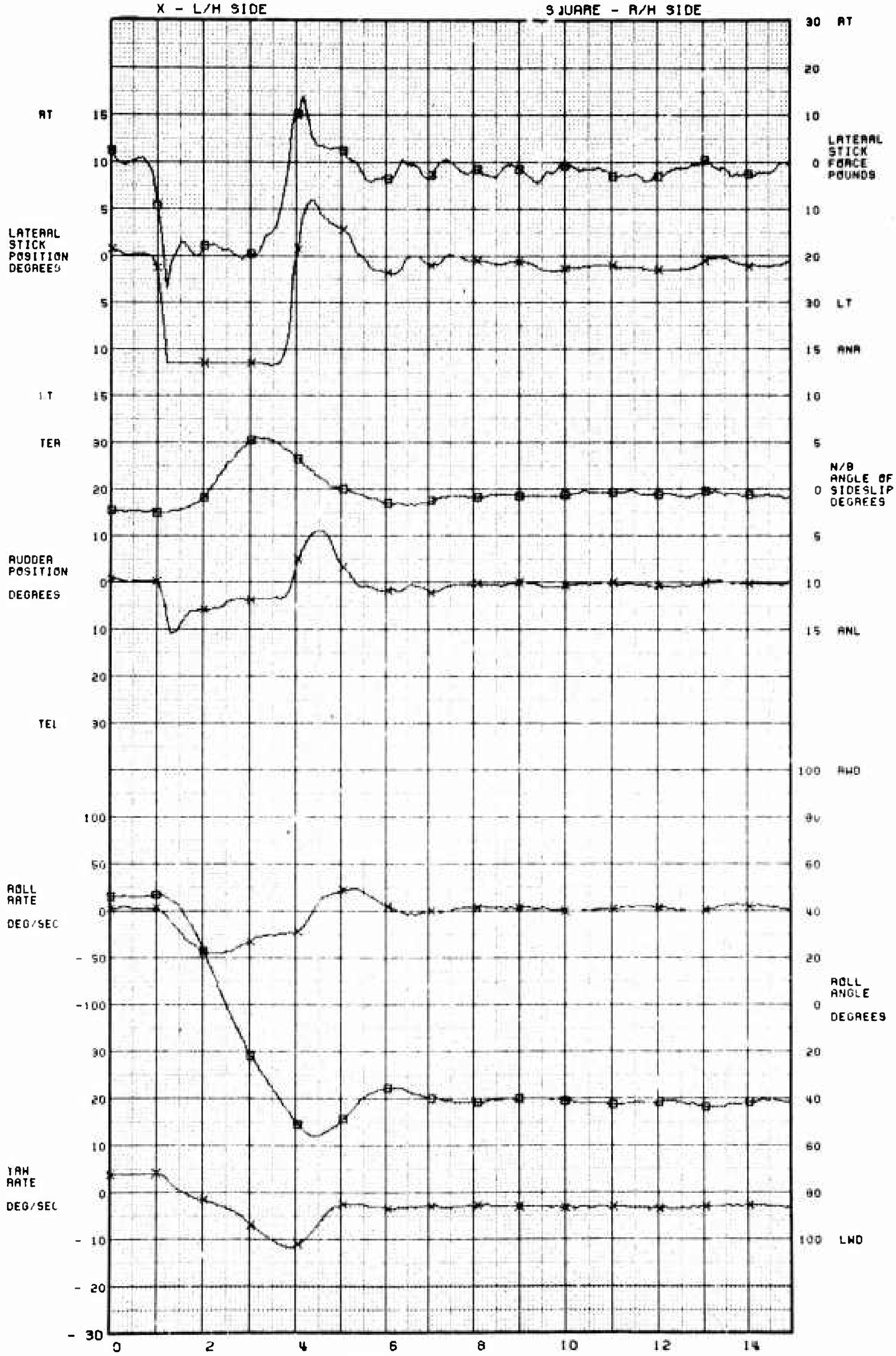


FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 16 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

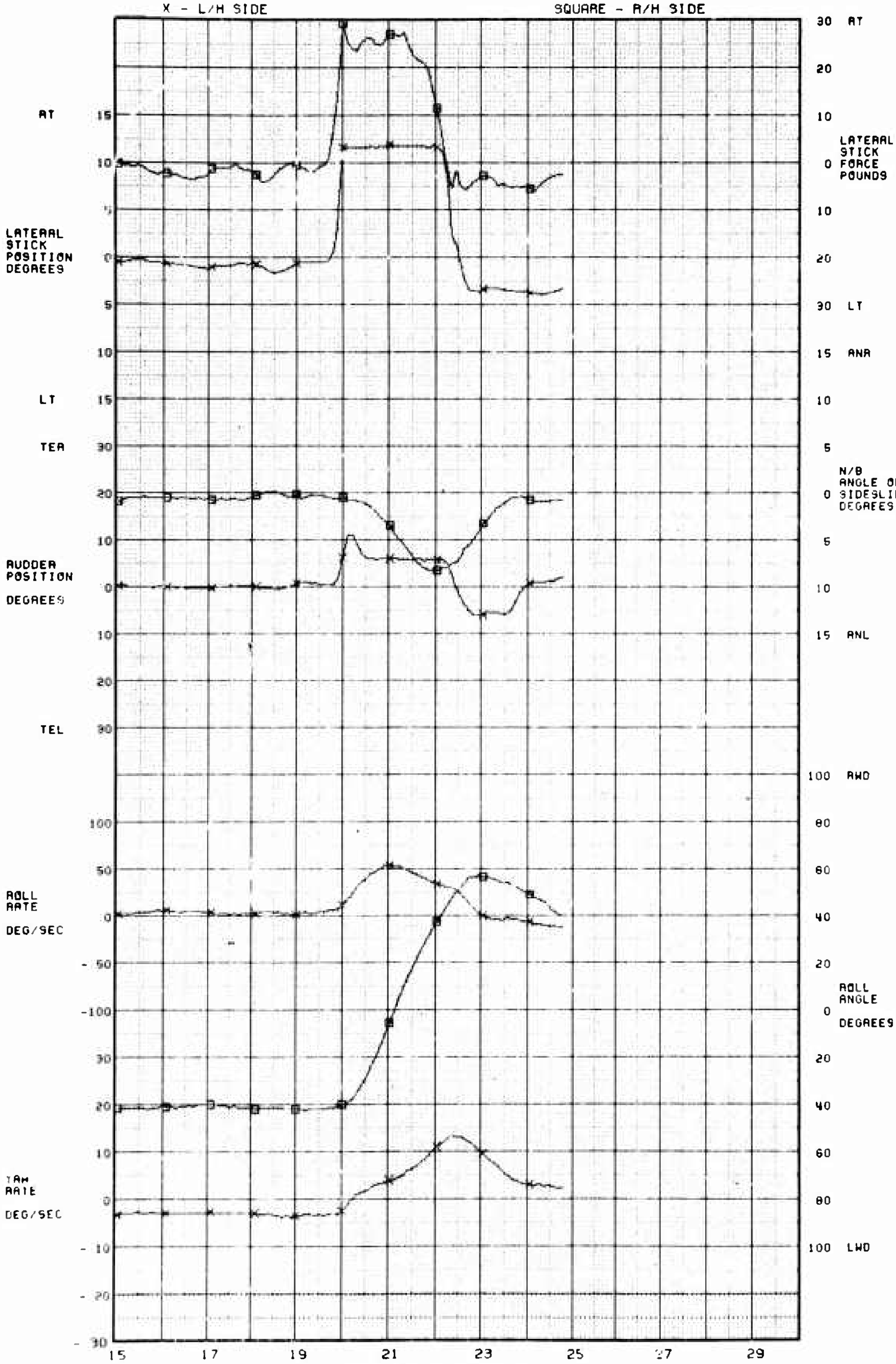


FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

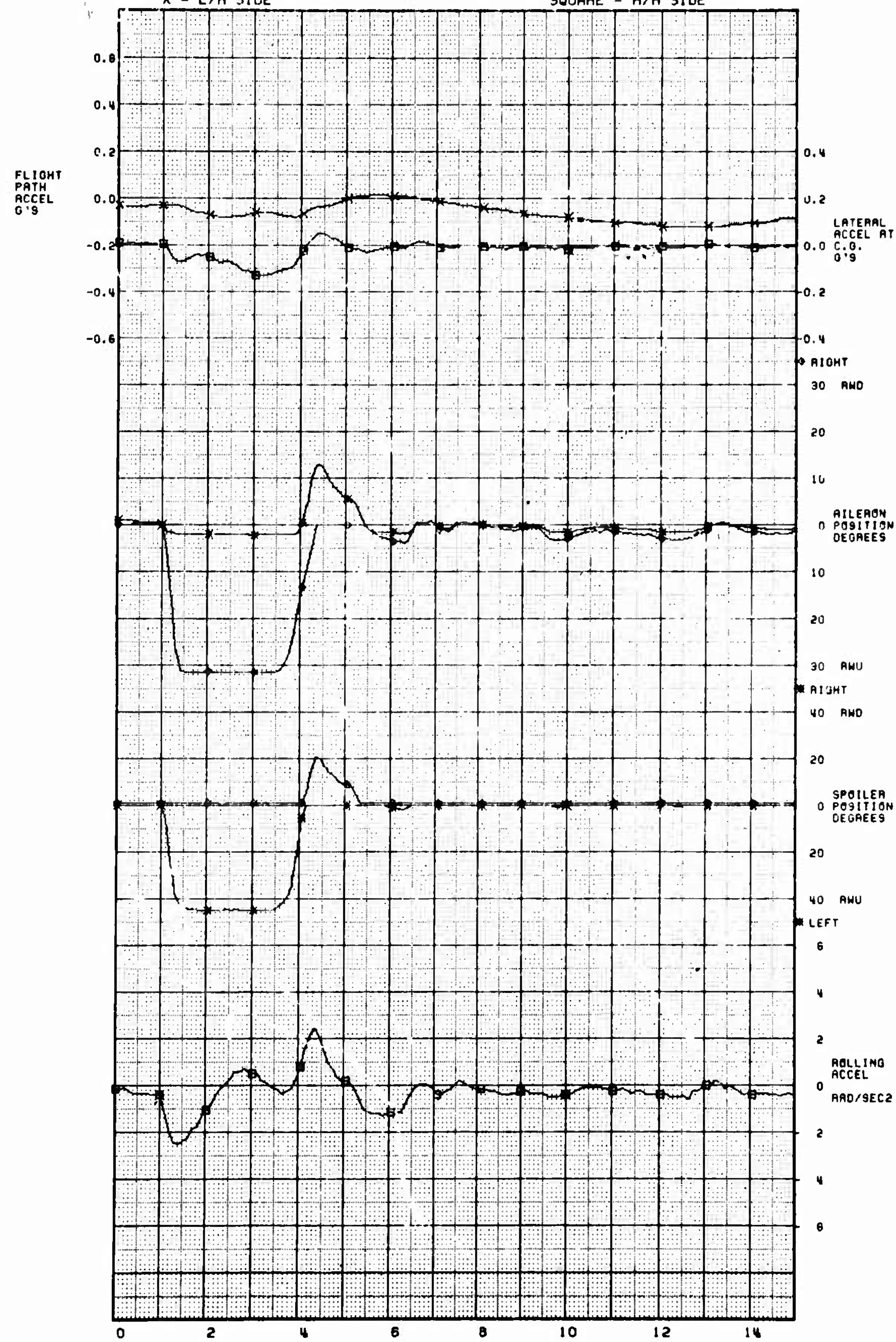
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 16 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE



ELAPSED TIME IN SECONDS

FIGURE 154 AILERON ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-272 RUN 16 DATE 23 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0 37
ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)
X - L/H SIDE SQUARE - R/H SIDE

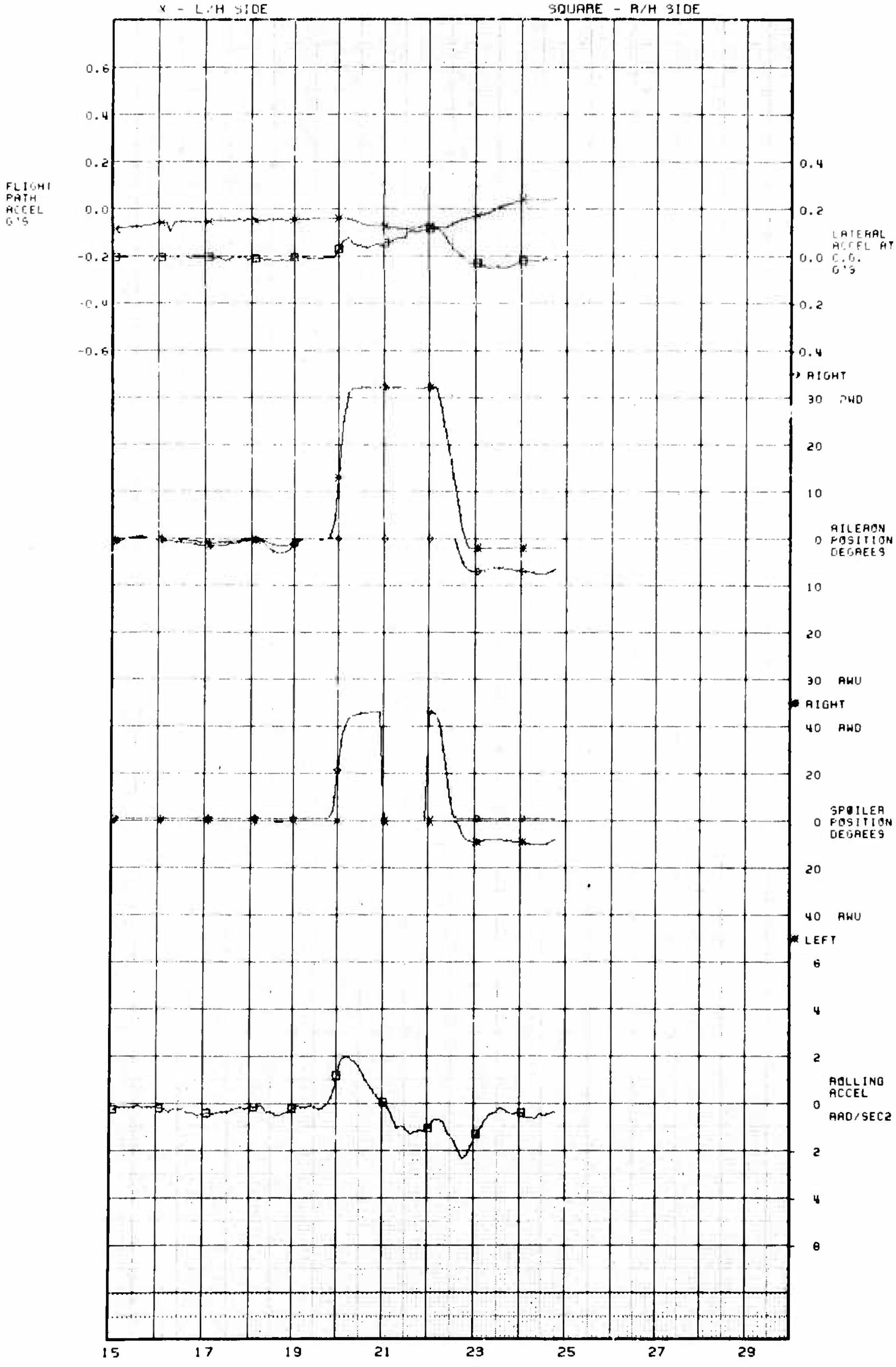
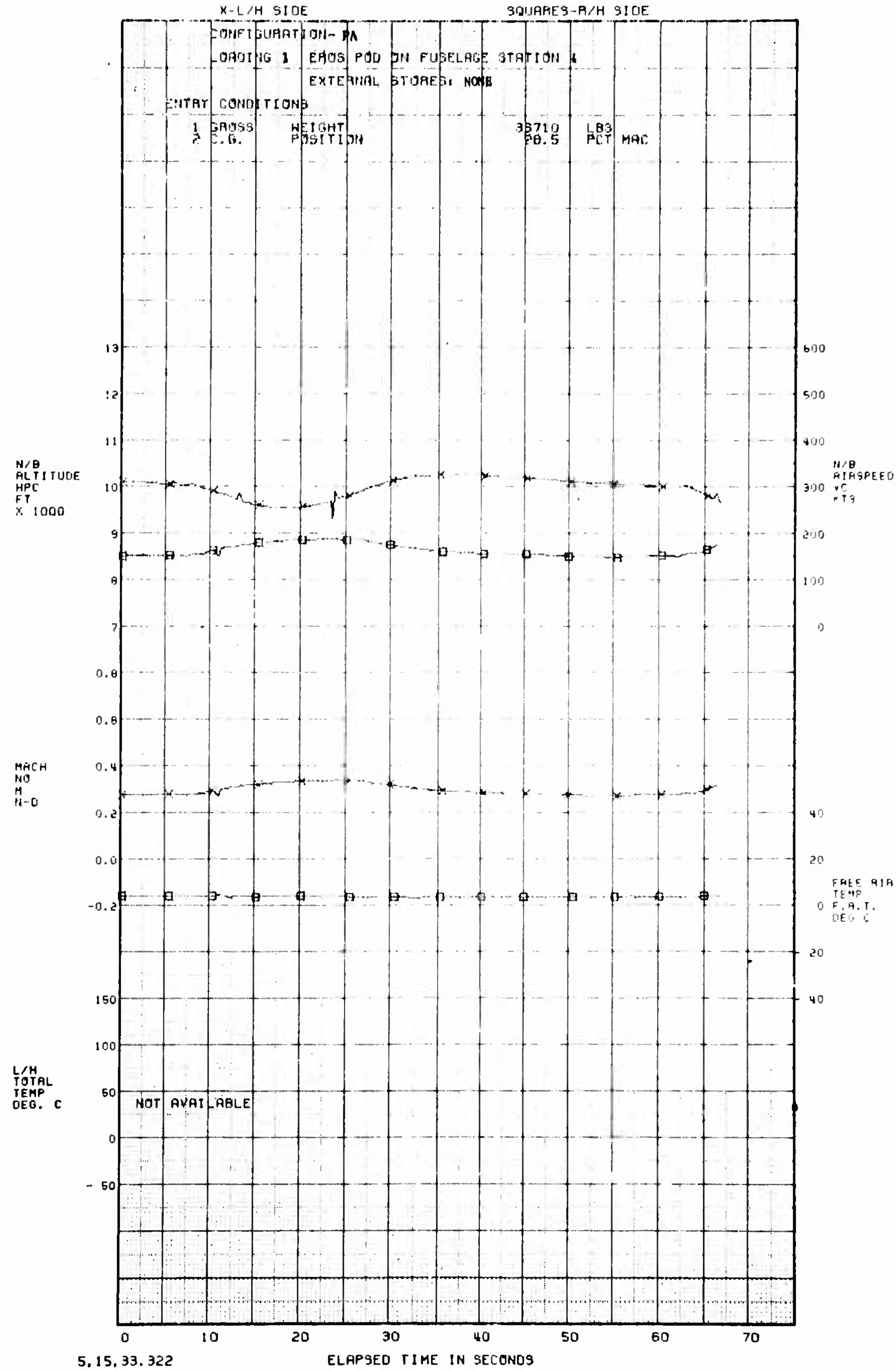


FIGURE 154 AILERON ROLL TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

FLT 287-272 RUN 20 DATE 23 MAY 1972



5,15,33.322

FIGURE 155 RUDDER ROLL TIME HISTORY

PAGE 02

F-4E USAF S/N 66-287A

FLT 287-272 RUN 20 DATE 23 MAY 1972

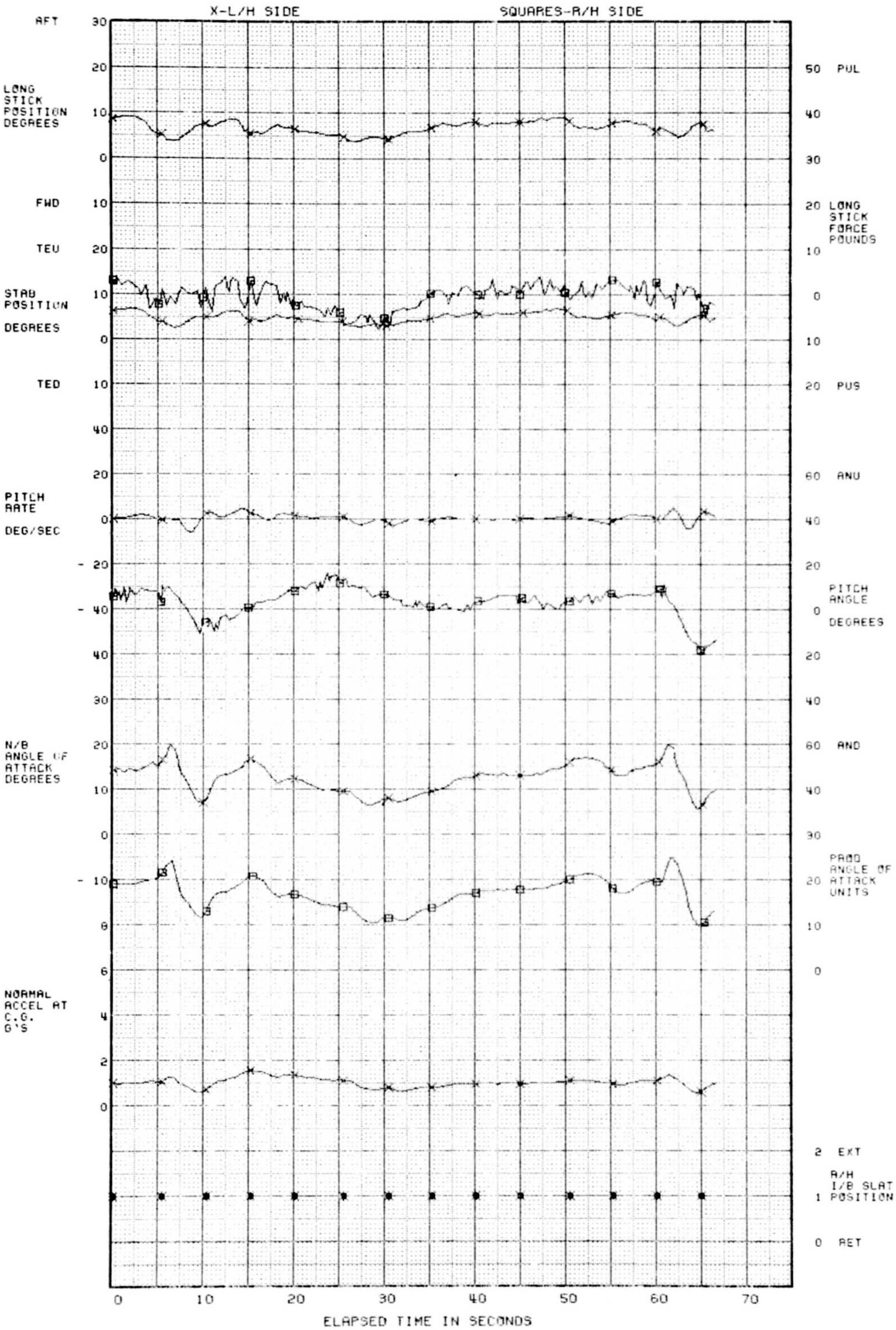


FIGURE 155 RUDDER ROLL TIME HISTORY (CONTINUED)

F-4E USAF S/N 66-287A

FLT 287-272 RUN 20 DATE 23 MAY 1972

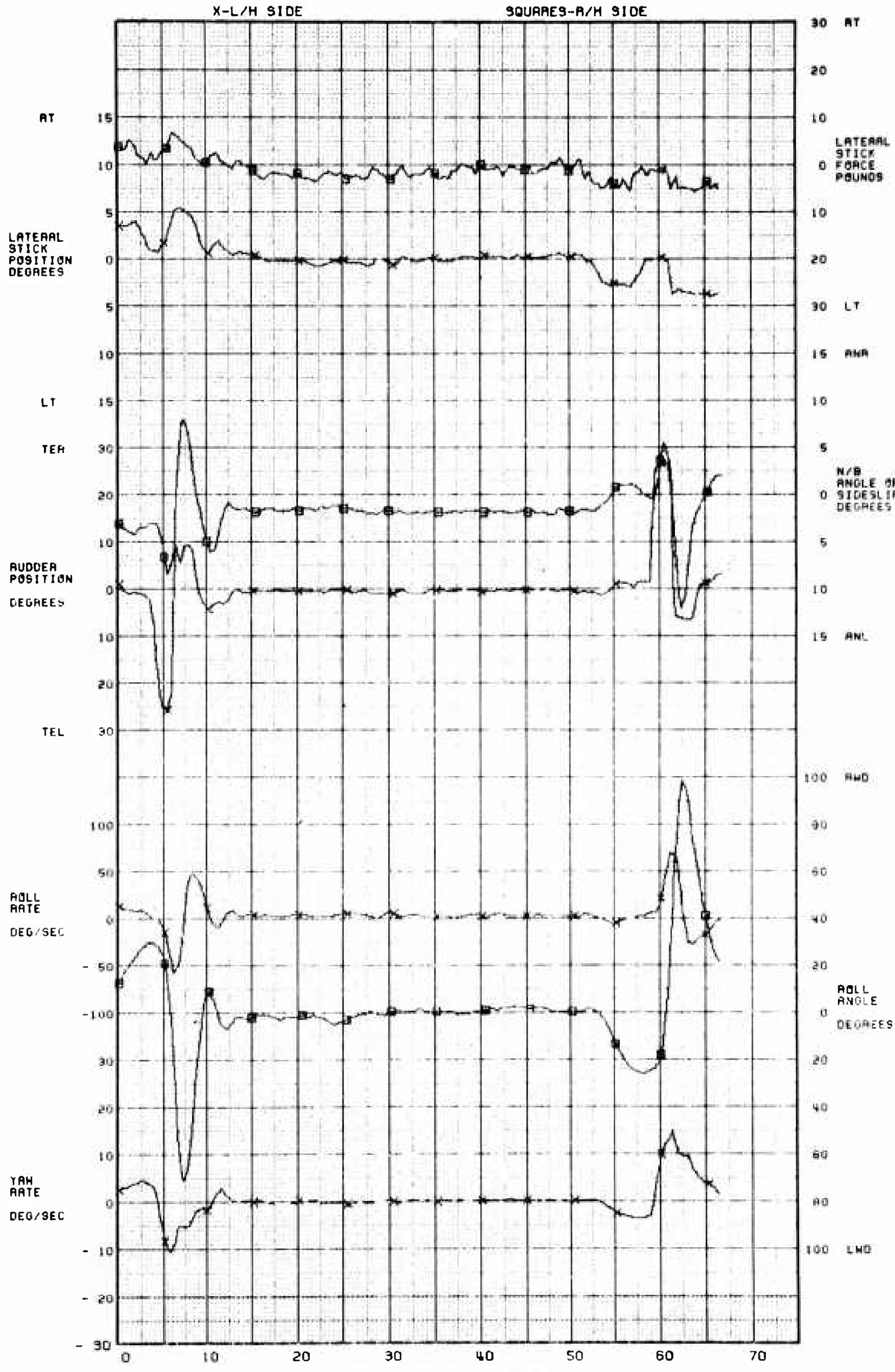


FIGURE 155 RUDDER ROLL TIME HISTORY (CONTINUED)

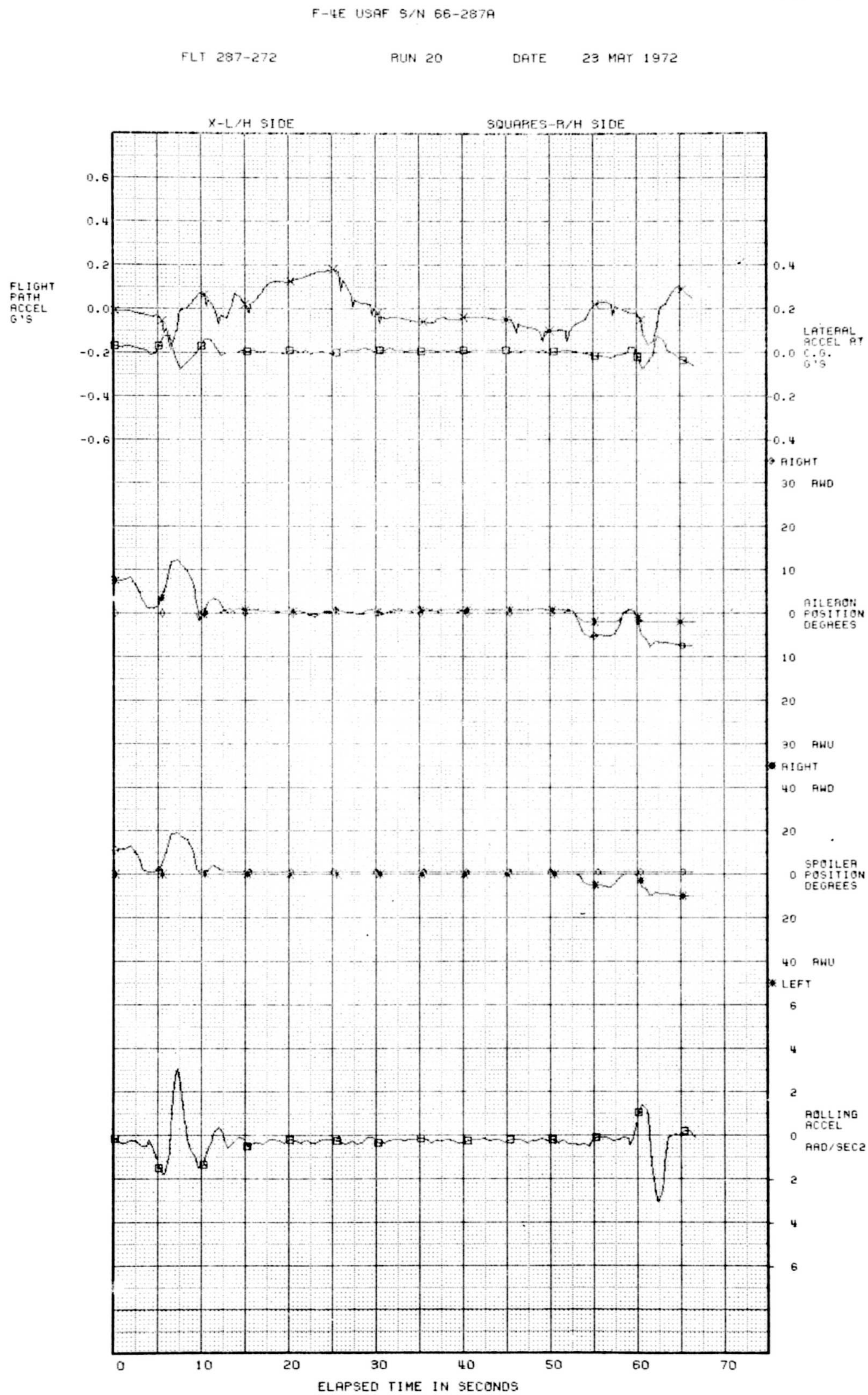


FIGURE 155 RUDDER ROLL TIME HISTORY (CONCLUDED)

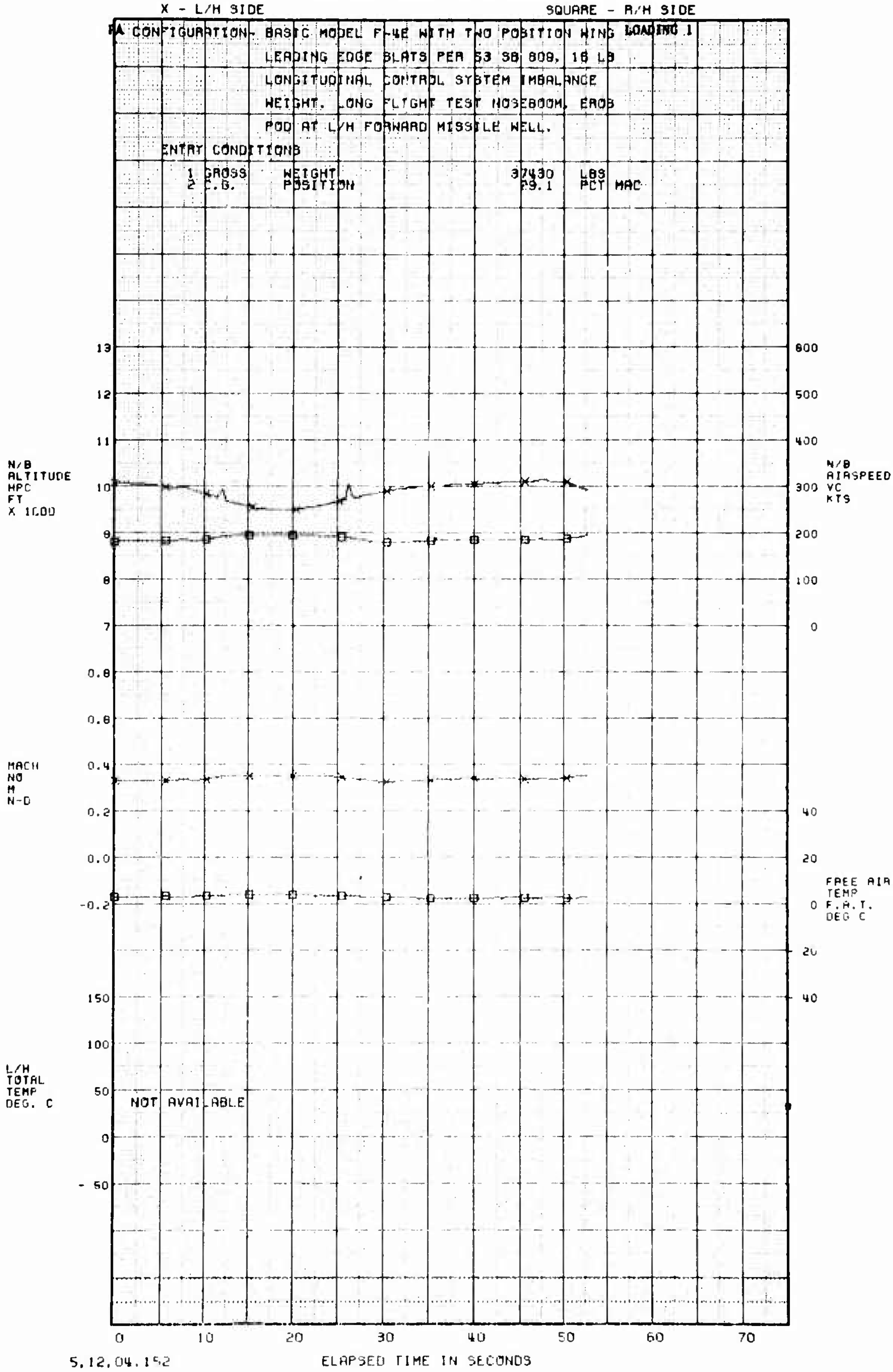
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 17 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE



5,12,04,152

FIGURE 156 RUDDER ROLL TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 17 DATE 23 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

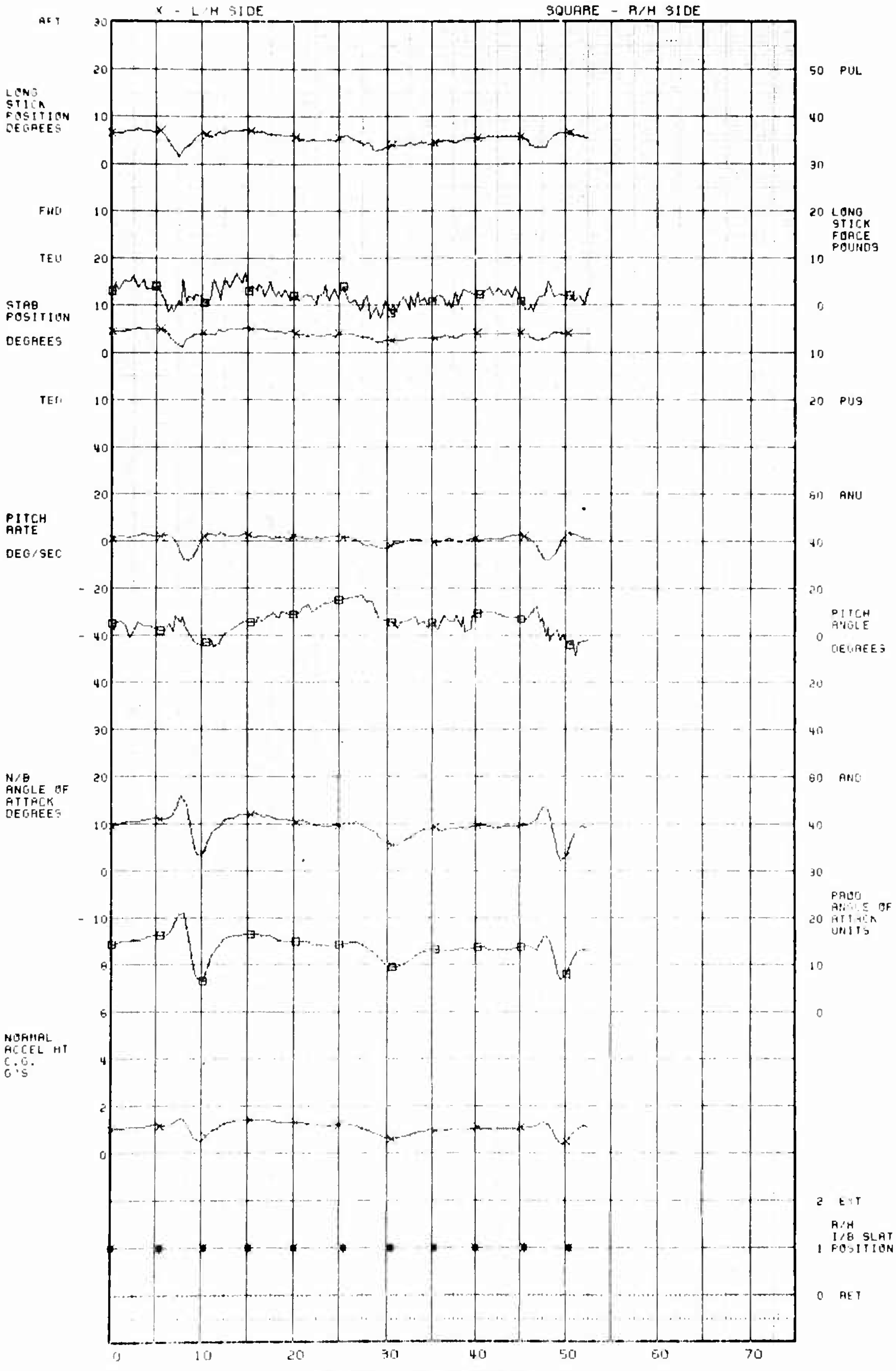


FIGURE 156 RUDDER ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS
FLT 287-272 RUN 17 DATE 23 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)

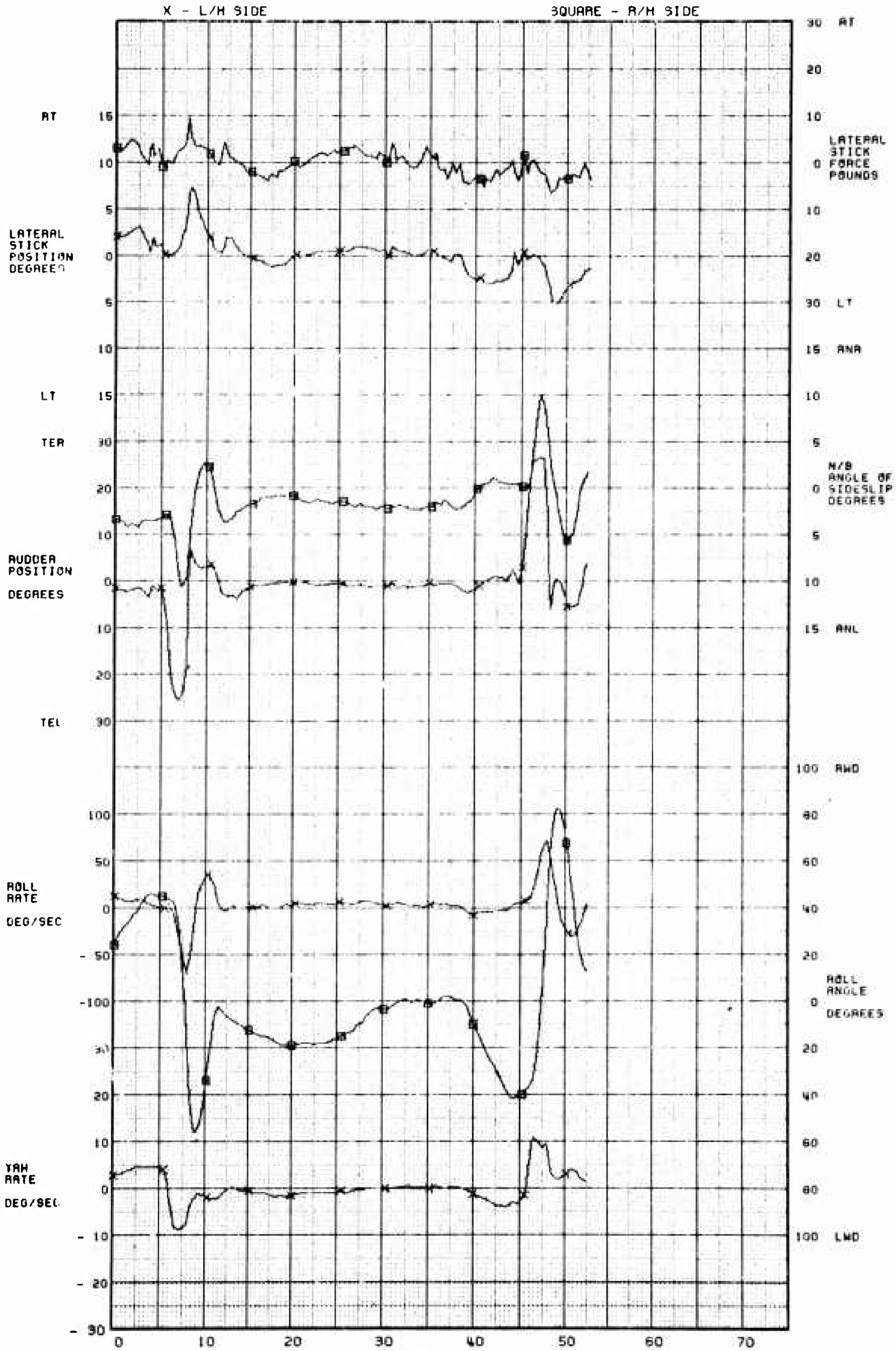


FIGURE 156 RUDDER ROLL TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-272 RUN 17 DATE 23 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
ROLLING PERFORMANCE (GEAR, SLATS, 30 DEG T.E. FLAPS)
X - L/H SIDE SQUARE - R/H SIDE

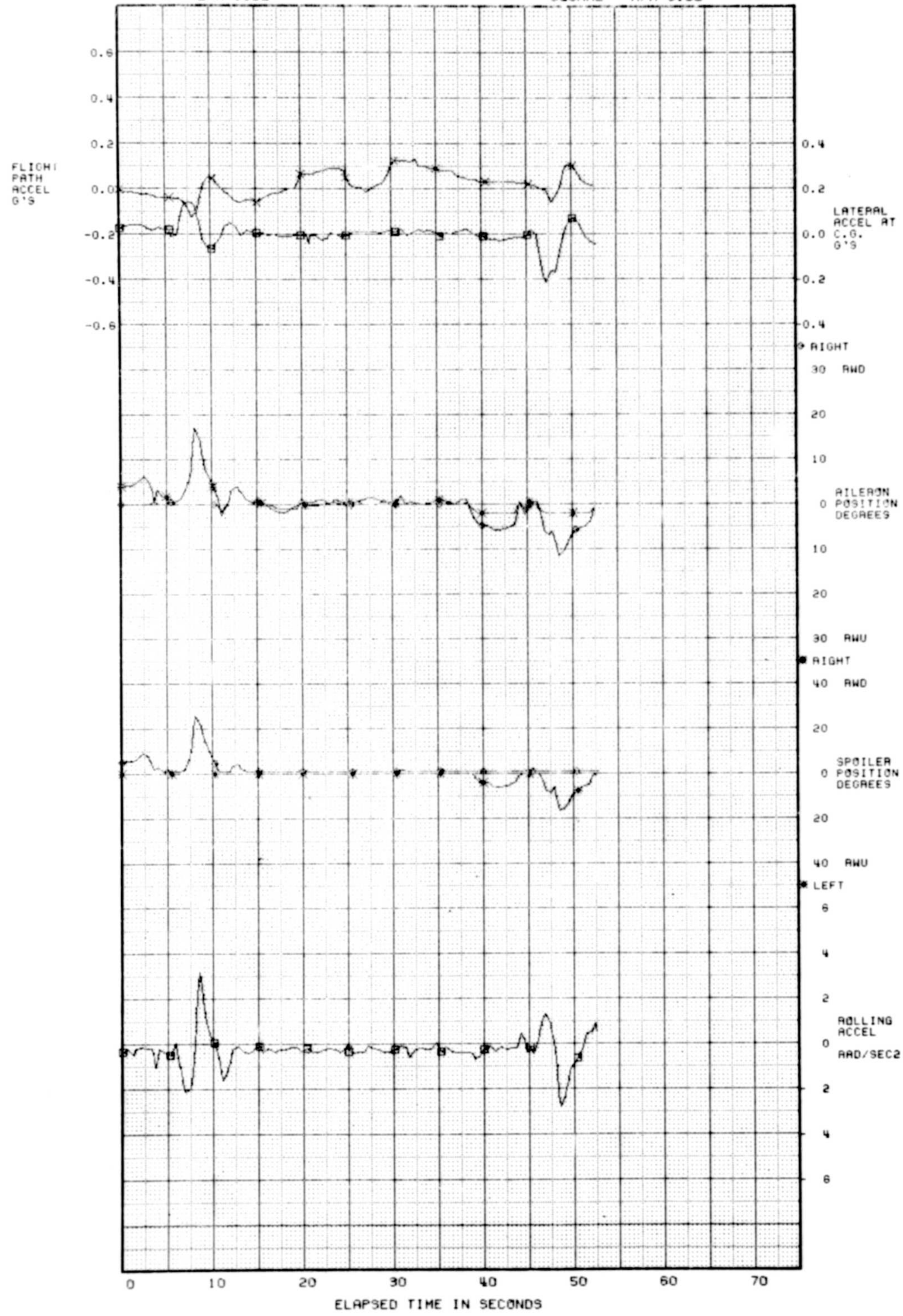


FIGURE 156 RUDDER ROLL TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

LOADING: I- NO STORES

CR CONFIGURATION

ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	MACH NO.	PRODUCTION AOA (UNITS)	SLATS
10,200	37,900	29.8	0.37	14	EXT

NOTE: SOLID SYMBOLS DENOTE TRIM.

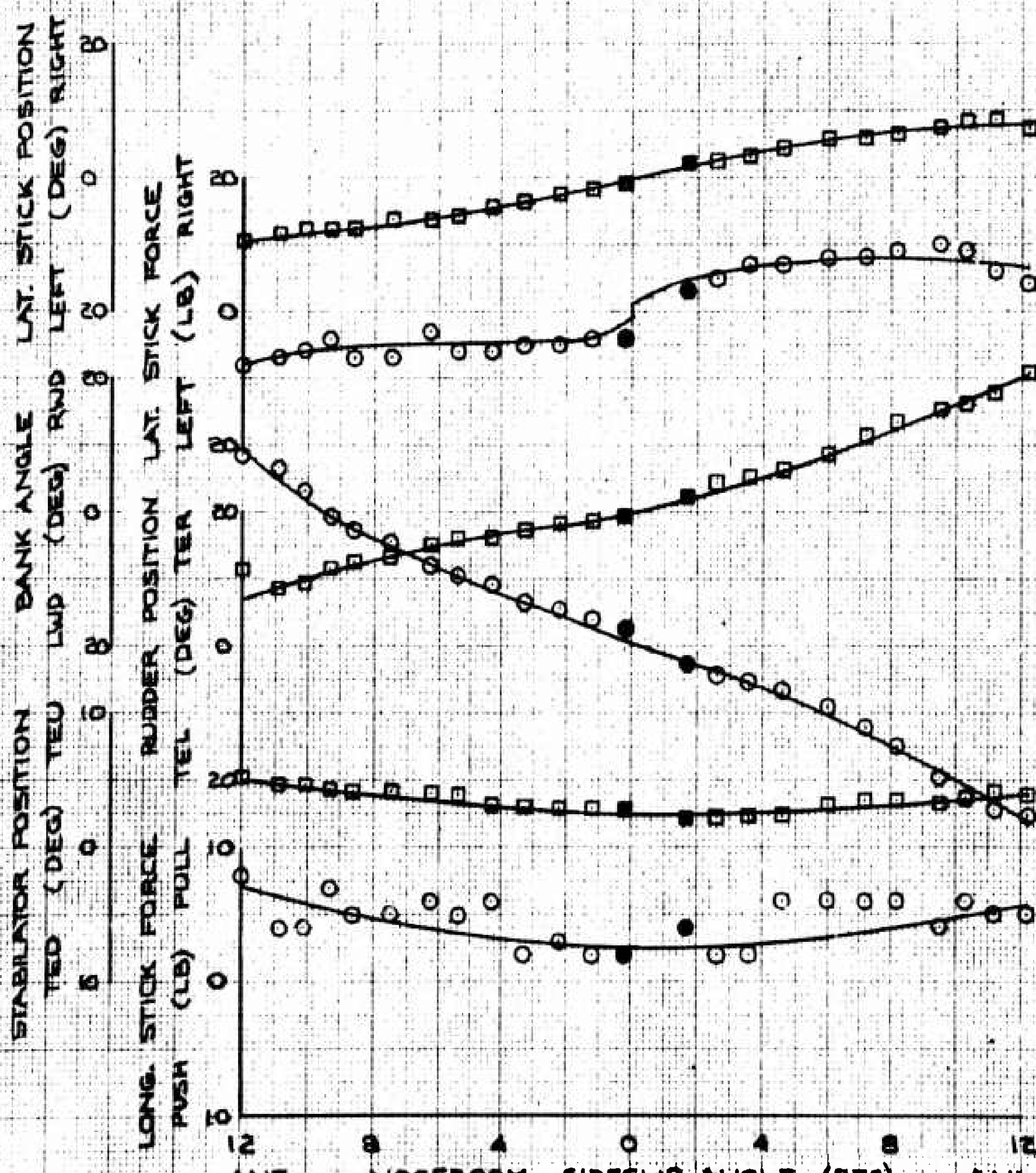


FIGURE 157 STATIC DIRECTIONAL STABILITY

F-4E USAF S/N 66-287A

LOADING : I: NO STORES

CR CONFIGURATION

ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	MACH NO.	PRODUCTION AOA (UNITS)	SLATS
10,200	35,800	27.8	0.81	8	RET

NOTE: SOLID SYMBOLS DENOTE TRIM.

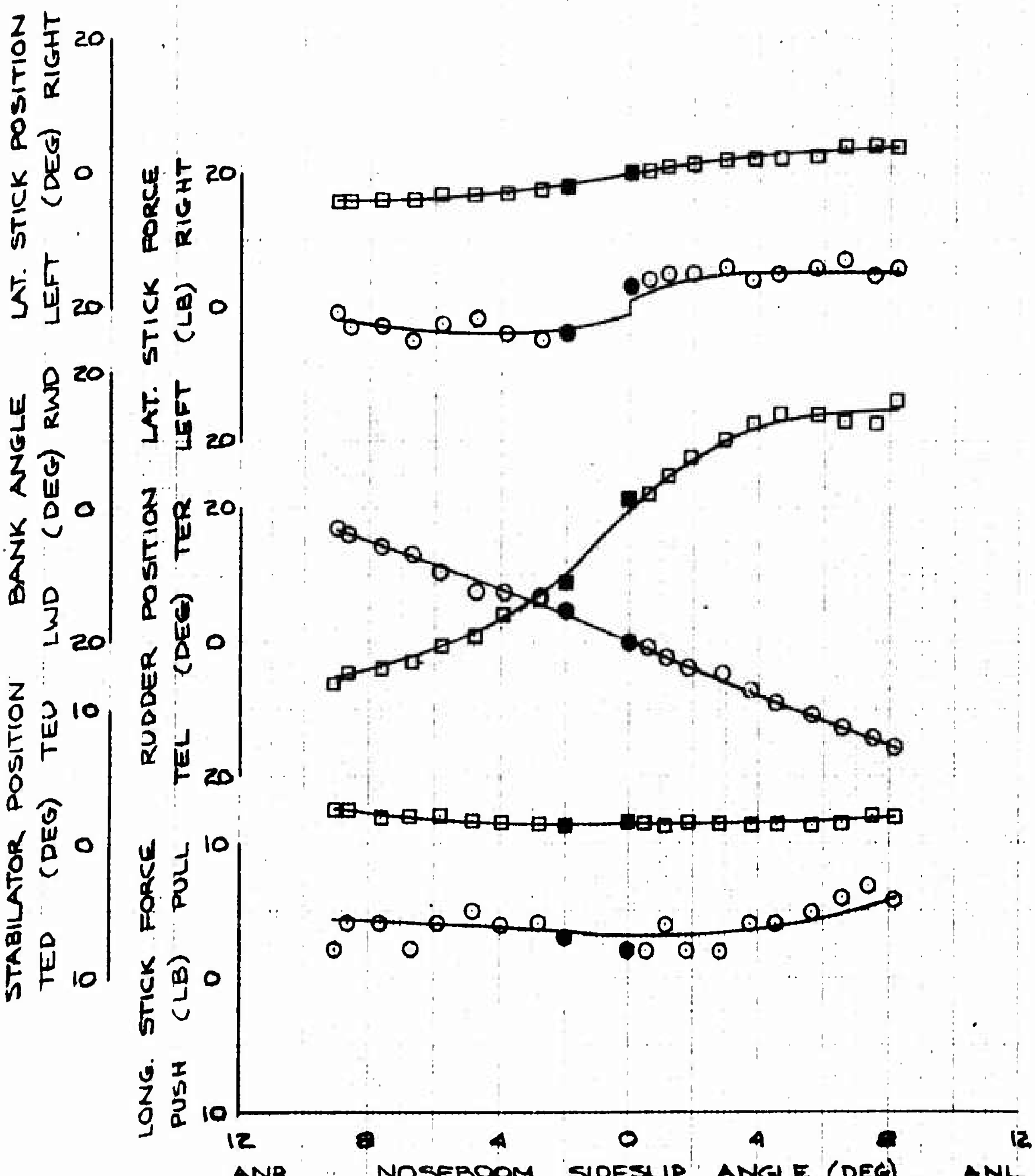


FIGURE 158 STATIC DIRECTIONAL STABILITY

F-4E USAF S/N 66-287A

LOADING: 1: NO STORES

CR CONFIGURATION

ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	MACH NO.	PRODUCTION AOA (UNITS)	SLATS
10,300	35,400	27.5	0.71	5	RET

NOTE: SOLID SYMBOLS DENOTE TRIM.

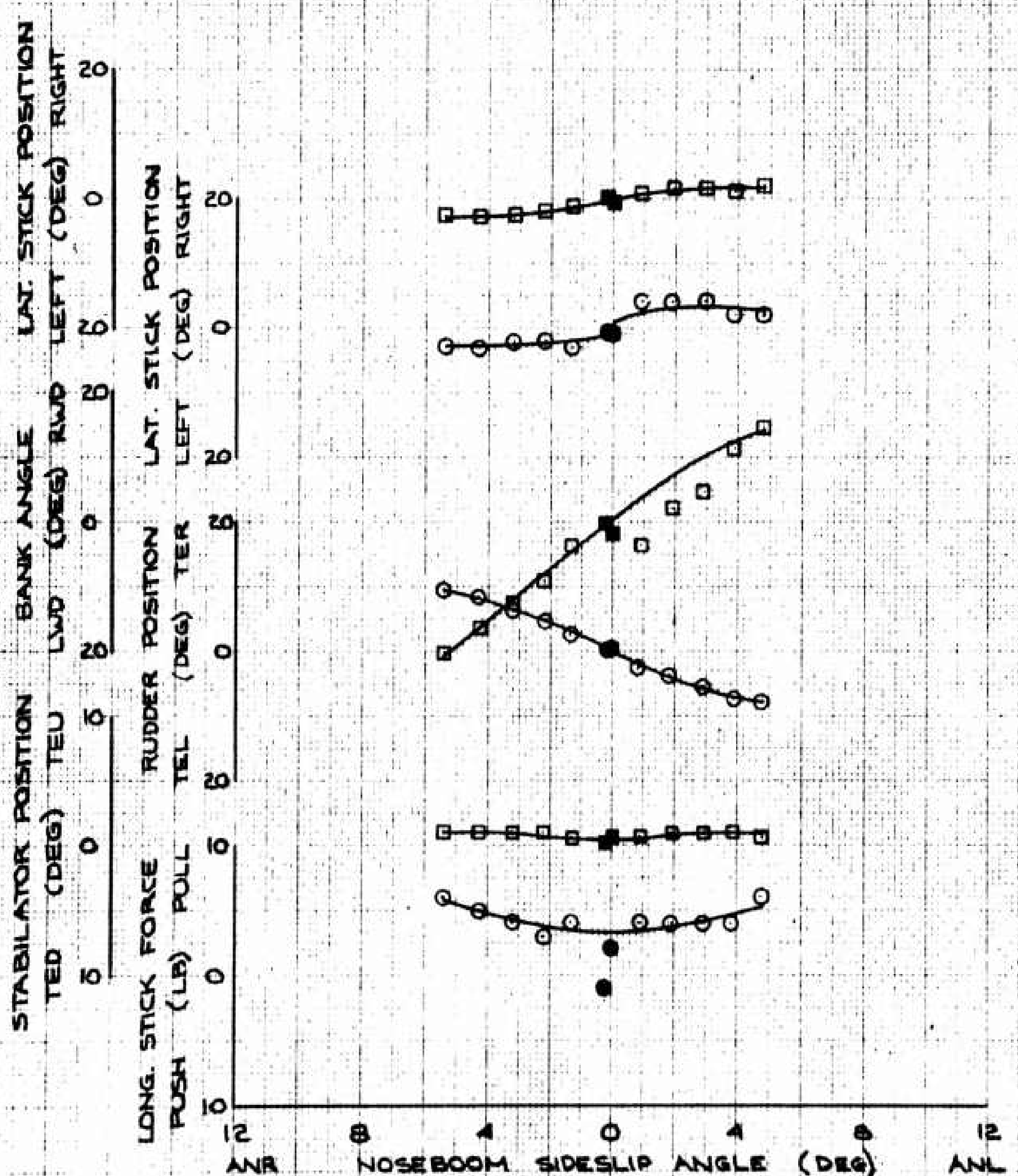


FIGURE 159 STATIC DIRECTIONAL STABILITY

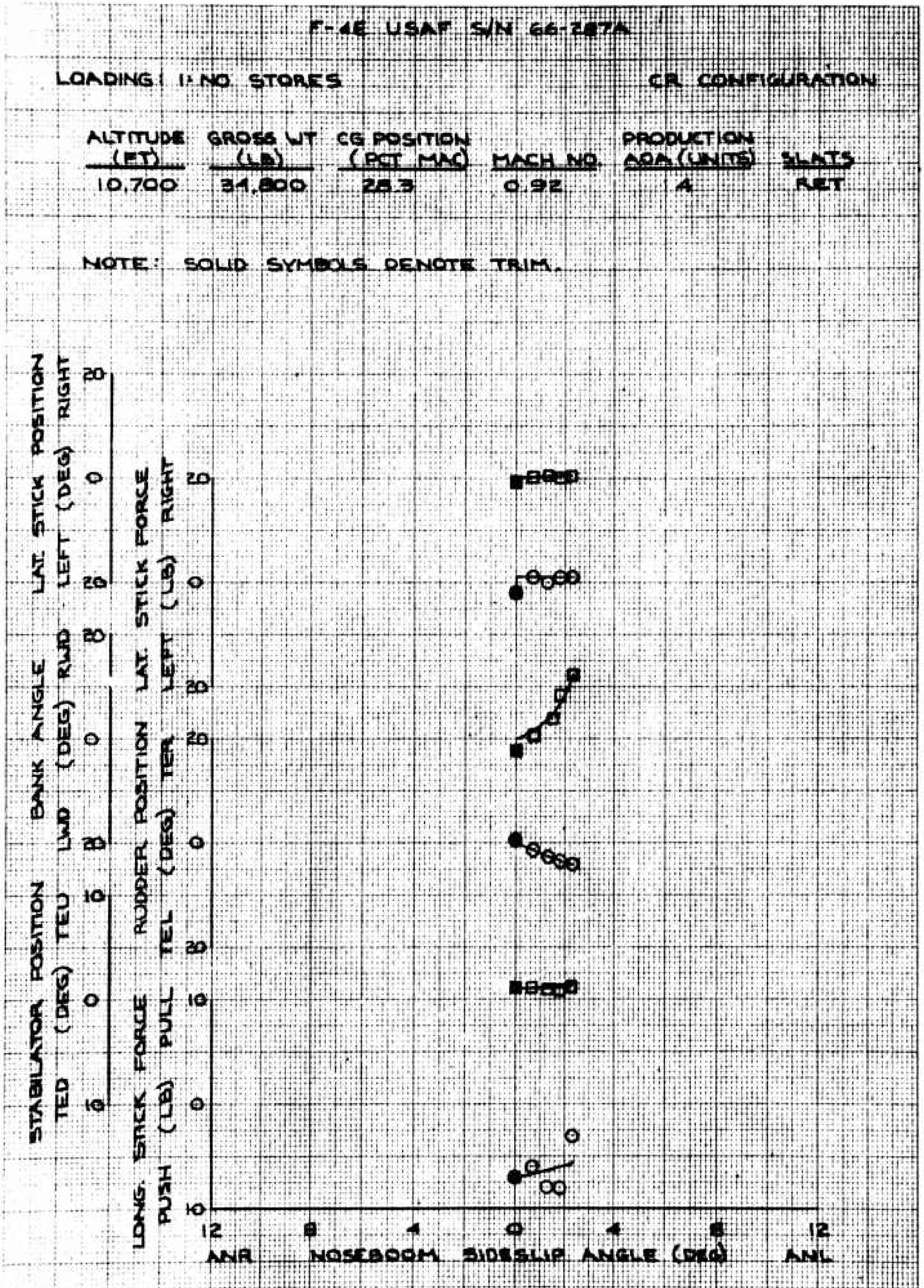


FIGURE 160 STATIC DIRECTIONAL STABILITY

F-4E USAF S/N 66-287A

LOADING: 1: NO STORES

PA CONFIGURATION

ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	KCAS	PRODUCTION AOA (UNITS)	SLATS
10,100	36,000	27.7	138	17	EXT

NOTE: SOLID SYMBOLS DENOTE TRIM.

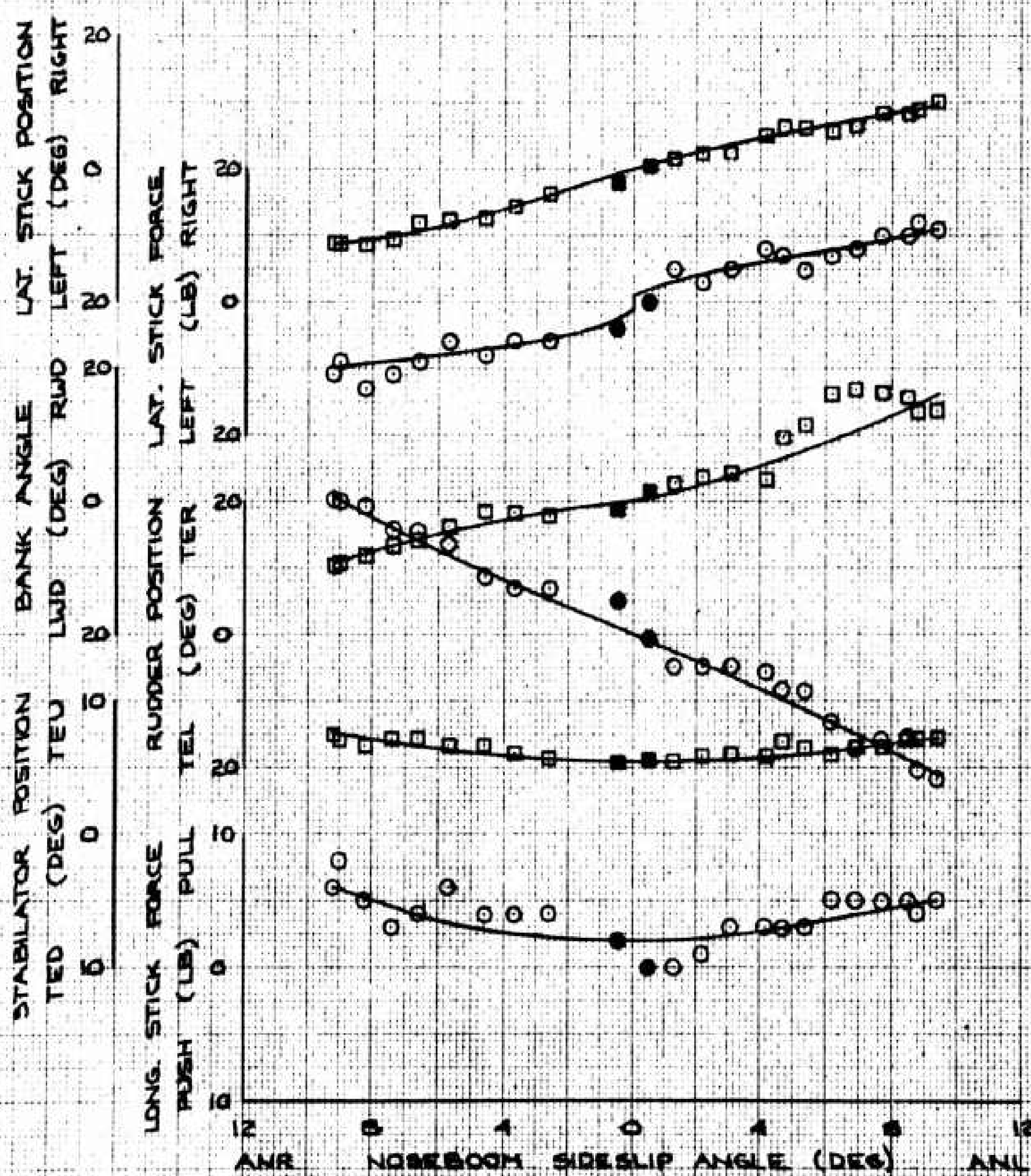


FIGURE 161 STATIC DIRECTIONAL STABILITY

F-4E USAF S/N 66-287A

LOADING : 1: NO STORES PA CONFIGURATION

ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	KCAS	PRODUCTION AOA (UNITS)	SLATS
10,600	35,500	28.0	199	10	EXT

NOTE: SOLID SYMBOLS DENOTE TRIM.

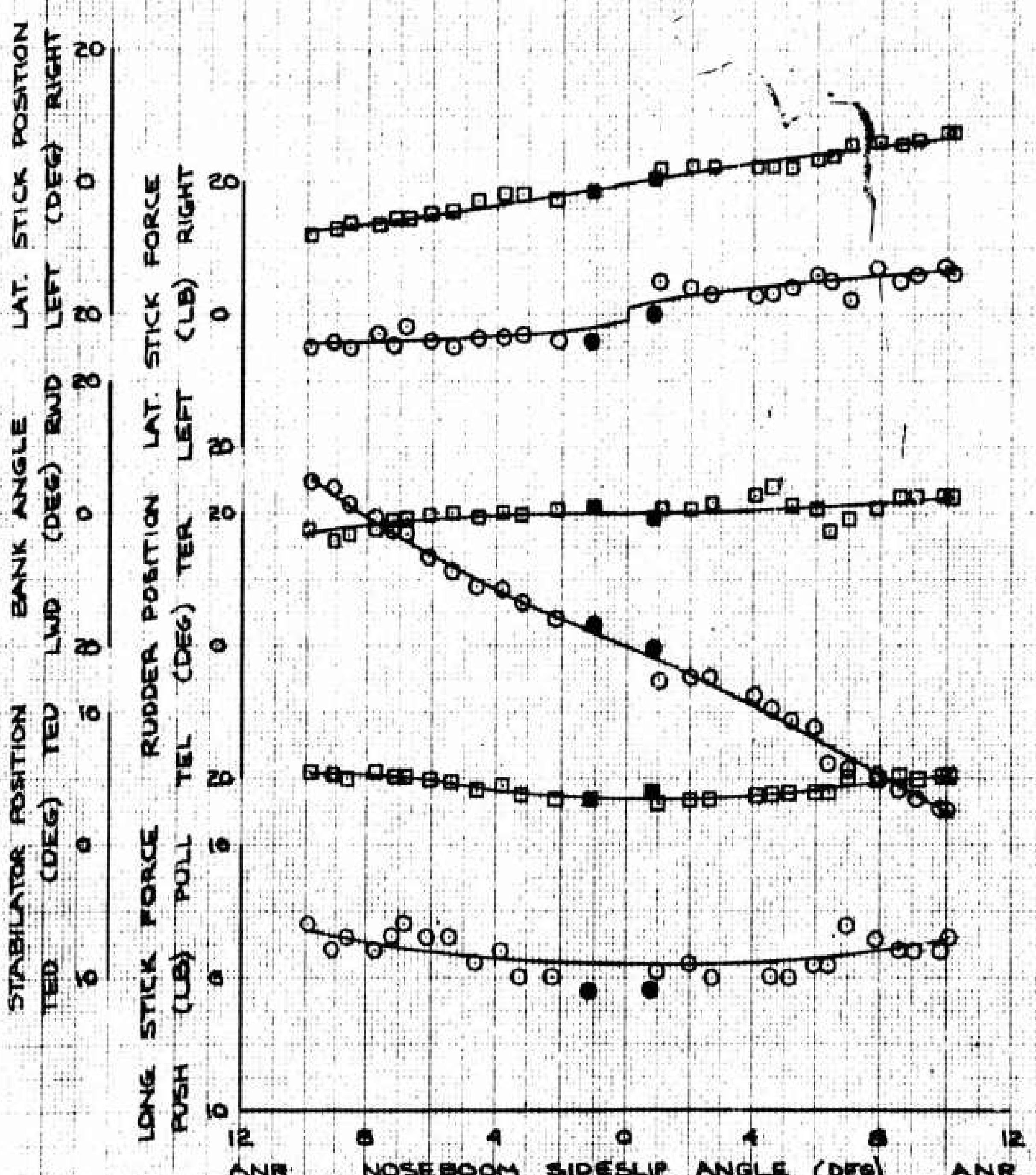


FIGURE 162 STATIC DIRECTIONAL STABILITY

F-4E USAF S/N 66-287A

LOADING: 1: NO STORES

PA CONFIGURATION

SYMBOL	CG LOCATION
O	APPROXIMATELY 25 PCT MAC
□	APPROXIMATELY 27 PCT MAC

NOTES: 1. "ON-SPEED" APPROACH AIRSPEEDS ARE FOR A 19.2 UNIT AOA APPROACH
2. FAIRING IS FROM CONTRACTOR MODEL STUDIES AND PREVIOUS FIXED-SLAT CONFIGURATION TESTS.

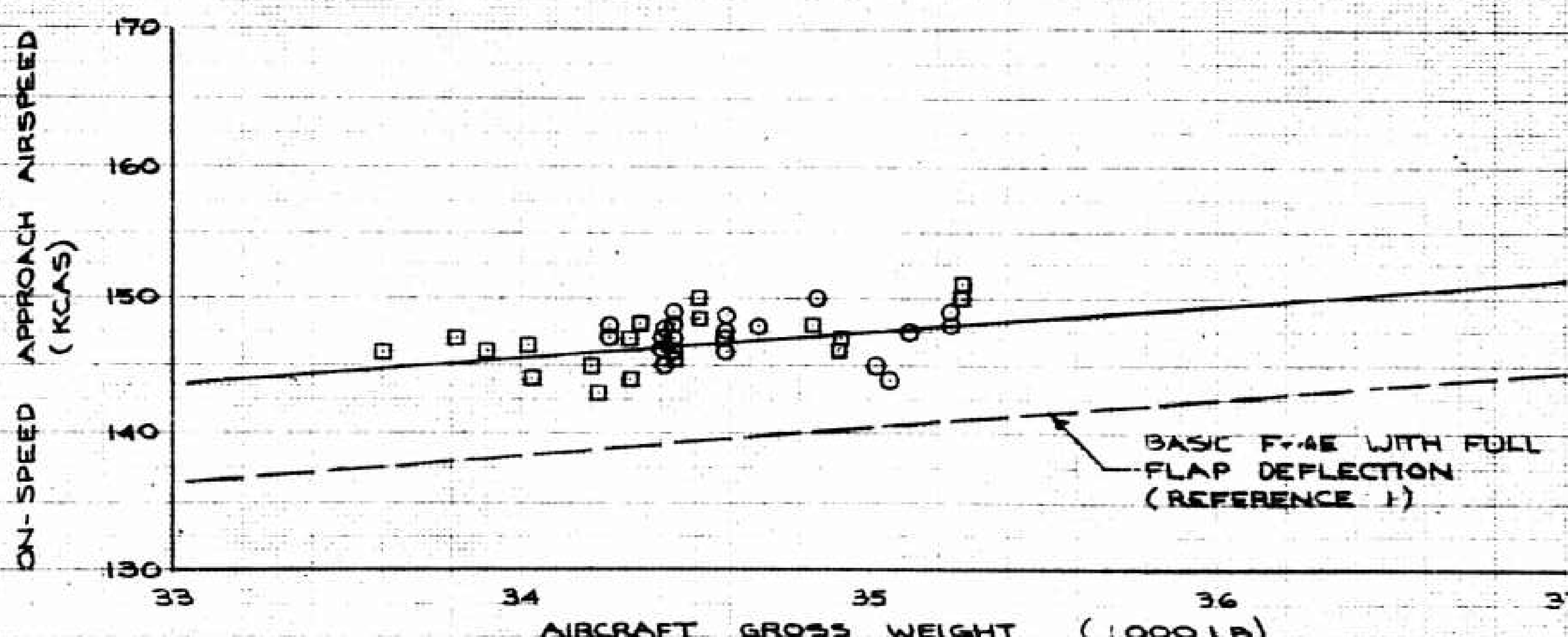


FIGURE 163 LANDING APPROACH AIRSPEED

F-4E USAF S/N 66-287A

SYMBOL	GROSS WT (LB)	AIM LOAD FACTOR (G)	STORE LOADING	SLATS LEFT	SLATS RIGHT	CONFIG
○	41,000	2	1	EXT	EXT	CR
□	38,500	2				
◇	37,100	1				
△	42,600	2.5	A2			
△	41,700		A2			
▽	42,000		3			
▽	35,900		1			
□	36,200					
◆	36,500			RET	RET	
▼	35,000			RET	RET	
▽	41,700			EXT	RET	
▲	35,800			EXT	RET	
○	35,800			EXT	EXT	PA
□	36,100					
▽	37,000		2			
▽	41,600		3			
◇	36,100		1			
■	35,800			RET	RET	
◆	35,500			RET	RET	
◇	35,500			EXT	RET	

NOTE: BUFFET ONSET DATA IS INCOMPLETE.

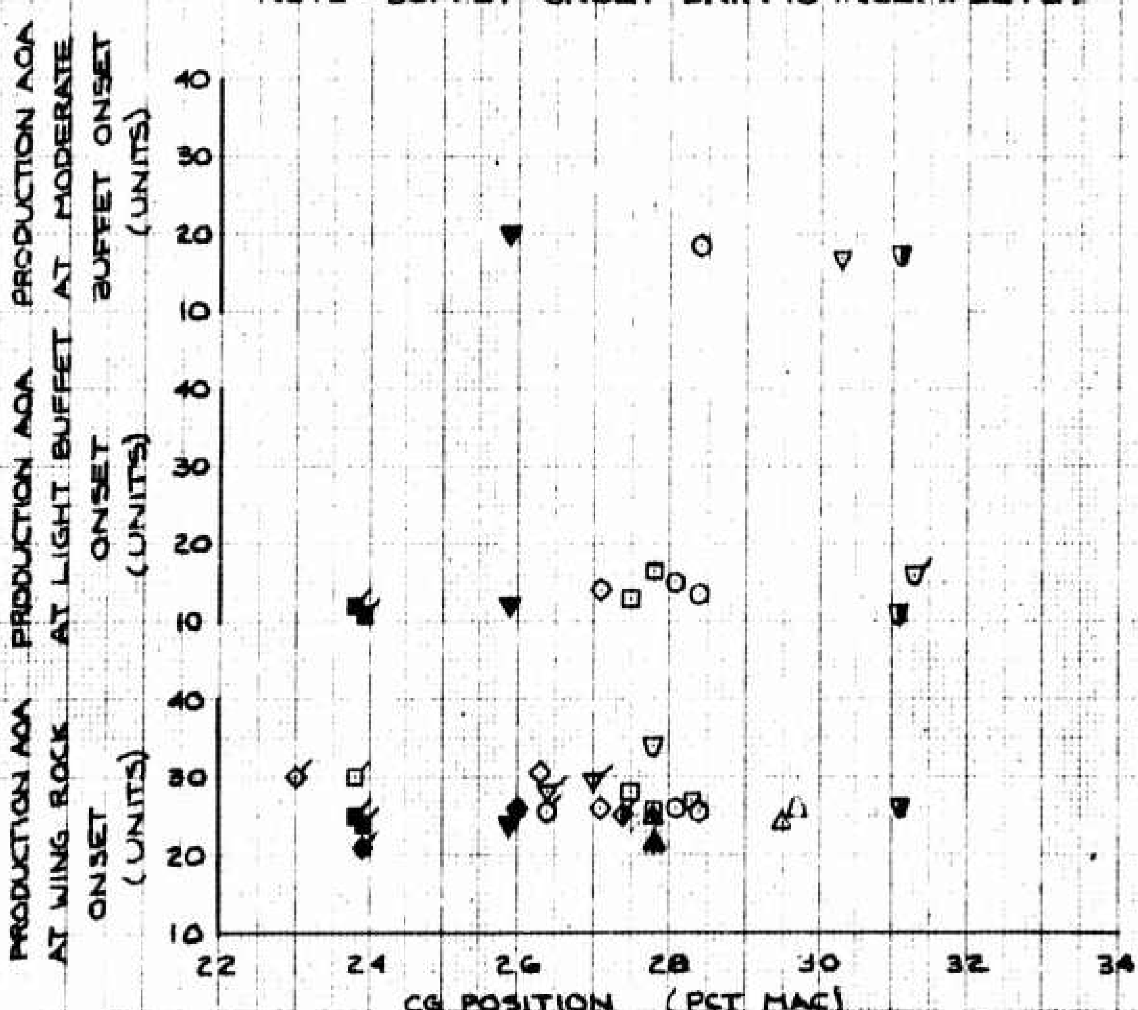
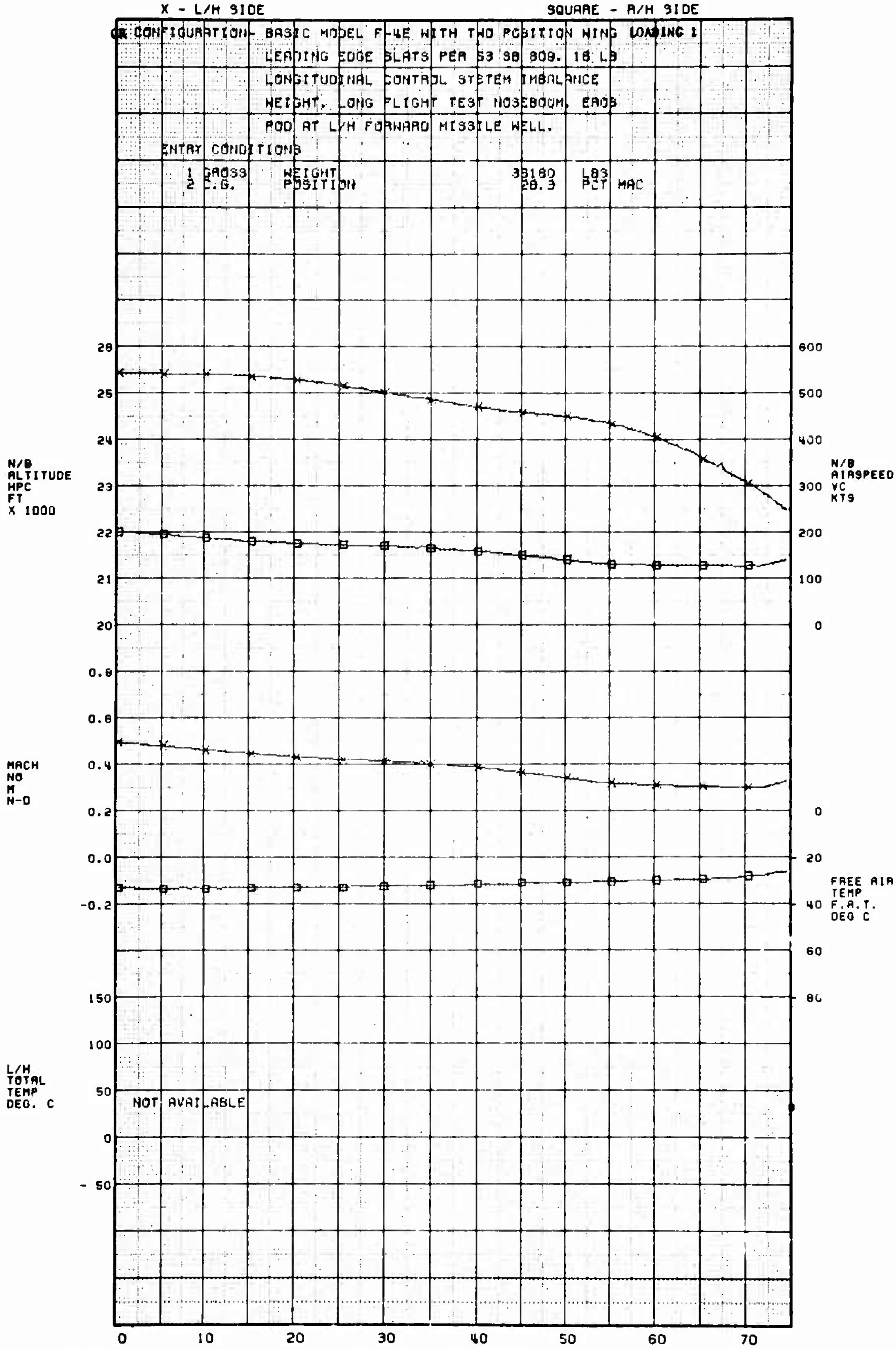


FIGURE 164 STALL APPROACH CHARACTERISTICS

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-254 RUN 10 DATE 18 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
APPROACH TO STALL



23.25.05.207

FIGURE 165 STALL APPROACH TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-264 RUN 10 DATE 16 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
APPROACH TO STALL

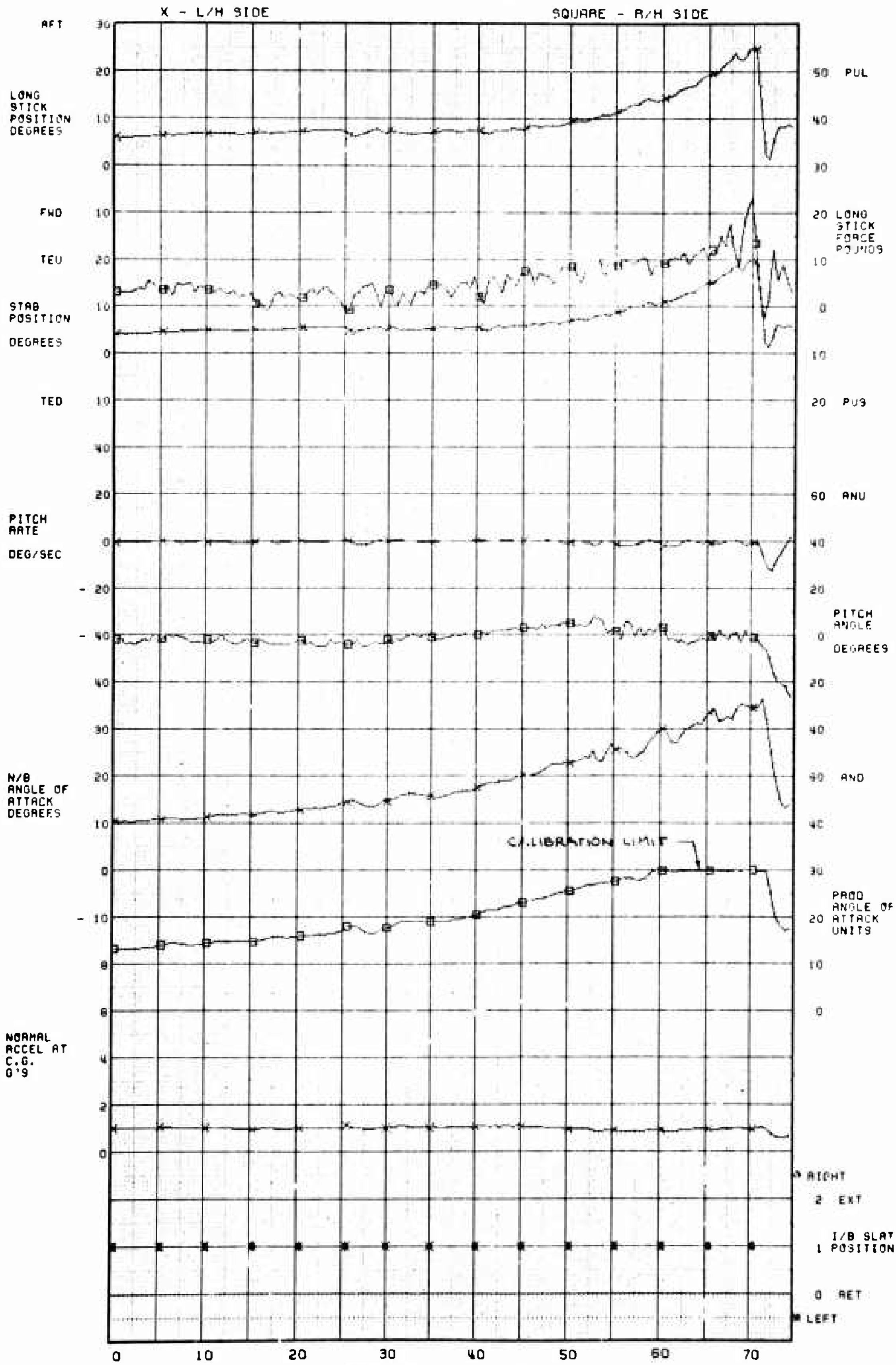


FIGURE 165 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-264 RUN 10 DATE 18 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL

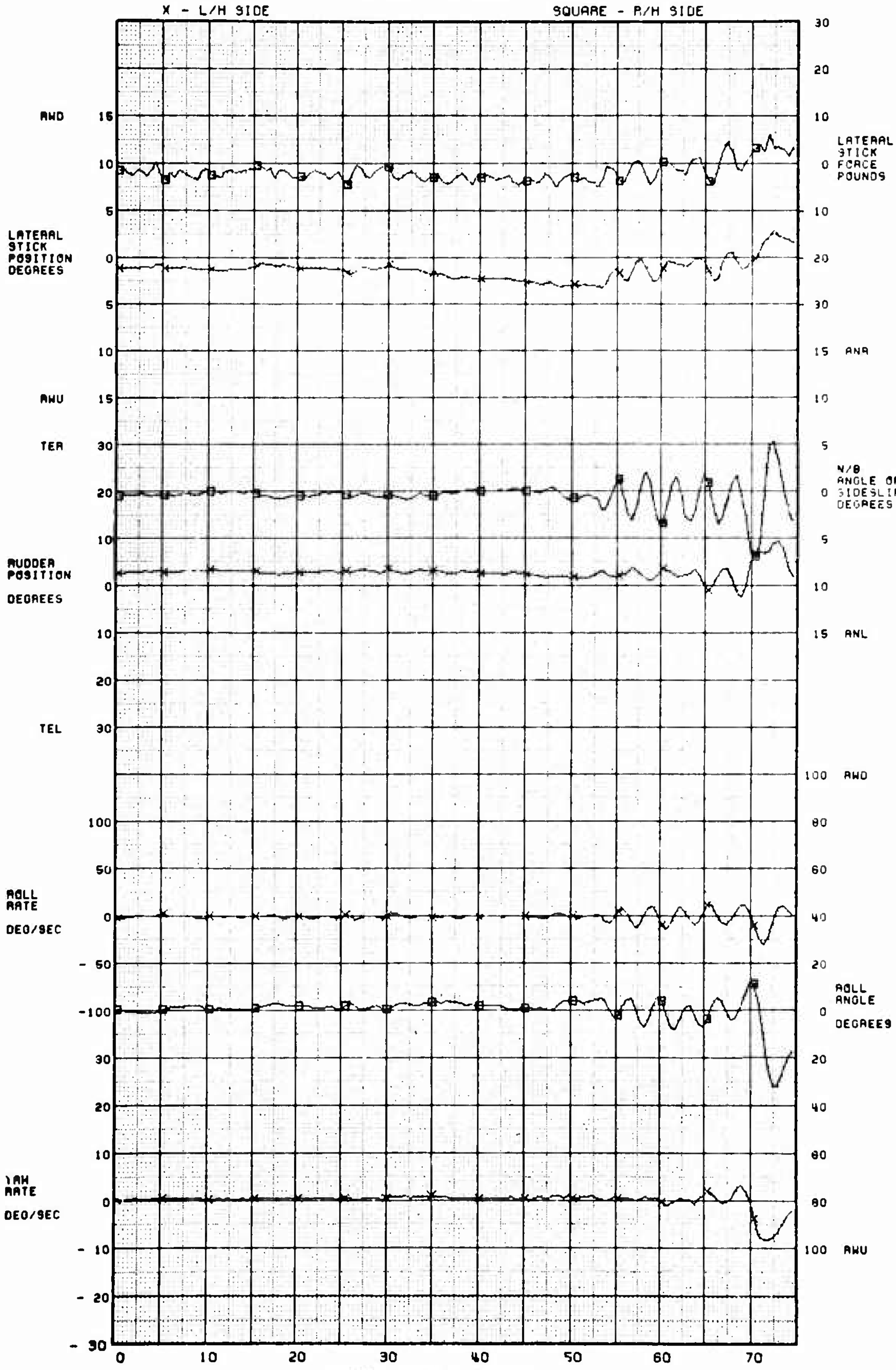


FIGURE 165 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-264 RUN 10 DATE 16 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
APPROACH TO STALL

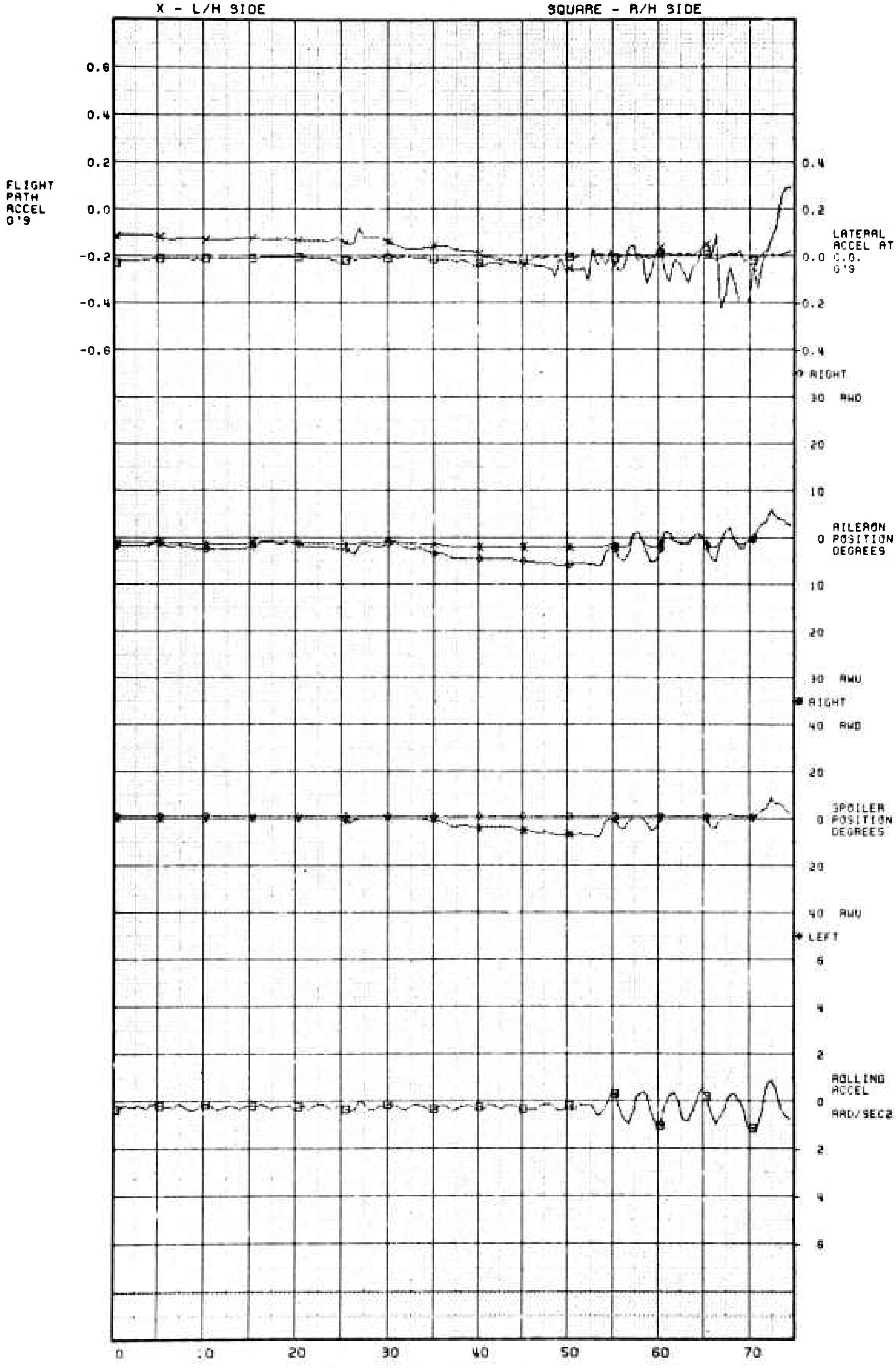


FIGURE 165 STALL APPROACH TIME HISTORY (CONCLUDED)

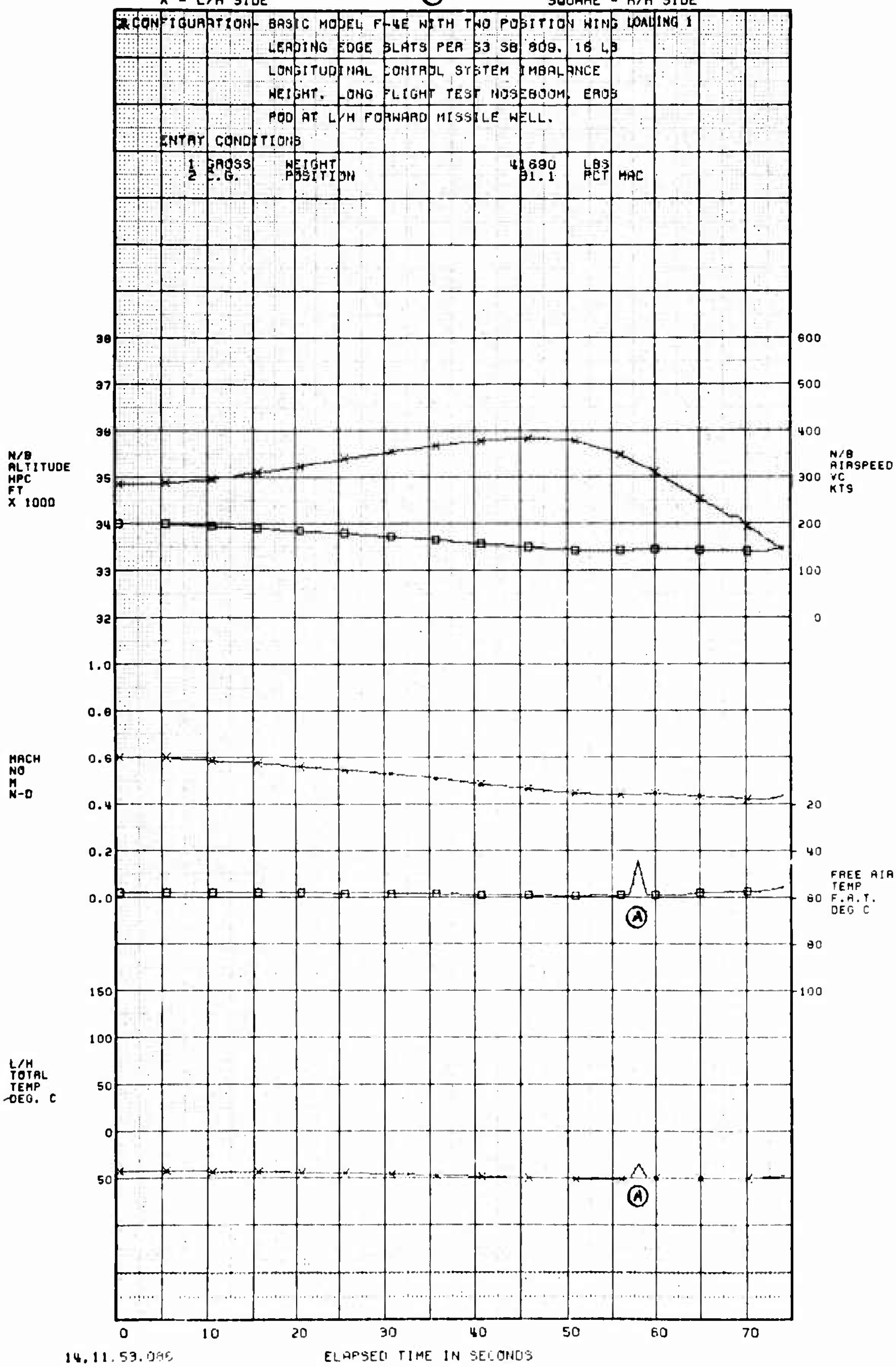
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-243 RUN 06 DATE 25 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL

X - L/H SIDE SQUARE - R/H SIDE



14.11.53.086

FIGURE 166 STALL APPROACH TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-243 RUN 06 DATE 25 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL

©

X - L/H SIDE SQUARE - R/H SIDE

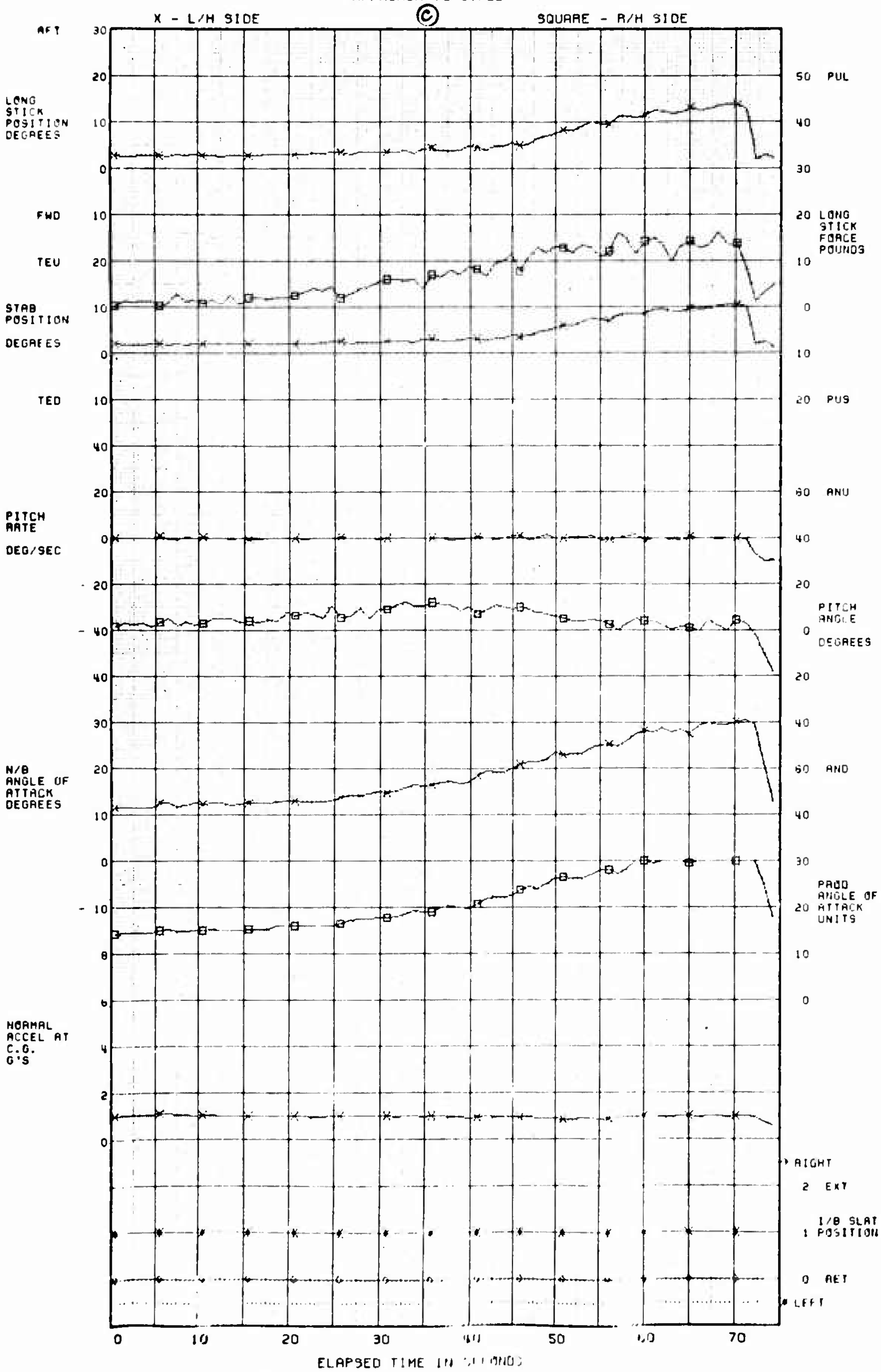


FIGURE 166 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-243 RUN 06 DATE 25 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL

©

X - L/H SIDE SQUARE - R/H SIDE

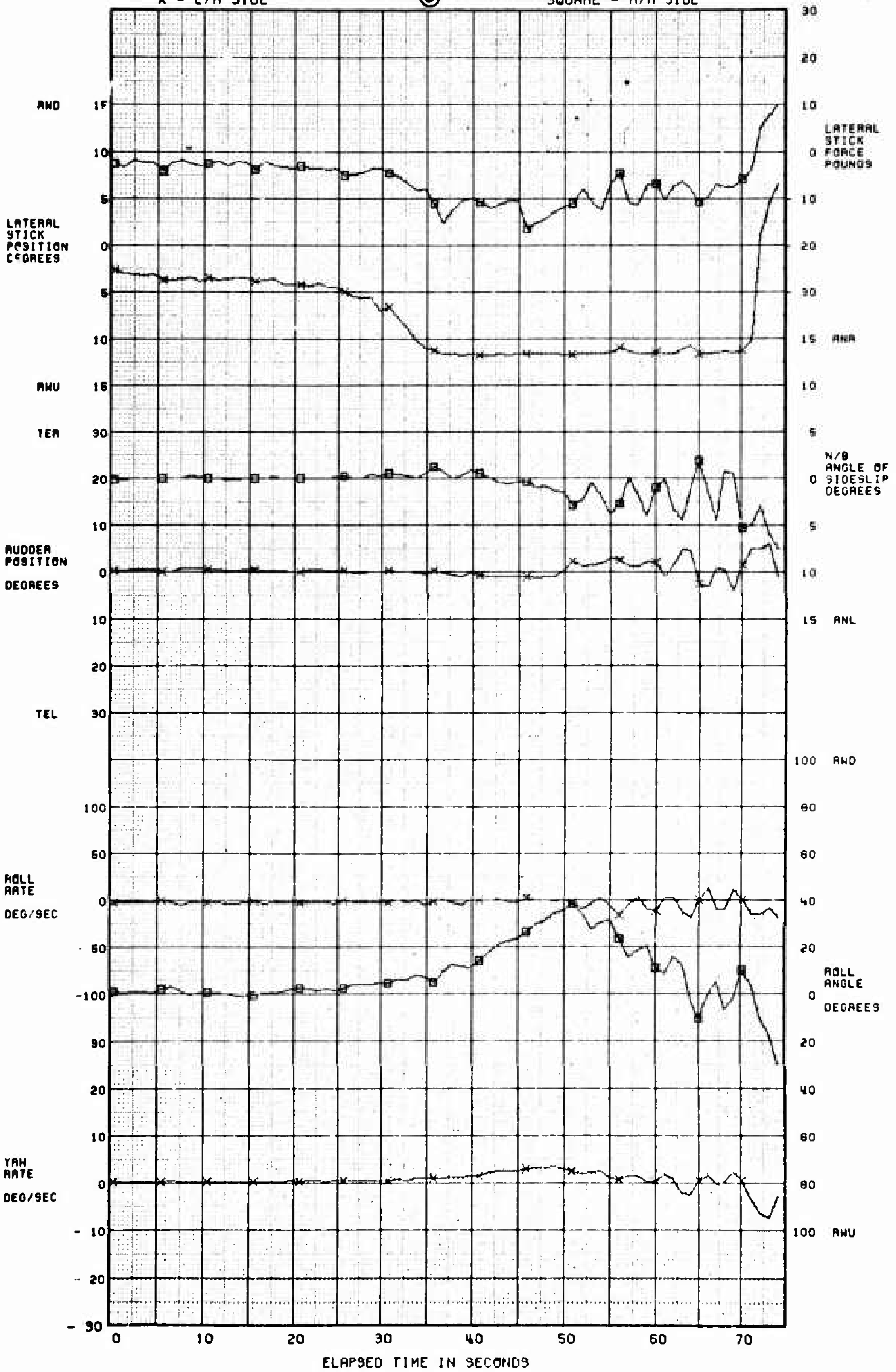


FIGURE 166 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-243 RUN 06 DATE 25 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL

©

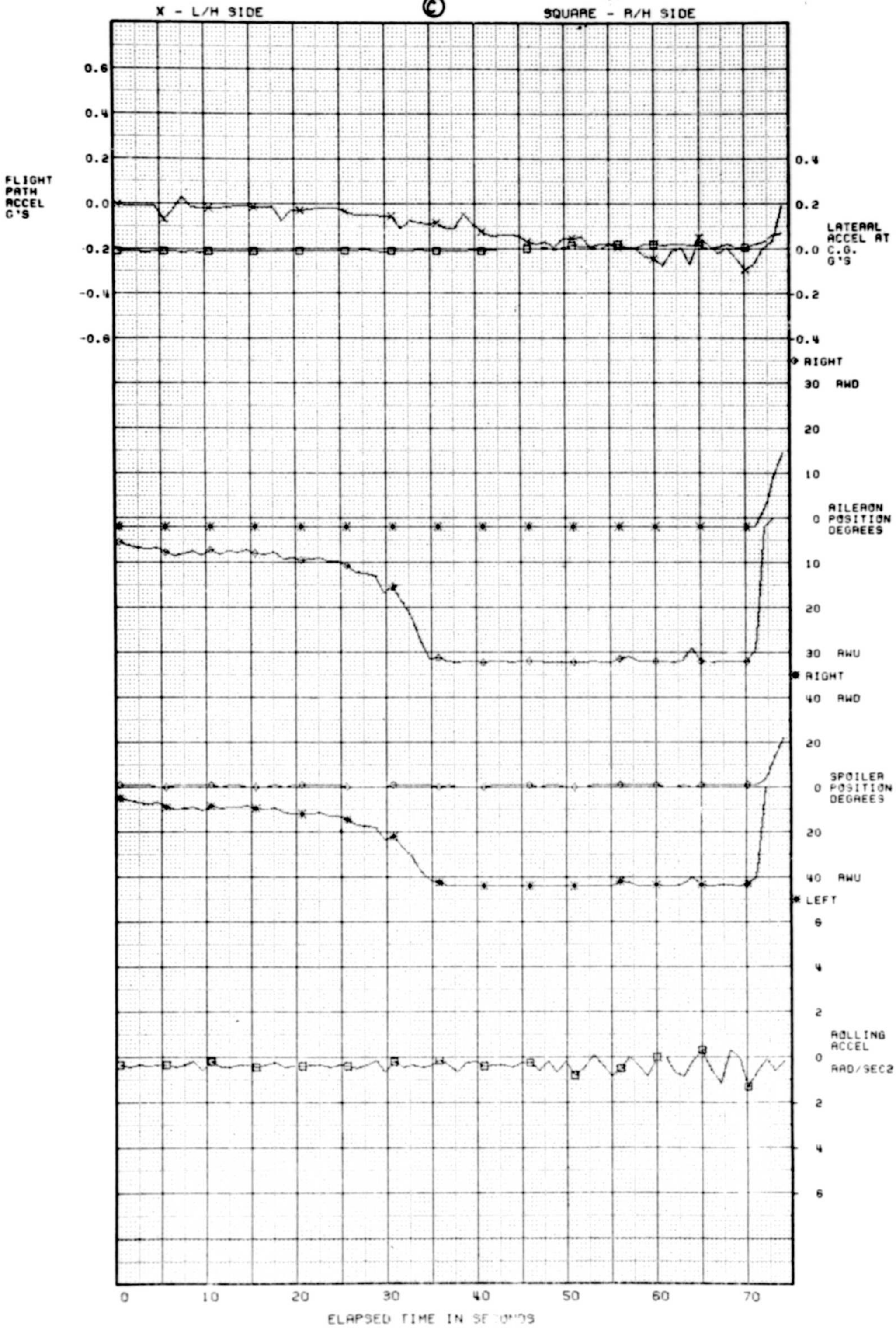


FIGURE 166 STALL APPROACH TIME HISTORY (CONCLUDED)

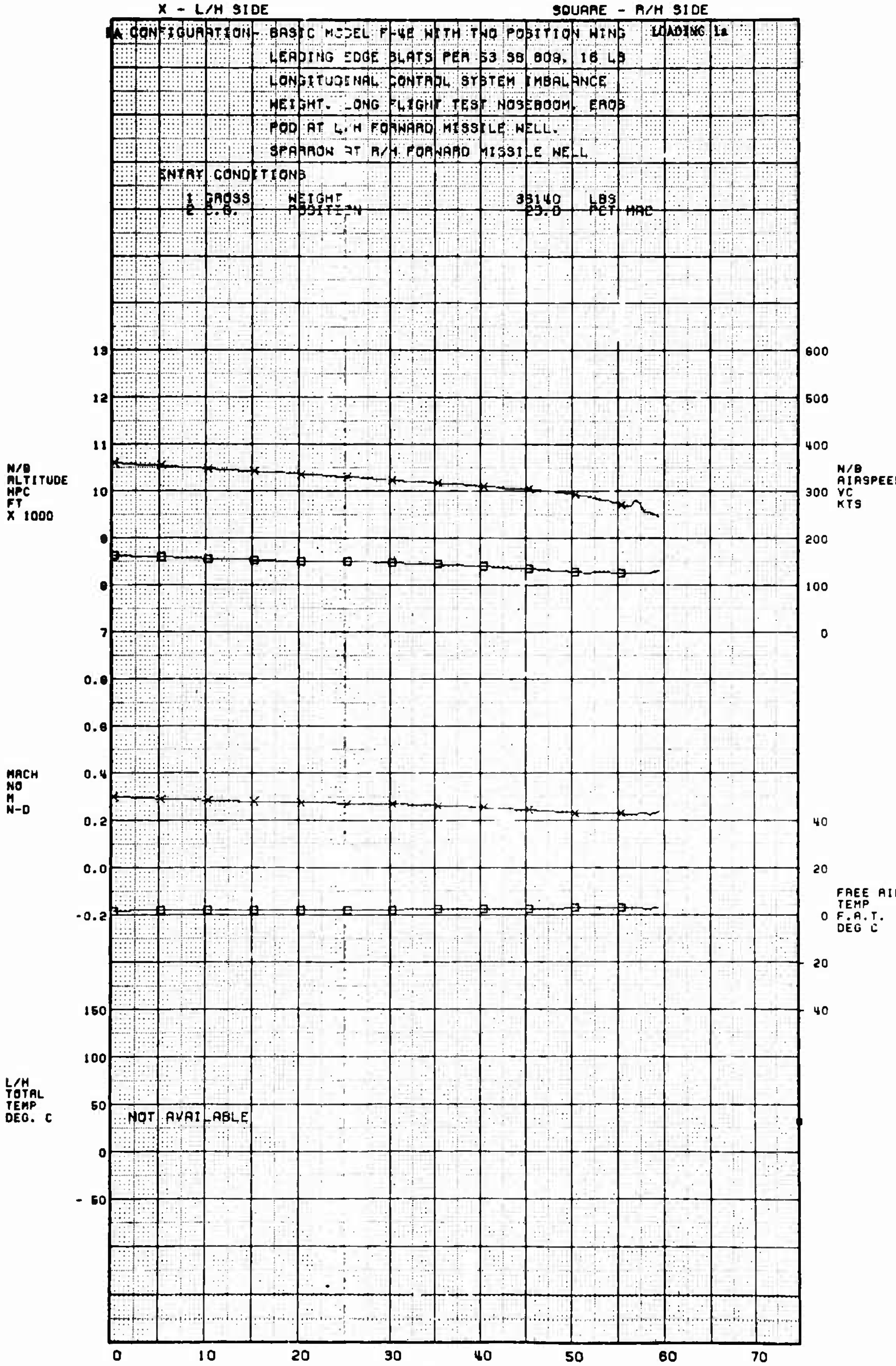
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 13 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE



18,18,49.317 ELAPSED TIME IN SECONDS

FIGURE 167 STALL APPROACH TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 13 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

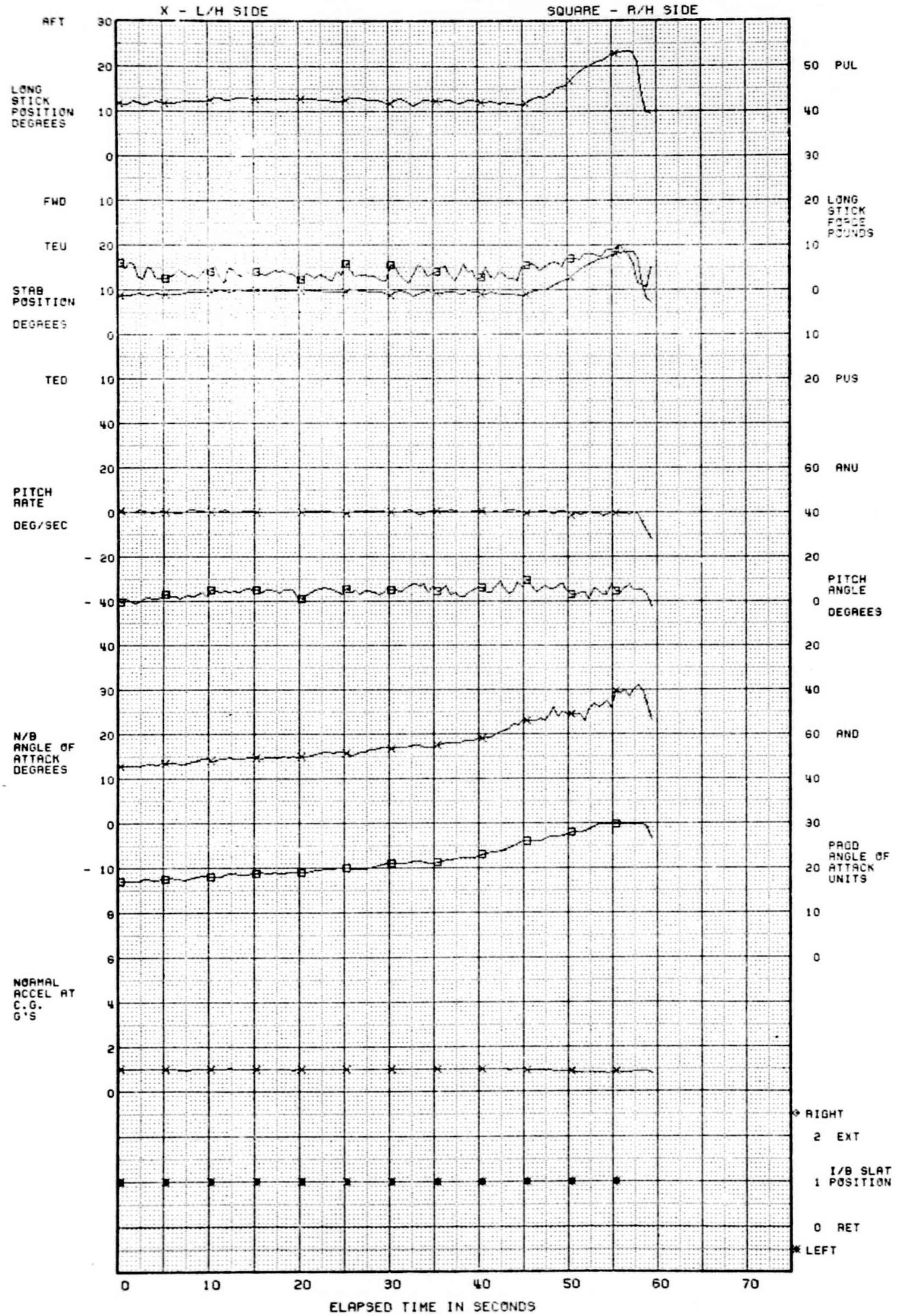


FIGURE 167 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 13 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

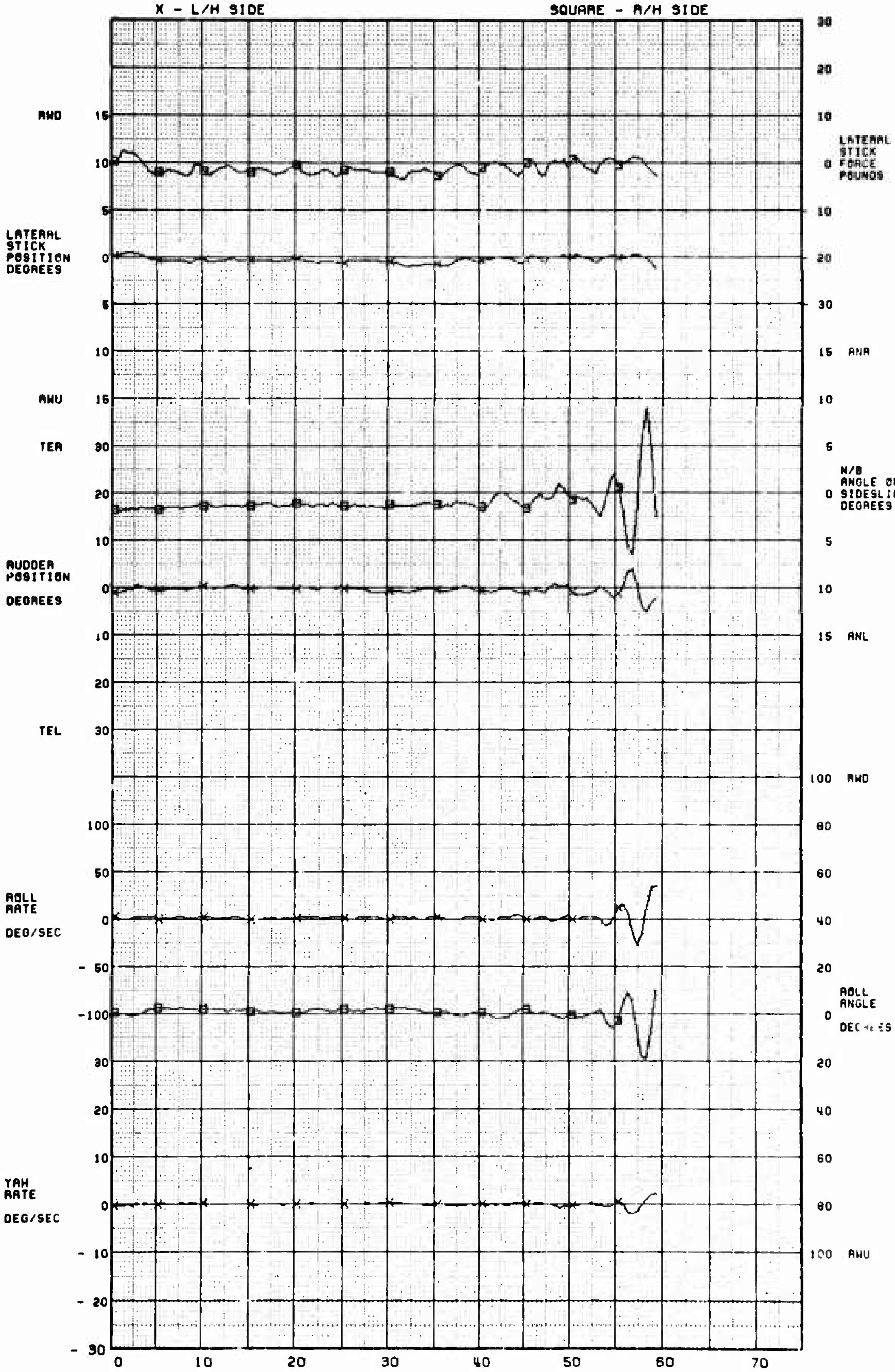


FIGURE 167 STALL APPROACH TIME HISTORY (CONTINUED)

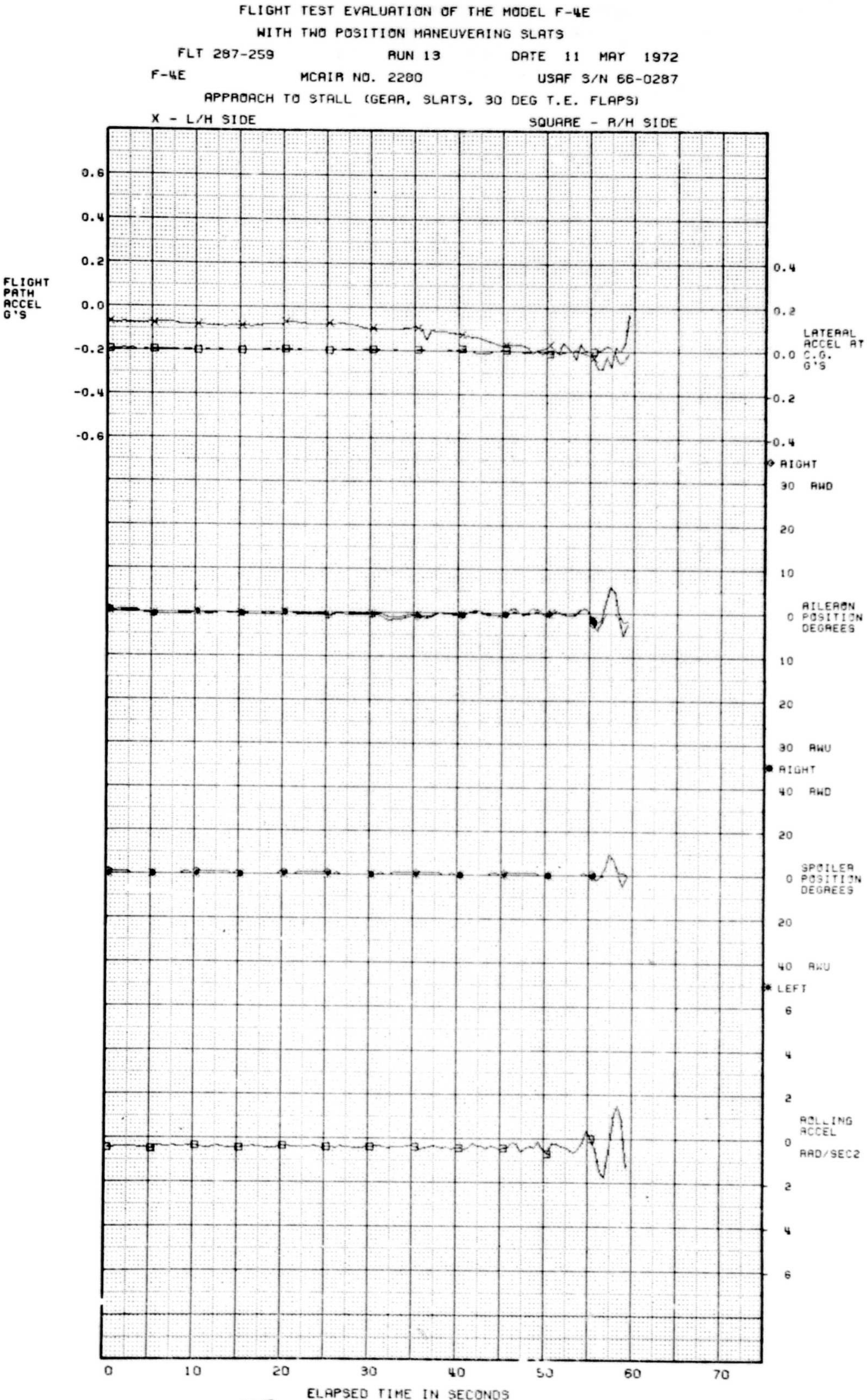


FIGURE 167 STALL APPROACH TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259　　RUN 15　　DATE 11 MAY 1972
F-4E　　MCAIR NO. 2280　　USAF S/N 66-0287
APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

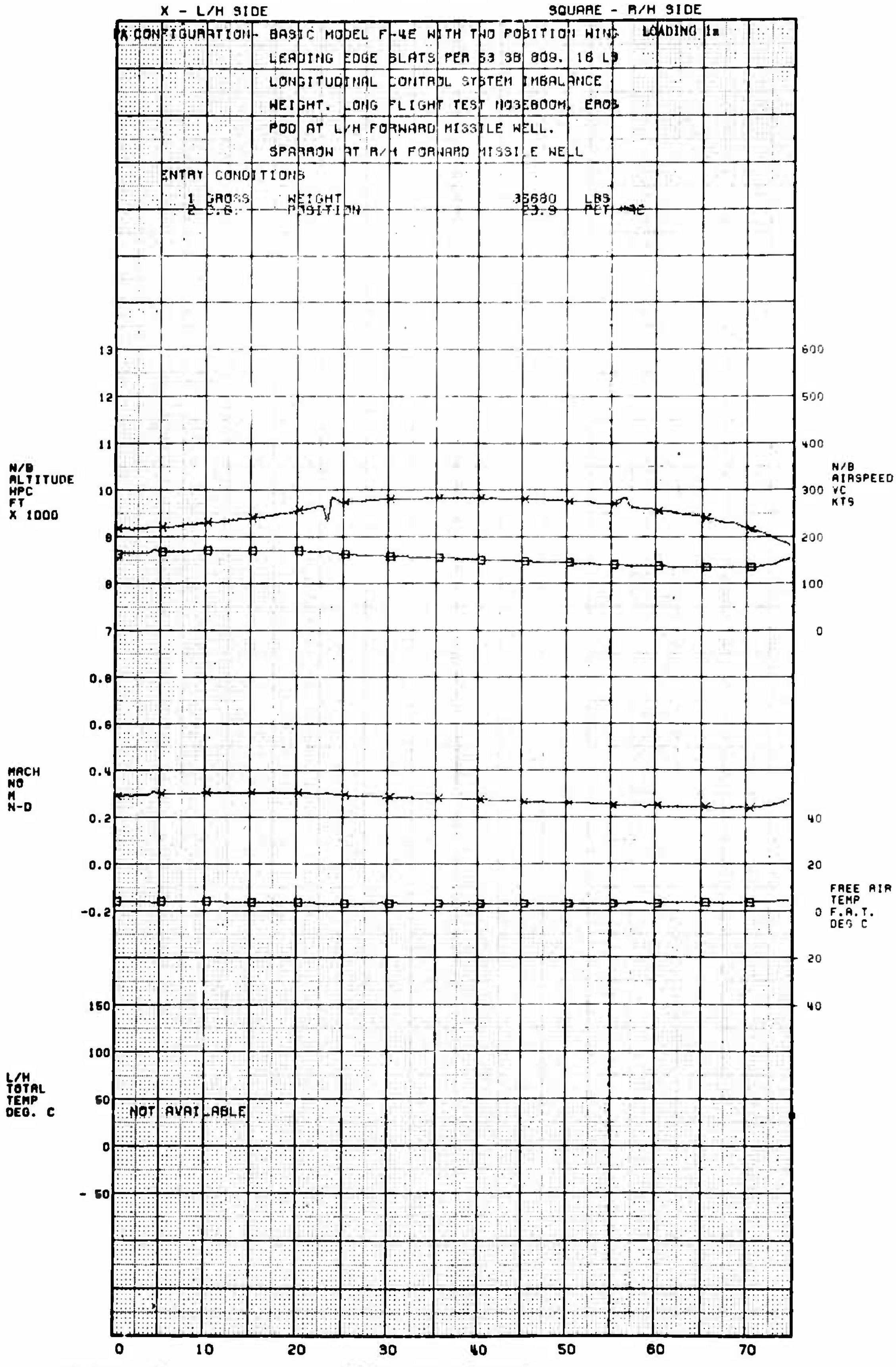


FIGURE 168 STALL APPROACH TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 15 DATE 11 MAY 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

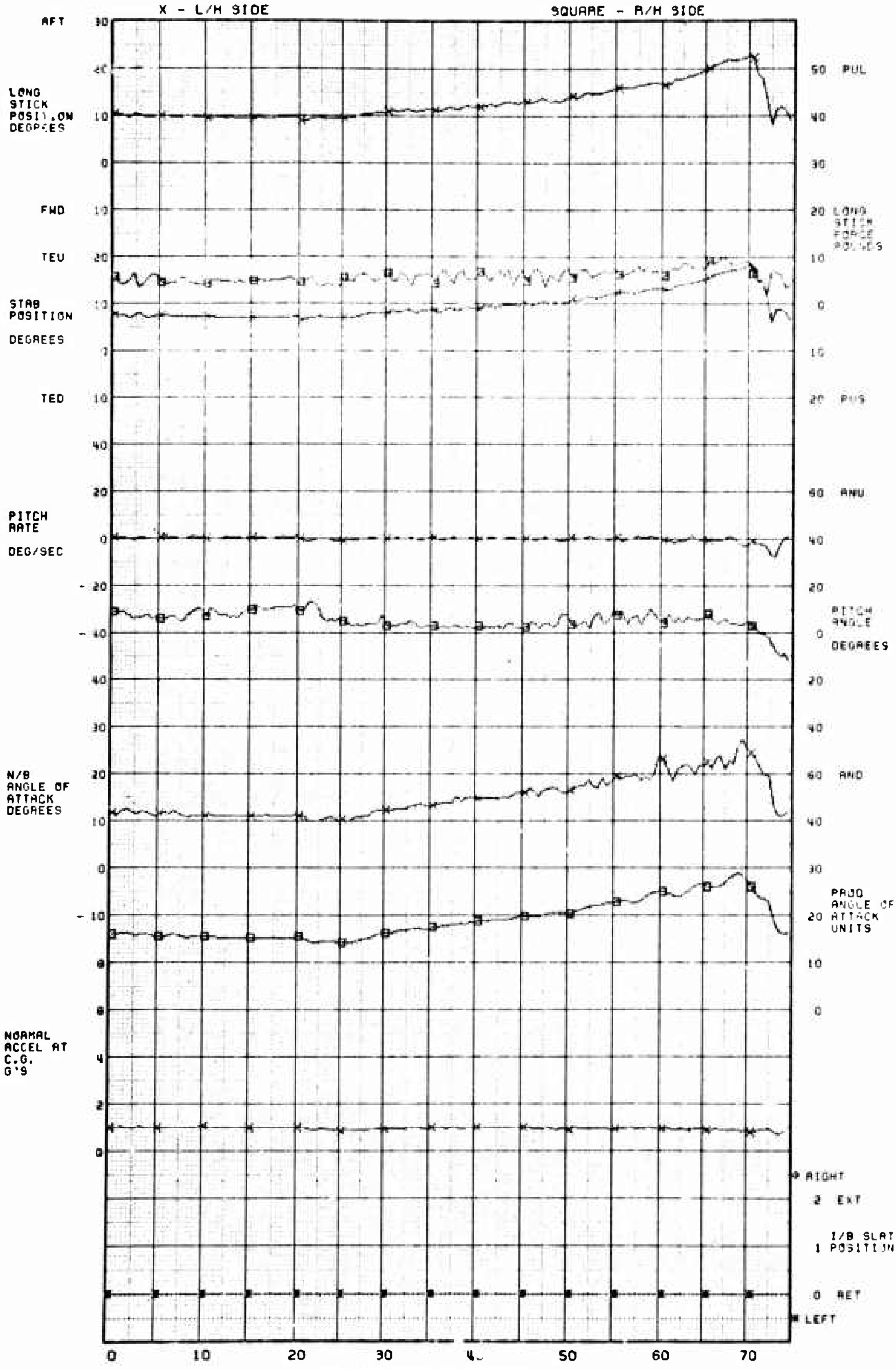


FIGURE 168 STALL APPROACH TIME HISTORY (CONTINUED)

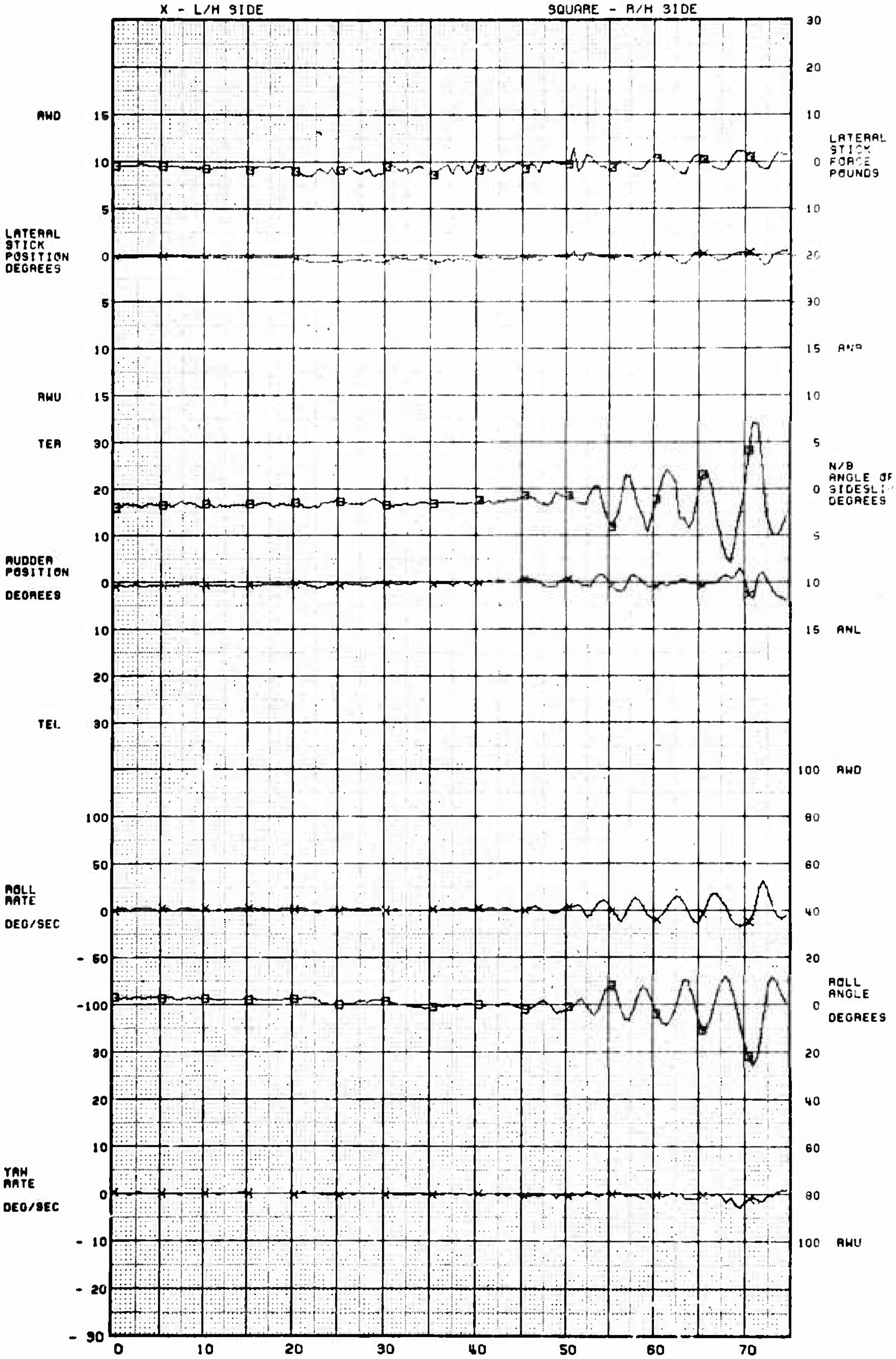
FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 15 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE



ELAPSED TIME IN SECONDS

FIGURE 168 STALL APPROACH TIME HISTORY (CONTINUED)

PAGE 04

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-259 RUN 15 DATE 11 MAY 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

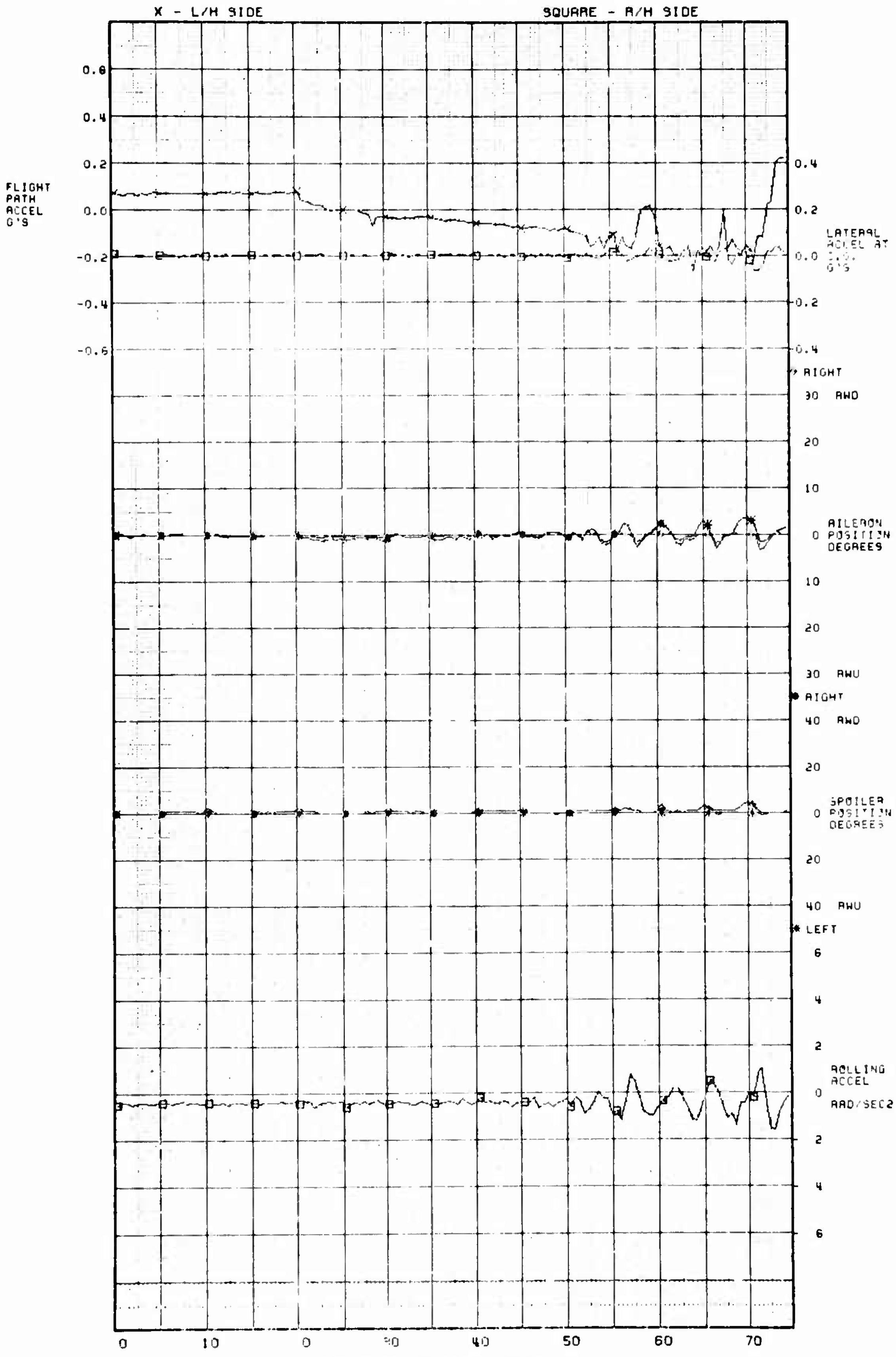


FIGURE 168 STALL APPROACH TIME HISTORY (CONCLUDED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-240 RUN 19 DATE 24 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE

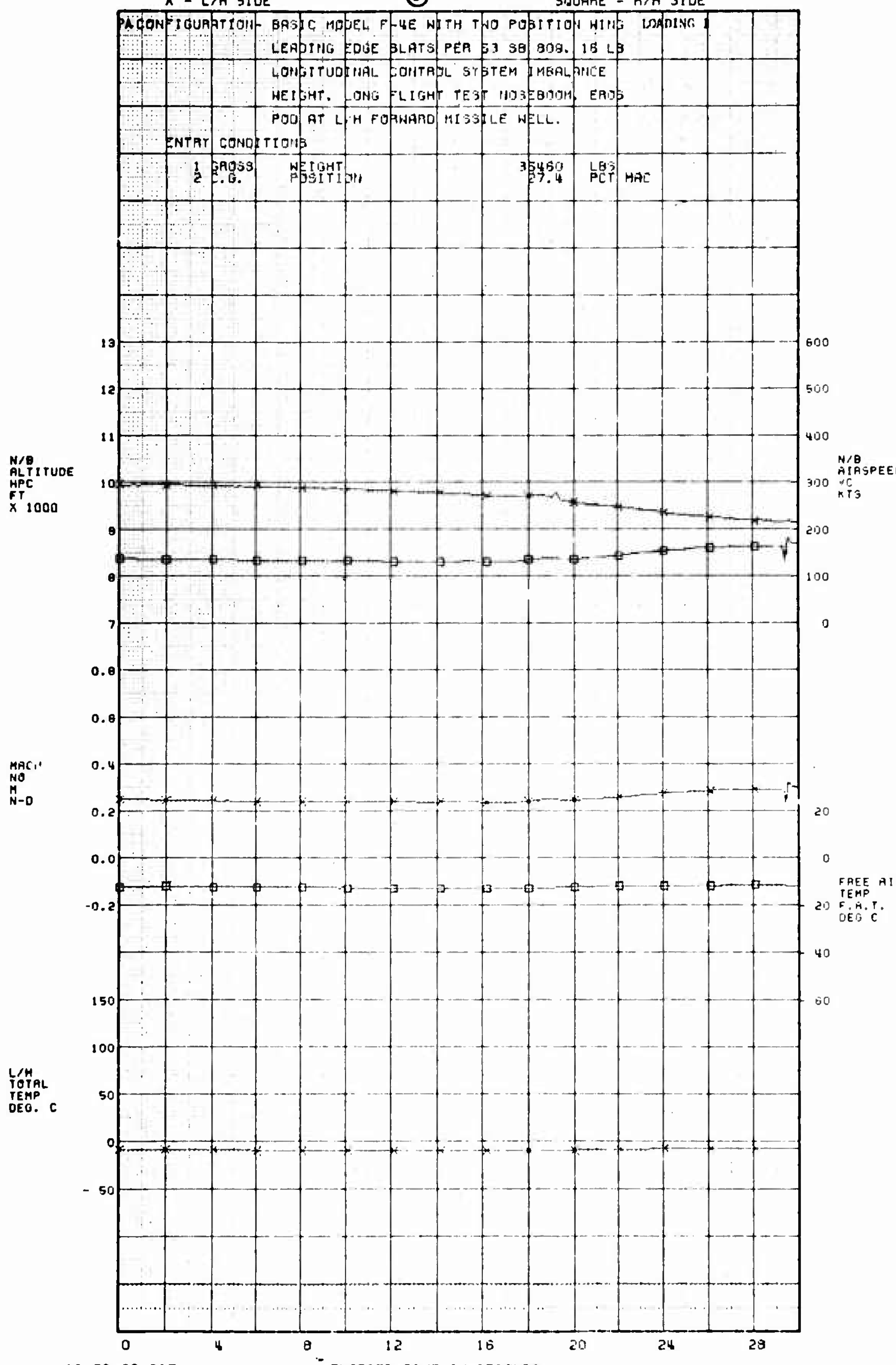


FIGURE 169 STALL APPROACH TIME HISTORY

FLIGHT TEST EVALUATION OF THE MODEL F-4E

WITH TWO POSITION MANEUVERING SLATS

FLT 287-240 RUN 19 DATE 24 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

Ⓒ

X - L/H SIDE SQUARE - R/H SIDE

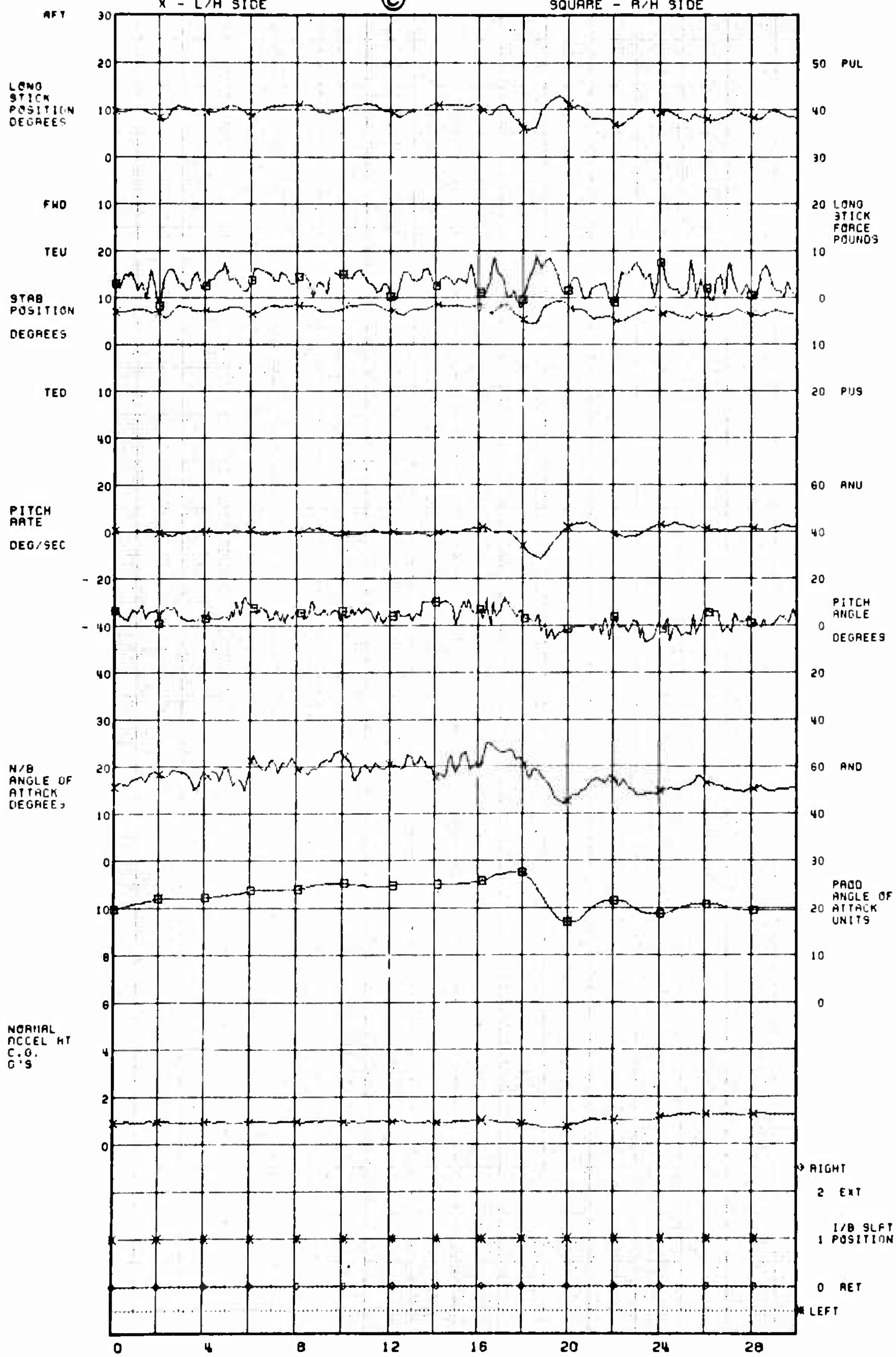


FIGURE 169 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-240 RUN 19 DATE 24 APRIL 1972

F-4E MCAIR NO. 2280 USAF S/N 66-0287

APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

X - L/H SIDE SQUARE - R/H SIDE

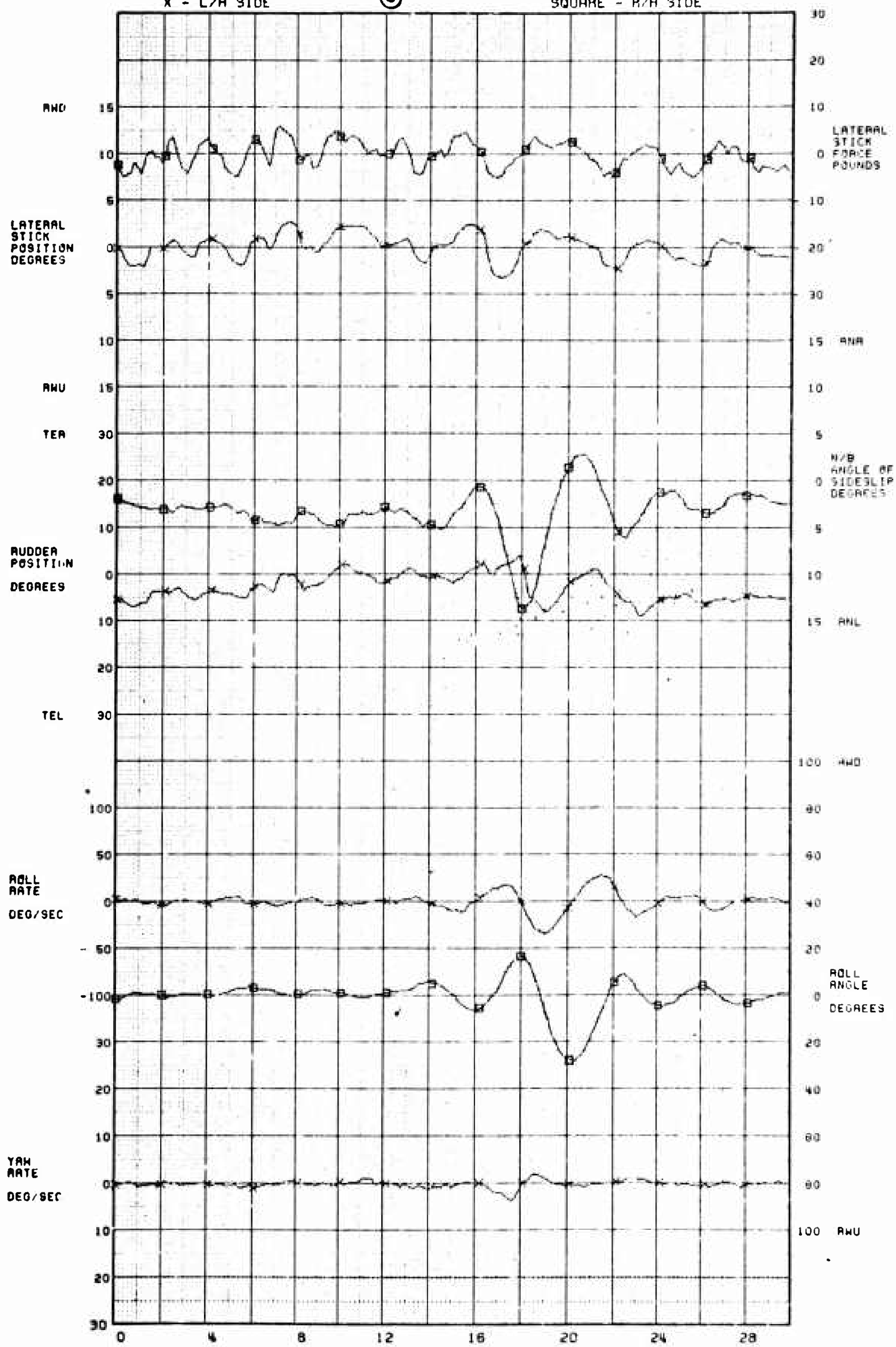


FIGURE 169 STALL APPROACH TIME HISTORY (CONTINUED)

FLIGHT TEST EVALUATION OF THE MODEL F-4E
WITH TWO POSITION MANEUVERING SLATS

FLT 287-240 RUN 19 DATE 24 APRIL 1972
F-4E MCAIR NO. 2280 USAF S/N 66-0287
APPROACH TO STALL (GEAR, SLATS, 30 DEG T.E. FLAPS)

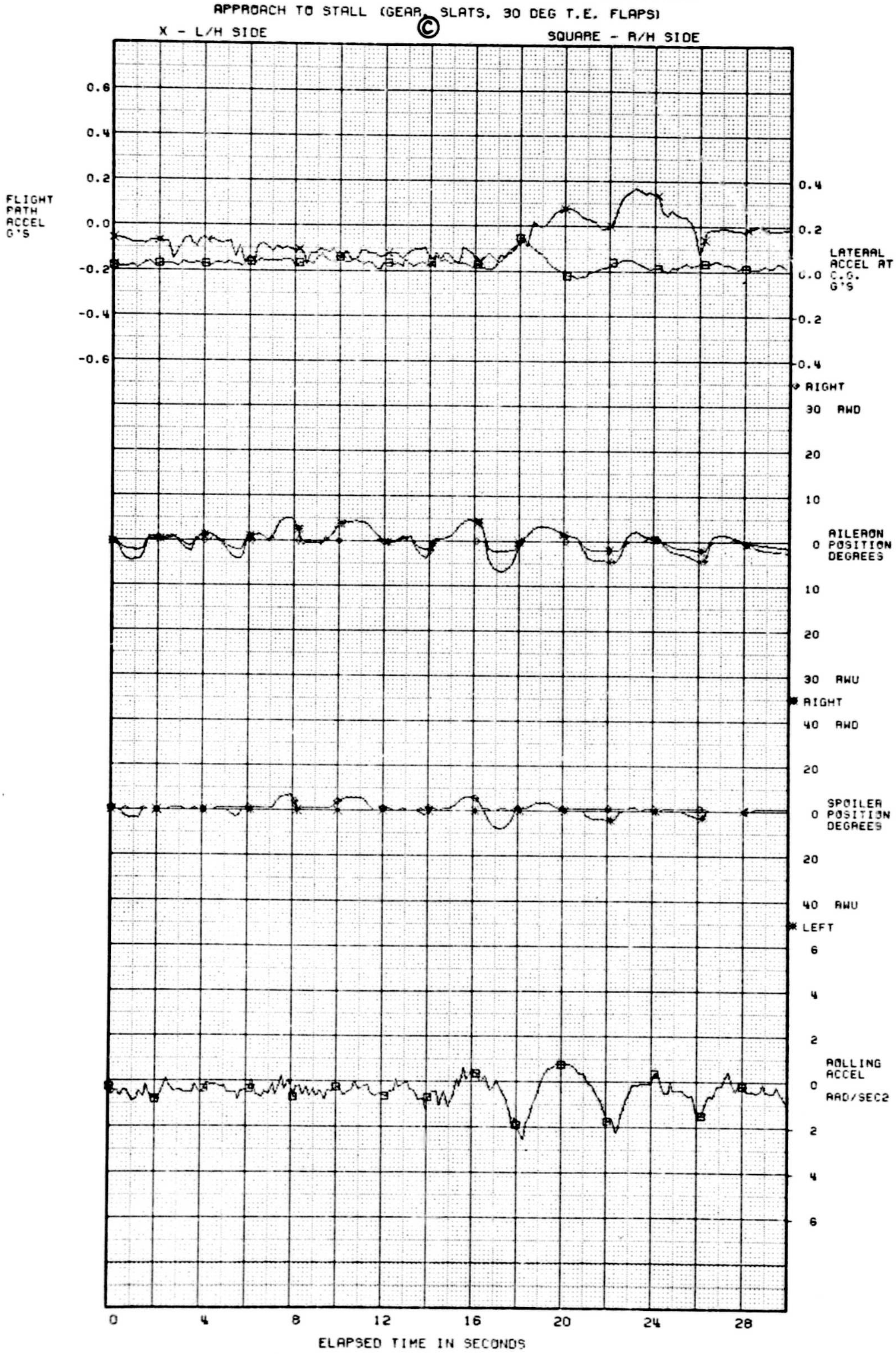


FIGURE 169 STALL APPROACH TIME HISTORY (CONCLUDED)

F-4E USAF S/N 66-287A

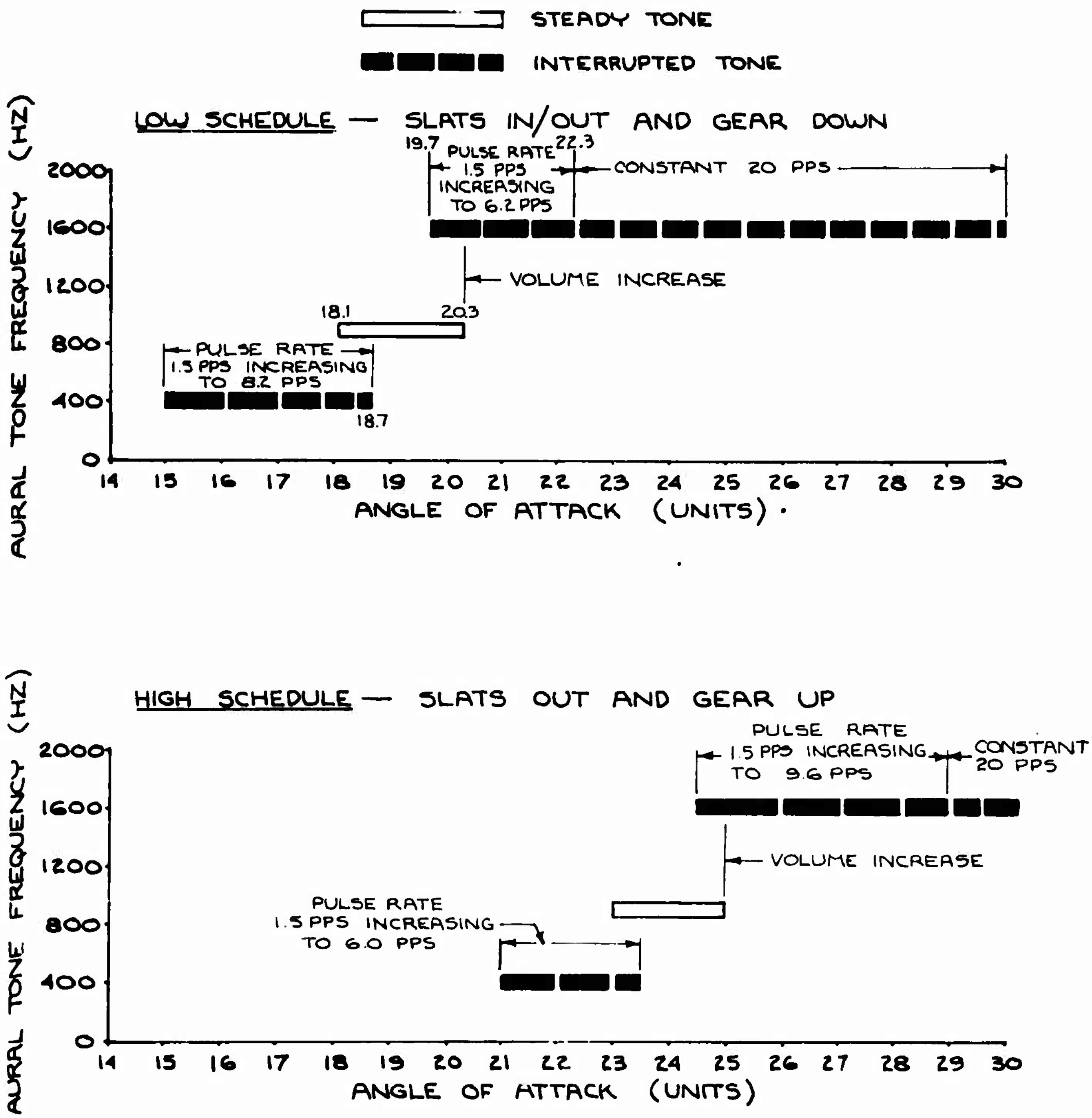


FIGURE 170 ANGLE OF ATTACK AURAL TONE INDICATIONS

F-4E USAF S/N 66-287A

LOADING : 1 NO EXTERNAL STORES — CR CONFIGURATION

SYMBOL	ALTITUDE (FT)	GROSS WT (LB)	CG POSITION (PCT MAC)	SLAT POSITIONS LEFT	SLAT POSITIONS RIGHT
▽	34,900	41,700	31.1	EXT	RET
O	36,100	41,100	30.7	RET	EXT

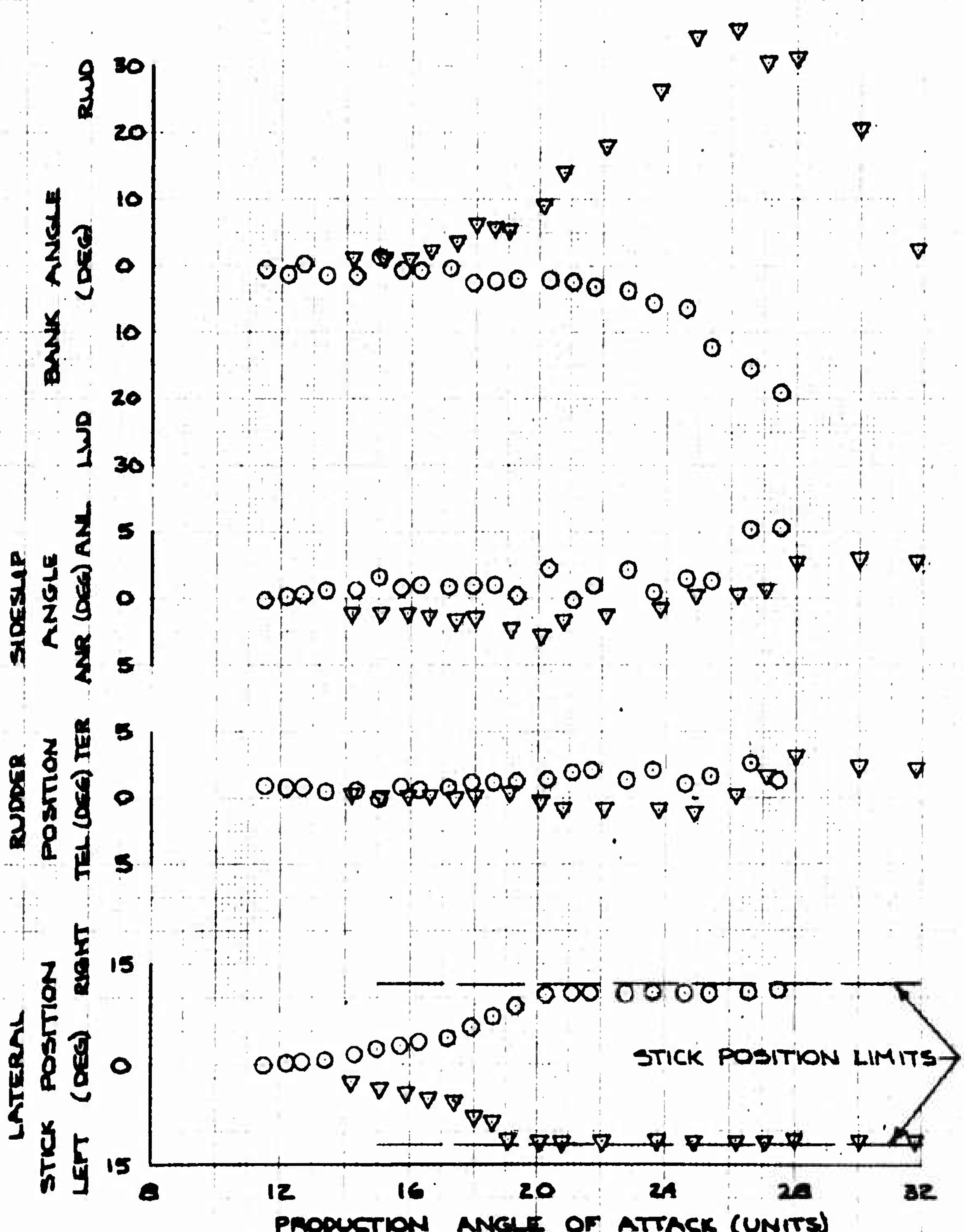


FIGURE 171 ASYMMETRIC SLAT CONTROL REQUIREMENTS

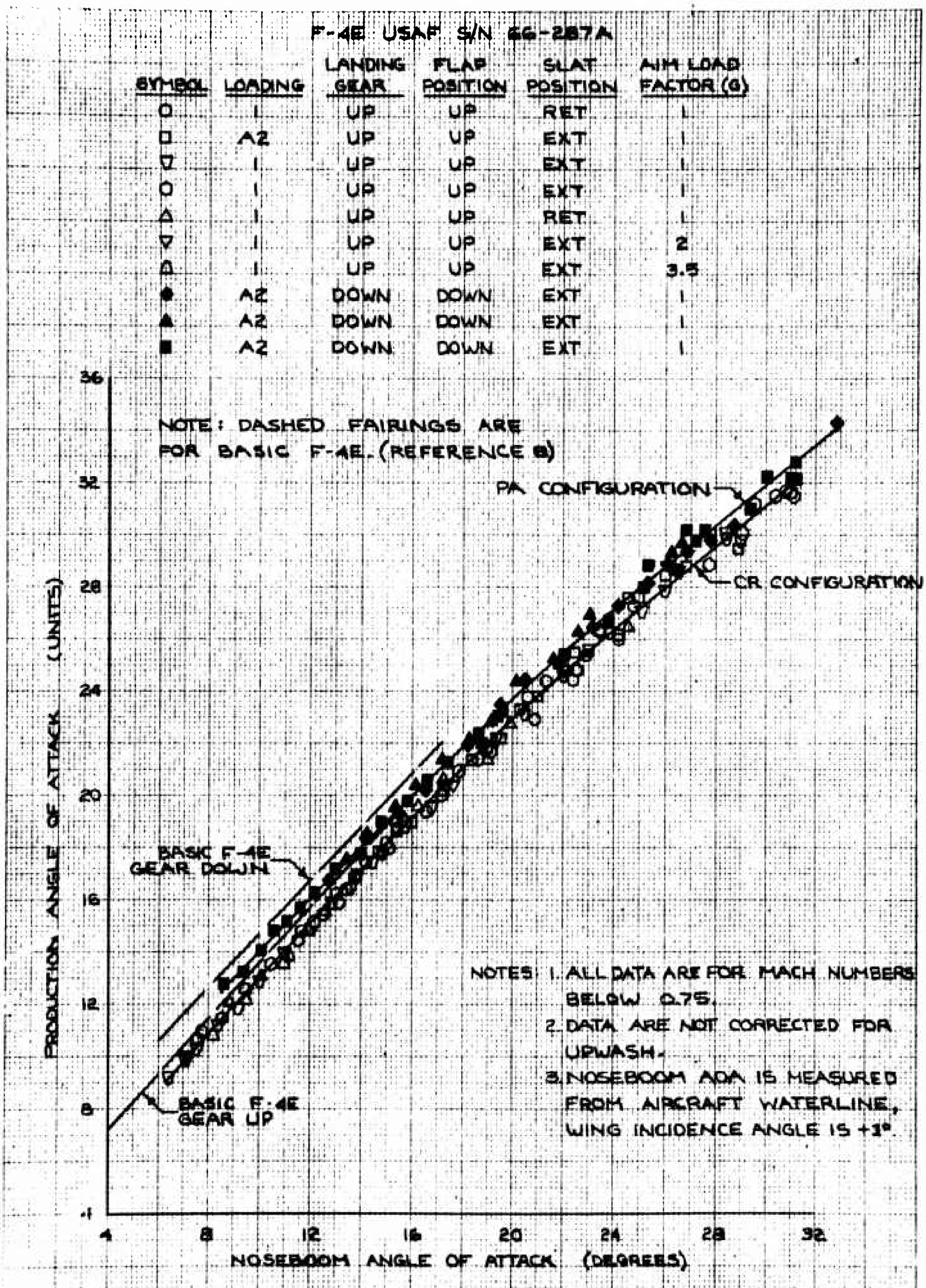


FIGURE 172 PRODUCTION AOA VERSUS NOSEBOOM AOA

APPENDIX II
TEST INSTRUMENTATION AND FLIGHT LOG

TEST INSTRUMENTATION

Test instrumentation used on F-4E, USAF S/N 66-287A, was designed, installed and maintained by MDC. Special instrumentation included a test noseboom, a 14-track magnetic tape airborne data recording system, and a UHF telemetry system.

The test noseboom system was installed on the radome (figure 11). This included a Rosemount noncompensated pitot-static probe, angle of attack and angle of sideslip vanes, and a vane for the Donner dual-axis flightpath accelerometer.

An Ampex magnetic tape recording system was installed in the radome in place of the production radar package. Data was recorded on a 14-track magnetic tape recorder utilizing a pulse duration modulation (PDM) system which incorporates two multicoders and a proportional multiplex (FM-FM) system. Operation speeds for the Ampex tape system could vary from 60 inches per second to 1.875 inches per second. During this test program only 15 inches per second was used. The data recording system was operated from either the front or the aft cockpit.

The test aircraft was also equipped with a UHF telemetry system for real time monitoring of critical parameters and inflight data edition.

Parameter	Range	Units
Altitude (noseboom)	-1K to 60K	feet
Airspeed (noseboom)	80 to 800	knots
Angle of attack (production)	+5 to +35	units
Angle of attack (noseboom)	-10 to +40	degrees
Pitch angle	-40 to +40	degrees
Roll angle	-185 to +185	degrees
Pitch rate	-40 to +40	degrees/sec
Roll rate	-300 to +300	degrees/sec
Total air temperature (noseboom)	-50 to +200	degrees C
Total air temperature (fuselage installation	-50 to +200	degrees C
Yaw angle	-15 to +15	degrees
Yaw rate	-60 to +60	degrees/sec
Normal acceleration at cg	-3.5 to +10	g
Longitudinal acceleration at cg	-1.0 to +1.0	g
Lateral acceleration at cg	-0.5 to +0.5	g

Parameter	Range	Units
Flightpath acceleration	-0.6 to +0.6	g
Pitch acceleration	-1.0 tc +1.0	radian/sec^2
Roll acceleration	-6.0 to +6.0	radian/sec^2
Yaw acceleration	-1.0 to +1.0	radian/sec^2
Nosegear liftoff accelerometer	Uncalibrated	- - -
Stabilator position	10 LEU to 22 LED	degrees
Rudder position	-30 to +30	degrees
Aileron position (left and right)	-30 to +1	degrees
Spoiler position (left and right inboard)	0 to +45	degrees
Inboard slat position (left and right)	retracted - extended	- - -
Outboard slat position (left and right)	retracted - extended	- - -
Longitudinal stick force	-25 to +75	pounds
Slat/flap control switch position	norm-extend-retract	- - -
Longitudinal stick force	-25 tc +75	pounds
Lateral stick position	-12 to +12	degrees
rpm (left and right)	65 to 110	percent
Exhaust gas temperature	0 tc 1,200	degrees C
Main engine fuel flow (left and right)	720 to 15,000	pounds/hour
Main engine fuel flow temperature (left and right)	-50 to +150	degrees C
A/B core fuel flow (left and right)	2K to 16.9K	pounds/hour
A/B annulus fuel flow (left and right)	2K to 25.0K	pounds/hour
Total fuel quantity (production)	0 to 100	percent
Individual tank fuel quantities, tanks 1 to 7	0 to 100	percent
Record number	- - -	units, tens
Pilot's voice (T/M only)	- - -	- - -

FLIGHT LOG

F-4E USAF S/N 66-287A

Flight Number	Date (1972)	Takeoff (hr)	Duration (hr+min)	Tests Accomplished
228	30 Mar	0940	1+35	Manual and auto slat cycles were performed. Wind-up turns (WUT's) at 0.9 Mach and 35,000 ft, thrust-limited MIL power turns at 20,000 ft, stall approaches to 30 units AOA at 35,000 ft and 30,000 ft were conducted. No external stores.
229	4 Apr	1000	1+05	Max A/B turning performance tests were conducted at 35,000 ft at 1.5, 2.5, and 3.0 g's. Stabilized turns were also performed at 20,000 ft and 2.0 g's. No external stores.
230	4 Apr	1610	0+40	Max A/B turning performance tests were conducted at 20,000 ft with the slats extended and retracted. No external stores.
231	5 Apr	0915	0+35	Mil and max A/B turning performance tests were conducted at 10,000 ft with the slats extended and retracted. Stall approach was conducted at 18,000 ft. No external stores.
232	5 Apr	1230	1+05	Mil and max A/B turning performance tests were conducted at 35,000 ft with the slats extended and retracted. Stall approach was conducted at 18,000 ft. no external stores.
233	5 Apr	1530	0+50	Mil and max A/B turning performance tests were conducted with slats in and out at 20,000 ft, followed by left and right rolls in PA and cruise at 10,000 ft. No external stores.
234	6 Apr	1140	1+25	Static and dynamic longitudinal stability tests were conducted at 10,000 and 35,000 ft, SAS on and SAS off, followed by aileron and rudder rolls at 10,000 and 35,000 ft. External loading: two 370-gallon wing tanks, two MAU-12 pylons, one TER on each pylon, and four LAU-10 rocket pods without end cones on the TER shoulder stations.
235	6 Apr	1600	1+20	WUT's, stalls, and roll performance tests at 35,000 ft. Rolls in cruise and PA, and PA stalls at 10,000 ft. External loading: two 370-gallon external wing tanks, right tank half full and left tank empty. Stability index number = 59.6.
236	17 Apr	1440	0+50	Military thrust accelerations at 40,000 ft, slats in and out. Max A/B acceleration at 40,000 ft to 2.1 Mach. No external stores.
237	18 Apr	0720	1+24	Tower fly-bys in PA configuration. No external stores.
238	18 Apr	1320	1+50	Cruise performance tests at 190,000 W/δ and approximately 35,000 ft with no external stores. PA trim was flown at 10,000 ft.
239	21 Apr	1200	1+15	Qualitative flying qualities with asymmetric slat conditions. No external stores.
240	24 Apr	1000	1+15	Mil and max A/B accelerations, WUT's, roll performance tests and stall approaches in PA configuration at 35,000, 20,000, and 10,000 ft, with asymmetric slat conditions. No external stores.
241	24 Apr	1400	1+20	Static longitudinal stability and slat transient check at 10,000 ft. Turning performance test at 35,000 ft. Stall approaches at 35,000, 20,000 and 10,000 ft. No external stores. First AFFTC participation flight.

Flight Number	Date (1972)	Takeoff (hr)	Duration (hr+min)	Tests Accomplished
242	25 Apr	1200	1+20	Static and dynamic longitudinal stability evaluated at 10,000 and 35,000 ft. Lateral control effectiveness was evaluated and WUT's were conducted at 35,000 ft. Stall approaches were performed clean and in PA configuration at 35,000 and 10,000 ft, respectively. External loading: two 370-gallon wing tanks, two MAU-12 pylons, one TER on each pylon, and four LAU-10 rocket pods without end cones on the TER shoulder stations.
243	25 Apr	1600	1+30	Asymmetric slat handling qualities evaluated at 35,000 ft. WUT's were performed at 35,000 ft with the asymmetric slat condition. The PA trim curve was recorded with slats retracted, gear and flaps down. Touch-and-go landings were performed at Scott AFB in various combinations of slat/flap failure conditions. No external stores.
244	26 Apr	0900	1+20	TAC two-position slat evaluation flight. No external stores.
245	26 Apr	1300	1+05	TAC two-position slat evaluation flight. No external stores.
246	26 Apr	1630	0+45	Mil and max A/B accelerations at 40,000 ft were conducted with a decelerating turn. Stall approach at 35,000 ft to 30 units AOA. Air-to-air tracking was evaluated during descent from 35,000 ft. No external stores.
247	27 Apr	0930	1+00	Mil and max A/B accelerations 36,000 ft were conducted with a decelerating turn. Slats out PA trim curve was established at 10,000 ft. No external stores.
248	1 May	0900	0+55	Max A/B turning performance test was conducted at 20,000 ft. Asymmetric slat stall approach at 20,000 ft. No external stores.
249	1 May	1300	0+50	Max A/B acceleration and max A/B turning performance test conducted at 35,000 ft. No external stores.
250	1 May	1630	0+50	Max A/B acceleration and max A/B turning performance test conducted at 35,000 ft. No external stores.
251	2 May	0950	0+55	Max A/B accelerations and max A/B subsonic turning performance tests conducted at 20,000 ft. Roll performance test was also conducted in PA configuration at 10,000 ft. No external stores.
252	2 May	1330	0+55	Max A/B accelerations and turning performance tests were conducted at 35,000 ft. A WUT was performed at 18,000 ft. PA sideslip data, SAS on and off were obtained at 10,000 ft. No external stores.
253	2 May	1630	1+20	Military thrust accelerations and turning performance test were conducted at 20,000 ft. Pitch doublets were performed in PA configuration with SAS off at 10,000 ft. No external stores.
254	9 May	0940	0+55	Military thrust and max A/B accelerations were performed at 36,000 ft with a decelerating turn starting at Mach 2.1. Cruise trim curve was established at 10,000 ft. No external stores.
255	9 May	1400	0+50	Accelerations were performed with military thrust at 25,000 ft and max A/B at 36,000 ft. Static and dynamic longitudinal stability tests, SAS on and off, were conducted at 10,000 ft. No external stores.
256	10 May	0740	1+20	Cruise performance was conducted at 50,000 W/δ, with slat switch in NORM. Sideslips were also performed in PA at 8,000 ft, with SAS on and off. No external stores.

Flight Number	Date (1972)	Takeoff (hr)	Duration (hr+min)	Tests Accomplished
257	10 May	1230	1+10	Military thrust acceleration was performed at 10,000 ft. Static and dynamic longitudinal stability tests were conducted at 35,000 ft, SAS on and off. WUT's were also performed at 35,000 ft. No external stores.
258	10 May	1530	0+45	Max A/B supersonic turning performance tests conducted at 35,000 ft. PA trim curve was also established at 10,000 ft. No external stores.
259	11 May	0900	1+05	Military thrust climb to 35,000 ft, with static and dynamic longitudinal stability tests conducted at 35,000 ft, SAS on and off. Static and dynamic longitudinal stability tests also conducted at 10,000 ft. No external stores, with ballast for forward cg.
260	11 May	1230	0+50	Military thrust climb to 36,000 ft followed by a max A/B acceleration and a supersonic climb to 50,000 ft. A max A/B subsonic climb from 36,000 ft to 50,000 ft was also performed. Stall approaches in PA were performed at 10,000 ft. No external stores.
261	11 May	1530	0+55	Military thrust climb to 36,000 ft. Rudder rolls and aileron rolls were performed at 35,000 ft. AIM-7 missiles in forward stations and gun bay ballast. (Loading 1a)
262	12 May	1000	1+05	Military thrust climb to 36,500 feet was performed. WUT's and roll performance tests were also conducted at 10,000 ft. AIM-7 missiles in forward station and gun bay ballast. (Loading 1a)
263	12 May	1340	0+55	Military thrust climb to 36,000 ft with WUT's, subsonic and supersonic, at 36,000 ft. Roll performance tests and stall approaches were performed at 35,000 ft. Air-to-ground tracking during descent. No external stores.
264	15 May	1520	0+55	Maximum A/B takeoff was performed followed by a military thrust climb to 36,000 ft. WUT's, roll performance tests and stall approaches were conducted between 36,000 and 32,000 ft. Air-to-ground tracking was also accomplished prior to landing. No external stores.
265	16 May	0935	1+00	Maximum A/B takeoff followed by a military thrust climb to 35,000 ft performed. WUT's at 35,000 and 12,000 ft were also conducted. No external stores.
266	16 May	1420	0+35	Military thrust takeoff was performed followed by a military thrust climb to 36,000 ft. Supersonic maximum A/B thrust turning performance test was performed at 36,000 ft. Cruise and power approach stall approaches were accomplished. No external stores. (Flow divider removed and right wing slat restrictor installed to force slats to extend and retract at different rates.)
267	17 May	0900	0+45	A maximum A/B thrust takeoff was performed followed by a military thrust climb to 35,000 ft. Supersonic and subsonic turn performance tests were conducted at 35,000 and 20,000 ft, respectively. No external stores.
268	17 May	1200	0+40	A maximum A/B thrust takeoff was performed followed by subsonic maximum A/B turn performance tests at 20,000 ft with slats both extended and retracted. No external stores.
269	18 May	0900	1+05	This flight was flown with misrigged right outer wing slats to qualitatively determine the flying qualities resulting from production quality control problems.
270	22 May	0930	1+30	Cruise performance was conducted at 200,000 and 180,000 W/δ with no external stores. Roll performance tests and sideslips were performed at 35,000 and 10,000 feet, respectively.

Flight Number	Date (1972)	Takeoff (hr)	Duration (hr+min)	Tests Accomplished
271	22 May	1410	1+25	Cruise performance tests were conducted at 140,000 and 85,000 W/δ with no external stores. Roll performance tests and sideslips were also performed at 10,000 ft.
272	23 May	0820	1+05	Max A/B thrust takeoff was performed followed by maximum A/B thrust turning performance test at 10,000 ft. No external stores.
273	23 May	1445	1+05	Max A/B thrust turning performance was conducted at 20,000 ft. Cruise and PA aileron rolls, sideslips, and PA rudder rolls were performed at 10,000 ft. No external stores.
274	24 May	1045	1+20	A maximum A/B takeoff was performed followed by cruise performance test at 220,000 W/δ with no external stores. Aileron rolls and rudder doublets were also performed at 38,000 ft.
275	25 May	0820	0+45	Supersonic thrust-limited turn performance data obtained at 35,000 ft followed by roll performance test at 10,000 ft. No external stores.
276	31 May	1000	1+40	Ferry flight from St. Louis, Mo. (enroute stop at Cannon AFB, New Mexico). Cruise performance at 180,000 W/δ was obtained. Three external tanks.
277	31 May	1430	1+30	Continuation of ferry flight from Cannon AFB to Edwards AFB. No data obtained.
278	1 Jun	1030	0+35	Pilot canopy was lost shortly after takeoff. Flight was terminated without obtaining test data. No external stores.
279	15 Jun	0830	0+50	Functional check flight for pilot canopy installation. Test data were not recorded during this mission. No external stores.
280	16 Jun	0755	0+30	Takeoff performance was obtained in max A/B. A level acceleration in max A/B to the thrust limit of the aircraft (715 KIAS) was obtained at 5,000 ft altitude, followed by a 5-g WUT. A dive was performed from 30,000 ft to 750 KIAS at 18,000 ft. This was a demonstration by MDC to clear the aircraft to the airspeed limit for the F-4E. Landing performance data were obtained. No external stores.
281	16 Jun	1105	0+35	A max A/B acceleration at 20,000 ft altitude to 700 KIAS was performed, followed by a WUT to 5 g's. Supersonic thrust-limited turn performance data were obtained at 20,000 ft altitude and 1.4, 1.2, and 1.1 Mach number. Roll performance data at 35,000 ft and supersonic were also obtained. Takeoff and landing data were recorded. No external stores.
282	16 Jun	1400	0+35	A max A/B climb to 50,000 ft was performed followed by supersonic turn performance test at 20,000 ft. Takeoff and landing data were obtained. No external stores.
283	19 Jun	0840	0+30	A max A/B acceleration to 710 KIAS at 10,000 ft was performed followed by supersonic turn performance test at 20,000 ft. Takeoff and landing data were obtained. No external stores.
284	19 Jun	1300	0+45	A military thrust climb was performed to 40,000 ft altitude followed by supersonic WUT's at 35,000 and 25,000 ft. Takeoff and landing data were obtained. Two inert AIM-7 missiles aft (on stations 3 and 7).
---	20 Jun	----	----	Static thrust engine calibration. Data were obtained from idle to maximum afterburning thrust in 5 percent rpm increments for each engine and with both engines operating.
285	22 Jun	0830	1+40	Ferry flight from Edwards AFB to St. Louis, Mo. (enroute stop at Buckley NAS, Colorado). No data obtained.
286	22 Jun	1200	1+30	Continuation of ferry flight to St. Louis, Mo. No data obtained.

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UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Air Force Flight Test Center Edwards AFB, California	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP N/A

3. REPORT TITLE
Limited Performance and Flying Qualities Evaluation of the F-4E with the Retrofit Two-Position Maneuvering Slat Kit

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
Final

5. AUTHOR(S) (First name, middle initial, last name)
Billy R. Boxwell
Russell C. Hubenet, Sergeant USAF
Cecil W. Powell, Major USAF

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO OF REFS
August 1972	284	9

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	FTC-TR-72-35
c. Project Directive 72-27	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	N/A

10. DISTRIBUTION STATEMENT Distribution limited to U.S. Government agencies only (Test and Evaluation), August 1972. Other requests for this document must be referred to ASD/SD4T, Wright-Patterson AFB, Ohio 45433.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
N/A	6510th Test Wing Edwards AFB, California

13. ABSTRACT
The test objective was to evaluate the performance and flying qualities of the F-4E aircraft equipped with the two-position leading edge slat and to obtain data necessary to update the F-4 Flight Manual. The two-position slat test results show an increase in turning capability in most of the flight envelope compared with that of the basic F-4E, and were comparable to those obtained with the previous fixed slat configuration, Agile Eagle IV. The normal takeoff rotation technique described in the Flight Manual was considered unsatisfactory for slat-equipped aircraft. The installation of the two-position wing leading edge slat has degraded the maximum speed capability of the F-4 aircraft slightly. Cruise data obtained during the tests show a degradation in cruise performance of approximately four percent for the retracted slat configuration and seven percent for the extended slat. Decreased static stability made precise control of angle of attack (AOA) moderately difficult during landing approaches at 19 units AOA. Rudder rolls performed at high AOA showed improved performance. Lateral-directional flying qualities in the power approach configuration were generally not as good as with the unslatted F-4E, but were satisfactory. Tests performed to evaluate the flying qualities with simulated failures in one or more slat actuators revealed minor, acceptable degradations from the flying qualities observed with the symmetric slat condition.

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
F-4E aircraft						
performance						
flying qualities						
slats						
takeoff						
static stability						