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AXISYMMETRIC & NON-AXISYMMETRIC EXHAUST JET INDUCED-EFFECTS ON A V/STOL VEHICLE DESIGN

part I — data presentation

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(NASA-CR-166146) AXISYMMETRIC & NON-AXISYMMETRIC EXHAUST JET INDUCED-EFFECTS ON A V/STOL VEHICLE DESIGN. PART 1: DATA PRESENTATION Interim Report (Grumman Aerospace Corp.) 538 p HC A23/MF A01 N81-25064 Unclas G3/05 26033

GRUMMAN AEROSPACE CORPORATION

AXISYMMETRIC & NON-AXISYMMETRIC EXHAUST JET INDUCED-EFFECTS ON A V/STOL VEHICLE DESIGN (PART I: DATA PRESENTATION)

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SUMMARY

A wind tunnel investigation, sponsored by the NASA Ames Research Center, was conducted to determine the jet induced effects of several exhaust nozzle configurations (axisymmetric, non-axisymmetric, and vectoring/modulating variants) on the aeropropulsive performance of a twin-engine V/STOL fighter design. A 1/8 scale model was tested in the NASA Ames 11 ft transonic tunnel at static conditions and over a range of Mach numbers from 0.4 to 1.4. Angle of attack was varied from 0° up to a maximum of 13° and exhaust flow simulation was obtained by employing compressed air and varying the nozzle pressure ratio from jet off up to a maximum of ten.

This report is the first of a series of three reports covering this comprehensive wind tunnel investigation of approximately 2,000 test points. It makes available all the model data and test data (static and wind-on) for the technical community. The second report, (Part II: Analysis of Results) will thoroughly analyze and interpret the test results reported herein. The third report, (Part III: Experimental Technique), will discuss the experimental aspects (e.g.: test technique, test problems and solutions, etc.) of the wind tunnel program.

This investigation has contributed to the aeropropulsion V/STOL data base. The data presented herein show that significant differences in aeropropulsion performance can be expected by varying the exhaust nozzle type and its geometric parameters on a V/STOL underwing nacelle installation.

LIST OF FIGURES

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SYMBOLS & ABBREVIATIONS

ADEN	Augmented Deflector Exhaust Nozzle
ALBEN	Asymmetric Loan Balanced Exhaust Nozzle
ALPHA	Angle-of-attack
ALT	Alternate nozzle hardware piece
A/B	Afterburning
A9	Area-ratio-setting flap of ADEN
Anoz	Nozzle throat area
AOA	Angle-of-attack
Aw	Wing reference area (6.016 ft^2, 0.559 m^2)
$\bar{c}$	Mean aerodynamic chord (1.787 ft., 0.545 m.)
C	Constant
CAFT2	Axial component of static gross thrust coefficient
CDTRPM	Thrust-removed drag coefficient
CD1	Resultant main balance force coefficient resolved in drag direction
CLTRPM	Thrust-removed lift coefficient
CL1	Resultant main balance force coefficient resolved in lift direction
CMMTRP	Thrust-removed pitching moment coefficient
CMMT2	Static pitching moment coefficient
CNFT2	Normal component of static gross thrust coefficient
COM	ADEN Combat (Maximum - A/B)
CR	ADEN Cruise (Non - A/B)
DASH	ADEN Dash (Partial - A/B)
DEG	Degrees
Dext	Total external drag
F	Wind-on thrust component in drag direction
F.S.	Fuselage Station
F-Dext	Wind-on thrust-minus-drag in drag direction
F_s	Static thrust component in drag direction
I/F	Inlet fairing
M	Freestream Mach number
NPR	Average nozzle pressure ratio of both jets
NPRL	Nozzle pressure ratio of left hand jet

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SYMBOLS & ABBREVIATIONS (Cont)

Po	Free-stream ambient pressure
Po_s	Ambient pressure at static conditions
q	Free-stream dynamic pressure
T/R	Thrust-removed
W.L.	Water Line
α	Angle-of-attack
DELTA	Static vector angle (Defined positive when normal force is positive)
ΔF	Delta thrust, $(F_s - F)$

INTRODUCTION

To contribute to the developing VSTOL air vehicle/non-axisymmetric nozzle data base, the NASA Ames Research Center has sponsored the subject program. A realistic multimission twin-engine V/STOL fighter scale model was tested (June 1979) in the Ames 11 ft Transonic Wind Tunnel to investigate non-axisymmetric nozzle installed performance and inflight vectoring performance.

This scale model was previously tested in two other research programs (ref. 1, 2) but hardware failures either prevented acquisition of complete aircraft force data or severely limited the test configuration matrix from which worthwhile data could be salvaged. In the subject program, it was possible to obtain complete aircraft force data on all nozzle configurations over a wide range of test conditions.

Both force data and extensive lifting-surface pressure data were obtained in this program. The purpose of this report is to present all the complete aircraft force data in a graphical format so that it is readily useful to any user. Because of the large volume of data in this program, Appendices have been employed to organize the graphs according to nozzle configuration. The pressure data, tabulated in coefficient form, can be obtained from the Ames 11 ft Tunnel Facility

EXPERIMENTAL APPARATUS

TEST FACILITY

This test program was conducted in the NASA Ames Research Center 11 ft Transonic Wind Tunnel. This is a closed circuit, variable-pressure, continuous-flow wind tunnel normally operated from Mach 0.4 up to Mach 1.4. Stagnation pressure can be varied over a wide range. The test section is 11 X 11 ft in cross-section, and slotted walls provide for continuous operation throughout the complete Mach range. A facility description is contained in ref. 3.

SCALE MODEL

The model was a 1/8th scale representation of a twin-engine, thrust-vectoring, VSTOL fighter designed for Navy application. The configuration is designated 623-2004B, and a three-view sketch with overall dimensions is shown in Fig. 1. A photograph of the model installed in the Ames 11 ft tunnel test section is shown in Fig. 2. Note the bifurcated twin-boom system that supports the model through the non-metric vertical tails. This support system houses the high pressure air supply and all instrumentation lines.

The inlet nose simulated the aircraft inlet shape and attached to the forward end of the nacelle. This model did not employ the familiar bullet nose inlet fairings (except for one configuration); instead, it featured a flat plate dam arrangement recessed from the inlet leading edge surfaces. This design has been observed to more closely resemble the real inlet flow field of aerodynamic flow-through models than the "zero-spillage" bullet fairing (ref. 4). The inlet lip simulated the aircraft inlet lower lip contour.

Figure 3 provides an overview of the model support and air supply systems. As schematically illustrated, the model is supported by a bifurcated, twin-boom system which attaches to the vertical tail assemblies. Air supply for powering the model is delivered through the model support system. A representation of the flow-path through the model is illustrated in the figure.

The model force balance arrangement is illustrated in Fig. 4. With the exception of the vertical tails, the entire model was fully metric to a six-component flow-through aircraft main balance. This balance measured total aircraft forces and moments. The main balance metric break was located at the base of the vertical tails. This main balance was installed near the aircraft c.g. station. A flexible metal bellows arrangement was employed as the method for the airflow to bridge the metric break. This balance was instrumented to provide measuring capability for the three primary components of normal force, axial force, and pitching moment. The design limits of these components are ±5,000 lb, ±800 lb, and ±25,000 in.-lb, respectively.

In addition, a second six-component flow-through balance was employed to measure the forces and moments on the metric section of the left-hand nozzle. This balance attached to the main balance in a "piggy-back" arrangement. This nozzle force balance was installed in the left nacelle and was similar to the complete aircraft force balance in design. It was instrumented to provide ±200 lb of normal force, ±400 lb of axial force and ±1500 in. lb of pitching moment.

The primary reason for employing the additional complexity of the nozzle balance was to accurately measure static thrust force components (especially in the normal direction) which are necessary in order to obtain the static vector angle. Because the sphere of influence of nozzle variants and jet effects is not restricted to the nozzle balance metric system alone, the main balance is used for all drag/lift comparisons to ensure the accounting of all jet-induced phenomena.

Approximately 150 external surface pressure orifices were distributed over both upper and lower body and wing surfaces at six spanwise locations. Most orifices were intentionally located on the same side of the model so that effects of asymmetry would be avoided.

DESCRIPTION OF NOZZLE TYPES

Augmented Deflector Exhaust Nozzle - The Augmented Deflector Exhaust Nozzle (ADEN) V/STOL exhaust system (Fig. 5) is a variable area, internal/external expansion type, non-axisymmetric nozzle with throat area controlled by a variable geometry convergent-divergent upper flap assembly. The variable position ventral flap located downstream of the throat varies the nozzle internal expansion area ratio as required over a range of operating pressure ratios. The throat itself is located forward of the ventral flap hinge plane so that the nozzle throat area is not affected by the ventral flap position.

The arrangement of the ADEN nozzle flaps, deflector, expansion ramp, actuators, and structural elements have been carefully chosen to allow smooth afterbody contours. The non-axisymmetric nozzle shape blends well with supersonic airframe lines, minimizing drag-producing base regions; the cruise throat aspect ratio, (4 x 1), permits the ADEN to be installed without increasing frontal projected area.

For V/STOL operation, a rotating deflector mounted outside the nozzle casing diverts the jet downward. The nozzle upper flap assembly is actuated to the maximum open position during V/STOL operation to substantially reduce the flow Mach number approaching the turn. The ventral flap travel is scheduled so that the throat is established between the tip of the ventral flap and the deflector and rotates with the deflector so that flow turning is accomplished subsonically at all deflector settings; also, the low pressure region at the inside of the turn is freely vented to ambient air to allow free supersonic jet expansion.

Additionally, the ADEN is capable of providing inflight thrust vector control to obtain STOL performance as well as to improve aircraft flight maneuver and cruise capabilities by utilizing a Variable External Expansion Ramp (VEER). The VEER upper surface is designed to blend with the airframe contours, and the inner surface is contoured for effective jet expansion control. Variation of the VEER angle will deliver an upward or downward vertical thrust component as desired.

The ADEN utilized on the model tested in this program had not been optimized when the model design was frozen and, therefore, internal performance levels higher than those presented herein can be attained. Internal performance values from full-scale static test results confirm this (ref. 5).

Asymmetric Load Balanced Exhaust Nozzle - The Asymmetric Load Balanced Exhaust Nozzle (ALBEN), Fig. 6, is a CTOL derivative of the ADEN, and features an elliptical throat and expansion surface contours. Throat area and internal area ratio are set by an adjustable lower surface boattail flap. The rotating lower flap is actually part of a swiveling pressure vessel with a continuous structure that proceeds up the sidewalls and through a pressurized cavity in the fixed geometry upper expansion ramp structure. This design reduces actuation forces and maintains structurally effective hoop stress in the area control flap. Vectoring is accomplished by rotating a second flap forming part of the expansion ramp. This flap also has partial sidewalls to contain the flow. The partial sidewall continues upstream as fixed structure attached to the fixed upper ramp section where it houses the swiveling duct section.

The ALBEN utilized on the model tested in this program had not been optimized when the model design was frozen; therefore, performance levels higher than those presented herein can be attained. Internal performance values from scale model test results confirm this (ref 6).

Circular Exhaust Nozzle - An axisymmetric convergent-divergent (C-D) nozzle was employed in this test as a baseline configuration. This circular nozzle is a conventional axisymmetric nozzle which simulates a mid-1970 technology C-D design with a scheduled area ratio control. This axisymmetric nozzle provides a meaningful performance yardstick against which the non-axisymmetric nozzles can be evaluated.

The unvectored circular nozzle installation is compared with the ADEN and ALBEN installation in Fig. 7. This illustration shows the nacelle force balance metric break location and compares the amount of afterbody/nozzle length and area required to close out the afterbody and still permit thrust vectoring, if desired, with these three different nozzle types.

TEST CONFIGURATIONS

Nine different nozzle configurations were evaluated. Figure 8 shows that the Circular nozzle and the ALBEN were tested in their unvectored subsonic cruise modes while the ADEN was tested over a range of throat area and deflection angle (geometric) settings. Figures 9, 10, and 11 present representative sketches of the actual nozzle hardware tested for the Circular nozzle, ALBEN, and ADEN configurations, respectively. A comparison of the ADEN Cruise and ADEN Combat deflection angle variations is shown in Fig. 12 and 13 respectively.

Photographs of the nozzle/airframe installations are shown in Fig. 14, 15, 16, and 17. The non-afterburning (Cruise) unvectored configurations are to be compared by studying Fig. 14, 15, and 16; while the extremes in ADEN VEER vectoring capability can be observed from Fig. 16 and 17.

Utilizing the nine nozzle variants noted above, a total of 13 nozzle/airframe configurations were tested. They are listed below along with the corresponding average jet (throat) area per nozzle.

CONFIGURATION	JET AREA
1 – CIRCULAR NOZZLE	3.491 IN^2, 22.523 CM^2
2 – ALBEN	3.445 IN^2, 22.226 CM^2
3 – ADEN CR 0°	3.319 IN^2, 21.413 CM^2
4 – ADEN CR 0° ALT.	3.293 IN^2, 21.245 CM^2
5 – ADEN CR 5°	3.249 IN^2, 20.961 CM^2
6 – ADEN CR 10°	3.256 IN^2, 21.006 CM^2
7 – ADEN DASH	4.280 IN^2, 27.613 CM^2
8 – ADEN COM 0°	5.726 IN^2, 36.942 CM^2
9 – ADEN COM 0° ALT.	5.702 IN^2, 36.787 CM^2
10 – ADEN COM 0° + I/F	SAME AS COM 0°
11 – ADEN COM 10°	5.727 IN^2, 36.948 CM^2
12 – ADEN COM 20°	5.698 IN^2, 36.761 CM^2,
13 – ADEN COM 20° ALT.	SAME AS COM 20°

The three alternate (ALT.) nozzle configurations denote different nozzle hardware pieces dedicated to pressure measurements on the VEER. Since force data was obtained simultaneously during these "pressure runs," it provides a measure of repeatability (including both facility and hardware factors) and is therefore included herein.

Additionally, the ADEN COM 0° nozzle was retested in the presence of an ogive inlet fairing (I/F) as shown in Fig. 18. By comparing configurations ten and eight, the effect of two extremes in inlet fairing type on nozzle jet-effect increments can be studied.

All configurations were tested without horizontal tails so that any control effects unique to this airplane concept would not compromise on the generalization of these test data. For example, a user would most probably apply the thrust vectoring results to a canard-type fighter; therefore, testing without horizontal tails facilitates an analytical canard-correction to these test data.

EXPERIMENTAL PROCEDURES

TEST CONDITIONS

The six non-afterburning and the seven afterburning configurations were tested over the range of Mach number, angle-of-attack, and nozzle total pressure ratio shown in the matrices of Fig. 19 and 20 respectively. The charts have been organized so that the user can readily grasp the nozzle configurations that were (and were not) tested at a given M/NPR/α condition. The nozzle pressure ratio and angle-of-attack values are representative of nominal target conditions, but nevertheless are useful in understanding the test condition matrix.

The test plan was to obtain data at seven Mach numbers: 0.4, 0.6, 0.8, 0.9, 0.95, 1.2, 1.4 (and/or 1.35). The heaviest emphasis was placed on the three most representative Mach numbers: 0.6, 0.9, 1.4 (1.35). Reynolds number was held constant at 8.2×10^6 per m. NPR ranges are appropriately scheduled with Mach numbers but always include jet-off and simulated flow-through NPR conditions at each Mach number for diagnostic purposes. A sufficient number on α-conditions were selected so that drag polars could be developed with emphasis of higher lift coefficients at the lower Mach numbers.

The test condition matrix is quite complete despite configuration omissions of certain test conditions that were intentionally made in the interest of economics. Omissions generally occurred for one of the following reasons:

1 - ALT. configurations represent repeats of force data

2 - Non-afterburning and vectoring de-emphasized at supersonic speeds

3 - Data interpolations were deemed satisfactory

4 - Reduced interest at M=0.4 and 0.95

5 - Test conditions not representative to flight conditions

Grounding between metric and non-metric portions of the model occurred at certain conditions as angle-of-attack was increased. This grounding was observed as a clear "break" in axial force coefficient increasing with angle-of-attack. No break was observed in the normal force coefficient. Thus, both the lift and drag coefficients are affected by grounding above a certain "limit - α " as a function of Mach number as noted below:

MACH No.	LIMIT α (DEG)
0.4	9-1/2
0.6	8
0.8	7
0.9	6-1/2
0.95	6-1/2
1.2	~ 5
1.4 (1.35)	~ 5

As α is increased above the "limit - α ", the effect of the grounding increases correspondingly.

TEST PROCEDURES & DATA REDUCTION

The test data were obtained by first selecting the desired Mach number and Reynolds number (which was held constant at 2.5 x 10^6 per ft for the entire test.) An α-sweep, beginning and returning to α =0 deg, was made at jet-off conditions (designated as NPR=1). High pressure air was then turned on and allowed to stabilize at the desired NPR. Angle-of-attack was then varied in discrete increments. After the α-sweep, the model was returned to 0 deg (a repeat point) and the high pressure air was adjusted to produce another NPR. At the end of each Mach number, a final jet-off data point was taken as a "second-repeat-diagnostic."

Prior to the wind-on test phase, several pre-test calibrations were conducted. Balance calibrations and bellows interactions were determined for both nacelle and complete aircraft force balances. By employing an ASME reference nozzle, the model mass flows and metric to non-metric crossover momentum tare forces, in all directions, were assessed.

In concert with the wind-on test phase, static (M=0) runs were made "back-to-back" with the wind-on runs. Thus, for each nozzle, static calibration running occurred during the <u>same</u> "model-build" as that employed for the wind-on tests. For each individual nozzle variant at least three static runs were conducted so that static thrust coefficients could be determined from faired curves as precisely as possible.

The test measuring technique employed for this model was to measure thrust forces at static conditions and, correspondingly, thrust-minus-drag forces at wind-on conditions. However, the basic measurement objective of this test was to obtain total aircraft drag and lift forces which include the installation effects of the thrust vector but not the magnitude of the uninstalled thrust vector itself. In other words, the uninstalled static thrust component vectors are removed from the wind-on component vectors in order to obtain "thrust-removed" drag (and lift) forces as descriptively shown below:

$$[F_s]_{static} - [(F - D_{ext})]_{wind\text{-}on} = D_{ext} + (F_s - F)$$
$$= D_{ext} + \Delta F$$

Thus the drag deduced by removing the static thrust, F_s, from the wind-on thrust-minus drag, $(F - D_{ext})$, is equal to two terms --- the external drag existing on all surfaces wetted by the free stream flow plus a thrust decrement (or increment), ΔF, existing on surfaces wetted by the nozzle internal flow. This thrust decrement is a result of the external flow interactions with the internal flow, which alter the pressure distribution on the nozzle internal surfaces relative to static conditions (at the same nozzle pressure ratio). Alternatively, ΔF can be considered to be a nozzle internal drag rather than a thrust decrement. So the thrust removed parameter, commonly referred to as "drag," $(D_{ext} + \Delta F)$, is really the sum of both external and internal drags. This parameter includes all installation effects due to the exhaust system and is the key parameter of interest along the wind axis. The same methodology is easily applied to the lift direction and to pitching moments.

Because this model employed two balances, the option exists to use the <u>static</u> thrust components (axial force, normal force, pitching moment) from either of these balance systems in determining the thrust-removed parameters. The technical decision was made to use the static thrust components derived from the complete aircraft balance mainly because this approach makes use of the <u>same</u> measurement instrument for <u>both</u> static and wind-on data. Thus, inaccuracy in thrust-removed lift and drag due to a particular bias in the force balance system would tend to be minimized.

Also, the option exists to use either ideal thrust or tunnel static pressure as the basis for non-dimensionalizing thrust and thrust-minus-drag in order to determine the thrust-removed parameters. The latter methodology was employed because it is essentially independent of repeatability errors occurring in the determination of mass flow, total temperature, and total pressure.

In summary, all the thrust-removed data presented herein was obtained exclusively from the complete aircraft force balance and was determined according to the following descriptive procedure (e.g. drag at $\alpha = 0$ deg):

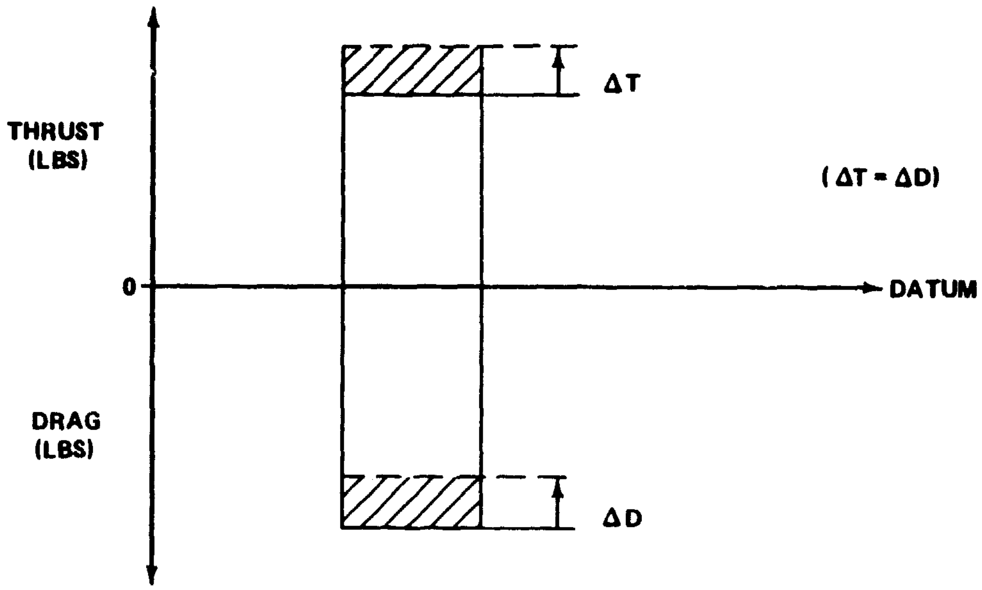
$$\frac{(D_{ext} + \Delta F)}{q\,A_w} = \left[\frac{F_s}{P_{o_s}\,A_{noz}} - \frac{(F - D_{ext})}{P_o A_{noz}}\right]_{NPR = C} \times \left(\frac{P_o A_{noz}}{q\,A_w}\right)$$

Similarly, lift and pitching moment coefficients were determined.

PROPOSED DATA ADJUSTMENT

A portion of the data presented herein has been corrected for an axial force shift of the main balance. This shift was observed to exhibit a regular behavior and therefore was calibratible by making several static runs just prior to the wind-on runs for each affected configuration. By correlating axial force coefficients between the main and nacelle balances, a well-defined correction to the main balance, as a function of axial load level, was obtained.

Experimental substantiation for this correction exists for the case when the main balance was sensing forces in the thrust direction (the most predominant case). However, experimental data that would substantiate a correction when the main balance was sensing forces in the drag direction could not practicably be obtained. Nevertheless, understanding the mechanism of the balance shift phenomenon provides a rationale to enable the determination of the correction for this "drag dominant" case --- in particular, when the jet is off (defined as NPR = 1.0). Using the sketch below it can be reasoned that when a balance shift increases thrust, it should correspondingly decrease drag when the sense of the applied load is reversed.



Both thrust and drag must change in magnitude in opposite directions from each other.

Using the example above, the correction for this erroneous shift in thrust must be an appropriate reduction in thrust. This was properly implemented in the final data reduction program for all the "thrust dominant" cases. Correspondingly, the correction for the shift in drag should be an appropriate increase in drag. Based on extensive post-test data correlations and trending studies of the entire data matrix, certain anomalies became apparent after the final data transmittal from the facility was received. Ensuing in-depth trouble-shooting led to the observation that the main balance shift correction for the "drag dominant" case was not properly implemented during the data reduction process.

Although specific experimental substantiation for the correction to be applied to the jet-off drag data of the "shift-affected" nozzle configurations does not exist, the authors believe that the above rationale should have been implemented. Accordingly, corrections to be applied to the "shift-affected" portion of the jet-off drag data contained in this data report are presented in Appendix O. It is recommended that the user utilize this additional information to increase the drag coefficient by the amounts shown in Appendix O.

PRESENTATION OF RESULTS

The results have been organized to enhance their utility to the reader. First, all the static results are located in Appendix A. For each of 11 distinct nozzle hardware pieces the following static parameters are provided:

- Axial Force Coefficient; CAFT2 = Main Balance Axial Force ÷ Ideal Thrust
- Normal Force Coefficient; CNFT2 = Main Balance Normal Force ÷ Ideal Thrust
- Pitching Moment Coefficient; CMMT2 - Main Balance Pitching Moment ÷ (Ideal Thrust x $\bar{c}$)
- Static Vector Angle; DELTA = $\tan^{-1}$ (-CNFT2 ÷ CAFT2)

The force and moment coefficients have been non-dimensionalized on an ideal thrust basis for this presentation because of wide familiarity throughout the technical community. For axial and normal components, lines of predicted performance levels (based on previous test data) are added for comparison.

Second, Appendices B through N present the wind-on data for all 13 nozzle/airframe configurations. One appendix has been assigned to each configuration for organizational purposes. For most configuration/Mach groupings, when the test condition matrix included at least four NPRs and four αs (for which there was no grounding), the following standard sequence of graphs is presented.

1. T/R lift coeff. vs. α ;(CLTRPM vs. α)
2. T/R lift coeff. vs. NPR; (CLTRPM vs. NPR)
3. T/R drag coeff. vs. NPR; (CDTRPM vs. NPR)
4. T/R pitching moment vs. lift coefficient; (CMMTRP vs. CLTRPM)
5. T/R drag polar; (CLTRPM vs. CDTRPM)
6. Powered drag polar; (CL1 vs CD1)

where:

- CL1 = Resultant Main Balance Force in Lift Direction ÷ qA_W
- CD1 = Resultant Main Balance Force in Drag Direction ÷ qA_W
- CLTRPM = (CL1) - (Static Thrust Component in Lift Direction ÷ qA_W)
- CDTRPM = (CD1) - (Static Thrust Component in Drag Direction ÷ qA_W)
- CMMTRP = (Main Balance Pitching Moment ÷ $qA_W \bar{c}$) - (Static Pitching Moment ÷ $qA_W \bar{c}$)

Note tha. the thrust-removed coefficients are obtained by conducting the above subtractions at any given wind-on NPR and q.

The above combination of six standard graphs is considered to be the most useful to the user, and also represents the minimum number of parameters necessary to provide complete test results without duplication. From the above, the user, if desirous, can construct crossplots. For example, drag vs. α can be obtained from 1. and 5. Also, pitching moment vs. NPR can be obtained from 2. and 4.

In situations where the test condition matrix was truncated (less than four NPRs and α s), such as at M = 0.95 and supersonic non-afterburning conditions especially, the above format of presentation was modified appropriately so that all the data could be presented in the most logical and complete format with the minimum number of graphs.

For both static and wind-on testing the same sign convention was employed. Forces in the lift and drag directions are positive. Thus a negative drag (or axial force) represents thrust. Nose up pitching moment is defined as positive and referenced to the airplane center of gravity. Thrust vector angle is measured relative to W.L. 19.312 (as noted in the model nozzle schematics) which is parallel to the balance axis. A positive angle corresponds to positive normal force.

CONCLUDING REMARKS

The intent of this data report was to make available all the necessary information pertaining to the subject wind tunnel investigation to the technical community at the earliest possible date. All the aeropropulsion data from the complete test configuration and test condition matrices are presented in the most useful and concise format. Sufficient background information regarding the experimental apparatus and experimental procedures are provided to facilitate proper interpretation of the test data by the aeropropulsion engineer. These data, presented herein, have contributed significantly to the aeropropulsion V/STOL data base.

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BETHPAGE, NEW YORK
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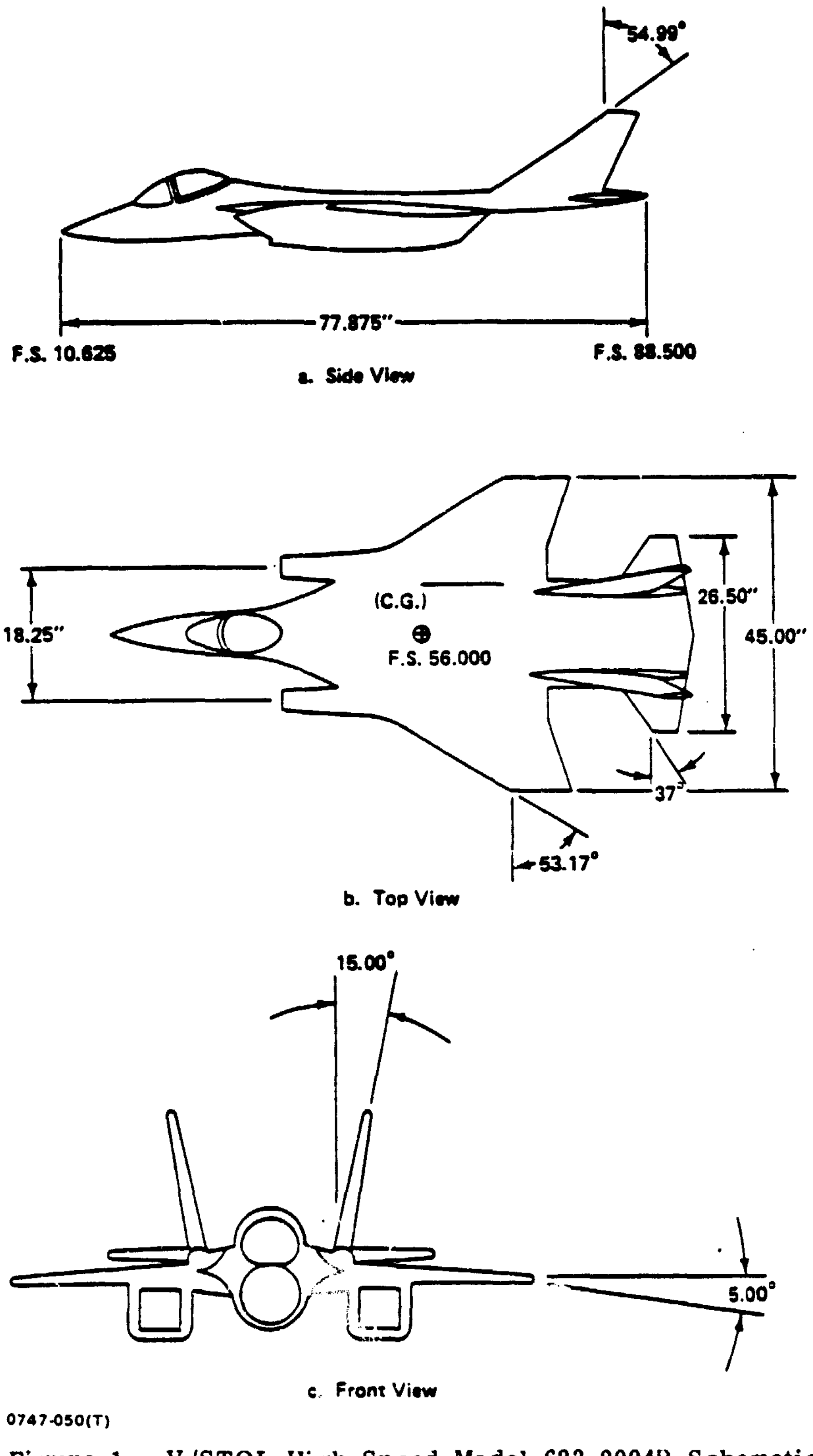

Figure 1. V/STOL High Speed Model 623-2004B Schematic

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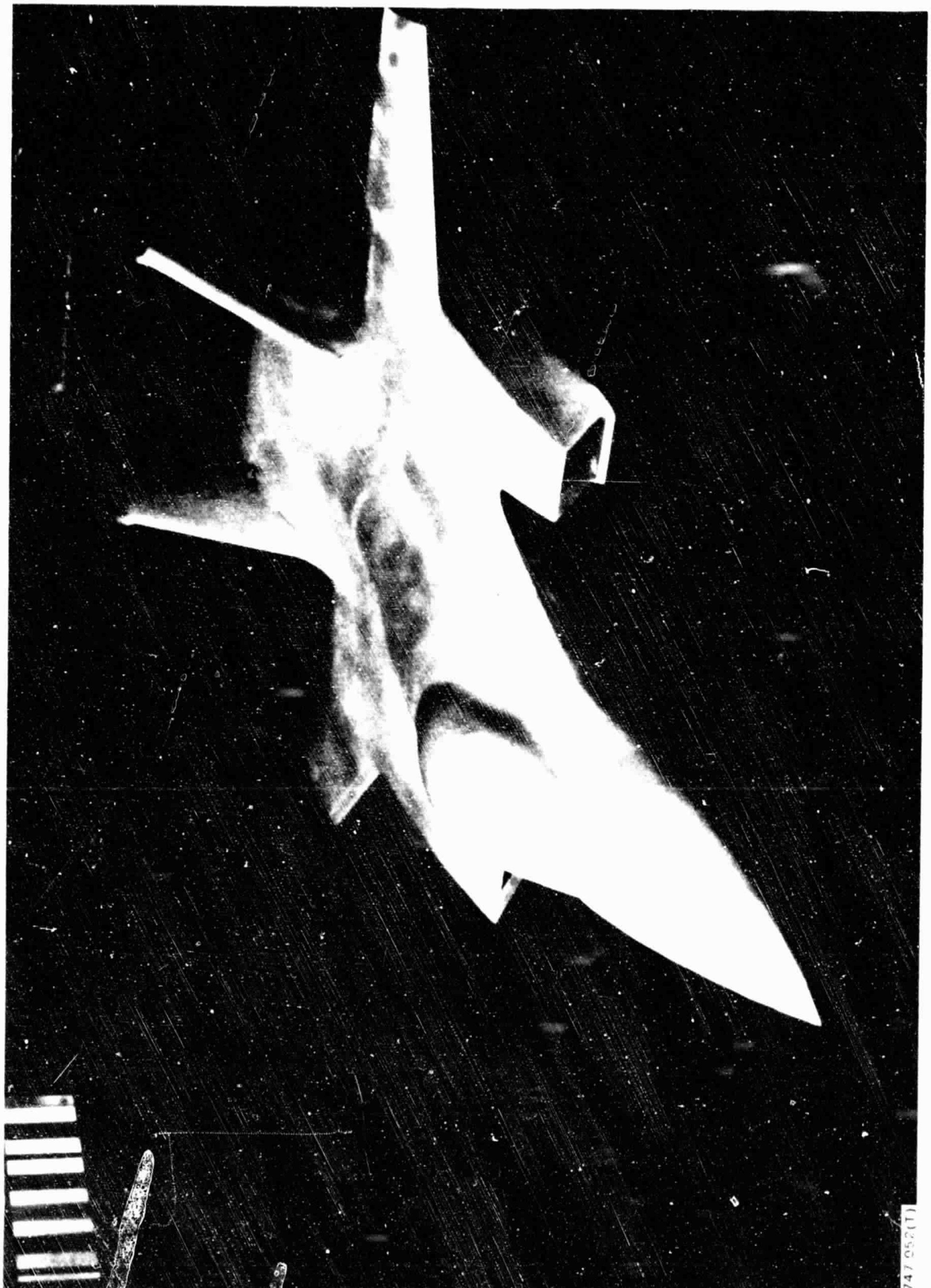


Figure 2. Model Installed in AMES 11 ft Tunnel

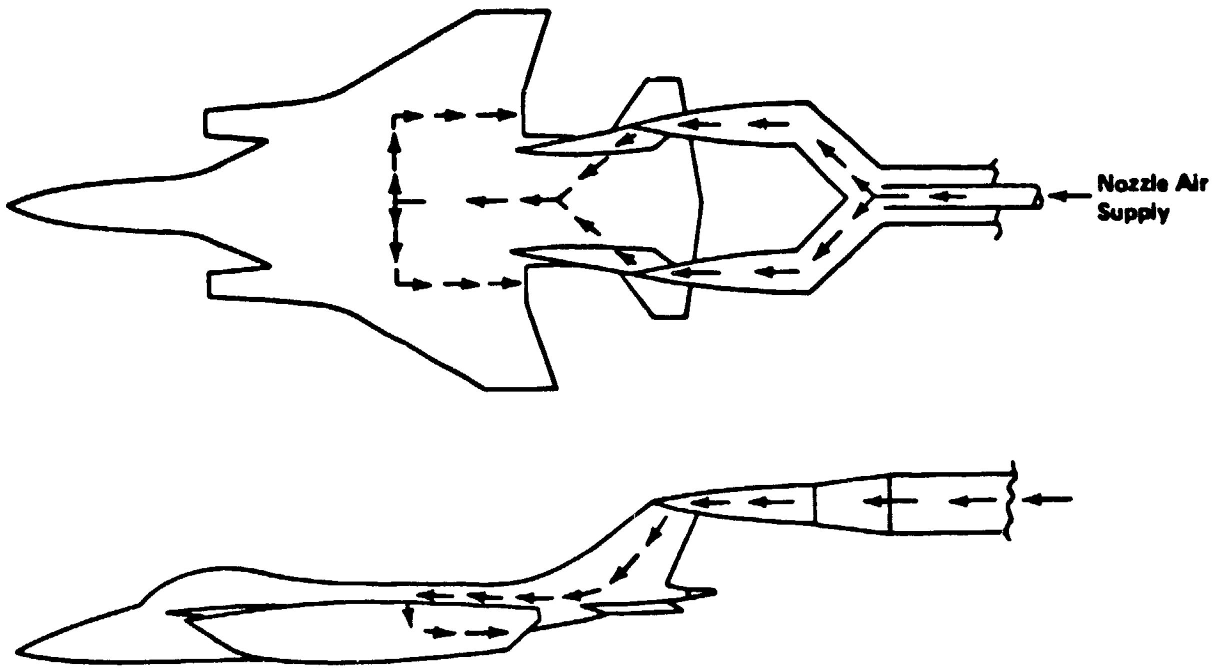


Figure 3. Model Support and Flow Systems

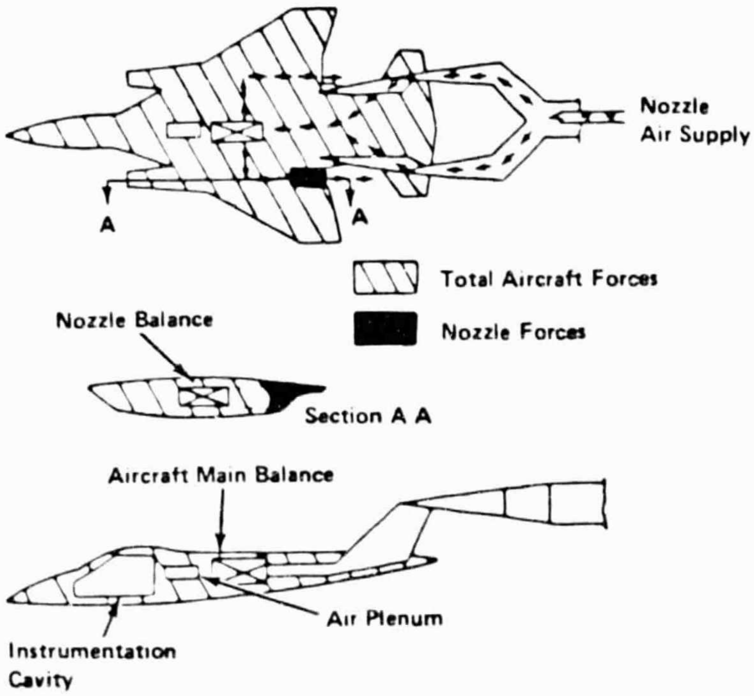


Figure 4. Model Force Balance Systems

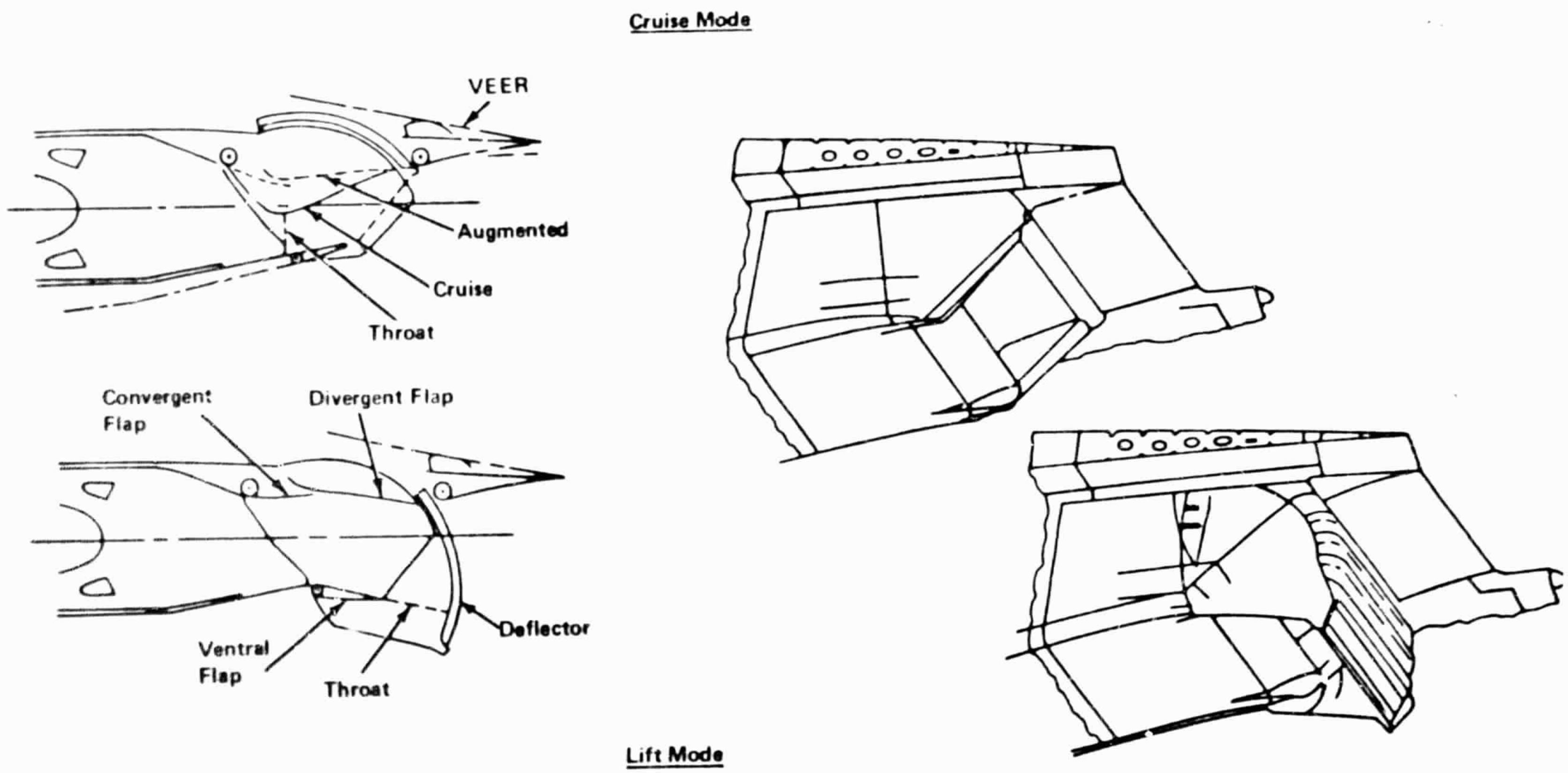
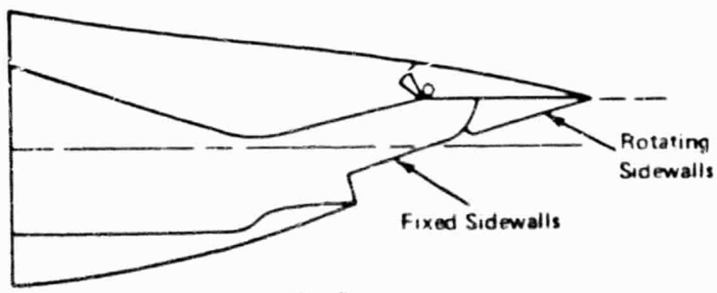


Figure 5. Augmented Deflector Exhaust Nozzle (ADEN)



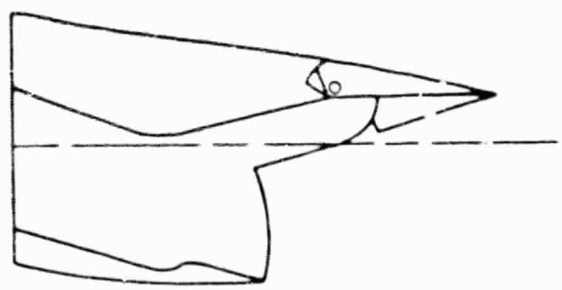


Figure 6. Asymmetric Load Balanced Exhaust Nozzle (ALBEN)

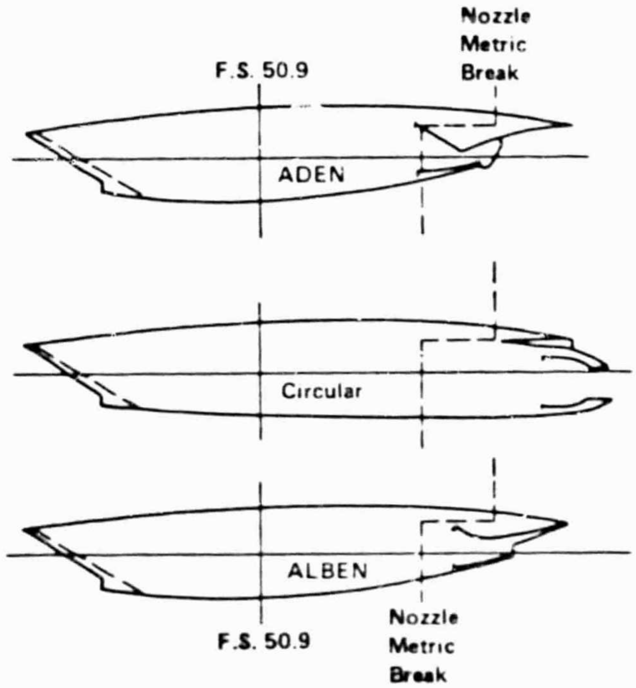


Figure 7. Test Nozzle Installations

NOZZLE TYPE	OPERATING MODE	DEFLECTION ANGLE, DEG
CIRCULAR		
CONVERGENT	CRUISE (NON A/B)	0
DIVERGENT		
REFERENCE		
NOZZLE		
ADEN	CRUISE (NON A/B)	0
AUGMENTED	CRUISE (NON A/B)	5
DEFLECTOR	CRUISE (NON A/B)	10
EXHAUST	DASH (INT A/B)	0
NOZZLE	COMBAT (MAX A/B)	0
	COMBAT (MAX A/B)	10
	COMBAT (MAX A/B)	20
ALBEN		
ASYMMETRIC	CRUISE (NON-A/B)	0
LOAD BALANCED		
EXHAUST		
NOZZLE		

0747-051(T)

Figure 8. Nozzle Configuration Matrix

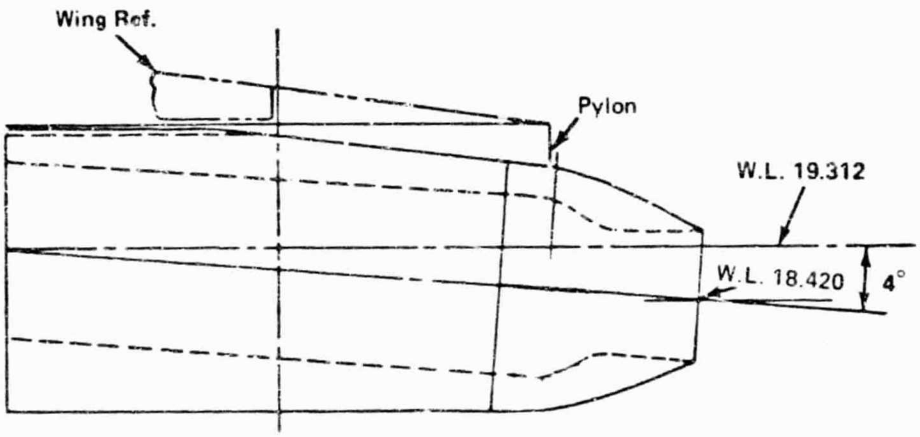
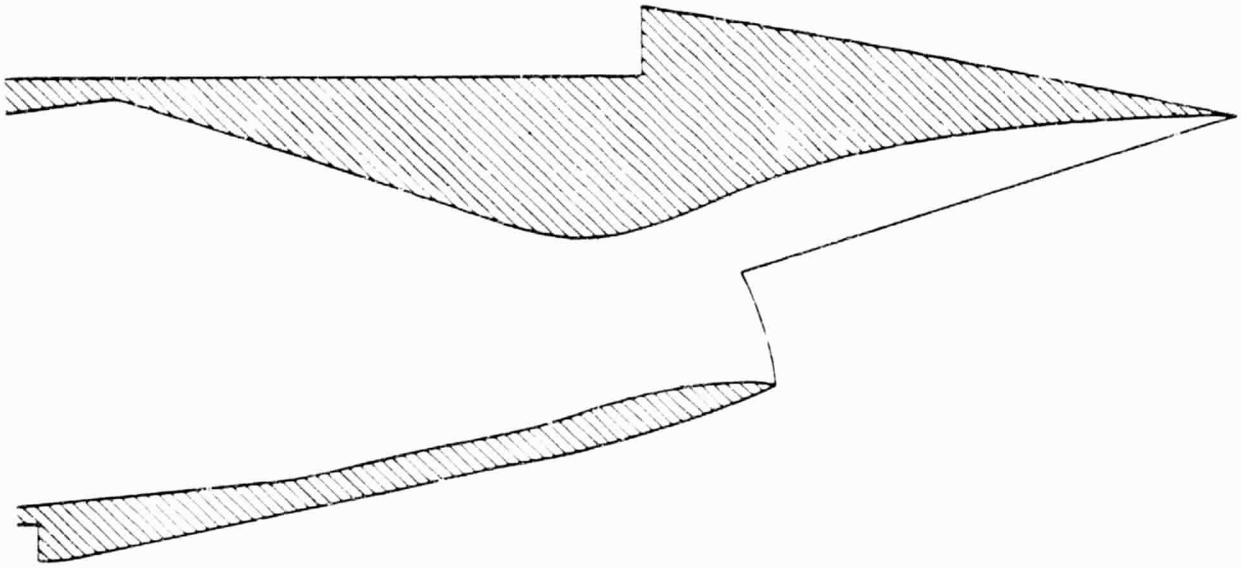


Figure 9. Circular Nozzle Model



0747-053(T)

Figure 10. ALBEN Model

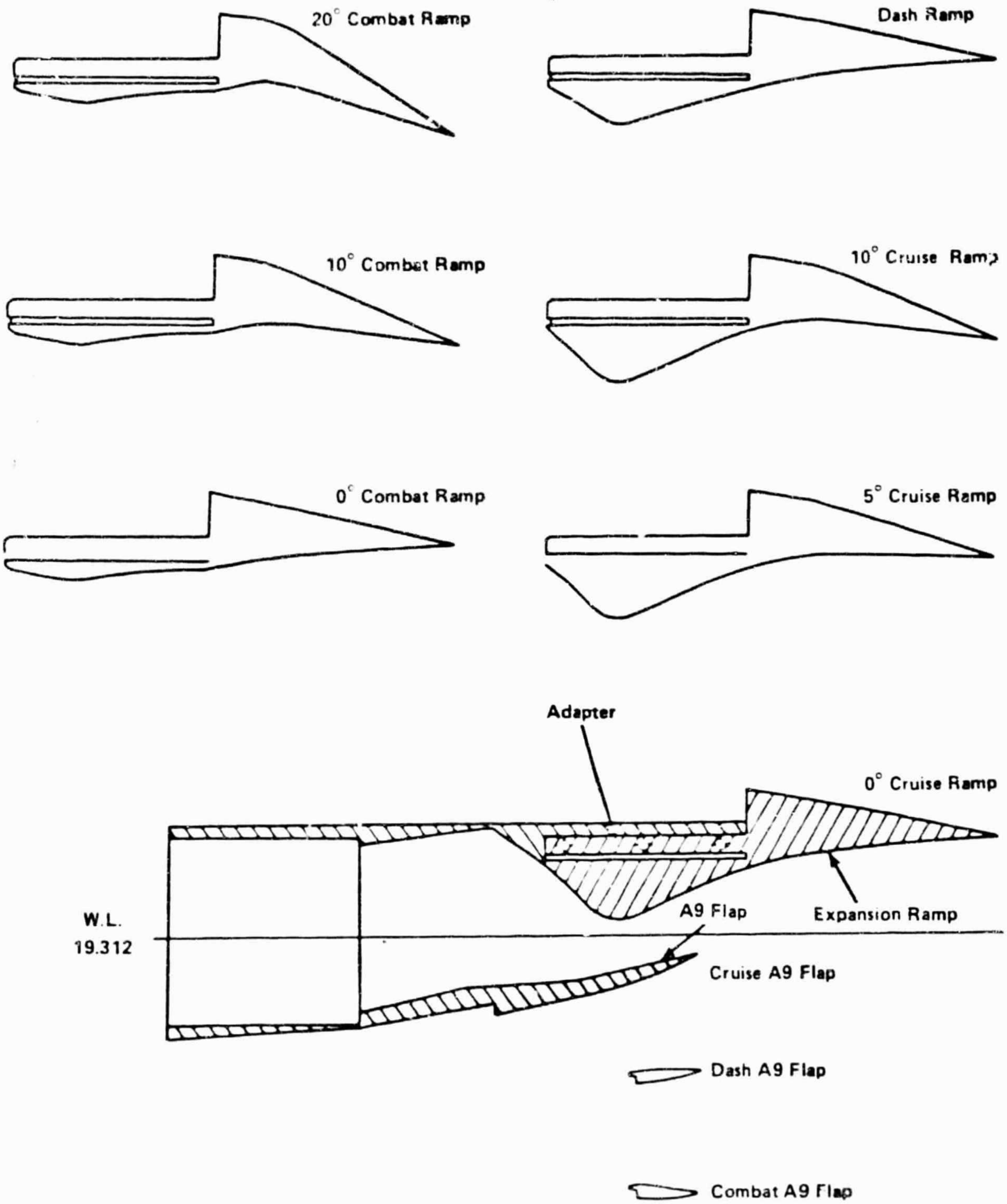


Figure 11. ADEN Model Variants

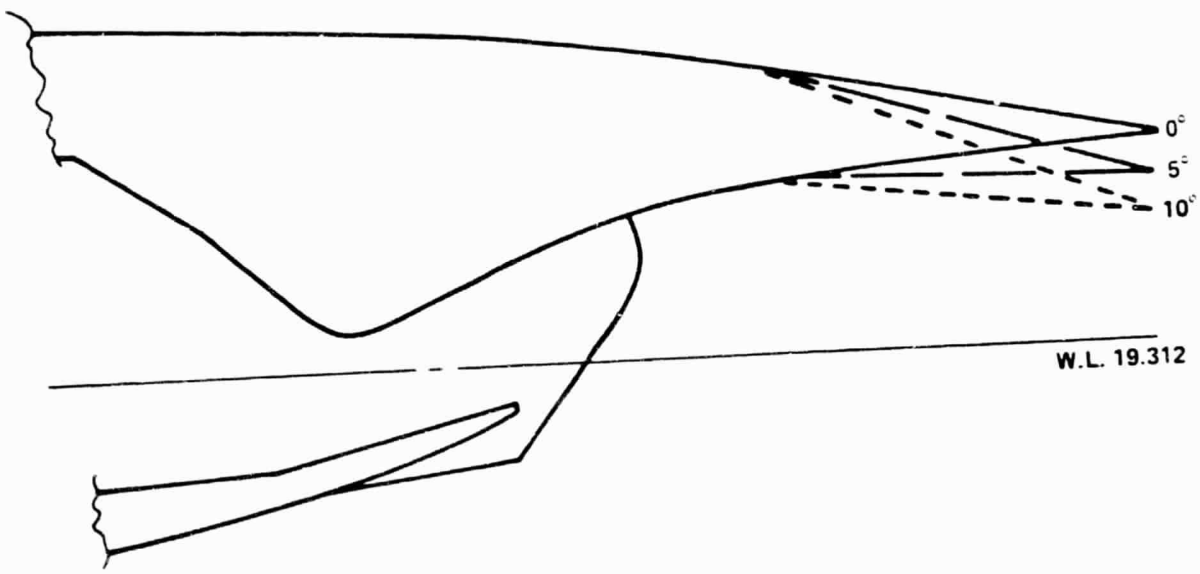


Figure 12. ADEN Cruise Vectoring Comparison

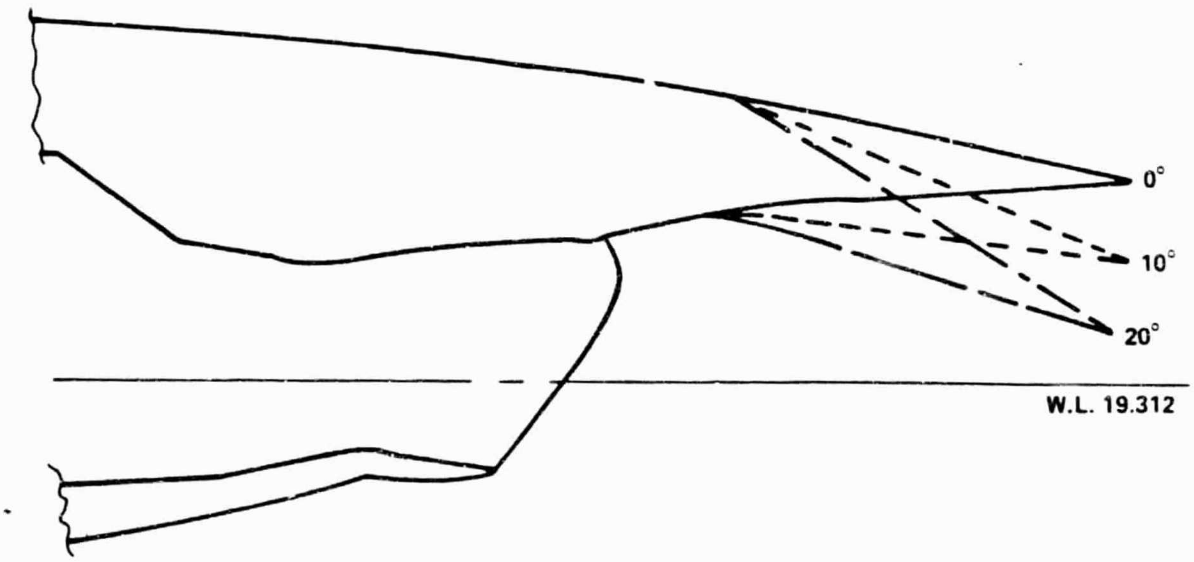
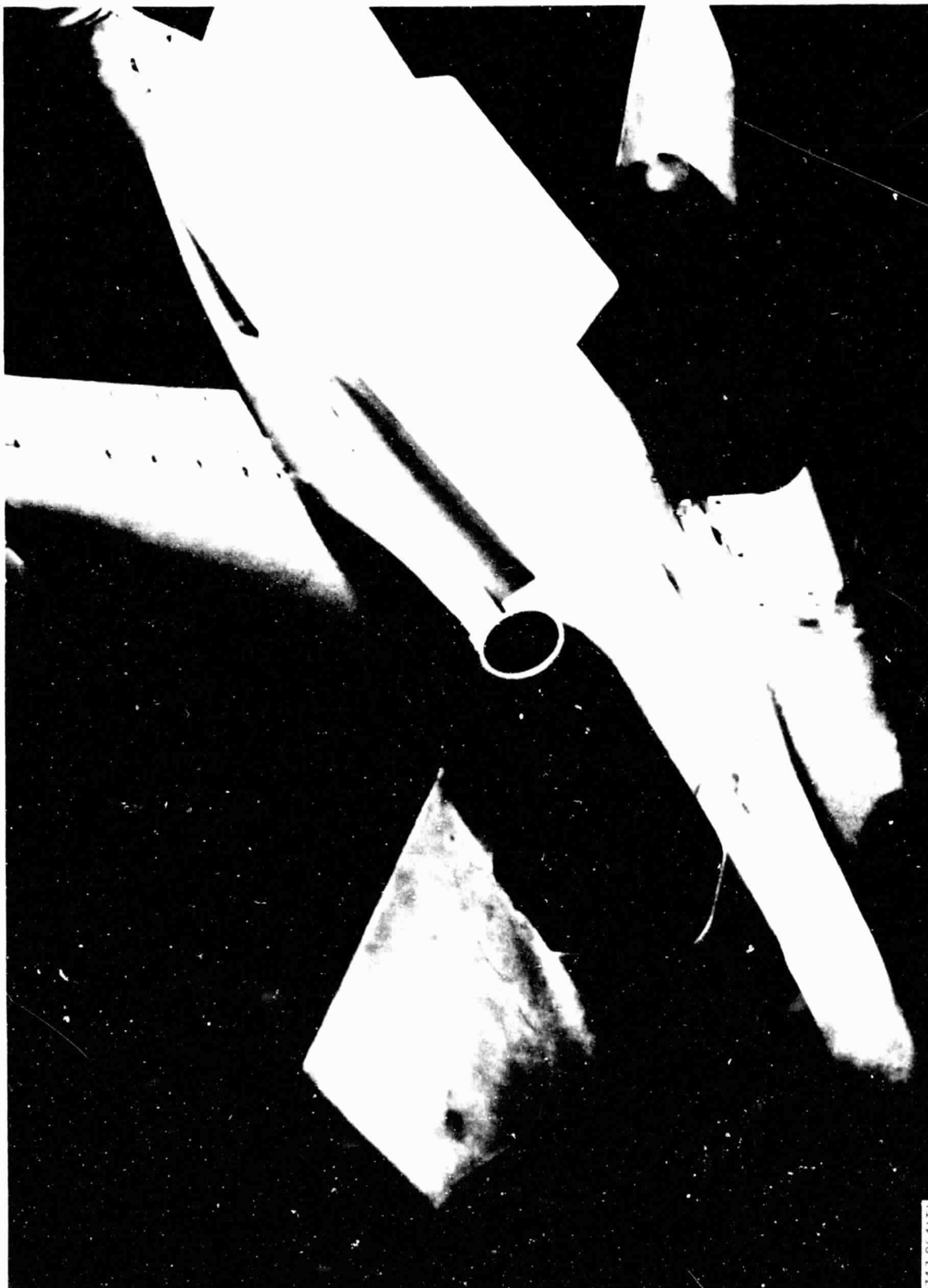


Figure 13. ADEN Combat Vectoring Comparison



0747-054(T)

Figure 14. Circular Nozzle/Airframe Configuration Installed in Tunnel

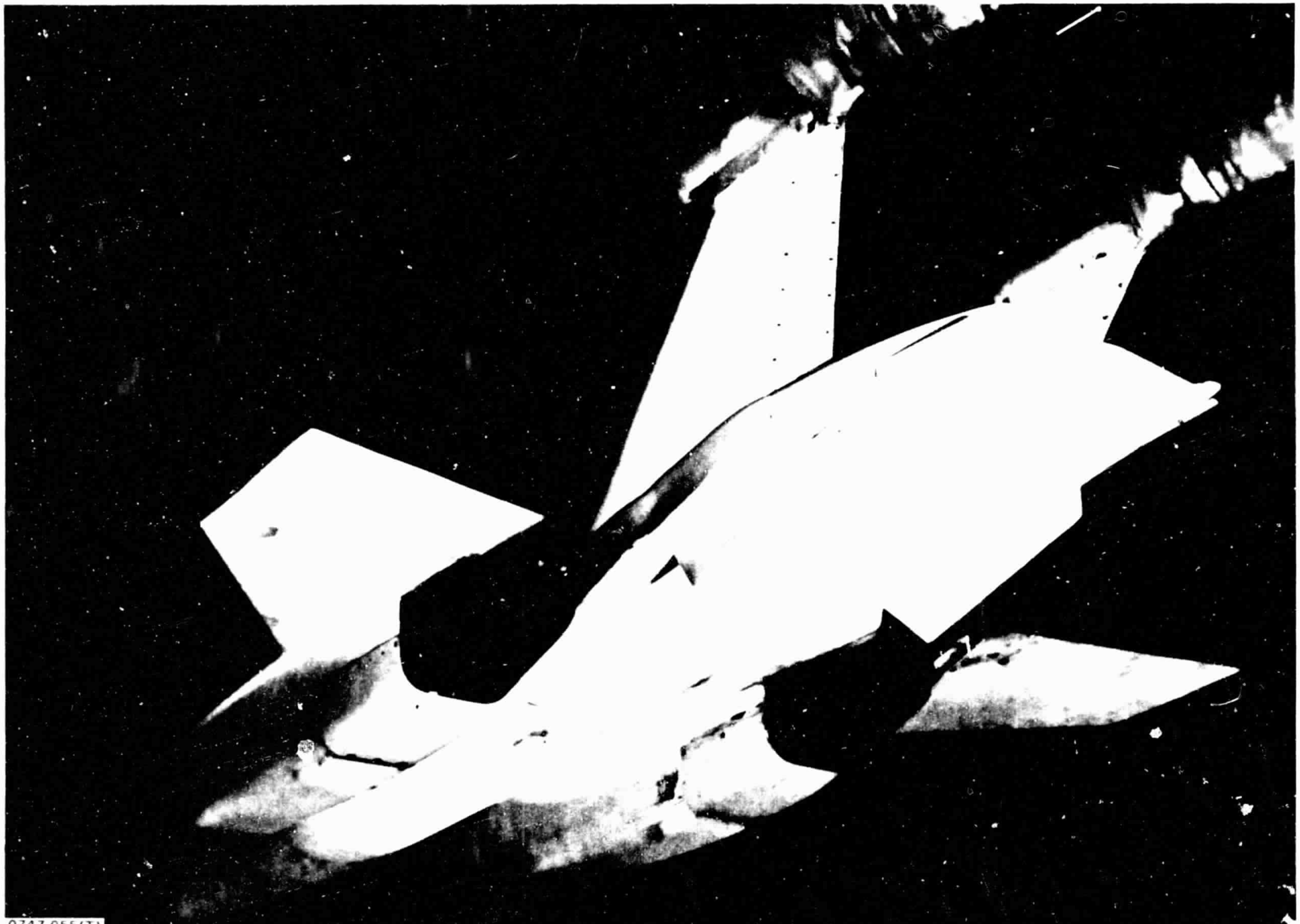
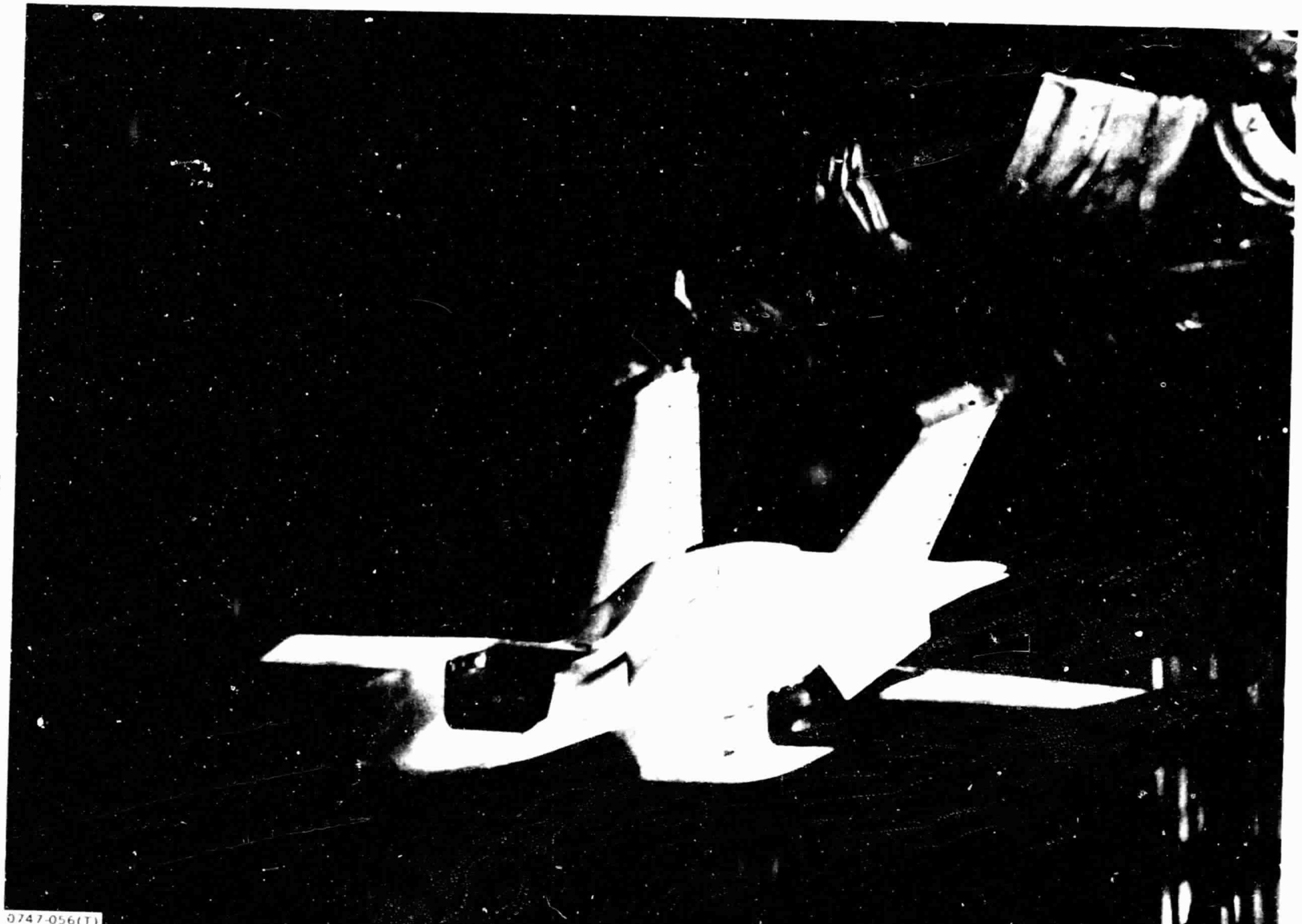


Figure 15. ALBEN Nozzle/Airframe Configuration Installed in Tunnel



0747-056(T)

Figure 16. ADEN Cruise, Unvectored Nozzle/Airframe Configuration Installed in Tunnel

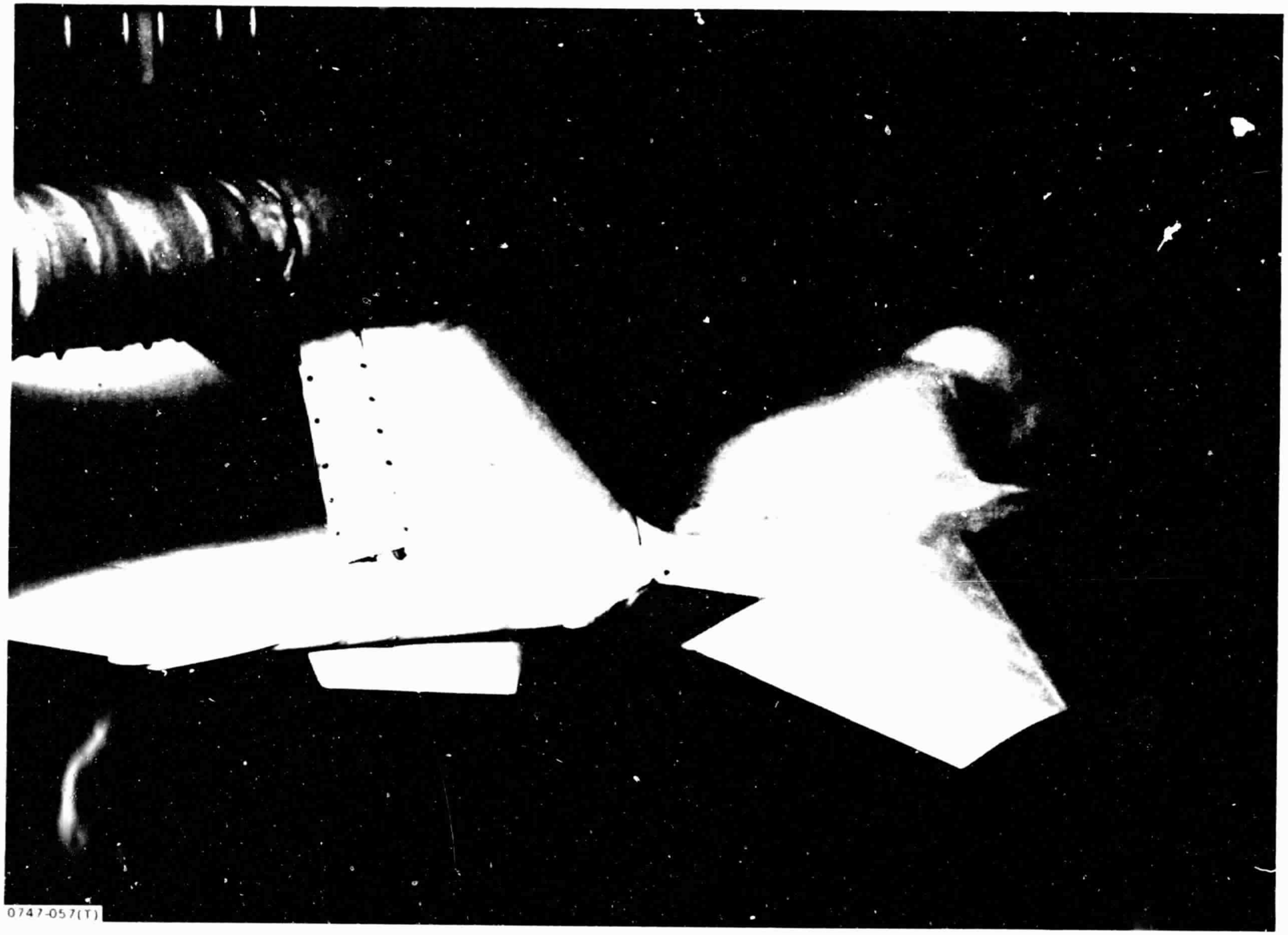
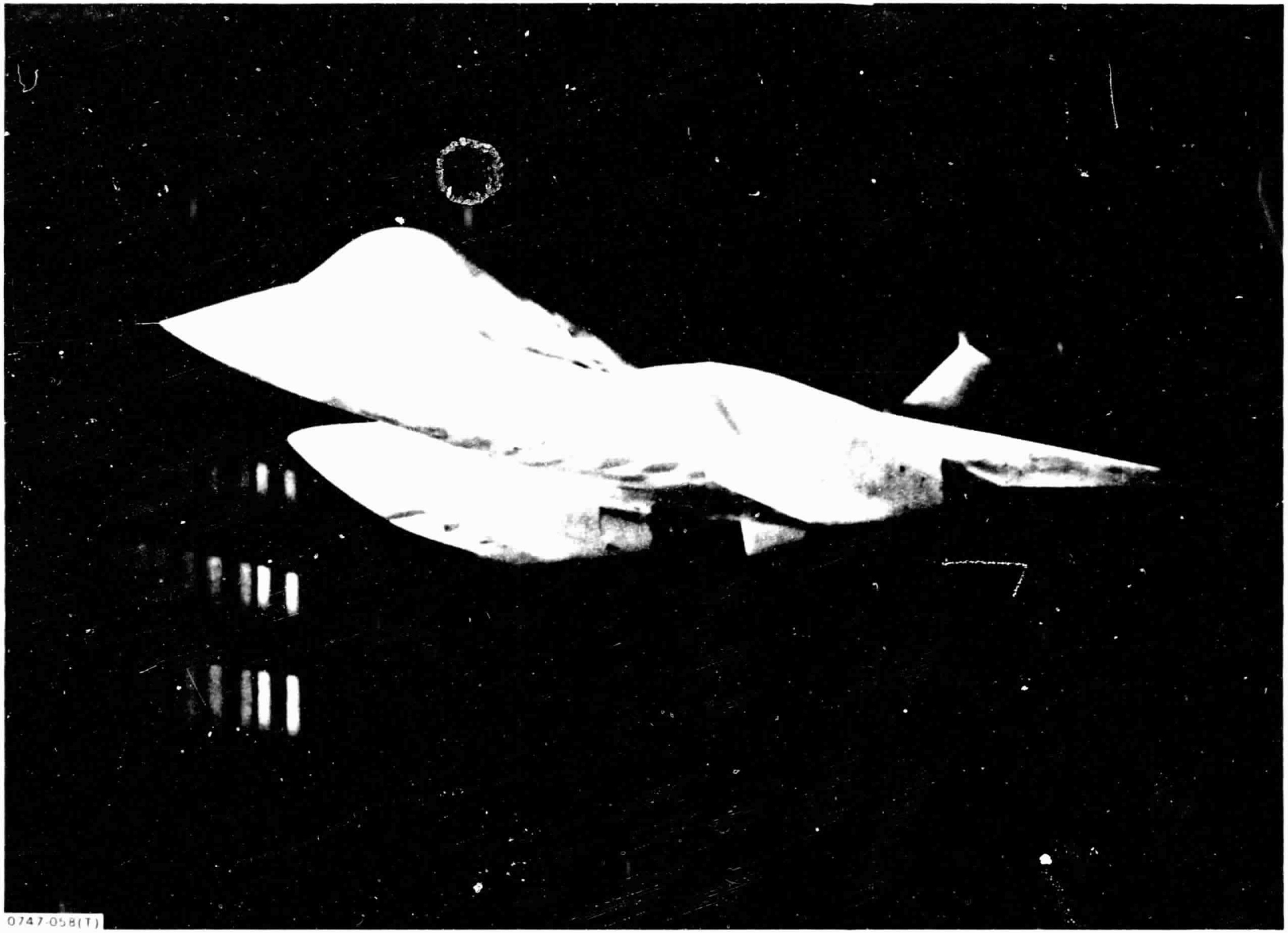


Figure 17. ADEN Combat, Vectored Nozzle/Airframe Configuration Installed in Tunnel



0747-058(T)

Figure 18. Model with Ogive Inlet Fairings Installed on Model

CONFIGURATION & TEST CONDITION MATRIX
NON–AFTERBURNING

NOMINAL		ANGLE OF ATTACK PER CONFIGURATION (NOMINAL)					
MACH	NPR	ADEN CR 0°	CR 0° ALT	ADEN CR 5°	ADEN CR 10°	CIRCULAR	ALBEN
0.4	1	0,3,6,9,12			0,3,6,9,12		
	1.15	0,3,6,9,12			0,3,6,9,12		
	2.5	0,3,6,9,12			0,3,6,9,12		
	3.0	0,3,6,9,12			0,3,6,9,12		
	4.0	0,3,6,9,12			0,3,6,9,12		
0.6	1	0,2,4,6,8,10	0,4,8		0,2,4,6,8,10	0,2,4,6,8,10	
	1.25	0,2,3,4,6,8,10,12	–		0,2,4,6,8,10	0,2,4,6,8,10	
	2.5	0,2,3,4,6,8,10,12	0,4,8		0,2,4,6,8,10	0,2,4,6,8,10	
	3.0	0,2,3,4,6,8,10,12	0,4,8		0,2,4,6,8,10	0,2,4,6,8,10	
	4.0	0,2,3,4,6,8,10,12	0,4,8		0,2,4,6,8,10	0,2,4,6,8,10	
0.8	1	0,2,4,6,8		0,2,4,6,8	0,2,4,6,8		0,2,4,6,8
	1.5	0,2,4,6,8		–	0,2,4,6,8		0,2,4,6,8
	3.0	0,2,4,6,8		–	0,2,4,6,8		0,2,4,6,8
	4.0	0,2,4,6,8		0,4,8	0,2,4,6,8		–
	5.0	0,2,4,6,8		0,2,4,6,8	0,2,4,6,8		0,2,4,6,8
	6.0	0,2,4,6,8		0,4,8	0,2,4,6,8		0,2,4,6,8
	7.0	0,2,4,6,8		–	2,4,6,8		–
0.9	1	0,2,4,6,8	0,4,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8
	1.6	0,2,4,6,8	–	–	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8
	3.0	0,2,4,6,8	0,4,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8
	4.0	0,2,4,6,8	0,4,8	0,2,4,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8
	5.0	0,2,4,6,8	0,4,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8
	6.0	0,2,4,6,8	0,4,8	0,4,8	1½,2,4,6,8	0,2,4,6,8	0,2,4,6,8
0.95	1	0,2,4,6			4	0,2,4,6	
	1.8	4			4	–	
	3.0	4			4	–	
	4.0	4			4	–	
	5.0	4			4	–	
	6.0	0,2,4,6			4	0,2,4,6	
	7.0	4			4	–	
1.35	1	0,2,4,6	0,4,6				0,2,4,6
	6.0	–	–				0,2,4
	8.0	0,2,4,6	0,4,6				0,2,4
	10.0	0,2,4,6	0,4,6				0,2,4
1.4	1	0				0,2,4,6	
	3.0	–				–	
	5.0	–				–	
	6.0	–				–	
	8.0	–				0,2,4,6	
	10.0	–				0,2,4,6	

0747-045(T)

Figure 19. Test Condition Matrix: Non-Afterburning Configurations

CONFIGURATION & TEST CONDITION MATRIX
AFTERBURNING

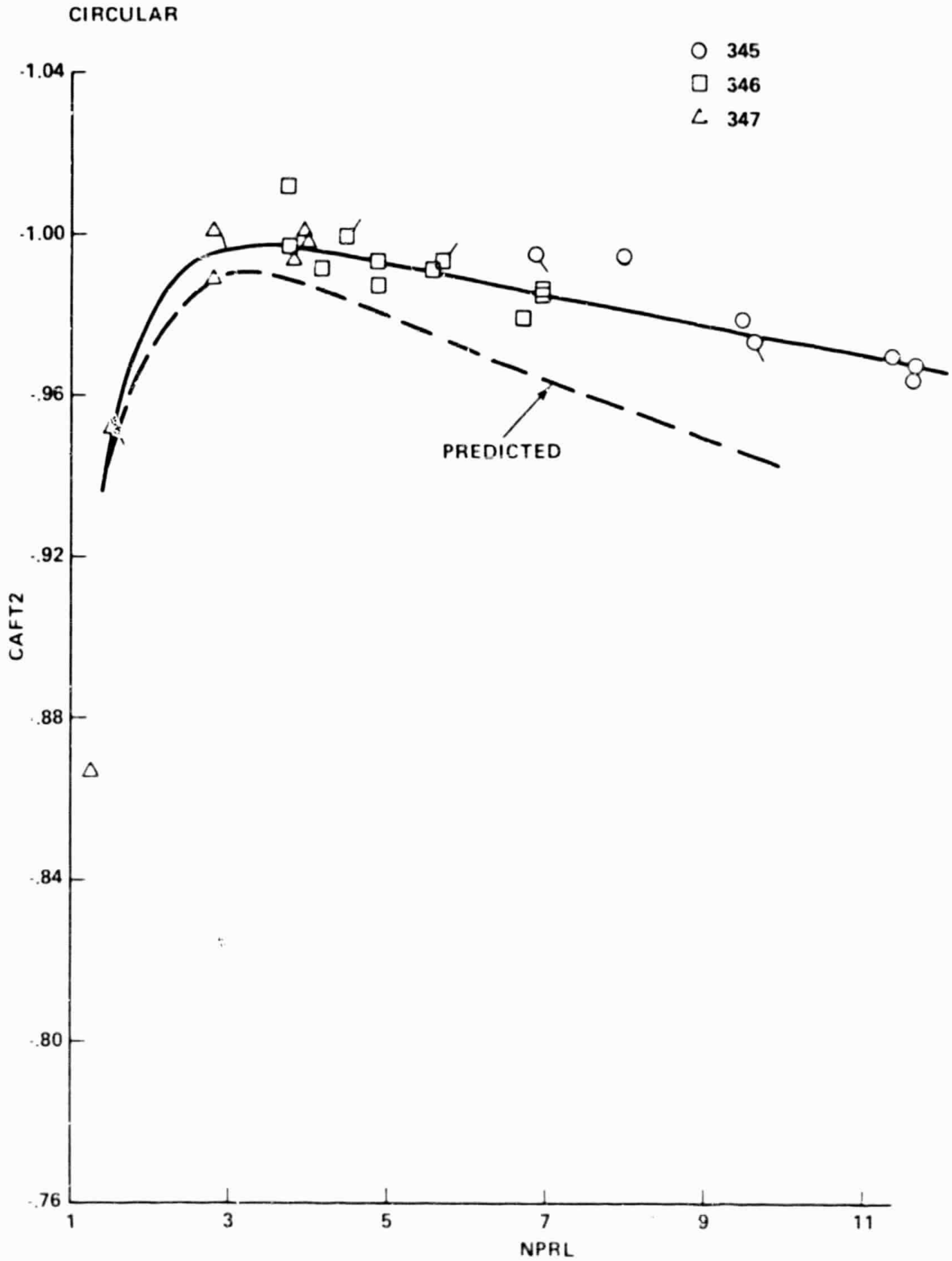
NOMINAL		ANGLE OF ATTACK PER CONFIGURATION (NOMINAL)						
MACH	NPR	ADEN COM 0°	COM 0° ALT	COM 0° + I/F	ADEN COM 10°	ADEN COM 20°	COM 20° ALT	ADEN DASH
0.4	1	0,3,6,9,12		0,3,6,9,12		0,3,6,9,12	0,3,6,9,12	
	1.15	0,3,6,9,12		–		0,3,6,9,12	–	
	2.5	0,3,6,9,12		0,3,6,9,12		0,3,6,9,12	0,3,6,9,12	
	3.0	0,3,6,9,12		–		0,3,6,9,12	–	
	4.0	0,3,6,9,12		–		0,3,6,9,12	–	
0.6	1	0,2,4,6,8,10	0,4,8	0,2,4,6,8	0,2,4,6,8	0,2,3,4,6,8,10	0,2,4,6,8,10	0,2,4,6,8
	1.25	0,2,4,6,8,10	–	–	0,2,4,6,8	0,2,4,6,8,10	–	0,2,4,6,8
	2.5	0,2,4,6,8,10	0,4,8	–	0,2,4,6,8	0,2,4,6,8,10	–	0,2,4,6,8
	3.0	0,2,4,6,8,10	0,4,8	0,2,4,6,8	0,2,4,6,8	0,2,4,6,8,10	0,2,4,6,8,10	0,2,4,6,8
	4.0	0,2,4,6,8,10	0,4,8	–	0,2,4,6,8	0,2,4,6,8,10	–	0,2,4,6,8
0.8	1	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	1.5	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	3.0	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	4.0	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	5.0	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	6.0	0,2,4,6,8			0,2,4,6,8	0,2,4,6,8		
	7.0	–			–	–		
0.9	1	0,2,4,6,8,10,11	0,4,8	0,2,4,6,8	0,2,4,6,8,10,11	0,2,4,6,8,10,11	0,2,4,6,8,10	0,2,4,6,8
	1.6	0,2,4,6,8,10,11	–	–	0,2,4,6,8,10,11	0,2,4,6,8,10,11	–	0,2,4,6,8
	3.0	0,2,4,6,8,10,11	0,4,8	–	0,2,4,6,8,10,11	0,2,4,6,8,10,11	–	0,2,4,6,8
	4.0	0,2,4,6,8,10,11	0,4,8	–	0,2,4,6,8,10,11	0,2,4,6,8,10,11	–	0,2,4,6,8
	5.0	0,2,4,6,8,10,11	0,4,8	–	0,2,4,6,8,10,11	0,2,4,6,8,10,11	–	0,2,4,6,8
	6.0	0,2,4,6,8,10,11	0,4,8	0,2,4,6,8	0,2,4,6,8,10,11	0,2,4,6,8,10,11	0,2,4,6,8,10	0,2,4,6,8
0.95	1	4			0,4	0,4		
	1.8	4			4	4		
	3.0	4			4	4		
	4.0	4			4	4		
	5.0	4			4	4		
	6.0	4			4	4		
	7.0	4			4	4		
1.2	1	0,2,4,6		0,2,4,6		0,2,4,6	0,2,4,6	0,2,4,6
	3.0	0,2,4,6		–		–	–	0,2,4,6
	5.0	0,2,4,6		–		–	–	0,2,4,6
	6.0	0,2,4,6		–		0,2,4,6	–	0,2,4,6
	8.0	0,2,4,6		0,2,4,6		0,2,4,6	0,2,4,6	0,2,4,6
1.4	1	0,2,4,6,	0,4,6	0,2,4,6		0,2,4,6	0,2,4,6	0,2,4,6
	3.0	0,2,4,6	–	–		–	–	0,2,4,6
	5.0	0,2,4,6	–	–		–	–	0,2,4,6
	6.0	0,2,4,6	0,4,6	–		–	–	0,2,4,6
	8.0	0,2,4,6	–	–		0,2,4,6	–	0,2,4,6
	10.0	0,2,4,6	0,4,6	0,2,4,6		0,2,4,6	0,2,4,6	0,2,4,6

0747-046(T)

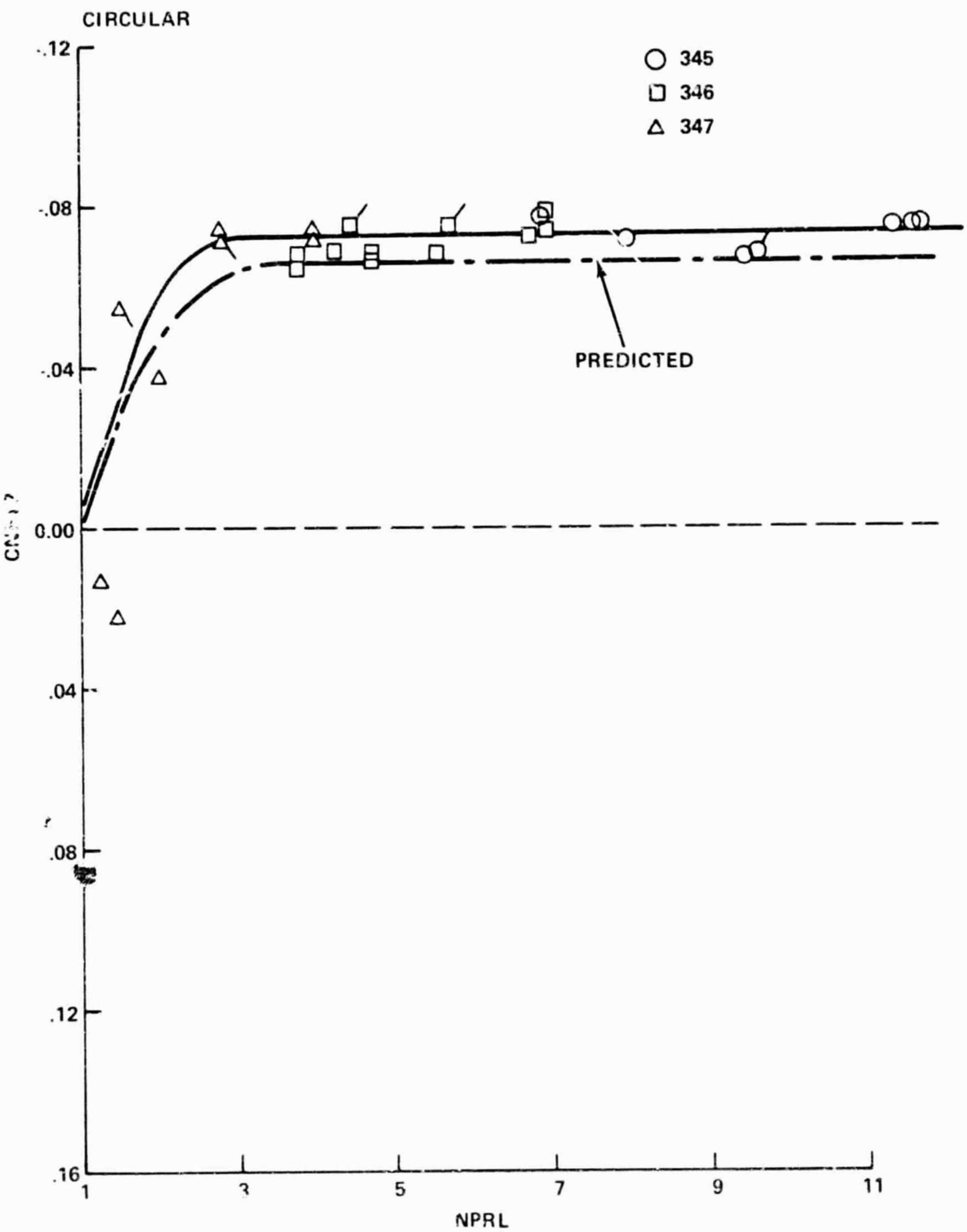
Figure 20. Test Condition Matrix: Afterburning Configurations

APPENDIX A

STATIC THRUST COEFFICIENTS


CIRCULAR
345
346
347
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
PREDICTED
1
3
5
7
9
11
NPRL

0747-001(T)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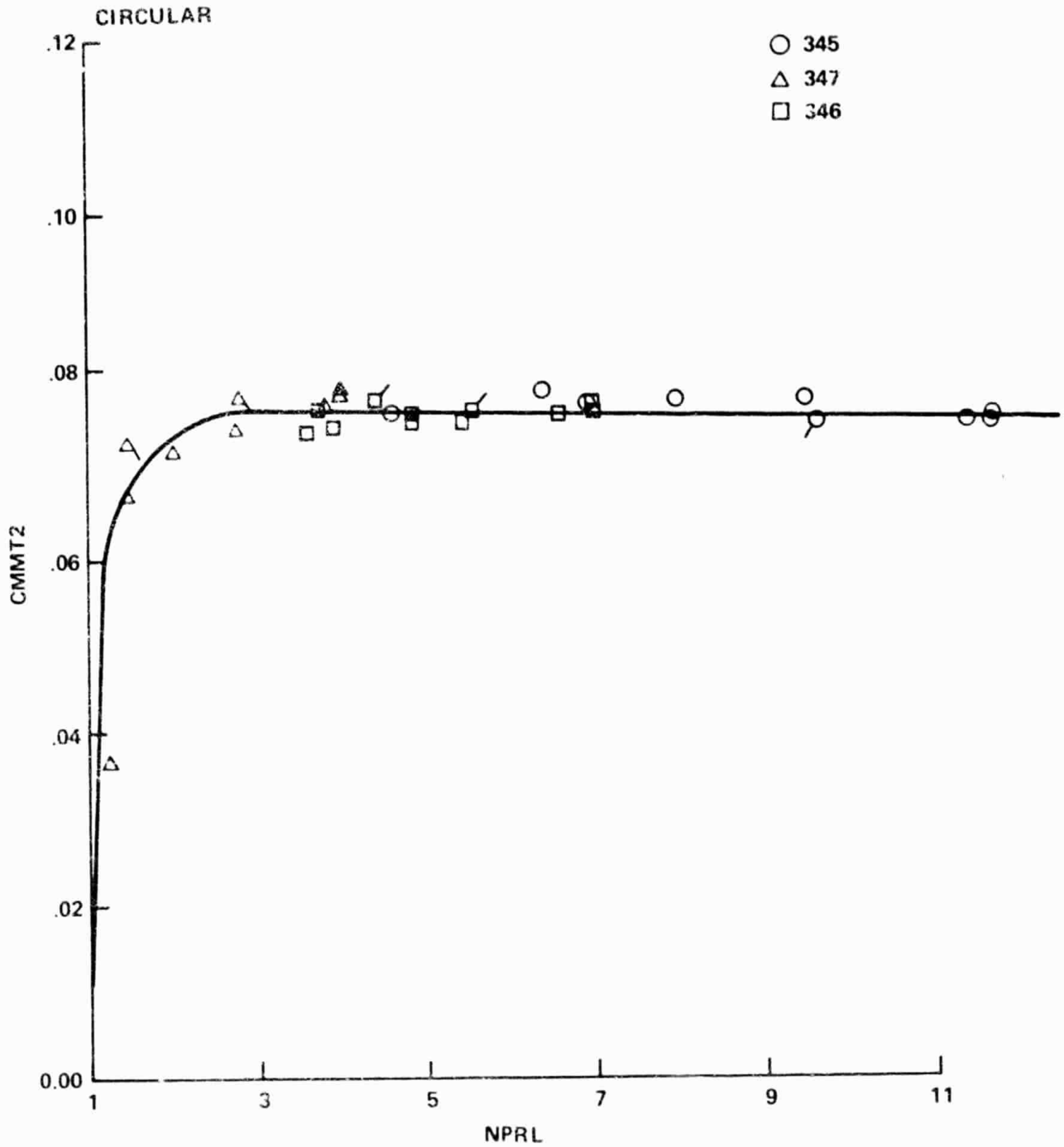
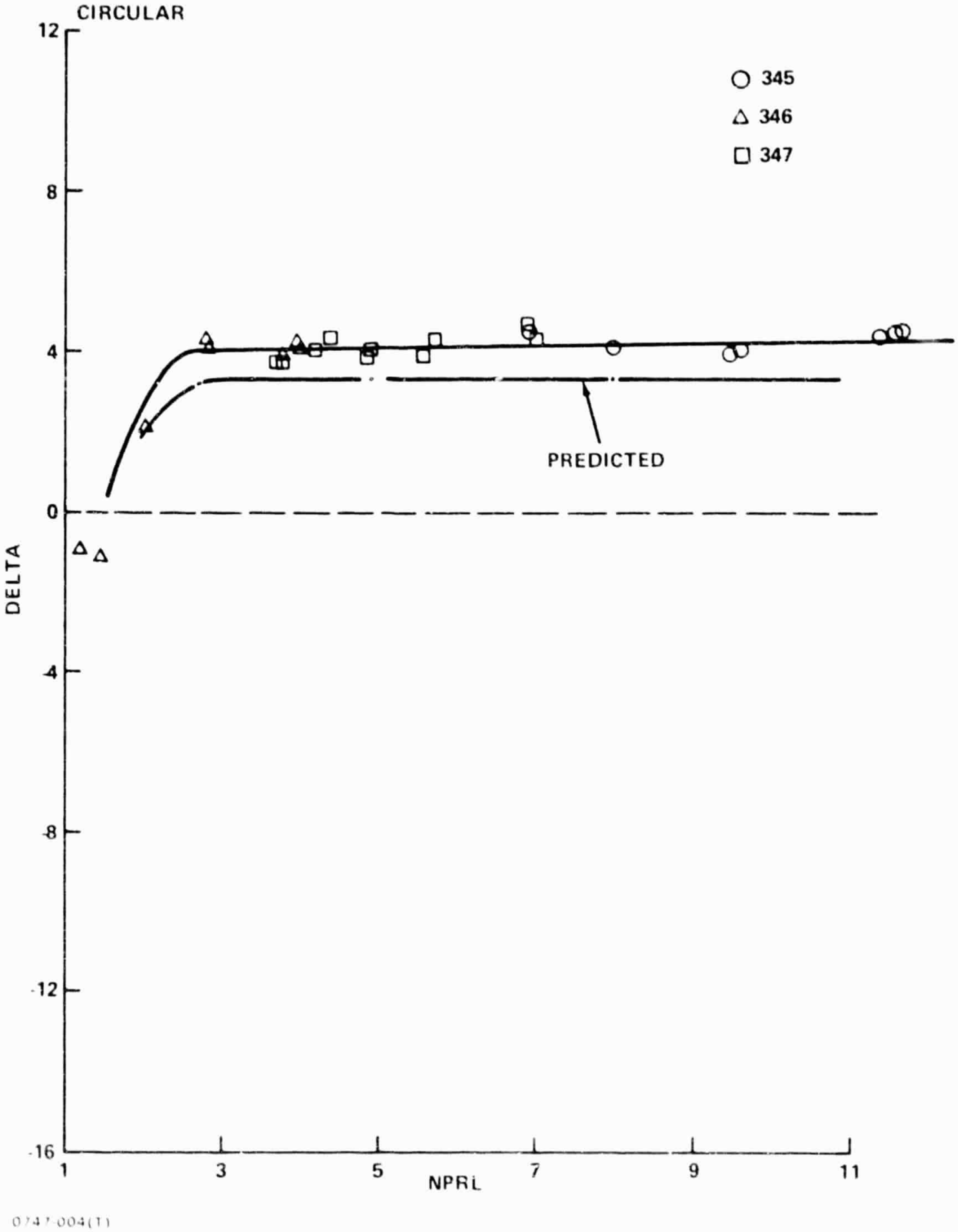
-.08
-.04
0.00
.04
.08
.12
.16
345
346
347
PREDICTED
1
3
5
7
9
11
NPRL

0747-002(T)



0747-003(T)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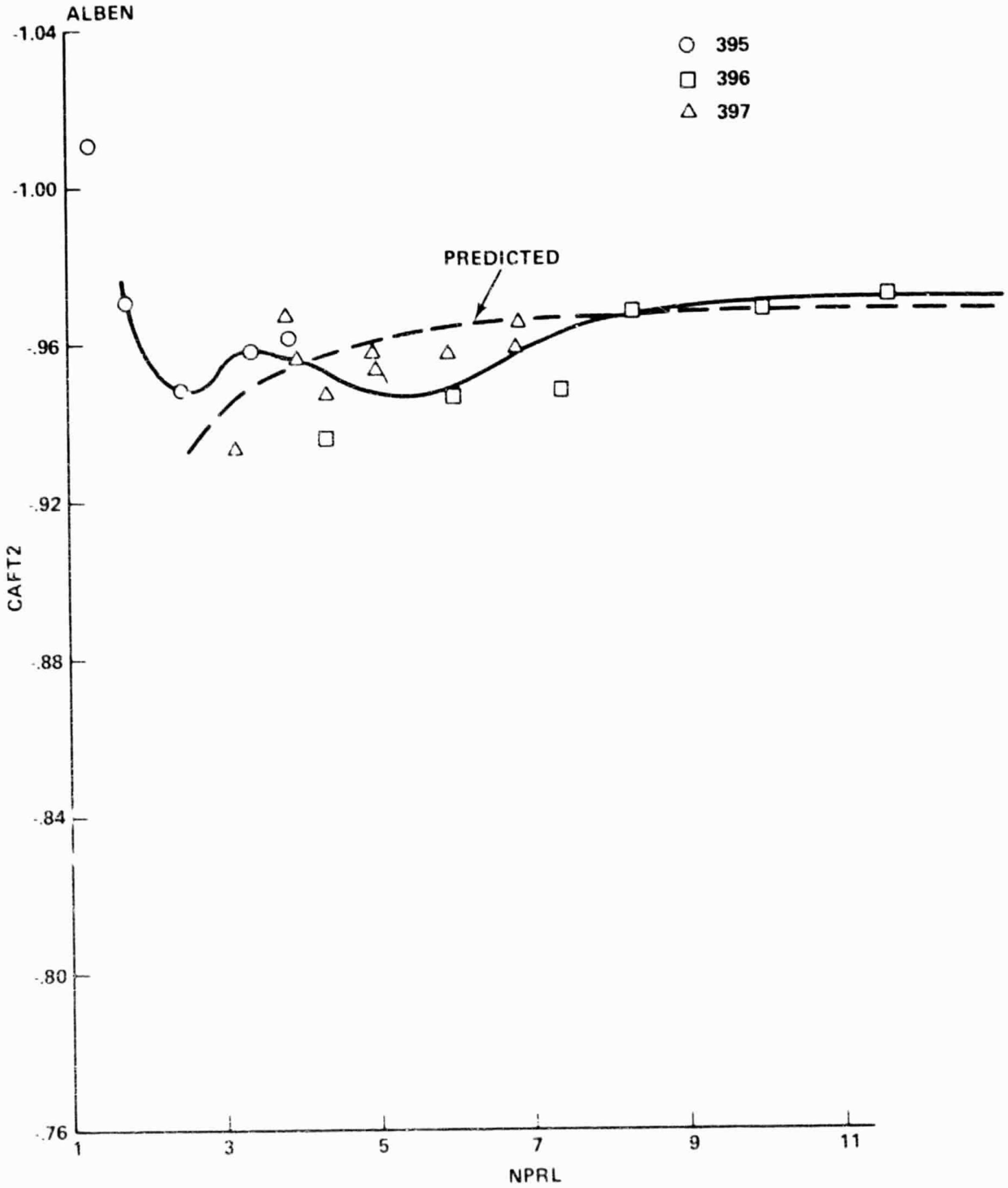
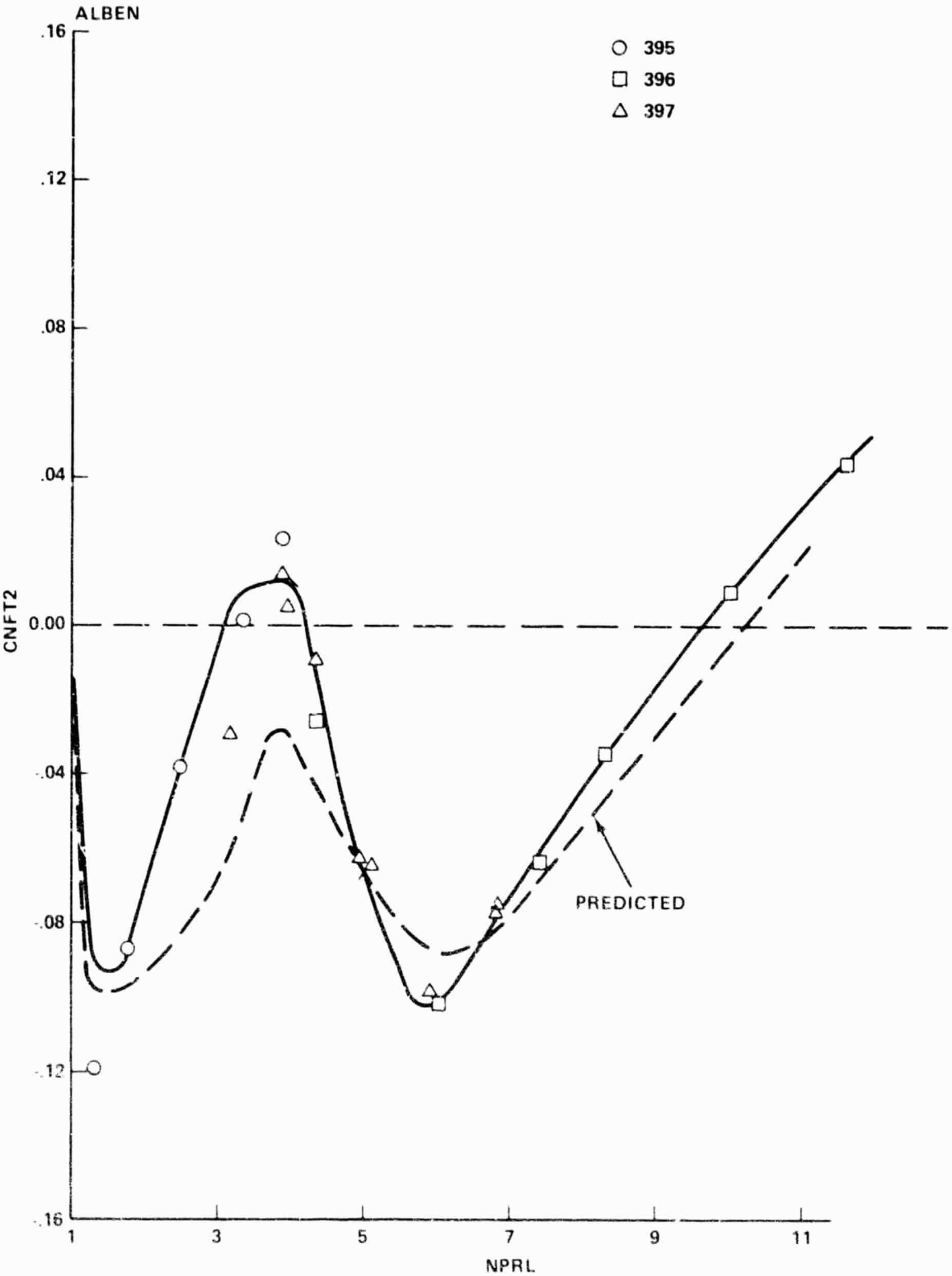
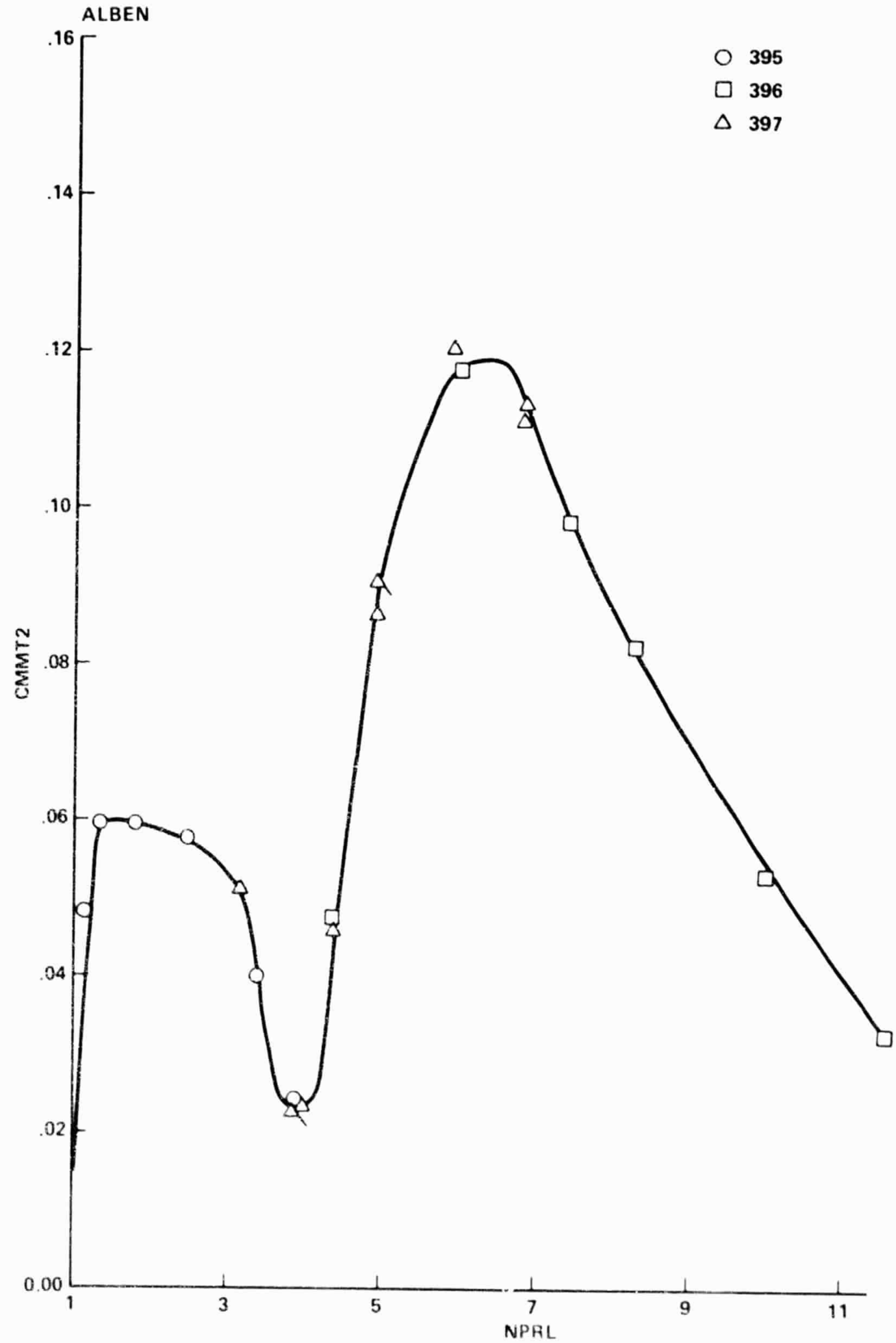
345
346
347
PREDICTED
DELTA
NPRL
12
8
4
0
-4
-8
-12
-16
1
3
5
7
9
11
0747-004(1)



ALBEN
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
395
396
397
PREDICTED
1
3
5
7
9
11
NPRL

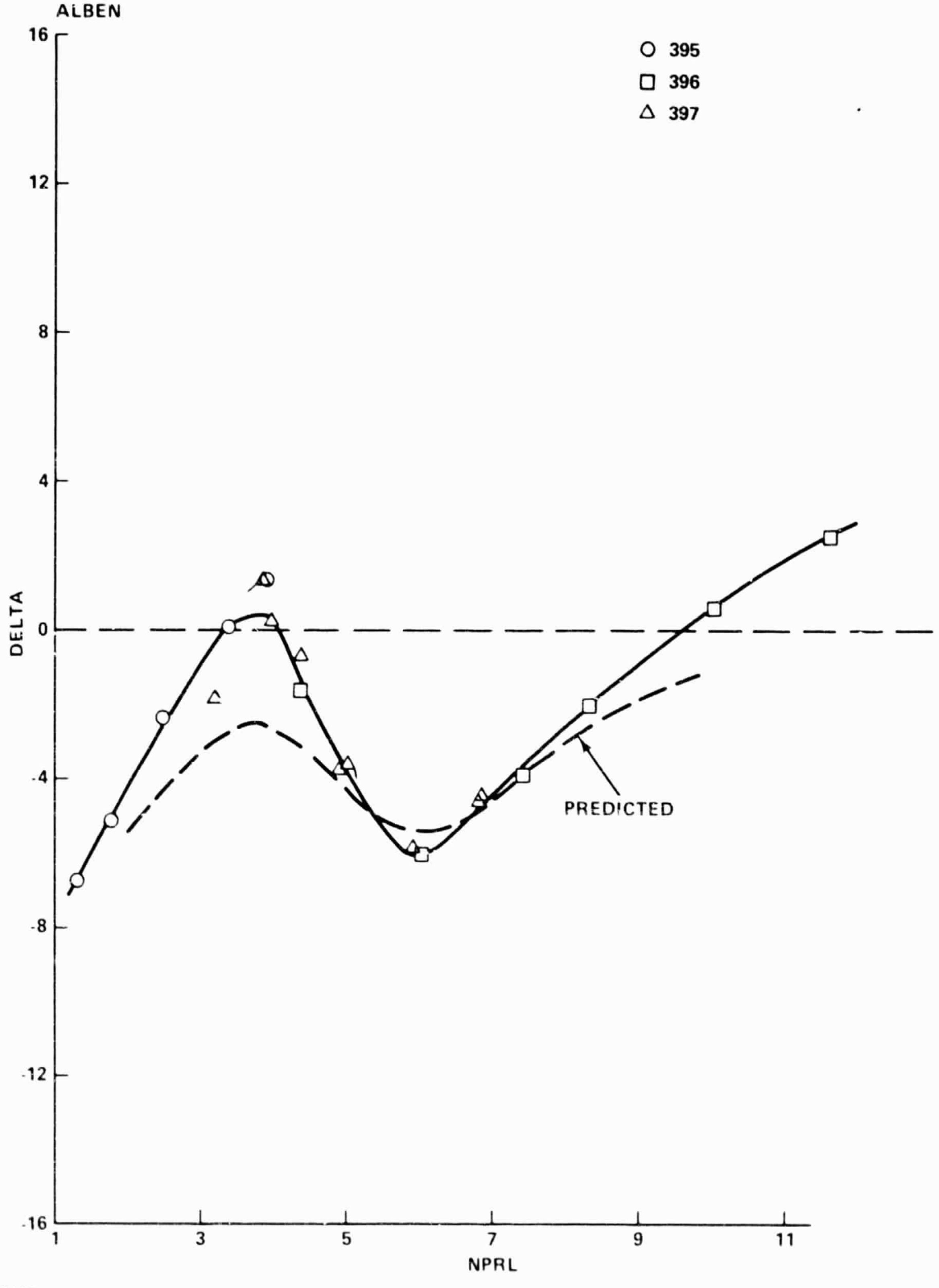

ALBEN
395
396
397
CNFT2
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
1
3
5
7
9
11
NPRL
PREDICTED

0747-006(T)



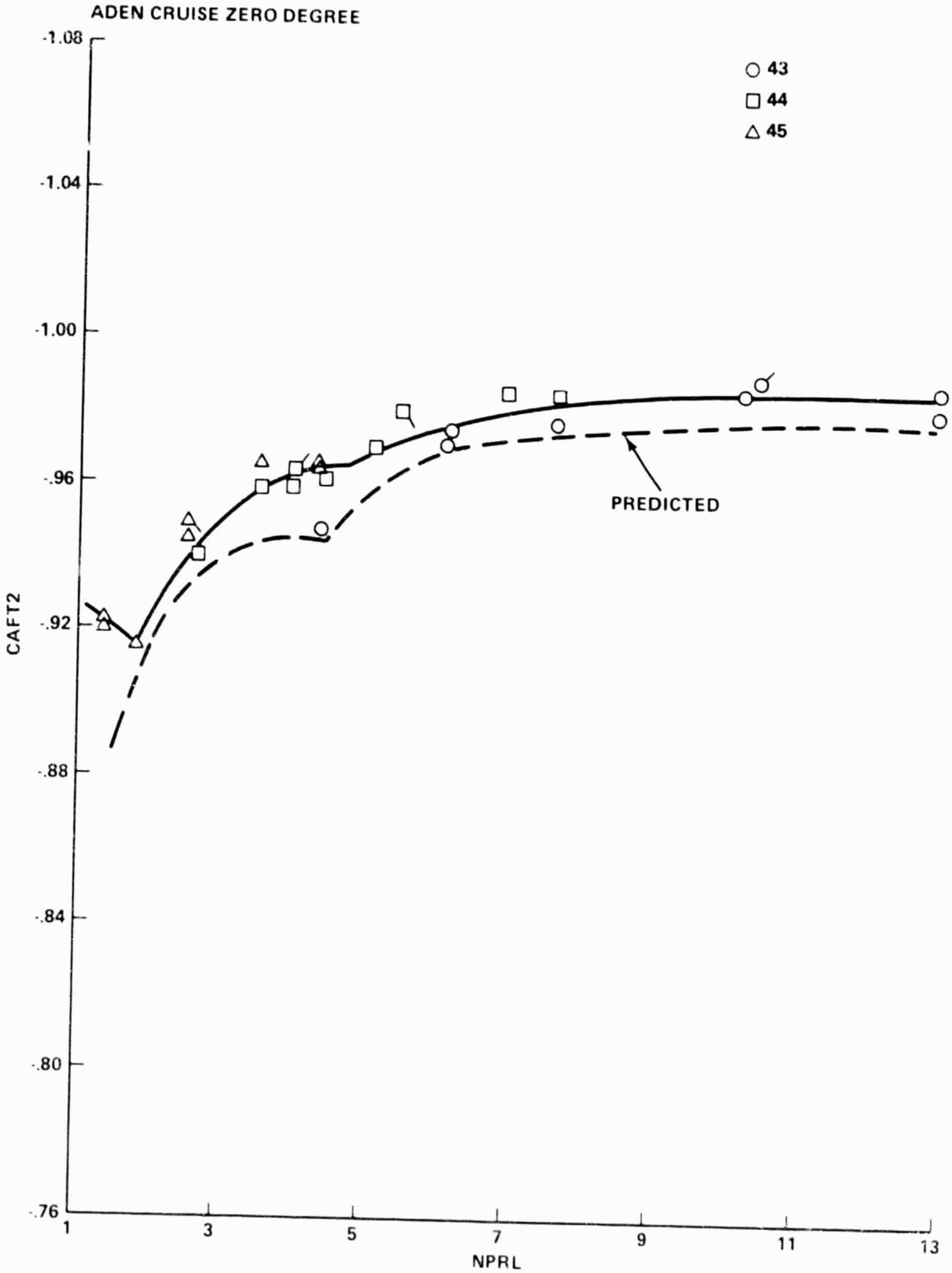
0747-007(T)

A-2(c)

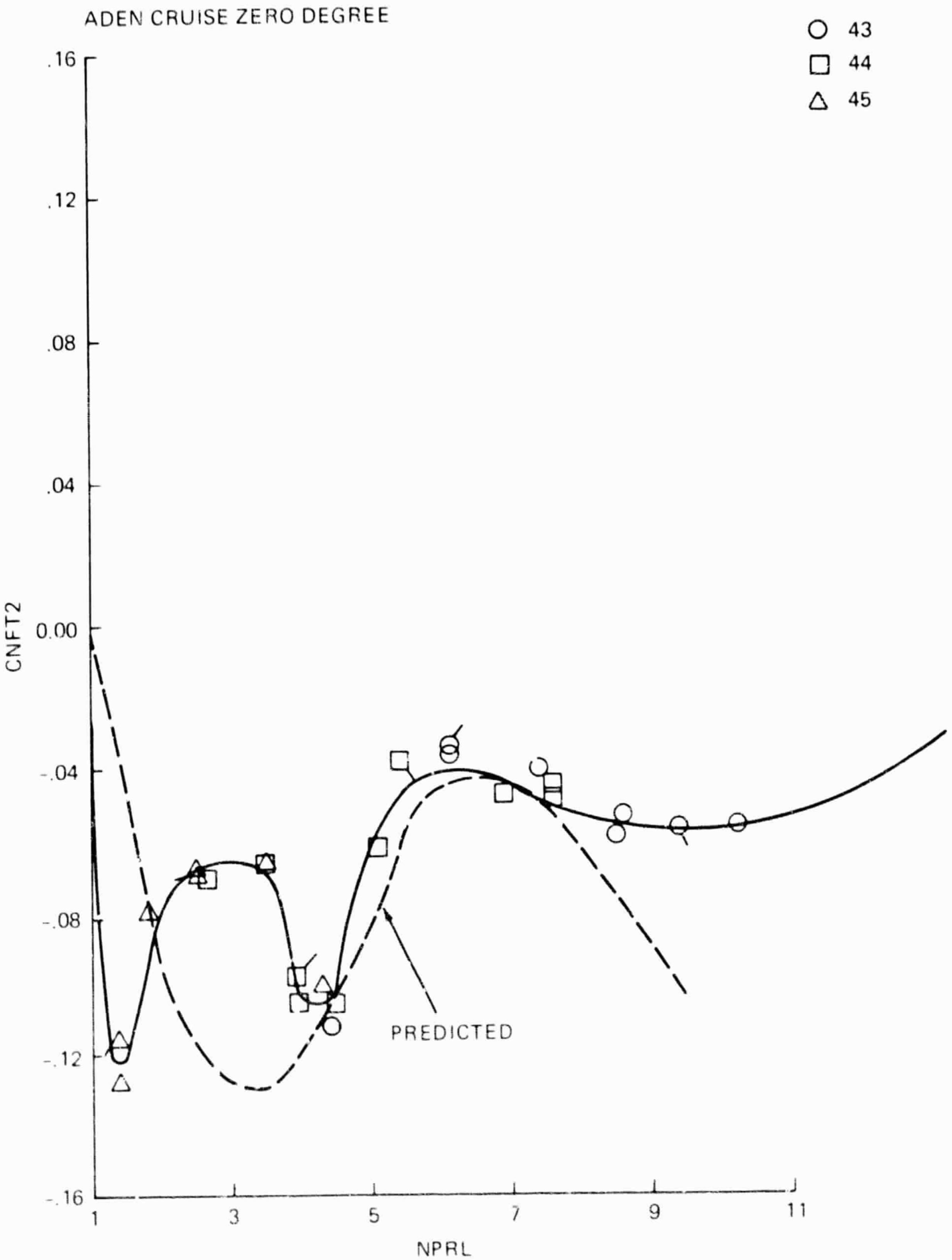


ALBEN
16
12
8
4
0
-4
-8
-12
-16
DELTA
○ 395
□ 396
△ 397
PREDICTED
1
3
5
7
9
11
NPRL

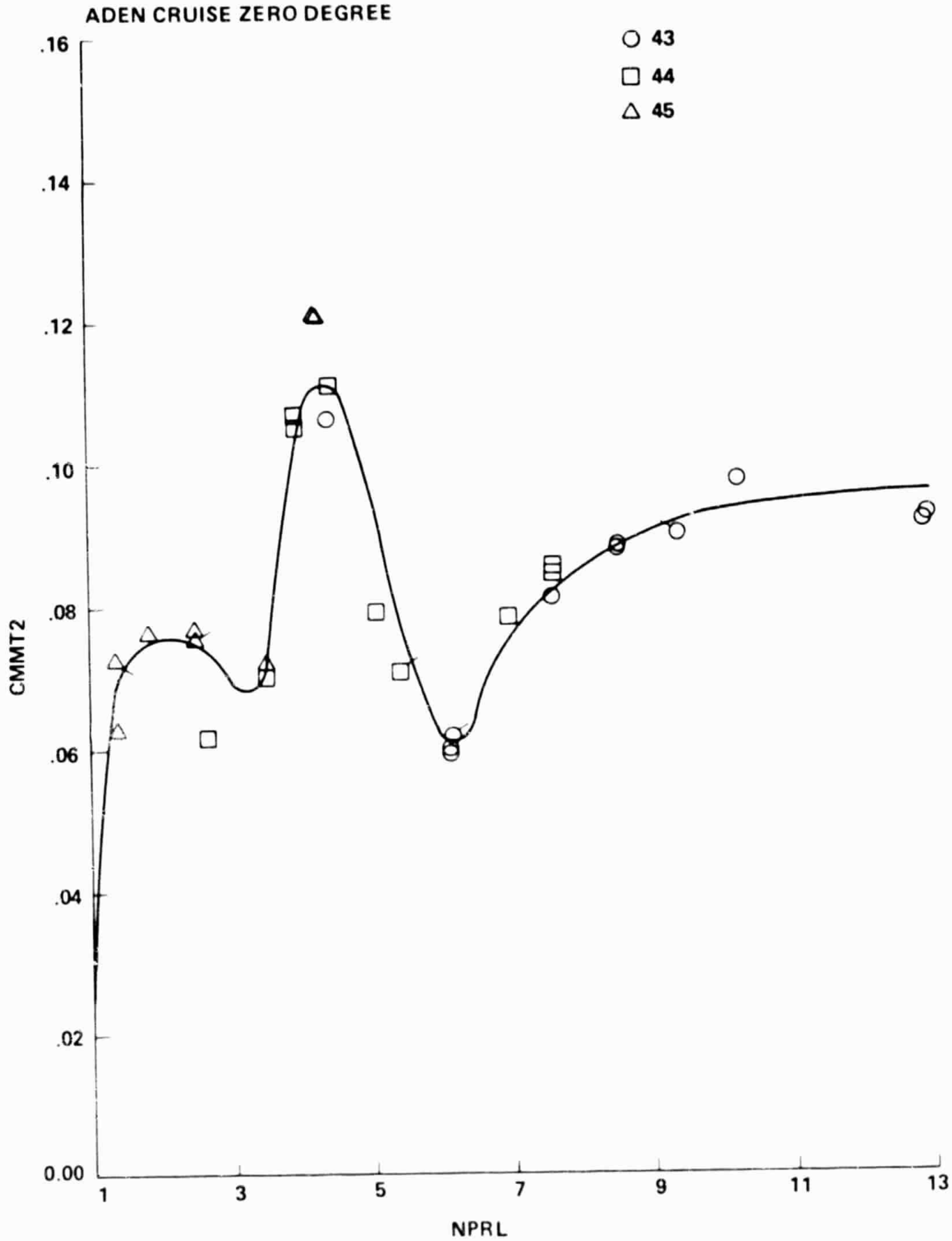
0747-008(T)


ADEN CRUISE ZERO DEGREE
-1.08
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
43
44
45
PREDICTED
1
3
5
7
9
11
13
NPRL

0747-009(T)


ADEN CRUISE ZERO DEGREE
43
44
45
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
PREDICTED
1
3
5
7
9
11
NPRL

0747-010(T)W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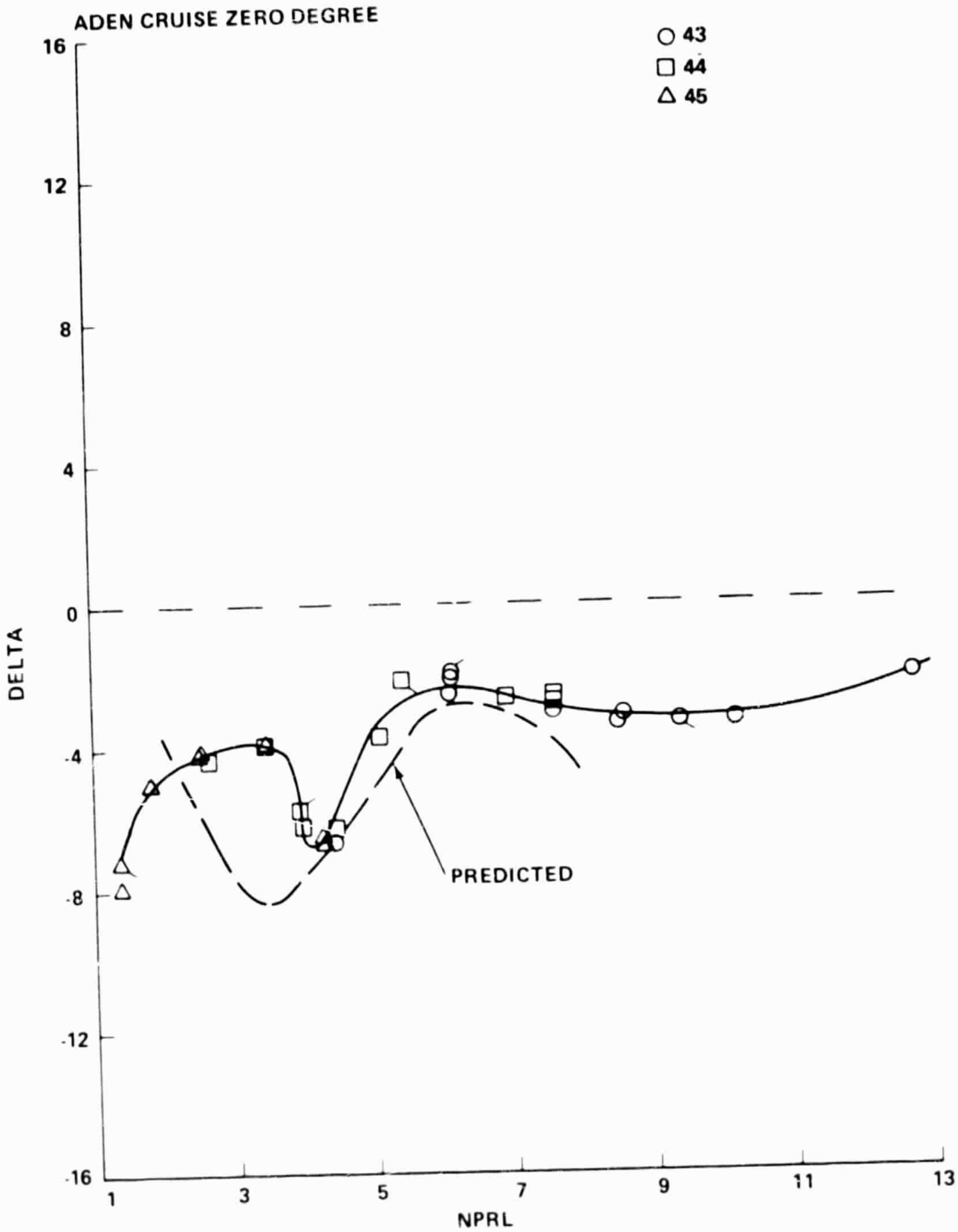
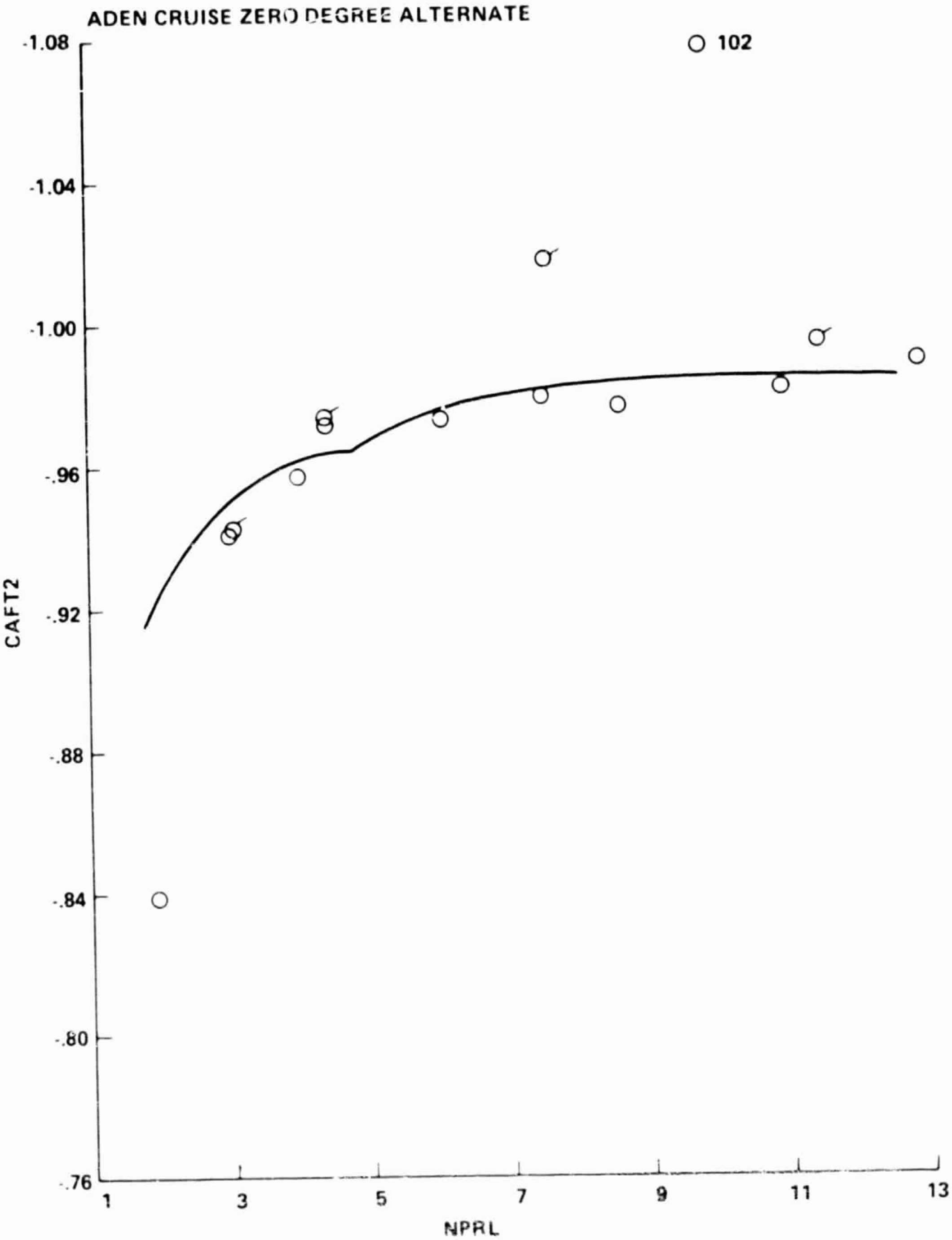
43
44
45
.16
.14
.12
.10
.08
.06
.04
.02
0.00
CMMT2
1
3
5
7
9
11
13
NPRL

0747 011(T)

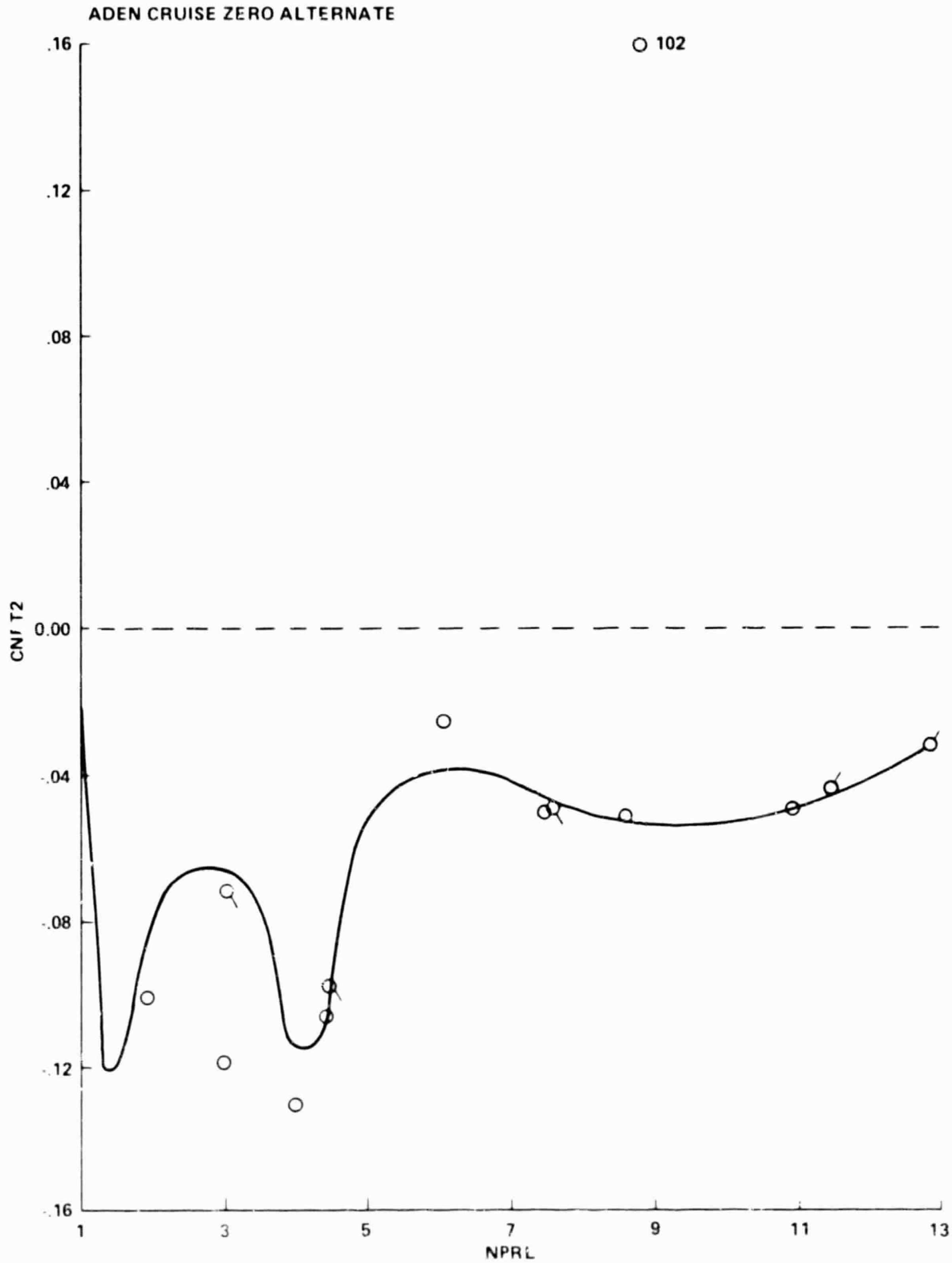

ADEN CRUISE ZERO DEGREE
○ 43
□ 44
△ 45
16
12
8
4
0
-4
-8
-12
-16
DELTA
PREDICTED
1
3
5
7
9
11
13
NPRL

0747-012(T)

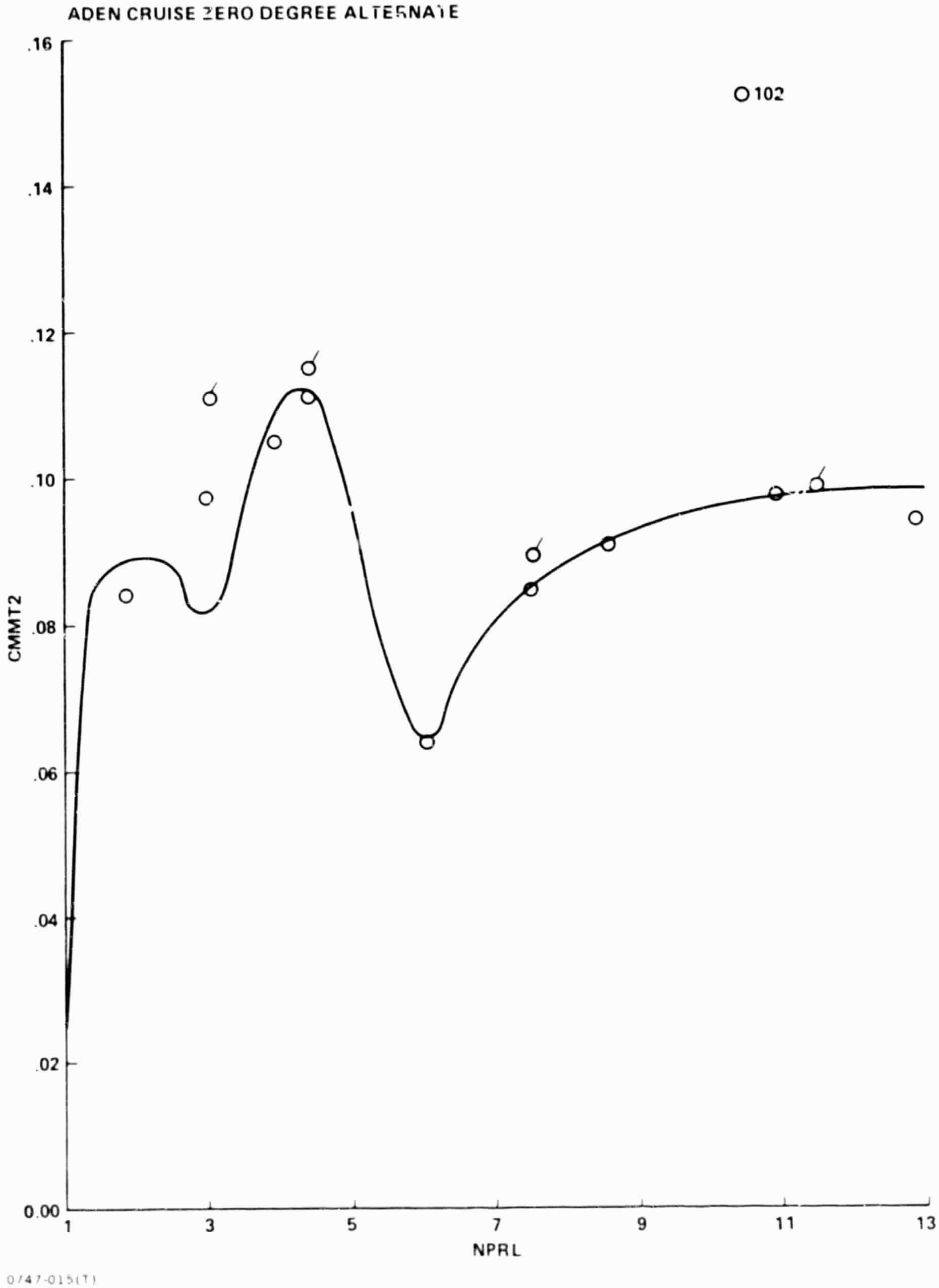


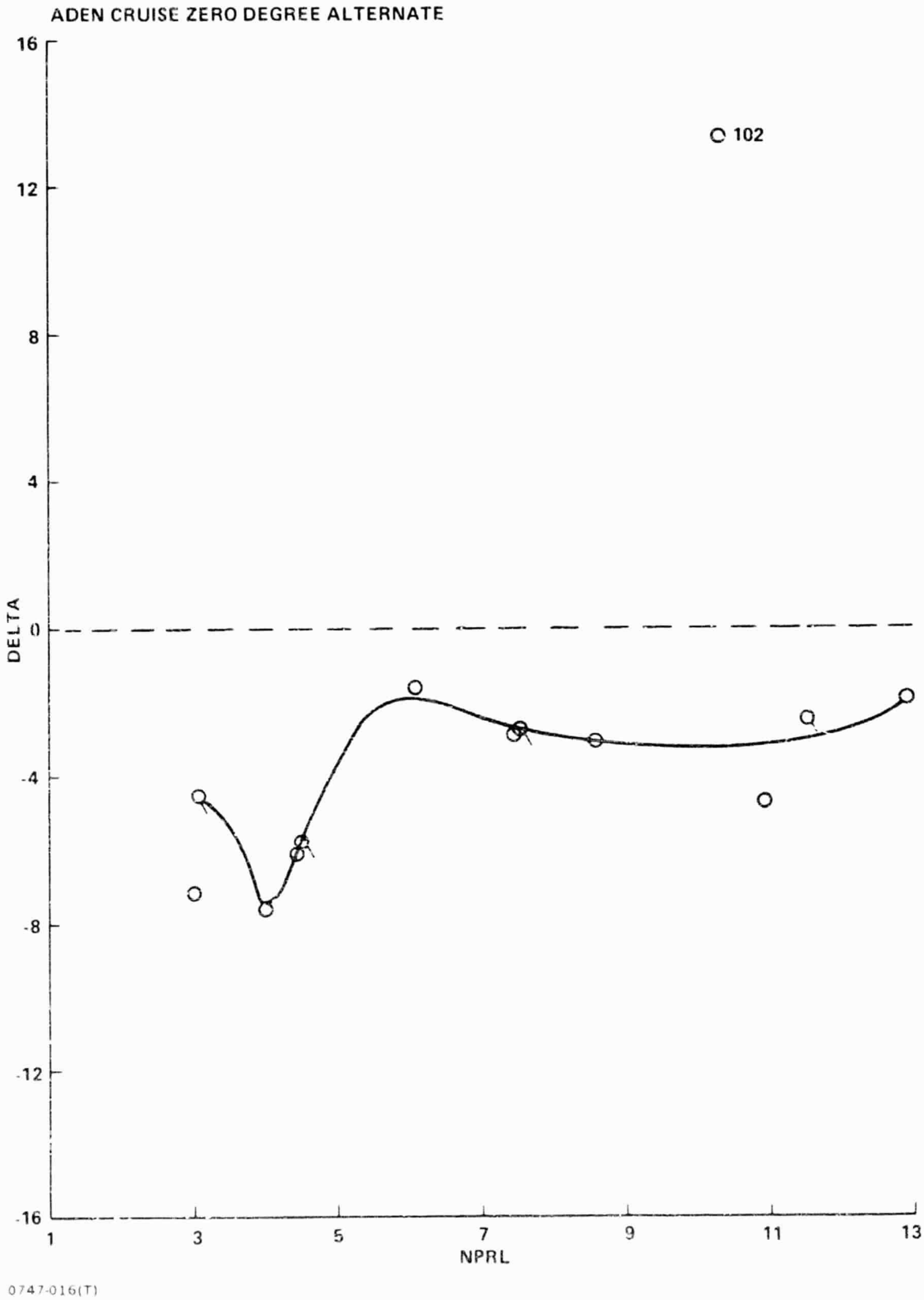
ADEN CRUISE ZERO DEGREE ALTERNATE
102
CAFT2
-1.08
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
1
3
5
7
9
11
13
NPRL

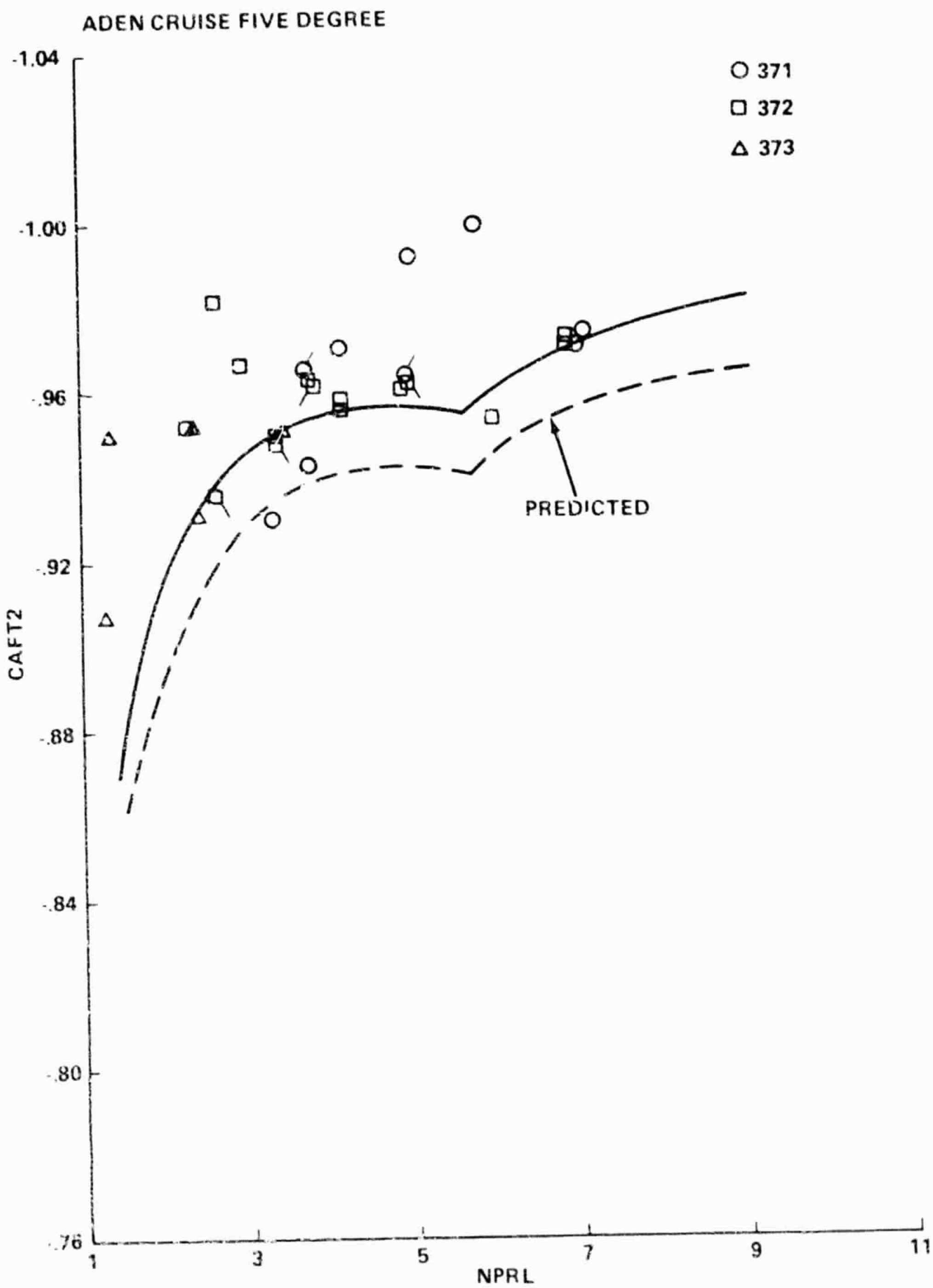
0747-013(T)


ADEN CRUISE ZERO ALTERNATE
102
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
1
3
5
7
9
11
13
NPRL

0747-014(T)

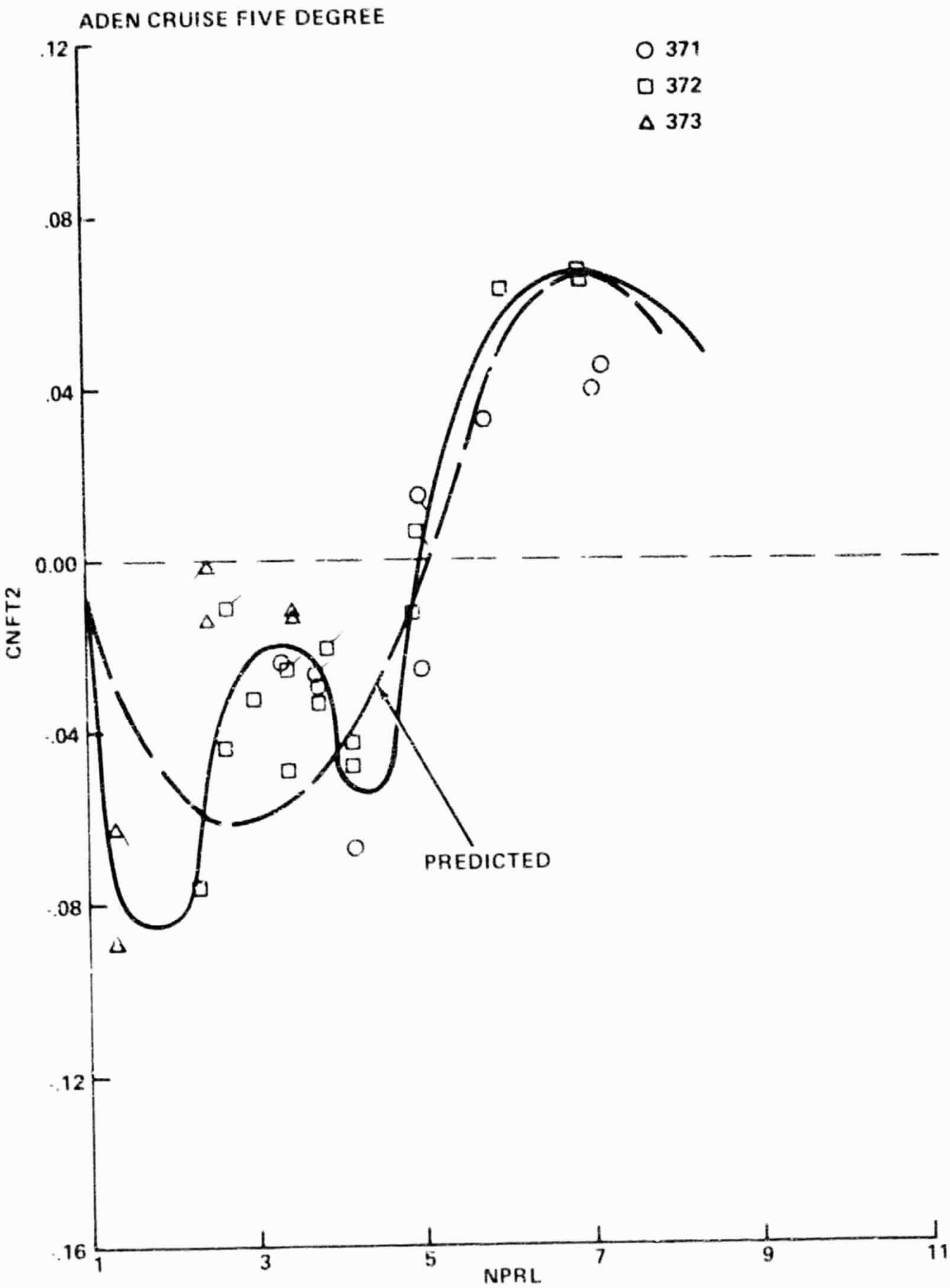

ADEN CRUISE ZERO DEGREE ALTERNATE
102
CMMT2
.16
.14
.12
.10
.08
.06
.04
.02
0.00
1
3
5
7
9
11
13
NPRL
0747-015(T)


ADEN CRUISE ZERO DEGREE ALTERNATE
102
16
12
8
4
0
-4
-8
-12
-16
DELTA
1
3
5
7
9
11
13
NPRL
0747-016(T)



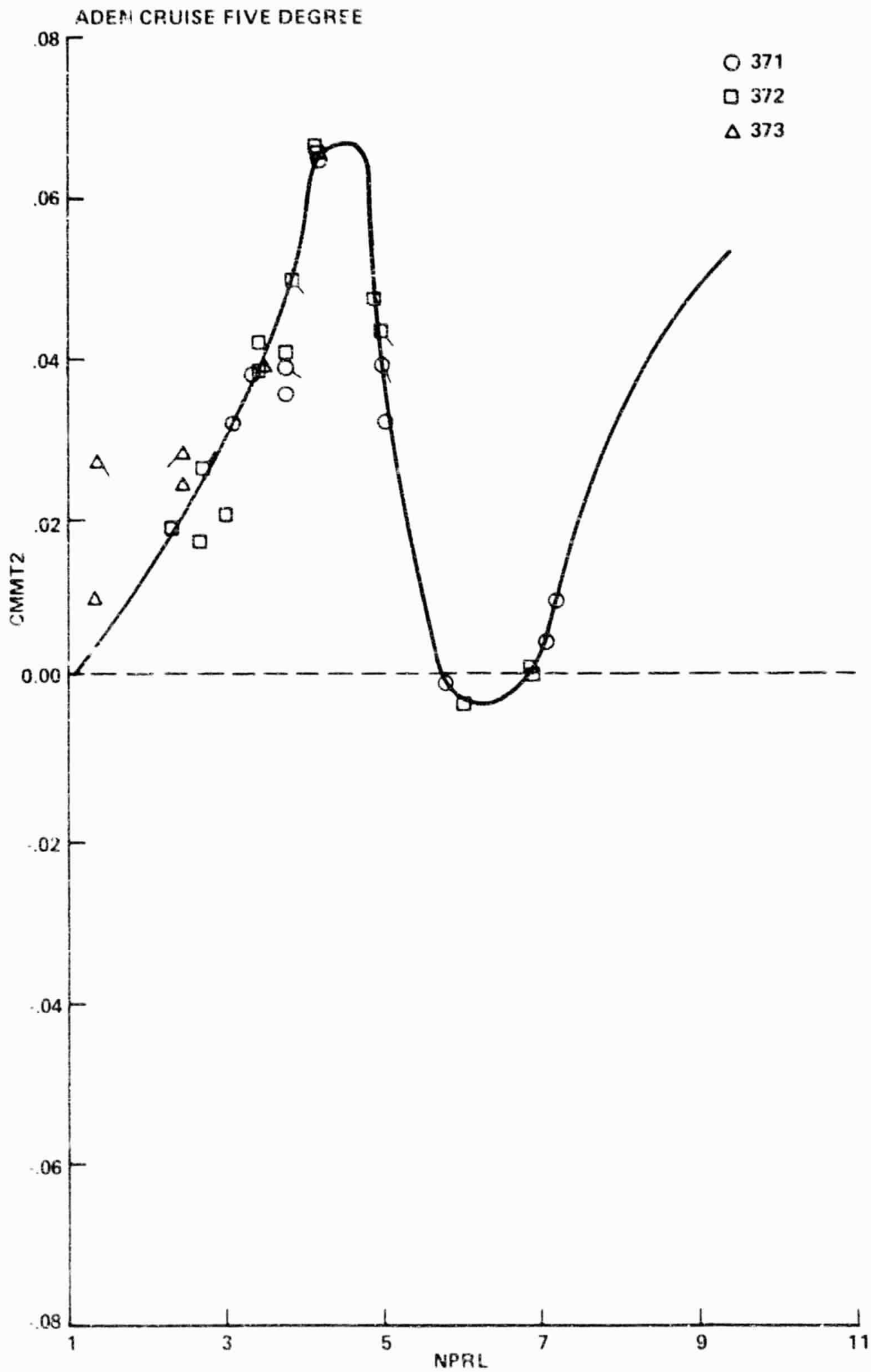
ADEN CRUISE FIVE DEGREE
371
372
373
PREDICTED
CAFT2
NPRL
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
1
3
5
7
9
11

0747-017(T)

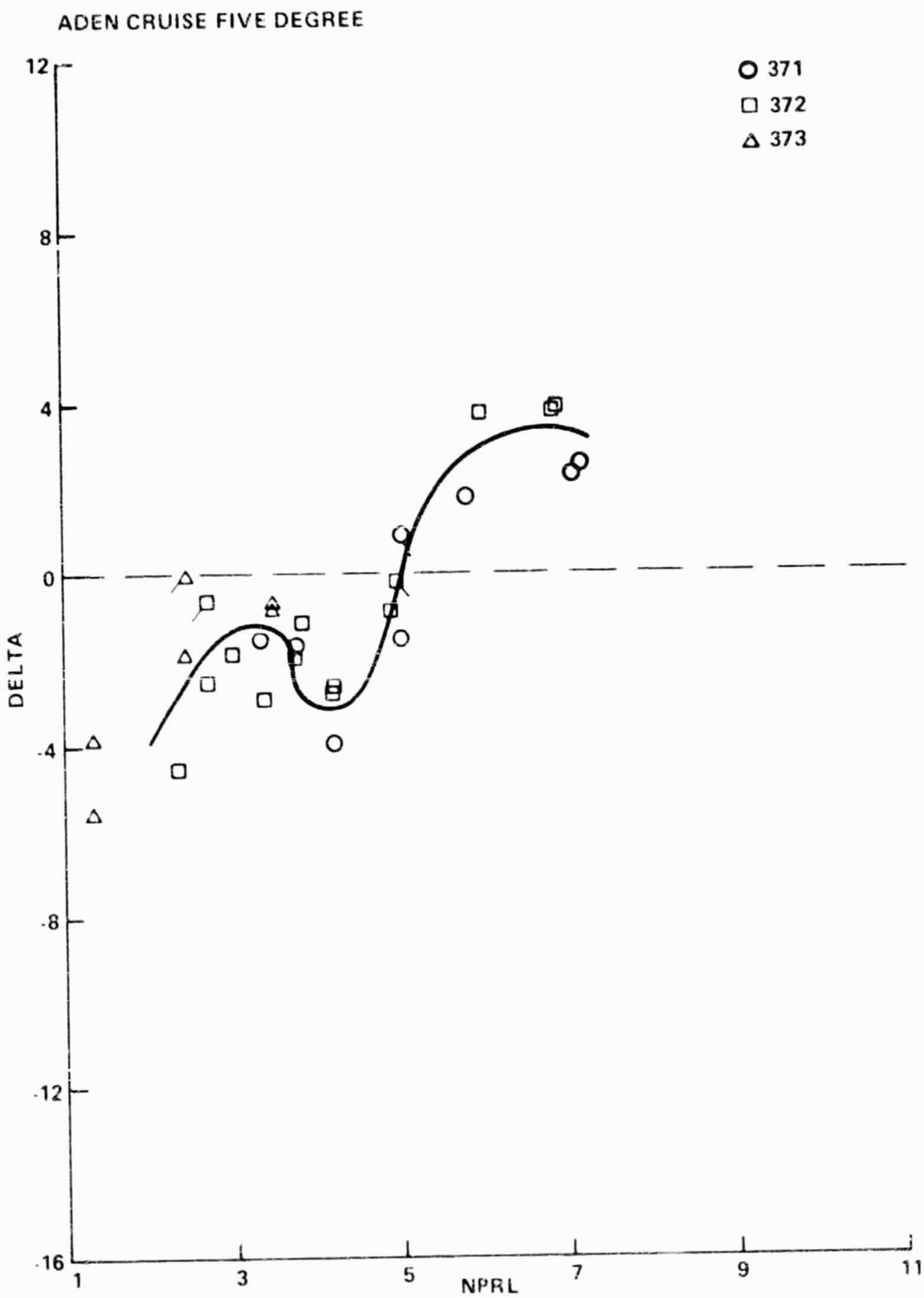


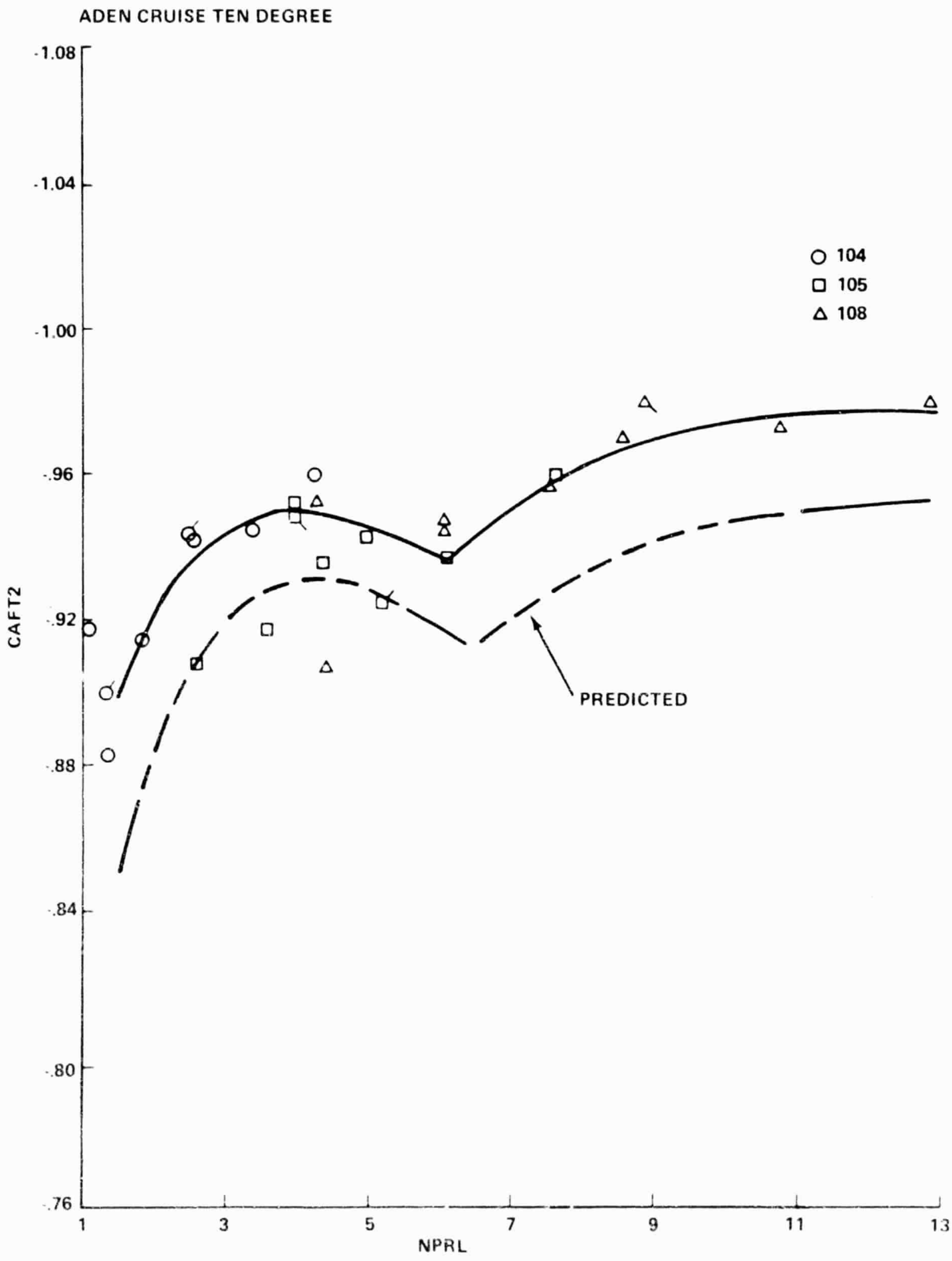
ADEN CRUISE FIVE DEGREE
371
372
373
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
PREDICTED
1
3
5
7
9
11
NPRL

0747-018(T)

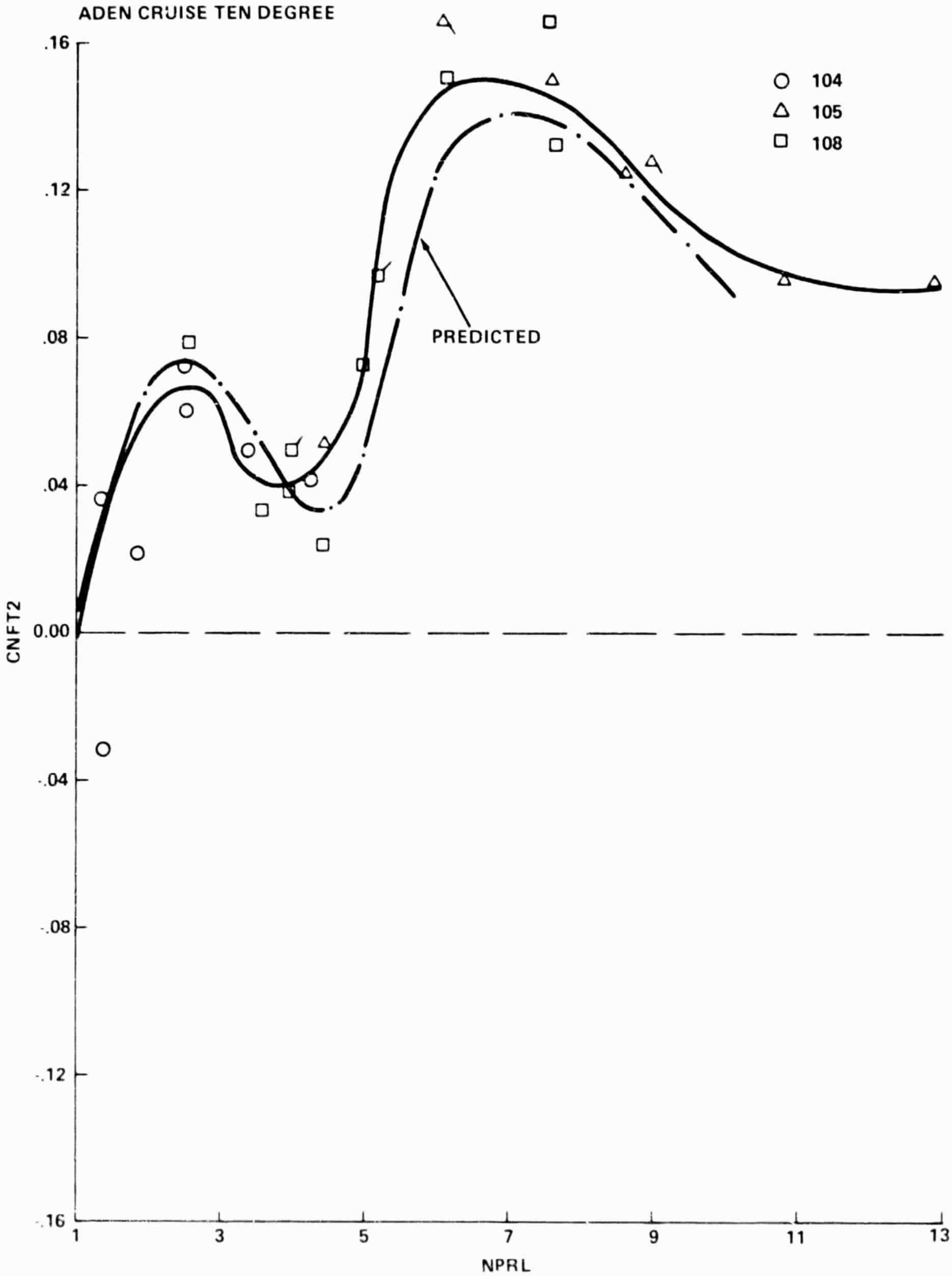

ADEN CRUISE FIVE DEGREE
371
372
373
.08
.06
.04
.02
0.00
-.02
-.04
-.06
-.08
CMMT2
1
3
5
7
9
11
NPRL

0747-019(T)

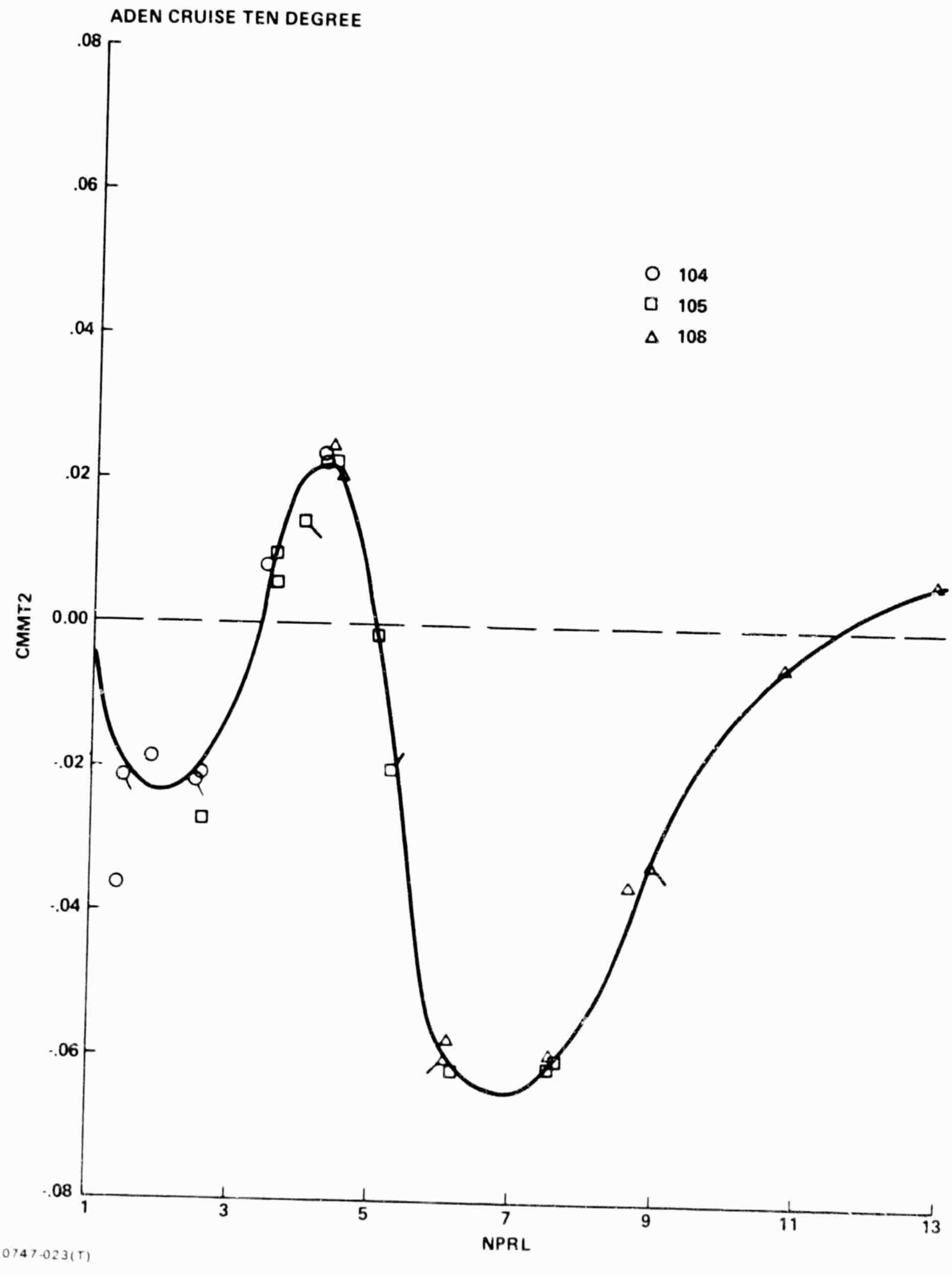

ADEN CRUISE FIVE DEGREE
371
372
373
12
8
4
0
-4
-8
-12
-16
DELTA
1
3
5
7
9
11
NPRL
0747-020(T)


ADEN CRUISE TEN DEGREE
-1.08
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
1
3
5
7
9
11
13
NPRL
104
105
108
PREDICTED

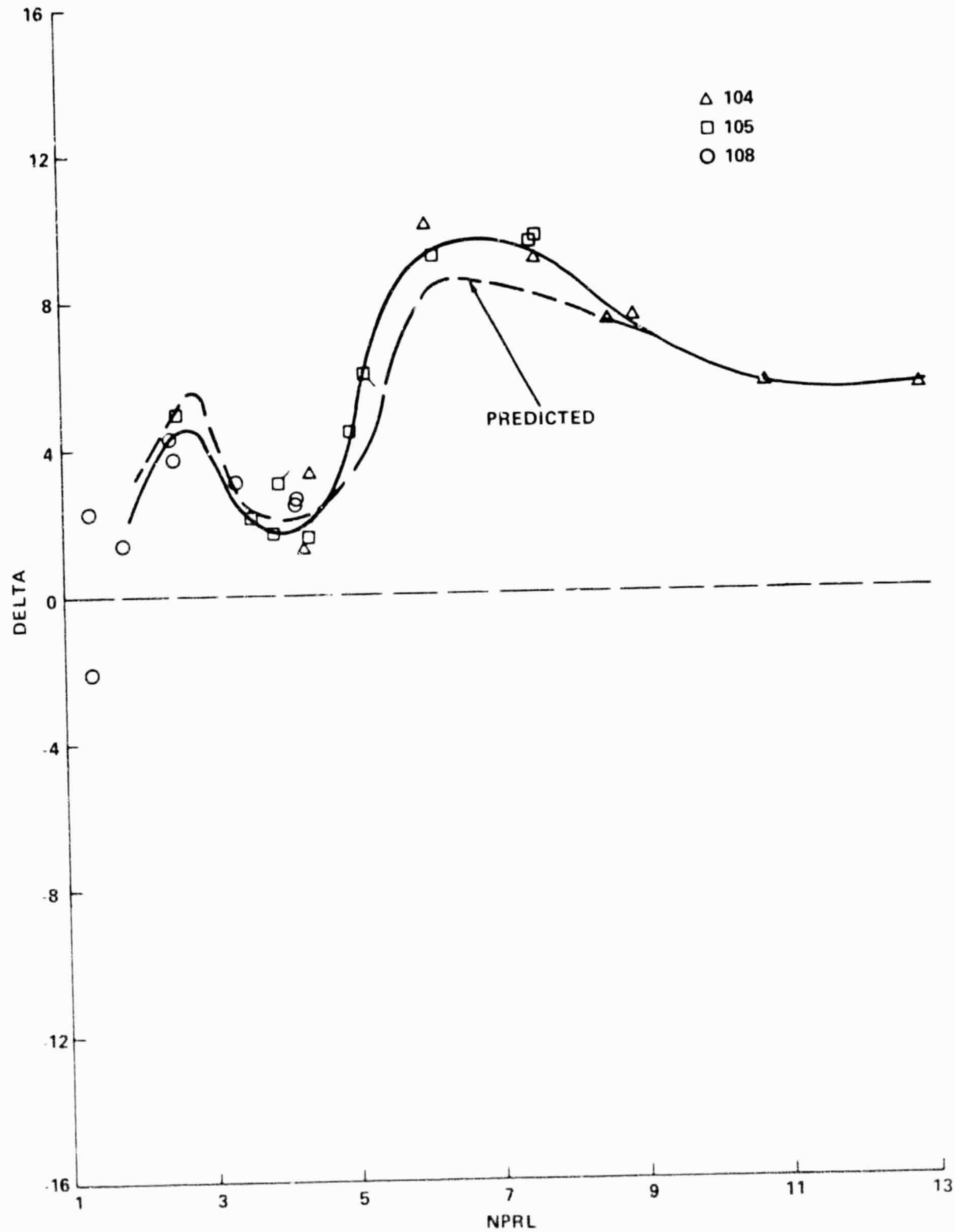
0747-021(T)


ADEN CRUISE TEN DEGREE
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
104
105
108
PREDICTED
1
3
5
7
9
11
13
NPRL

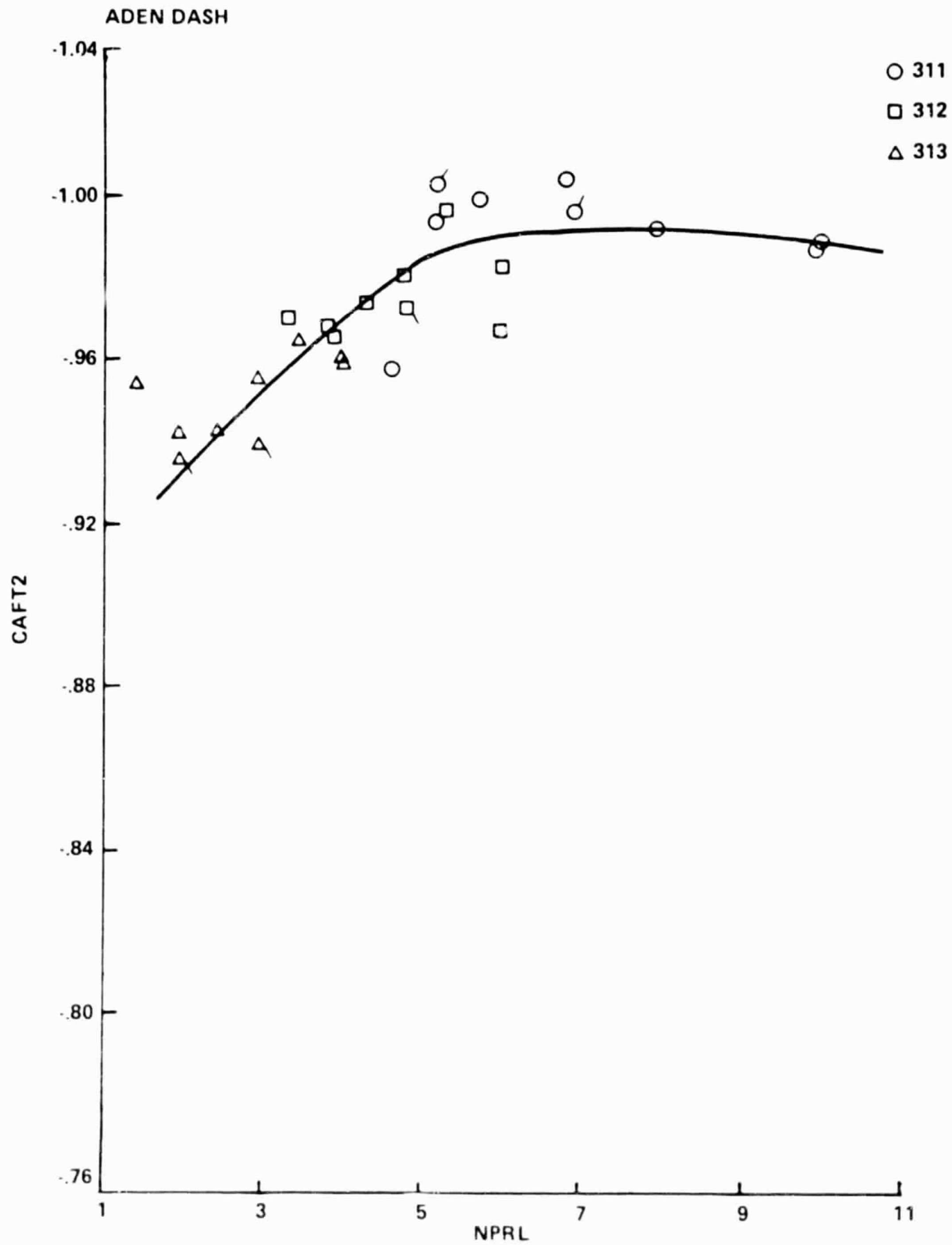
0747-022(T)


ADEN CRUISE TEN DEGREE
.08
.06
.04
.02
0.00
-.02
-.04
-.06
-.08
CMMT2
104
105
108
1
3
5
7
9
11
13
NPRL
0747-023(T)

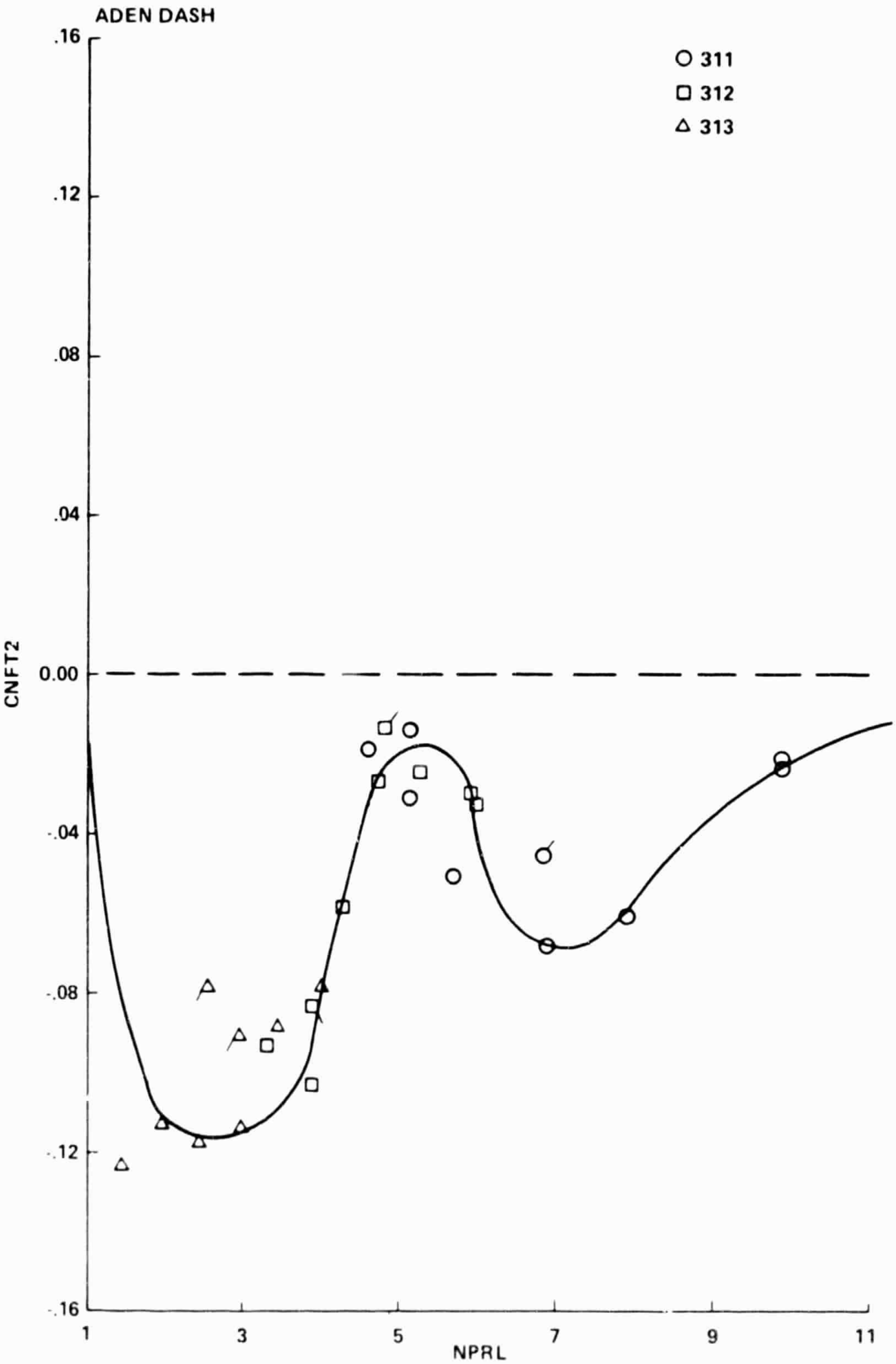
ADEN CRUISE TEN DEGREE



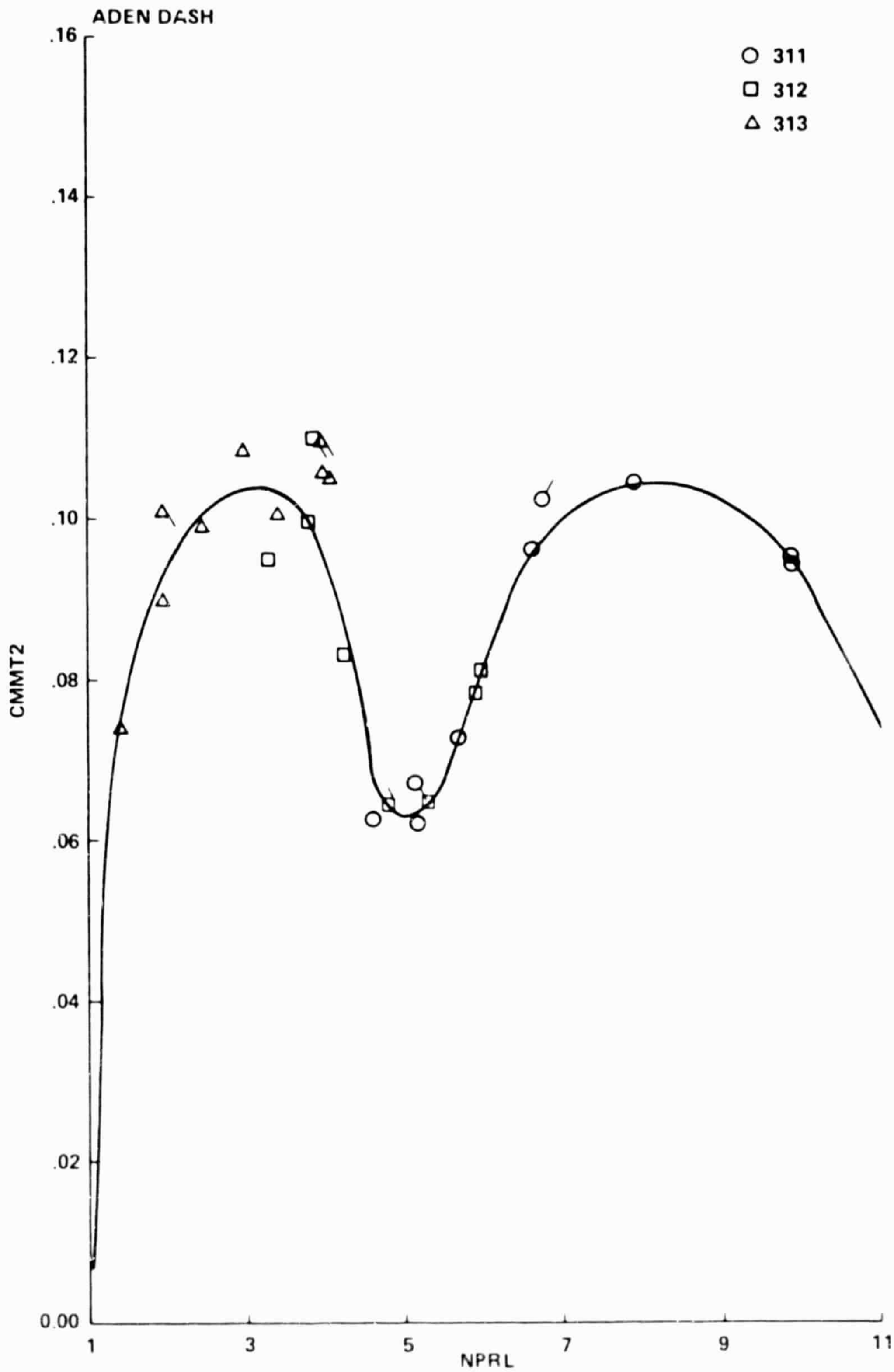
0747-024(T)


ADEN DASH
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
1
3
5
7
9
11
NPRL
311
312
313

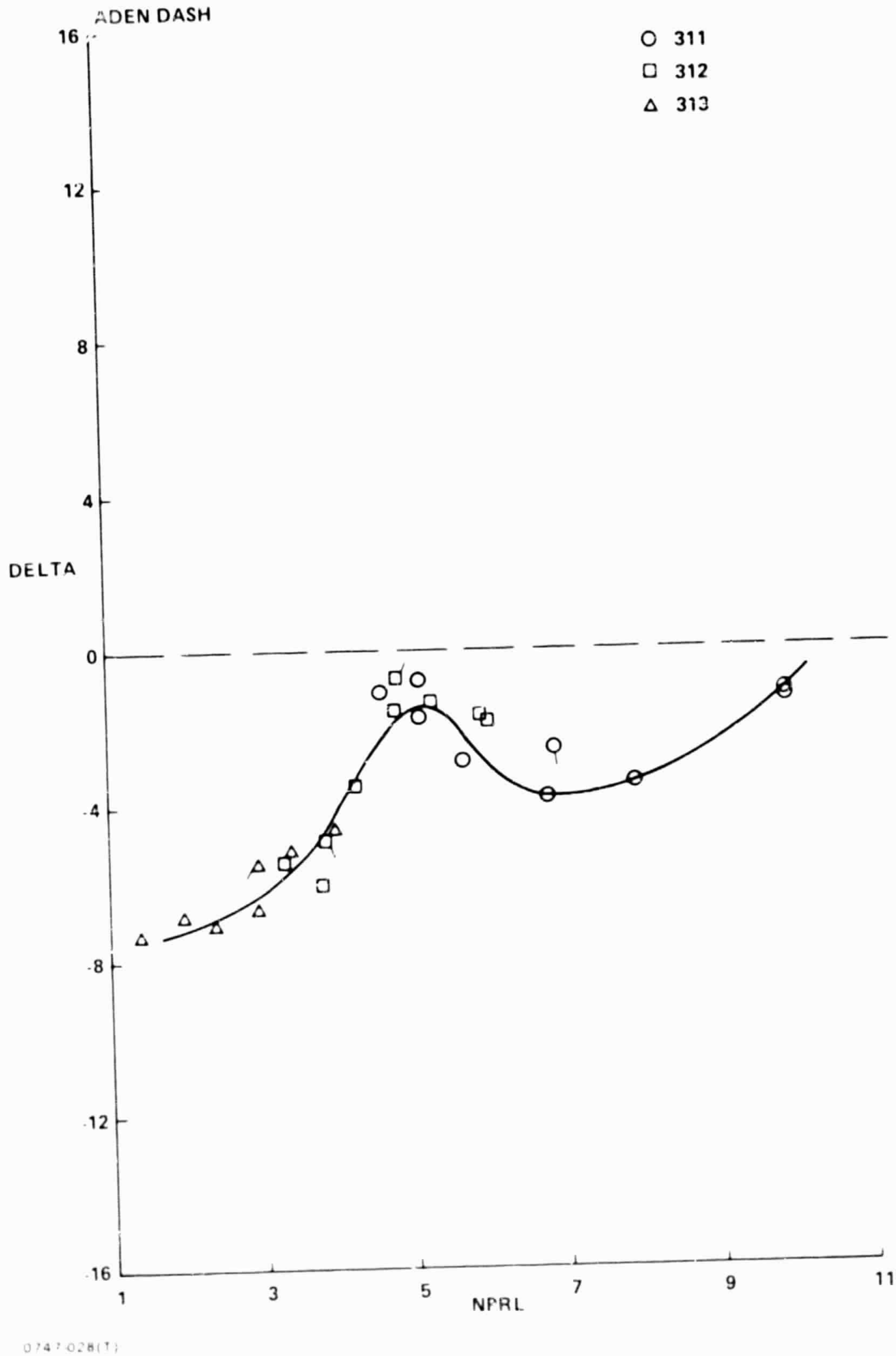
0747-025(T)

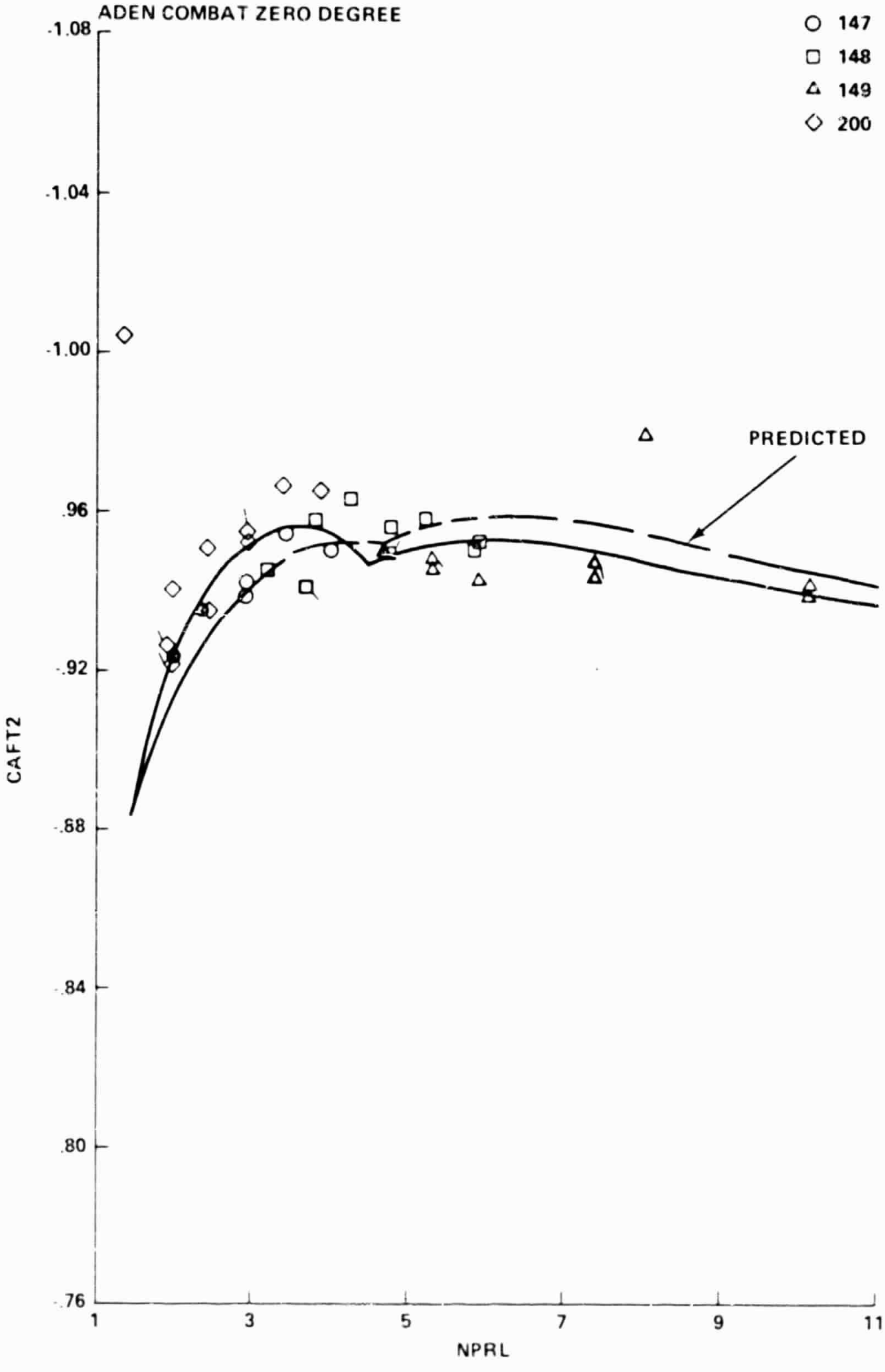

ADEN DASH
○ 311
□ 312
△ 313
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
1
3
5
7
9
11
NPRL

0747-026(T)

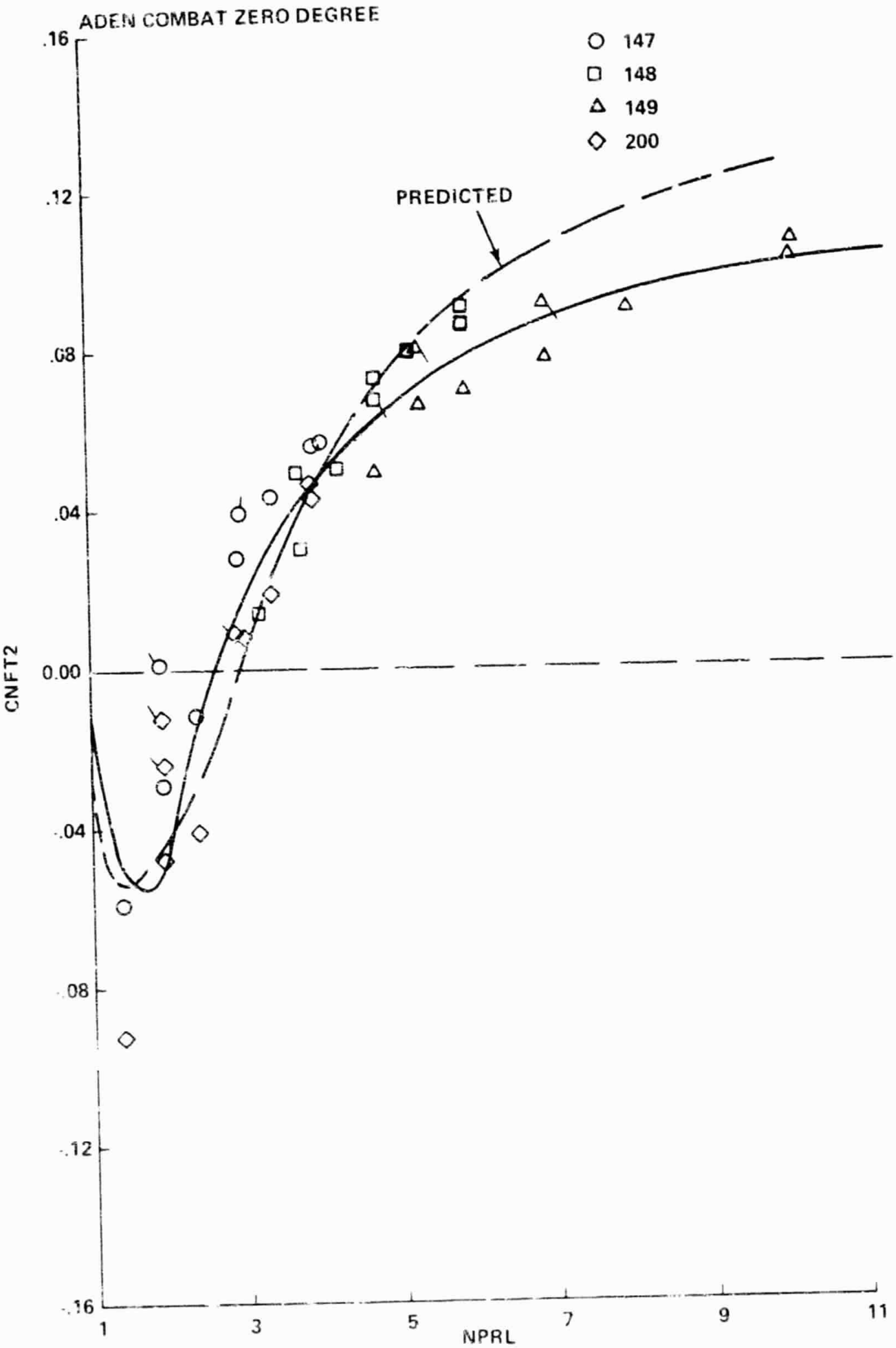

ADEN DASH
311
312
313
.16
.14
.12
.10
.08
.06
.04
.02
0.00
CMMT2
1
3
5
7
9
11
NPRL

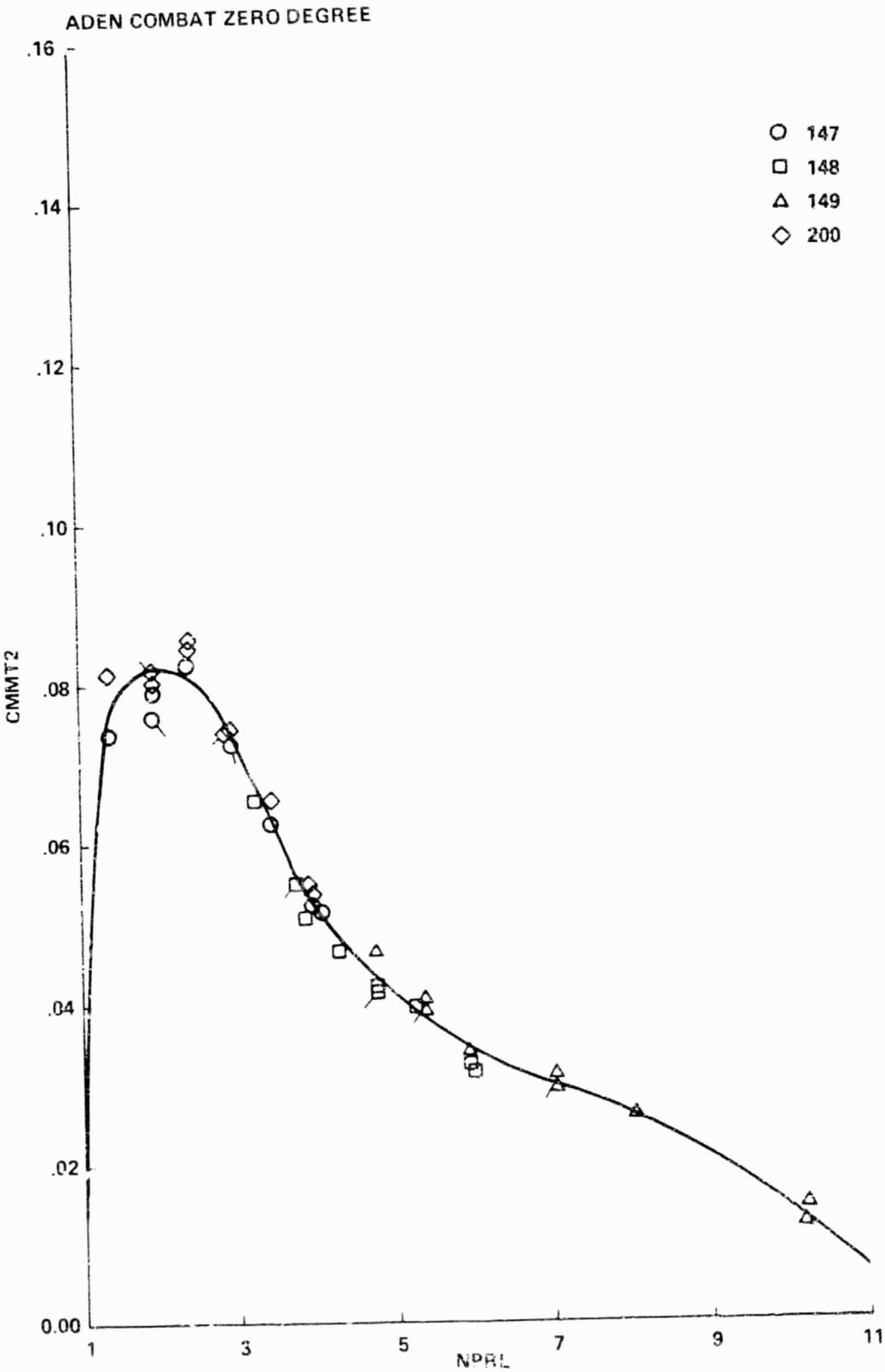
0747-027(T)


ADEN DASH
○ 311
□ 312
△ 313
16
12
8
4
0
-4
-8
-12
-16
DELTA
1
3
5
7
9
11
NPRL
0747-028(T)


ADEN COMBAT ZERO DEGREE
147
148
149
200
PREDICTED
-1.08
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
1
3
5
7
9
11
NPRL

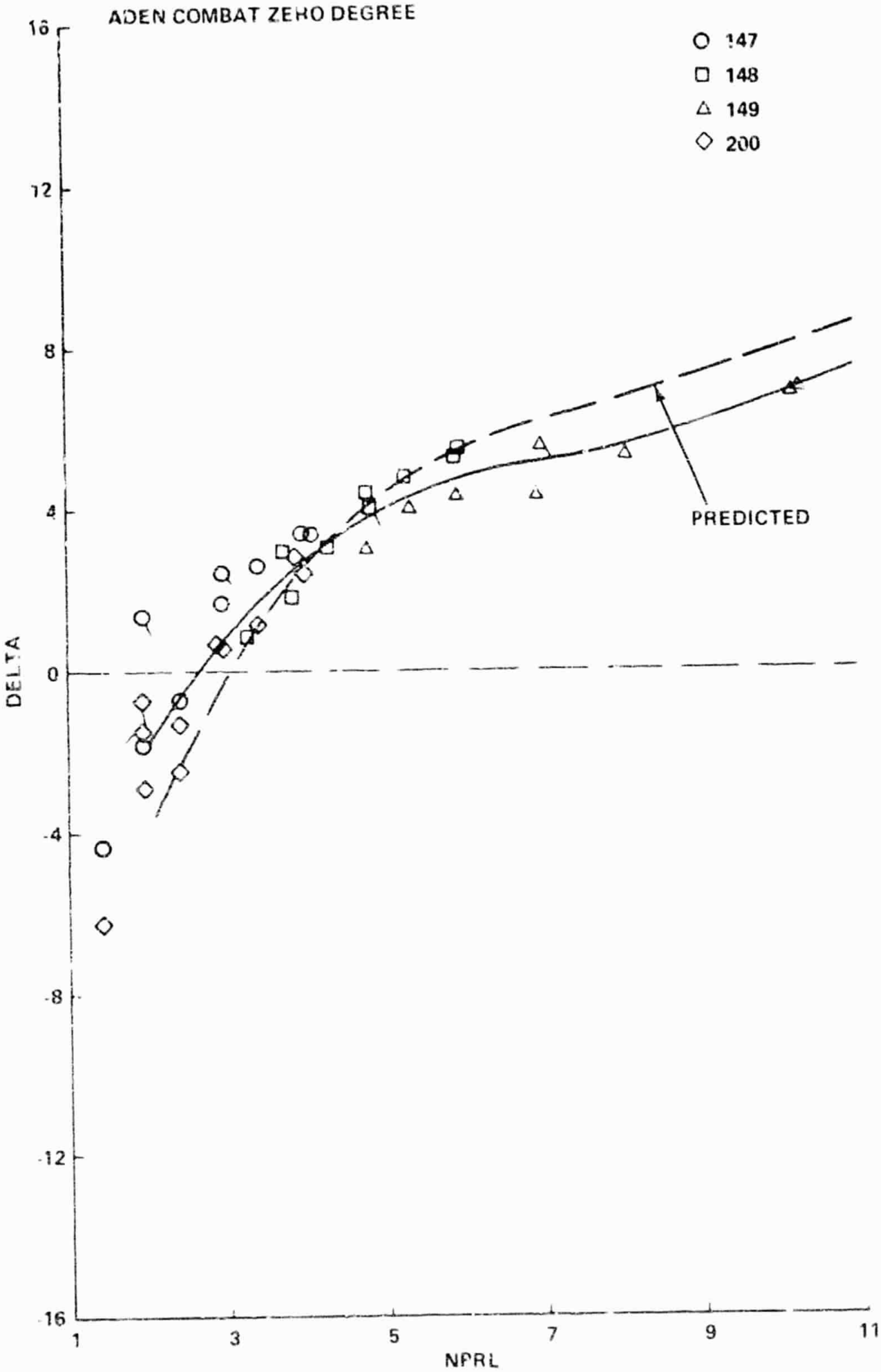
0747-029(T)


ADEN COMBAT ZERO DEGREE
147
148
149
200
PREDICTED
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
CNFT2
1
3
5
7
9
11
NPRL



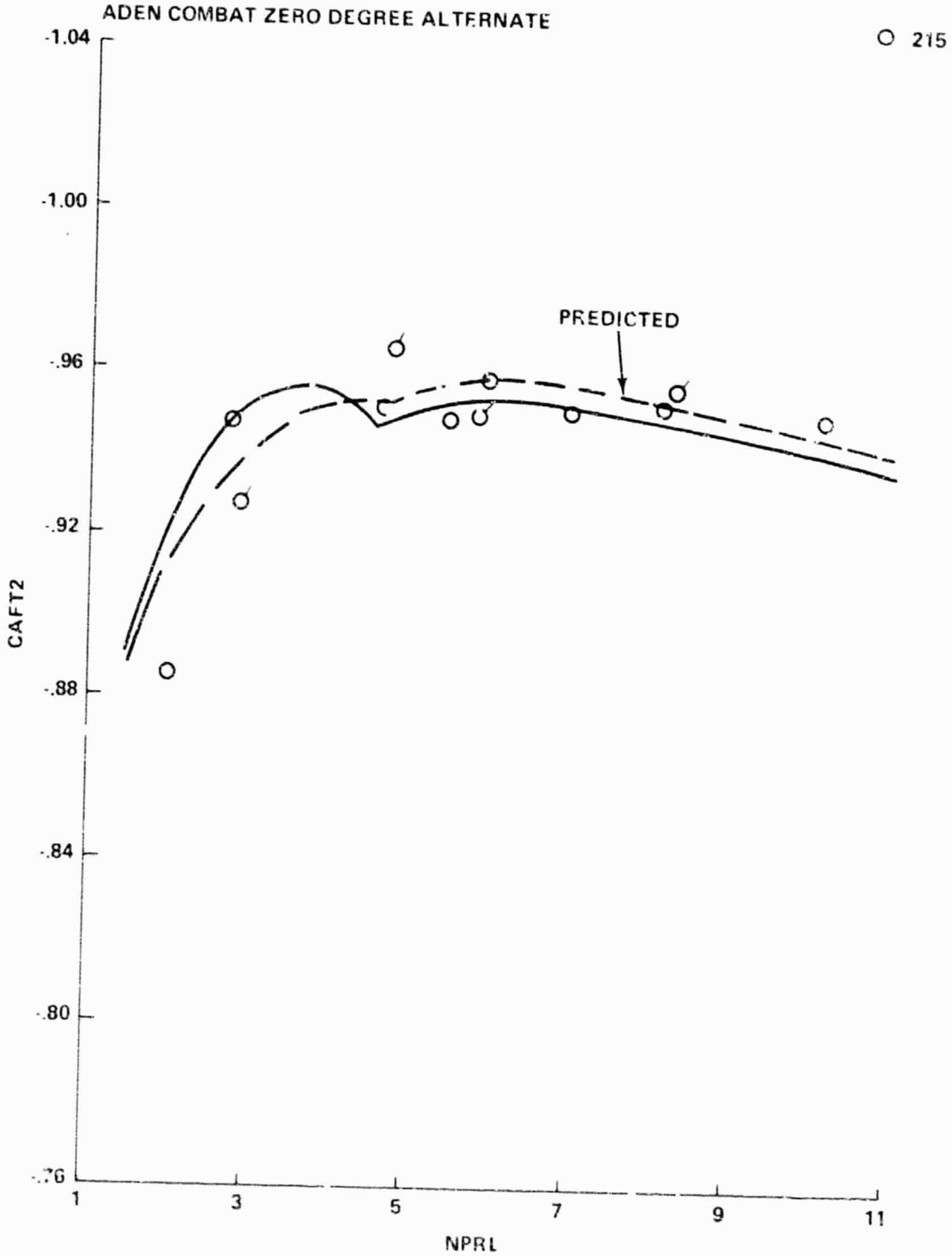
ADEN COMBAT ZERO DEGREE
.16
.14
.12
.10
.08
.06
.04
.02
0.00
CMMT2
147
148
149
200
1
3
5
7
9
11
NPRL

0747-031(T)

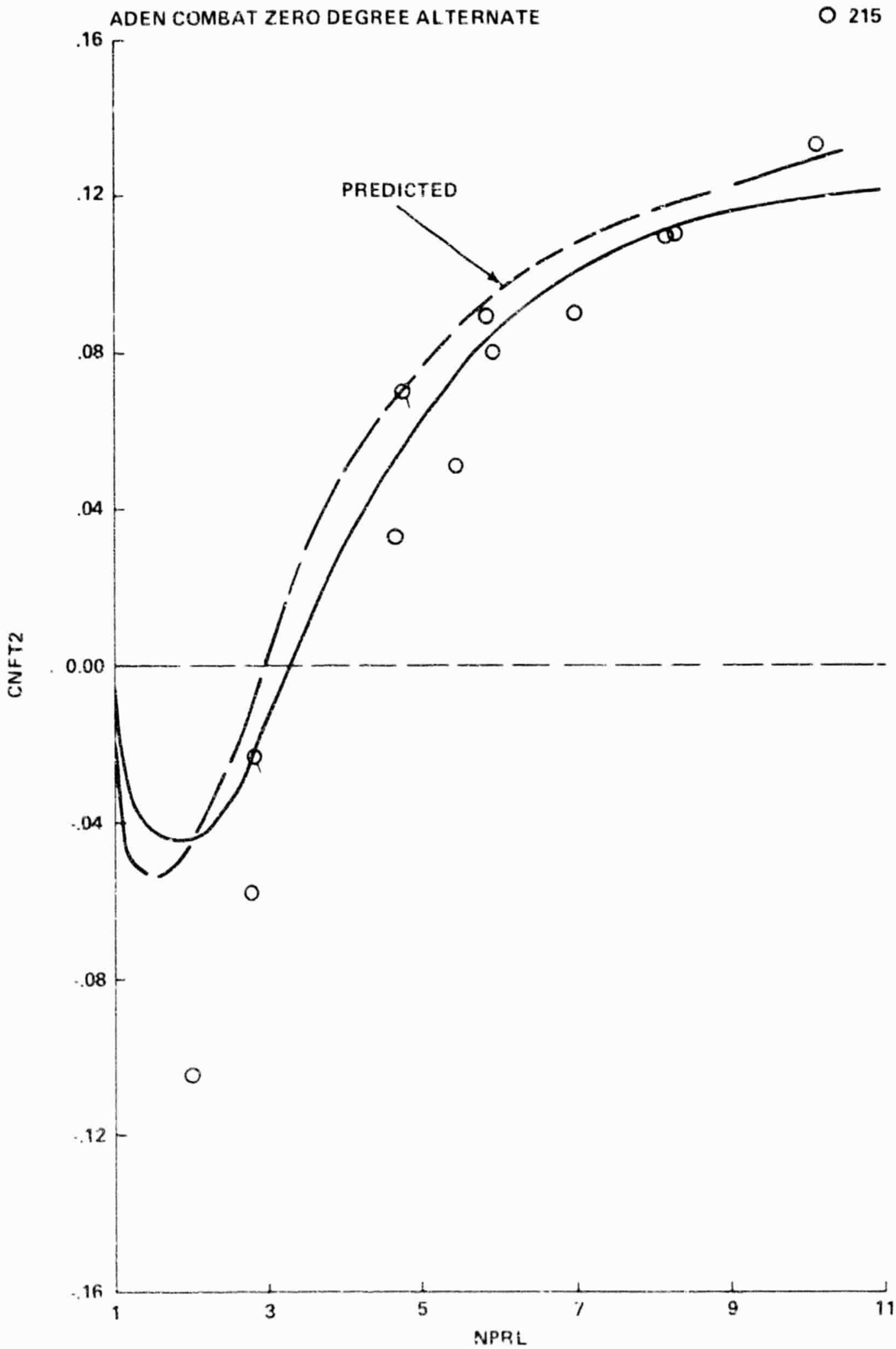


ADEN COMBAT ZERO DEGREE
147
148
149
200
PREDICTED
DELTA
NPRL
16
12
8
4
0
-4
-8
-12
-16
1
3
5
7
9
11

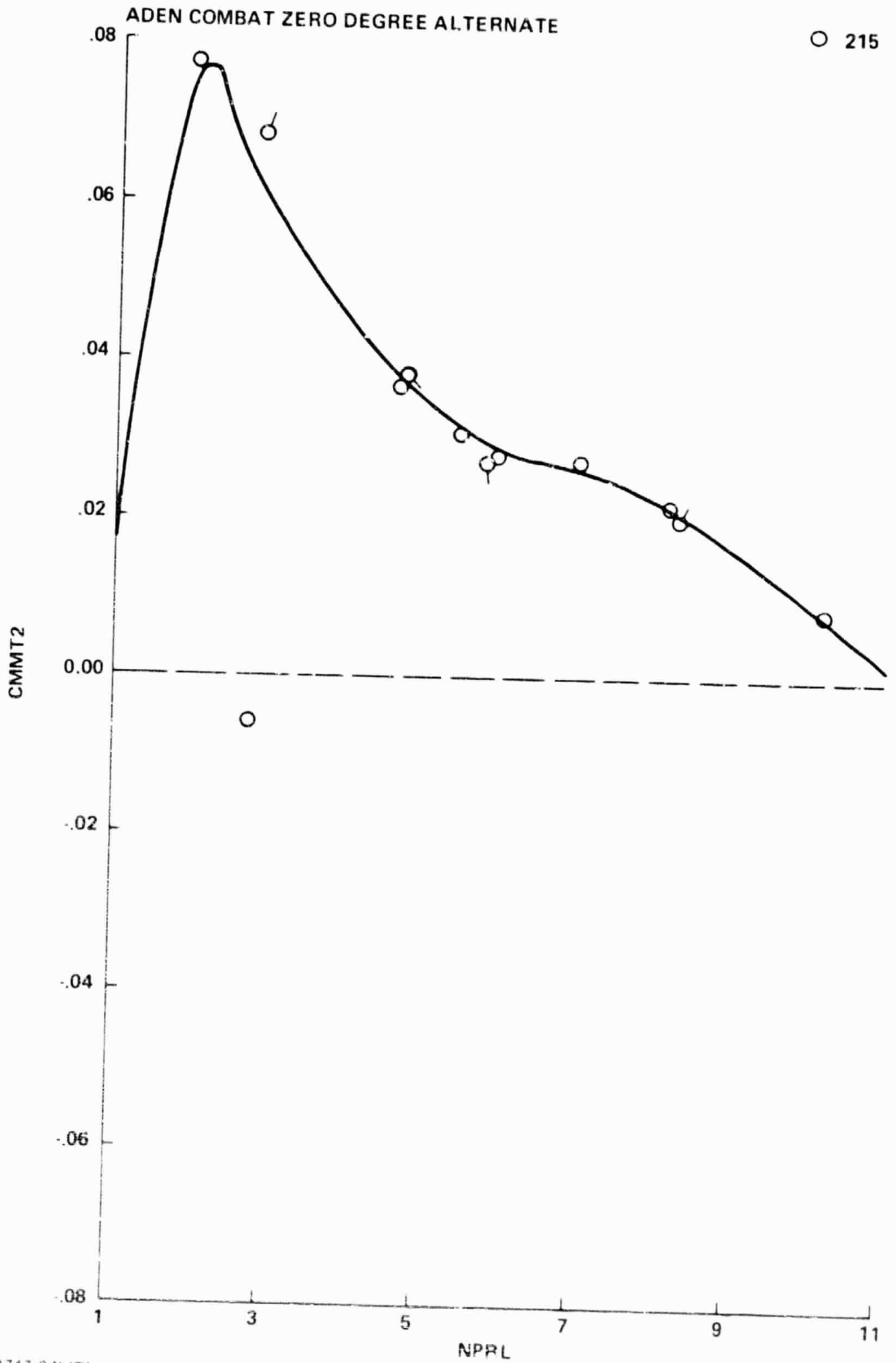
0747 032(T)


ADEN COMBAT ZERO DEGREE ALTERNATE
O 215
PREDICTED
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
1
3
5
7
9
11
NPRL

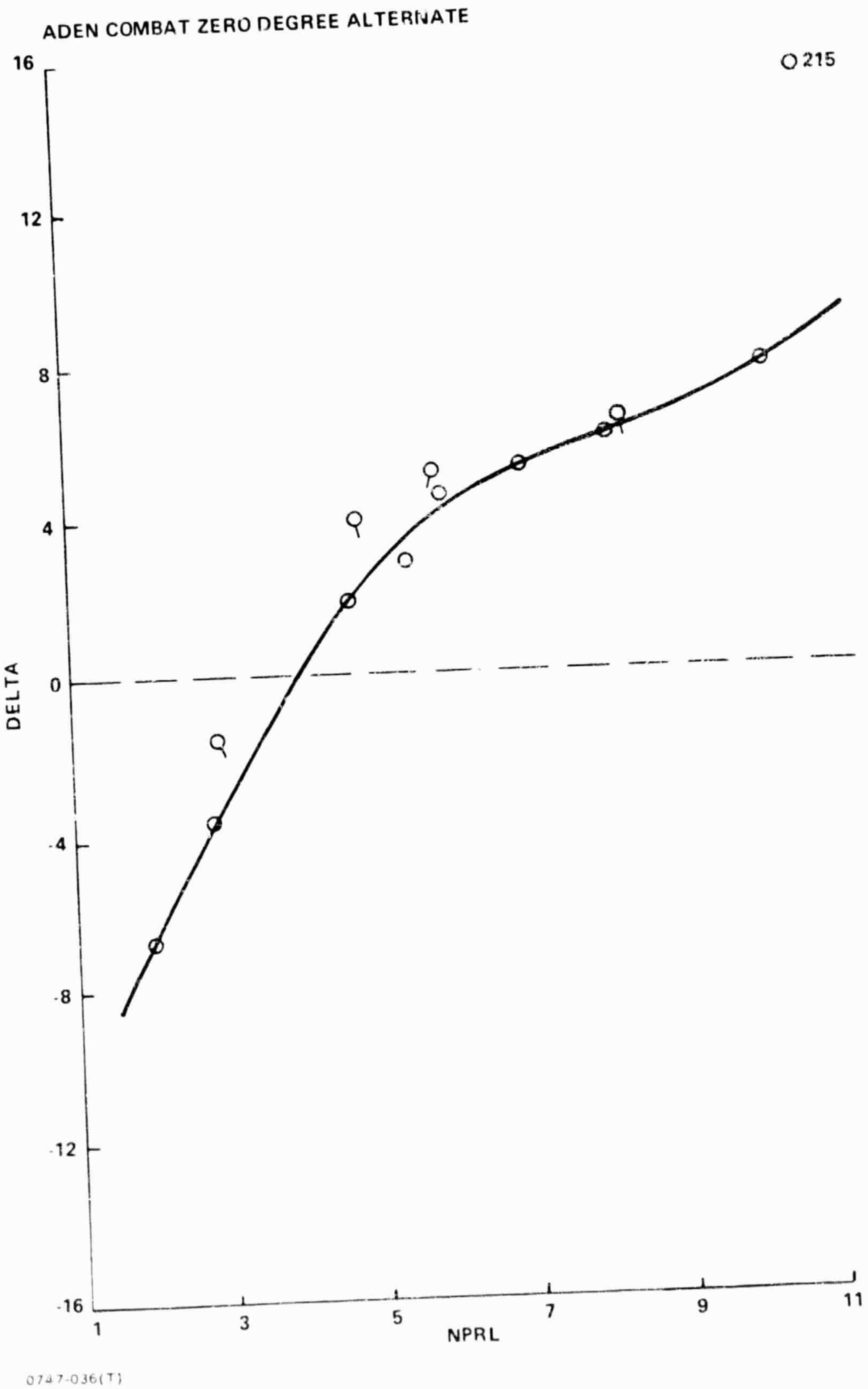
0747-033(T)

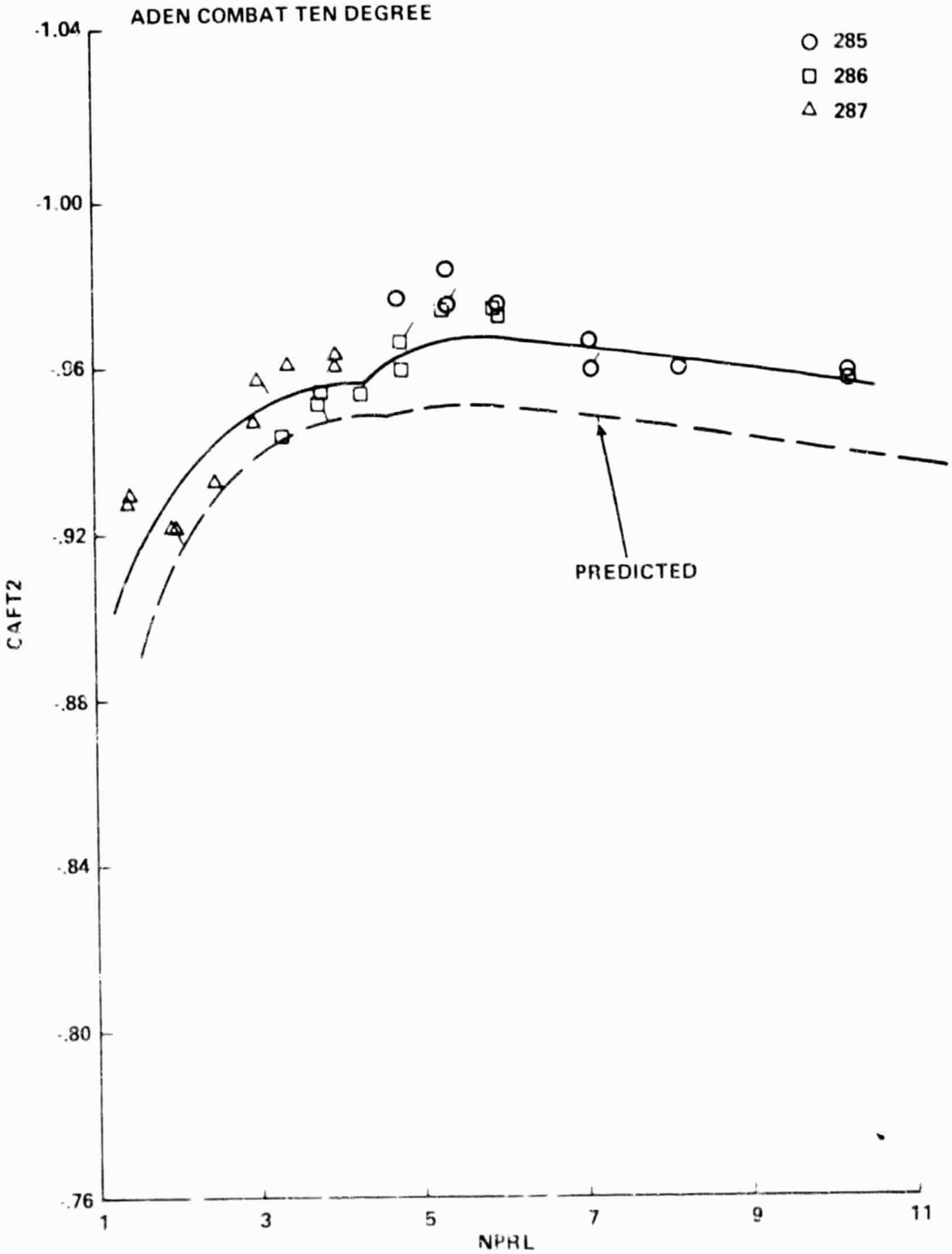

ADEN COMBAT ZERO DEGREE ALTERNATE
O 215
PREDICTED
CNFT2
NPRL
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
1
3
5
7
9
11

0747-034(T)

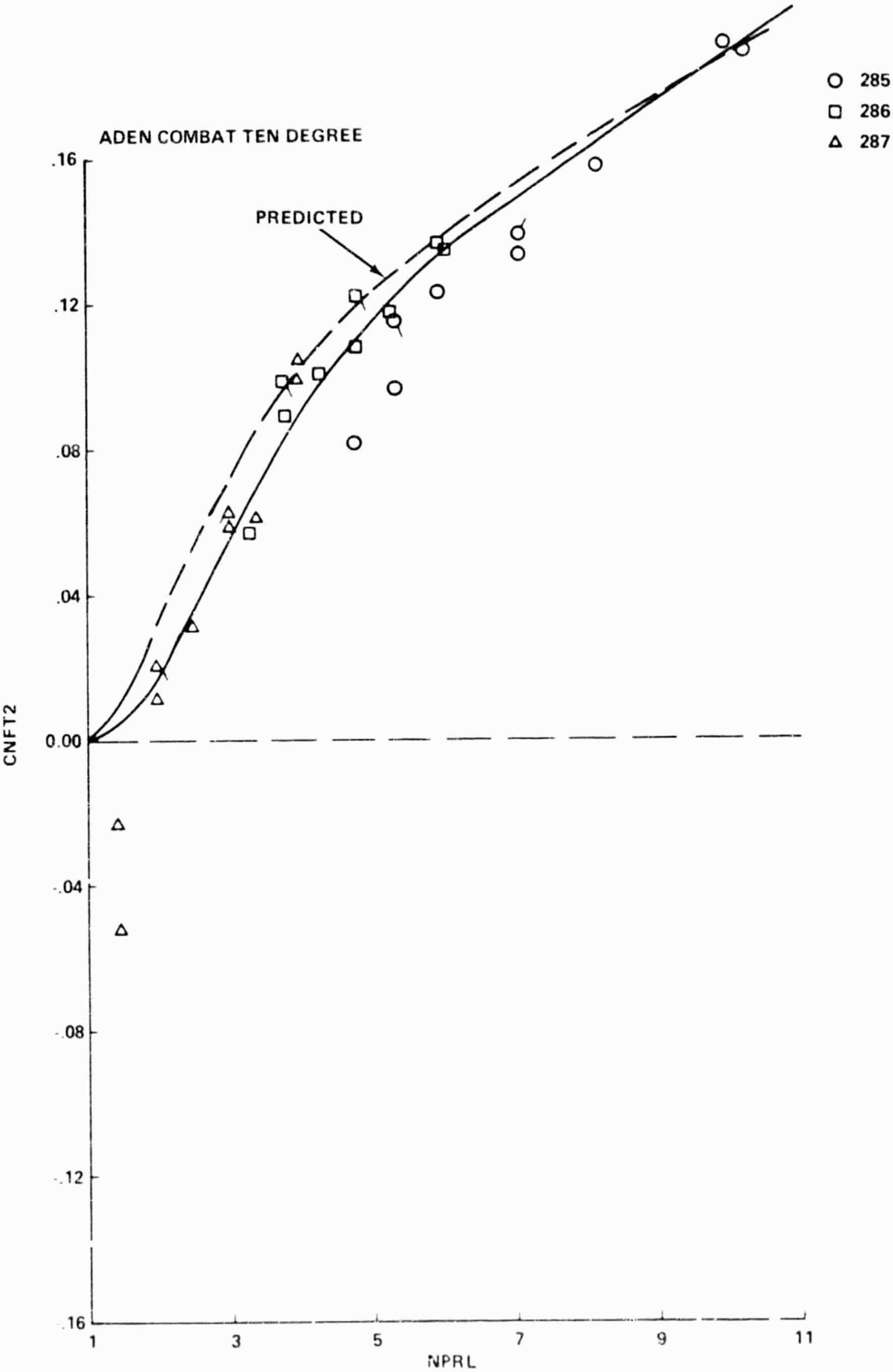

ADEN COMBAT ZERO DEGREE ALTERNATE
215
.08
.06
.04
.02
0.00
-.02
-.04
-.06
-.08
CMMT2
1
3
5
7
9
11
NPRL

0747-035(T)


ADEN COMBAT ZERO DEGREE ALTERNATE
O 215
16
12
8
4
0
-4
-8
-12
-16
DELTA
1
3
5
7
9
11
NPRL
0747-036(T)

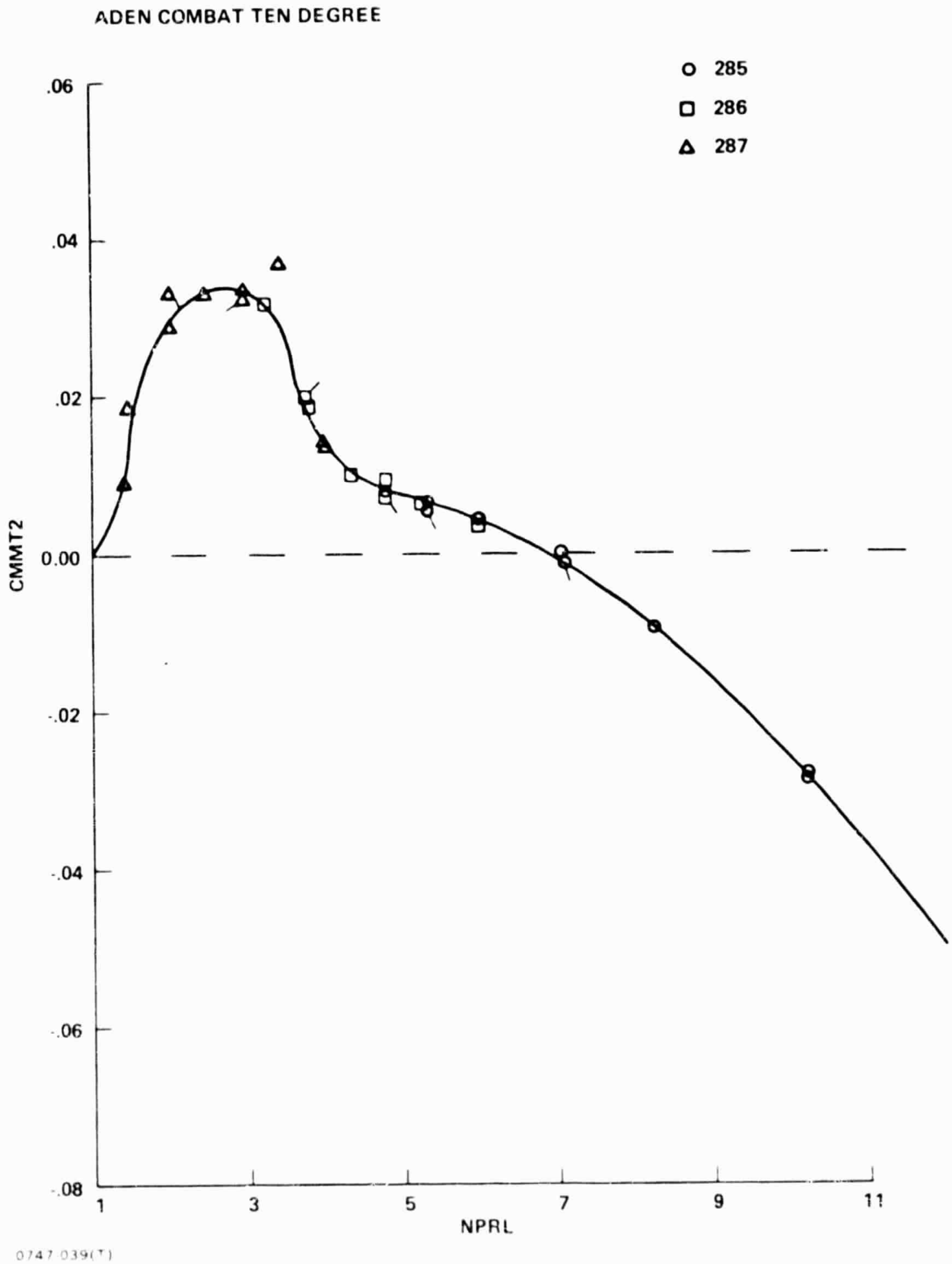

ADEN COMBAT TEN DEGREE
285
286
287
-1.04
-1.00
-.96
-.92
-.88
-.84
-.80
-.76
CAFT2
PREDICTED
1
3
5
7
9
11
NPRL

0747-037(T)

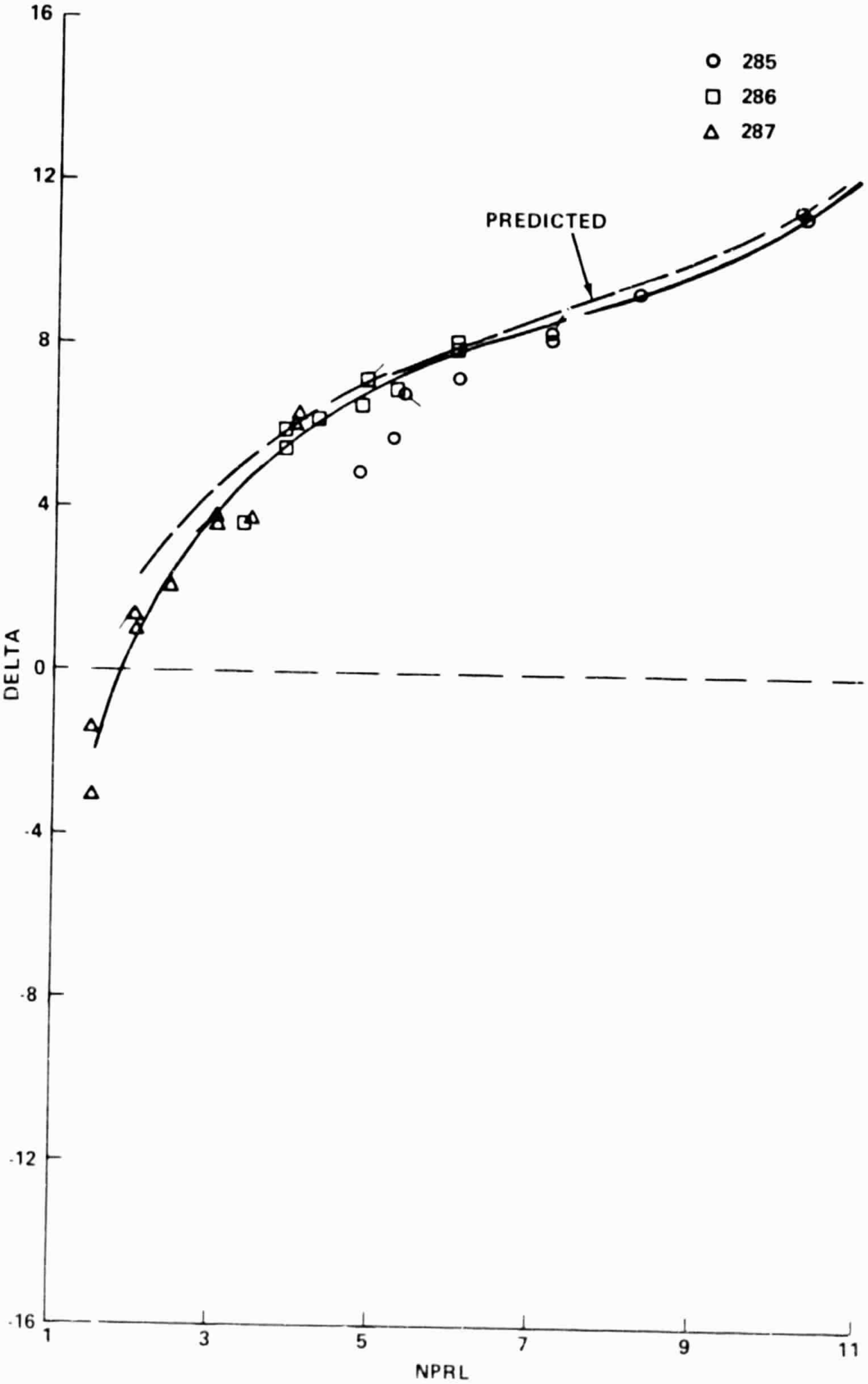


ADEN COMBAT TEN DEGREE
PREDICTED
285
286
287
CNFT2
NPRL
.16
.12
.08
.04
0.00
-.04
-.08
-.12
-.16
1
3
5
7
9
11

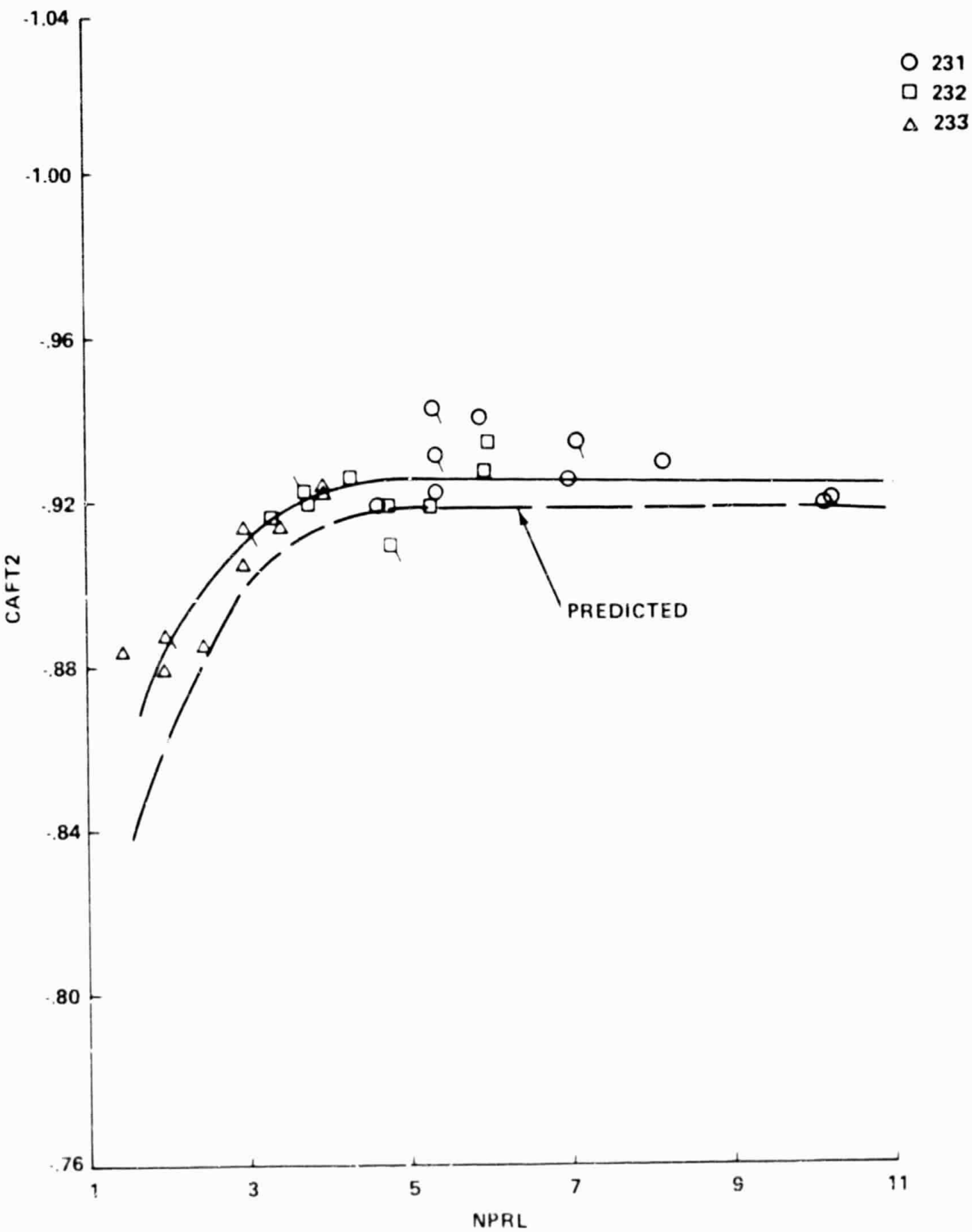
0747-038(T)


ADEN COMBAT TEN DEGREE
285
286
287
.06
.04
.02
0.00
-.02
-.04
-.06
-.08
CMMT2
1
3
5
7
9
11
NPRL
0747 039(T)

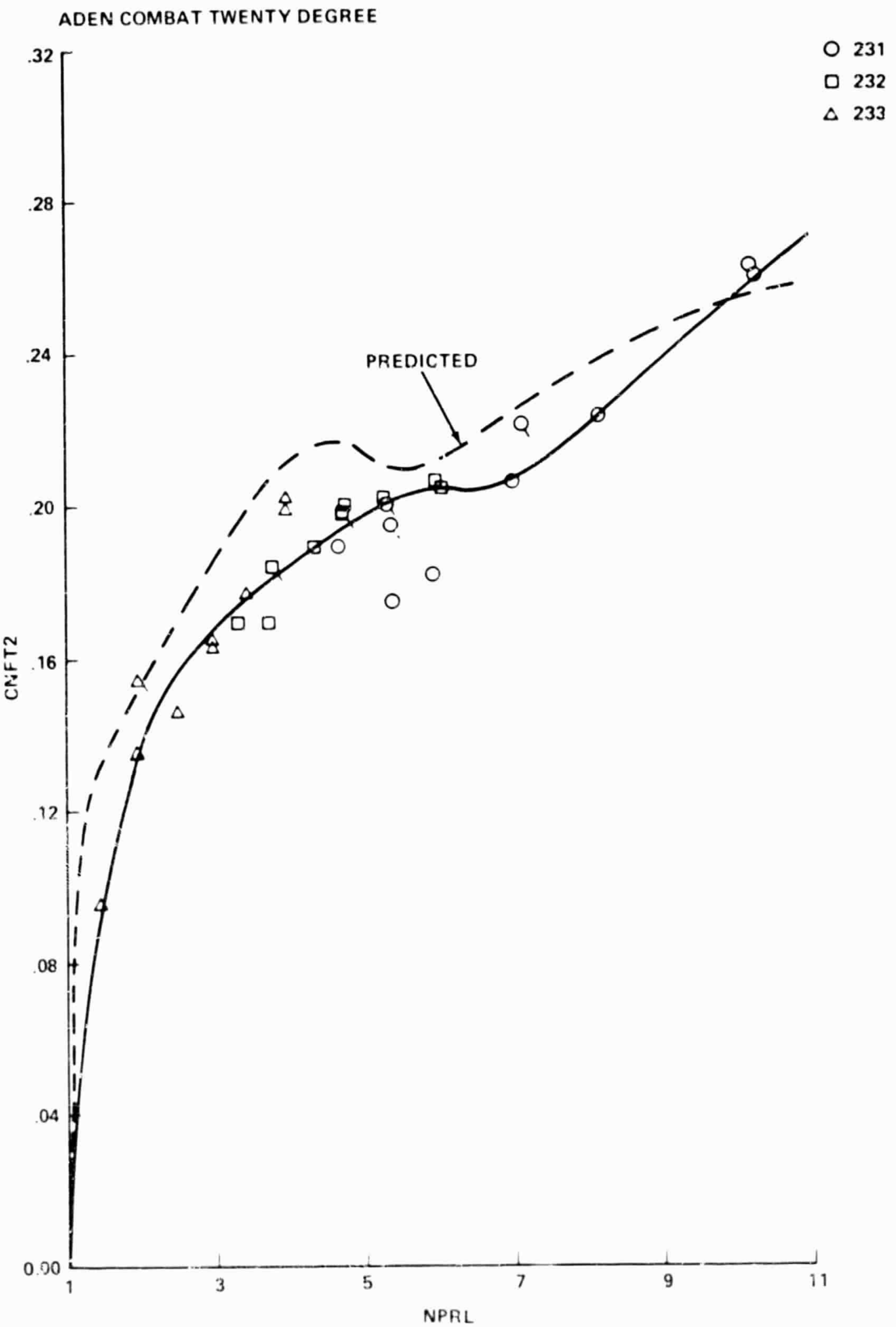
ADEN COMBAT TEN DEGREE



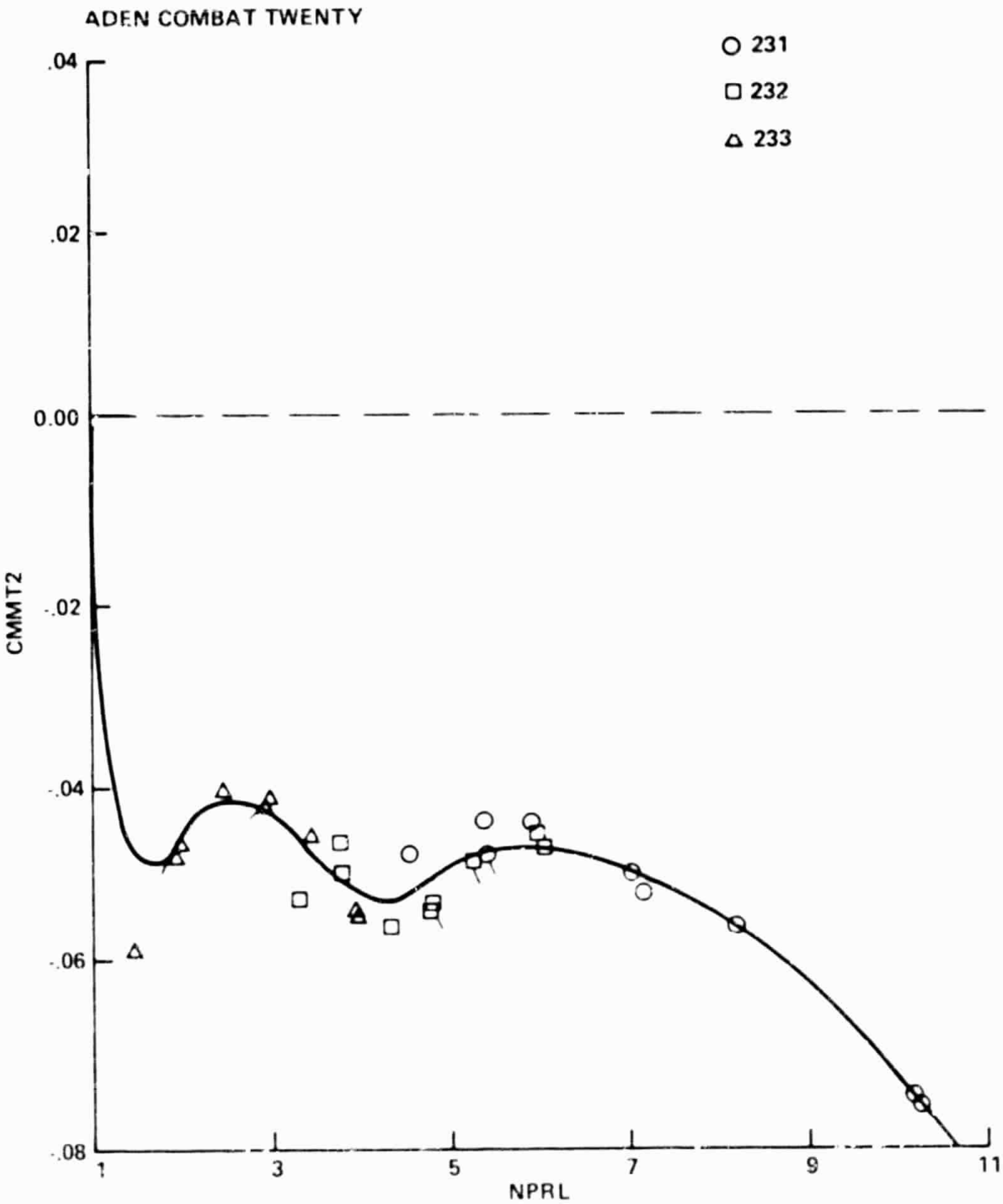
ADEN COMBAT TWENTY DEGREE



0747-041(T)

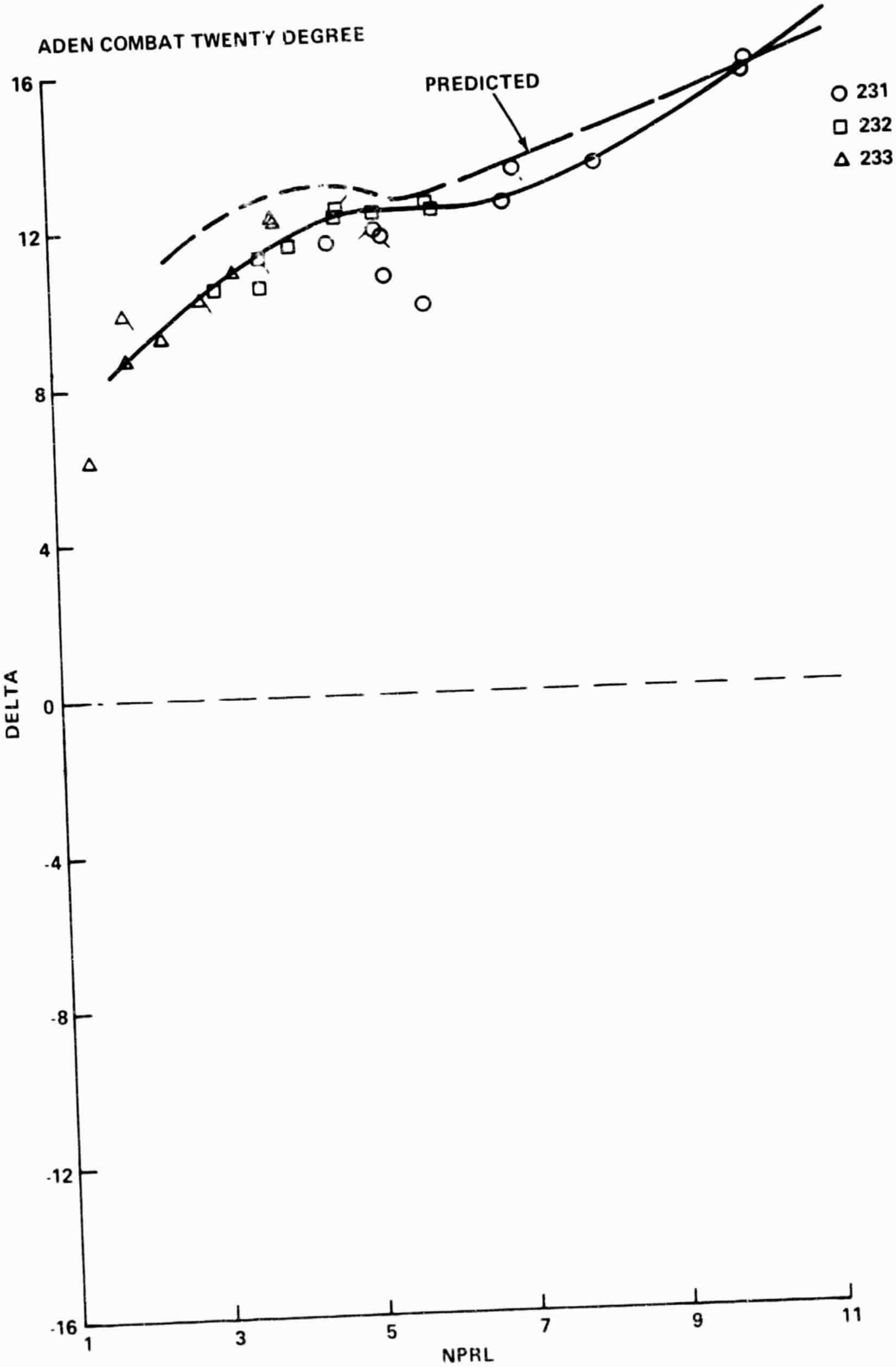

ADEN COMBAT TWENTY DEGREE
231
232
233
PREDICTED
CNFT2
NPRL
.32
.28
.24
.20
.16
.12
.08
.04
0.00
1
3
5
7
9
11

0747-042(T)



ADEN COMBAT TWENTY
231
232
233
.04
.02
0.00
-.02
-.04
-.06
-.08
CMMT2
1
3
5
7
9
11
NPRL

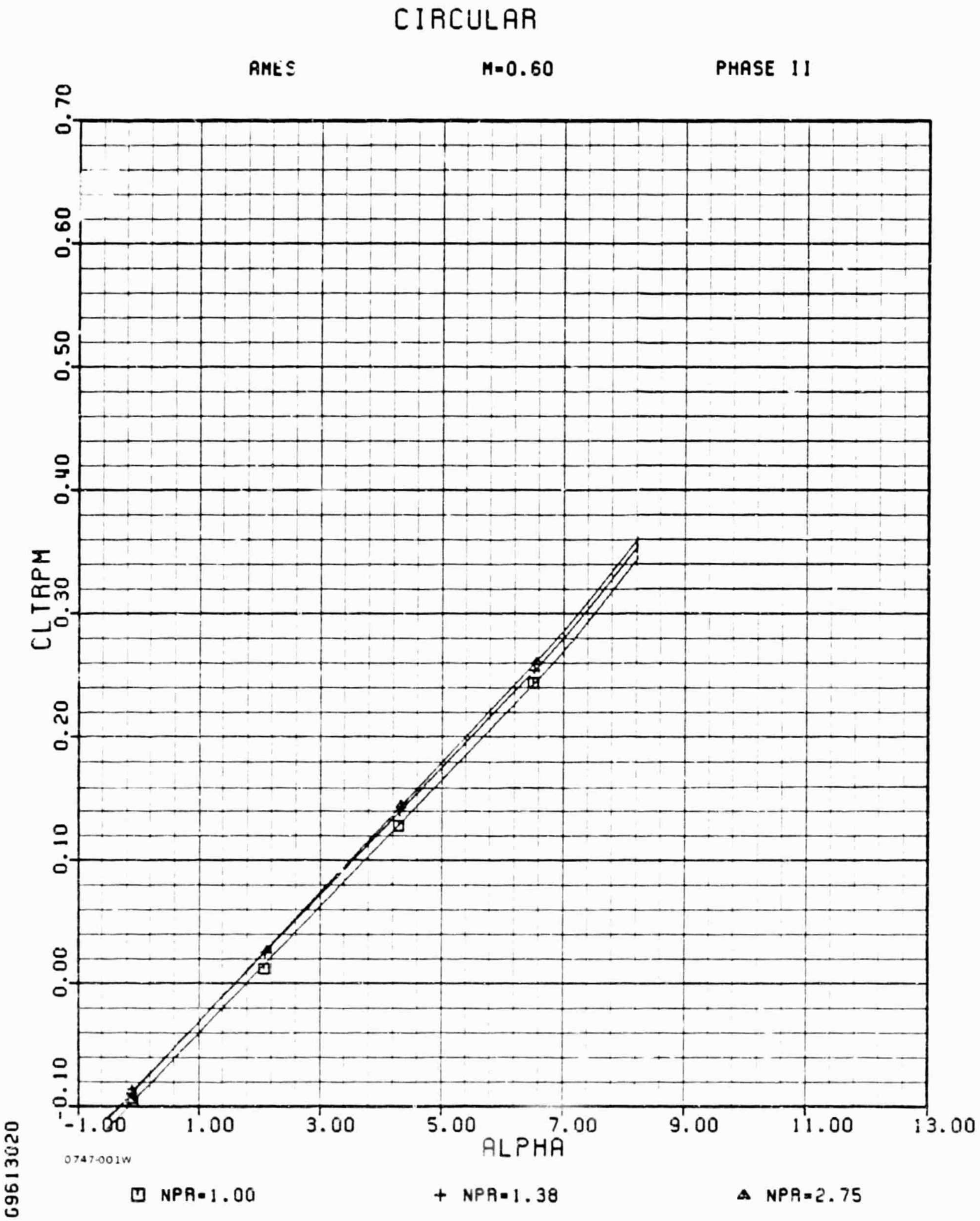
0747 643(T)

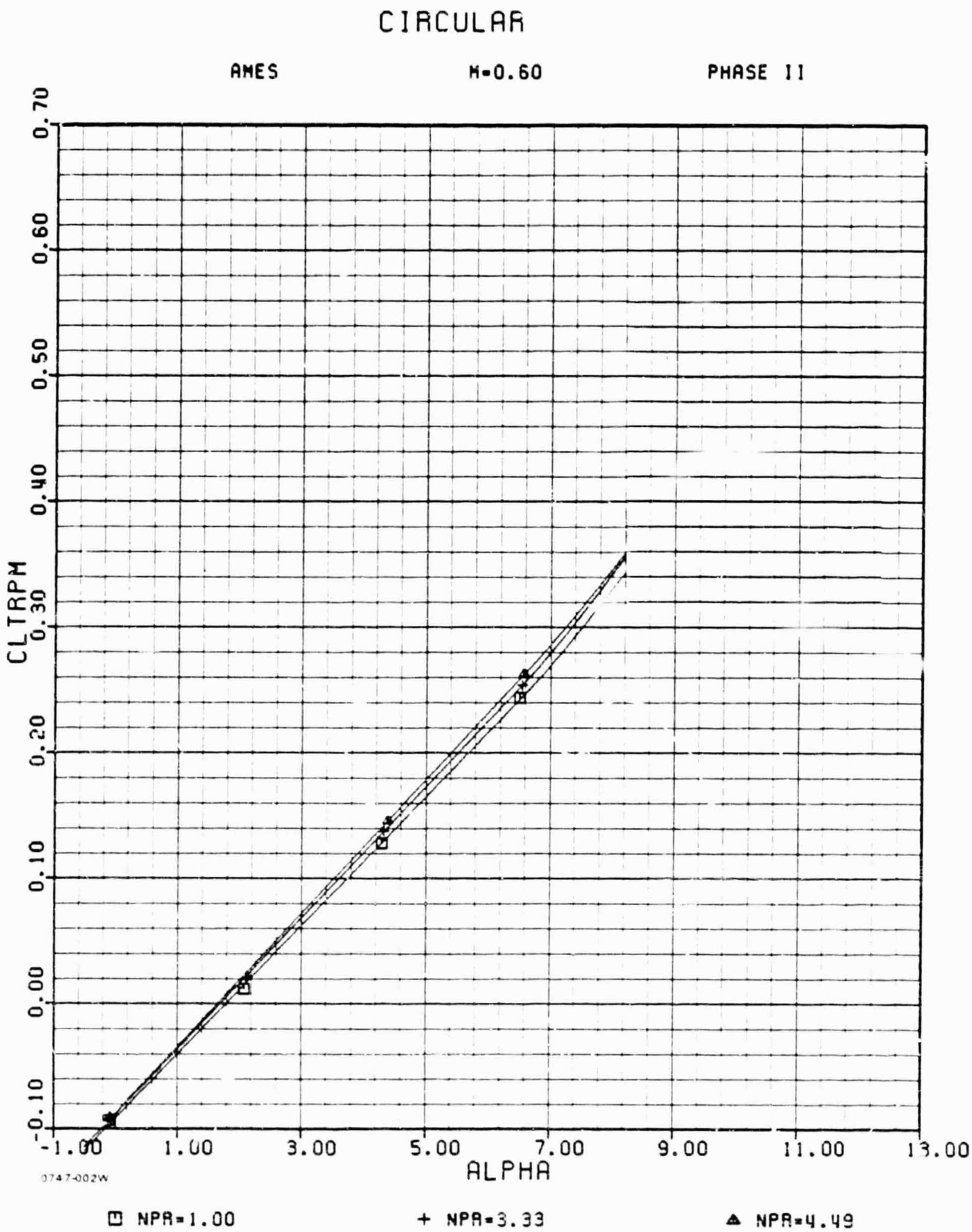

ADEN COMBAT TWENTY DEGREE
PREDICTED
231
232
233
DELTA
NPRL
16
12
8
4
0
-4
-8
-12
-16
1
3
5
7
9
11
0747-044(T)

C-2

APPENDIX B

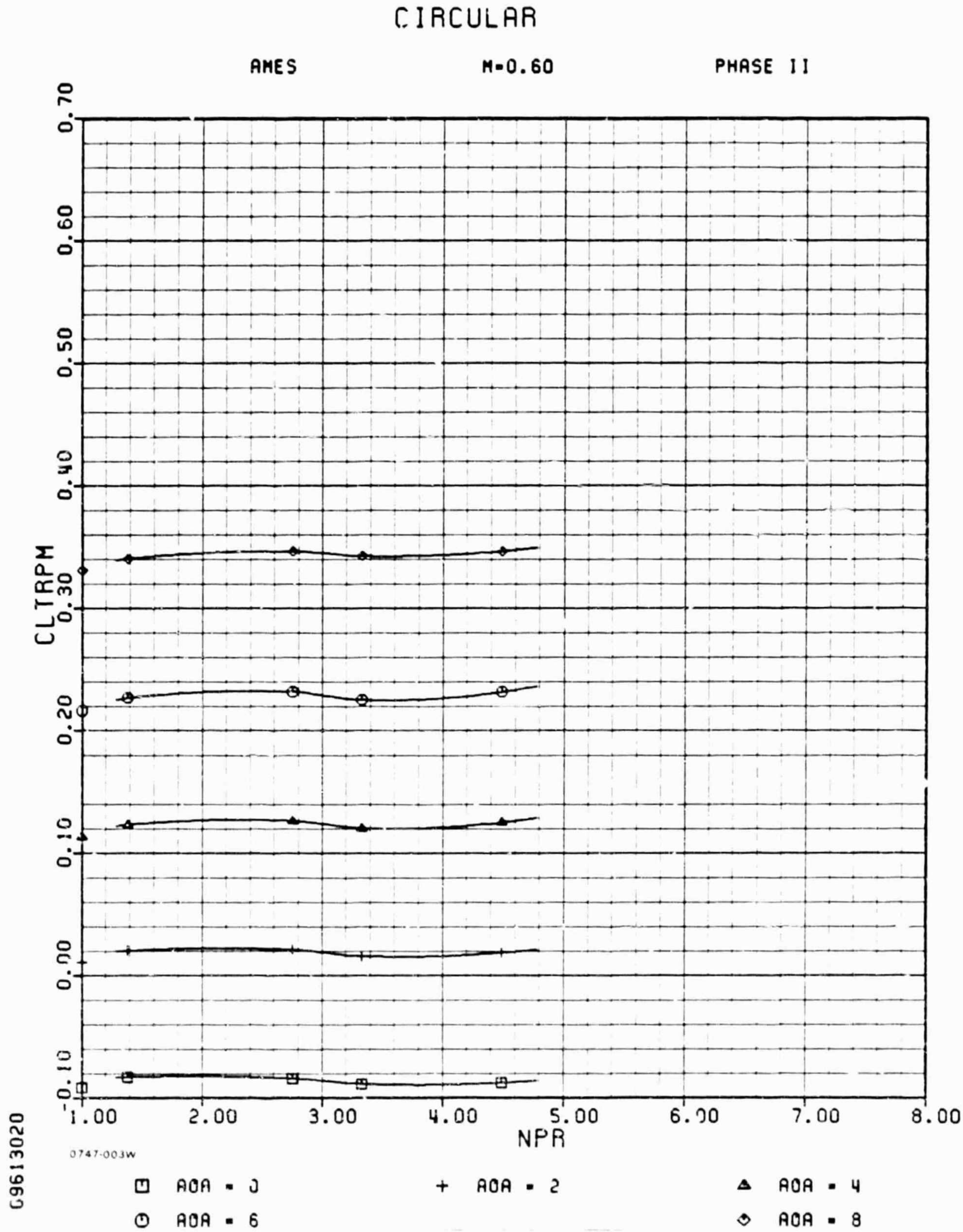
CIRCULAR NOZZLE WIND-ON DATA

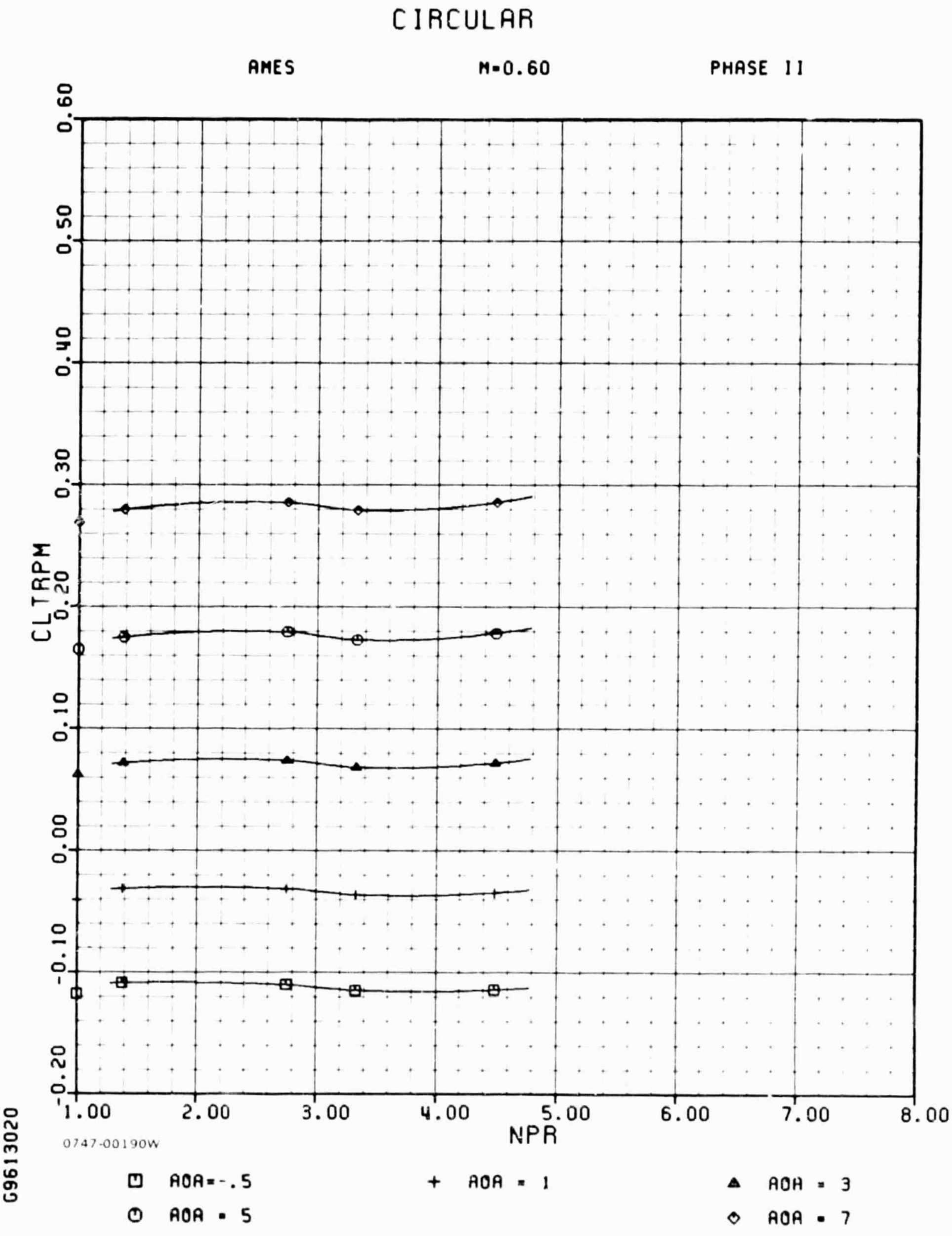

CIRCULAR
AMES
M=0.60
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-001W
G9613020
NPR=1.00
+ NPR=1.38
NPR=2.75



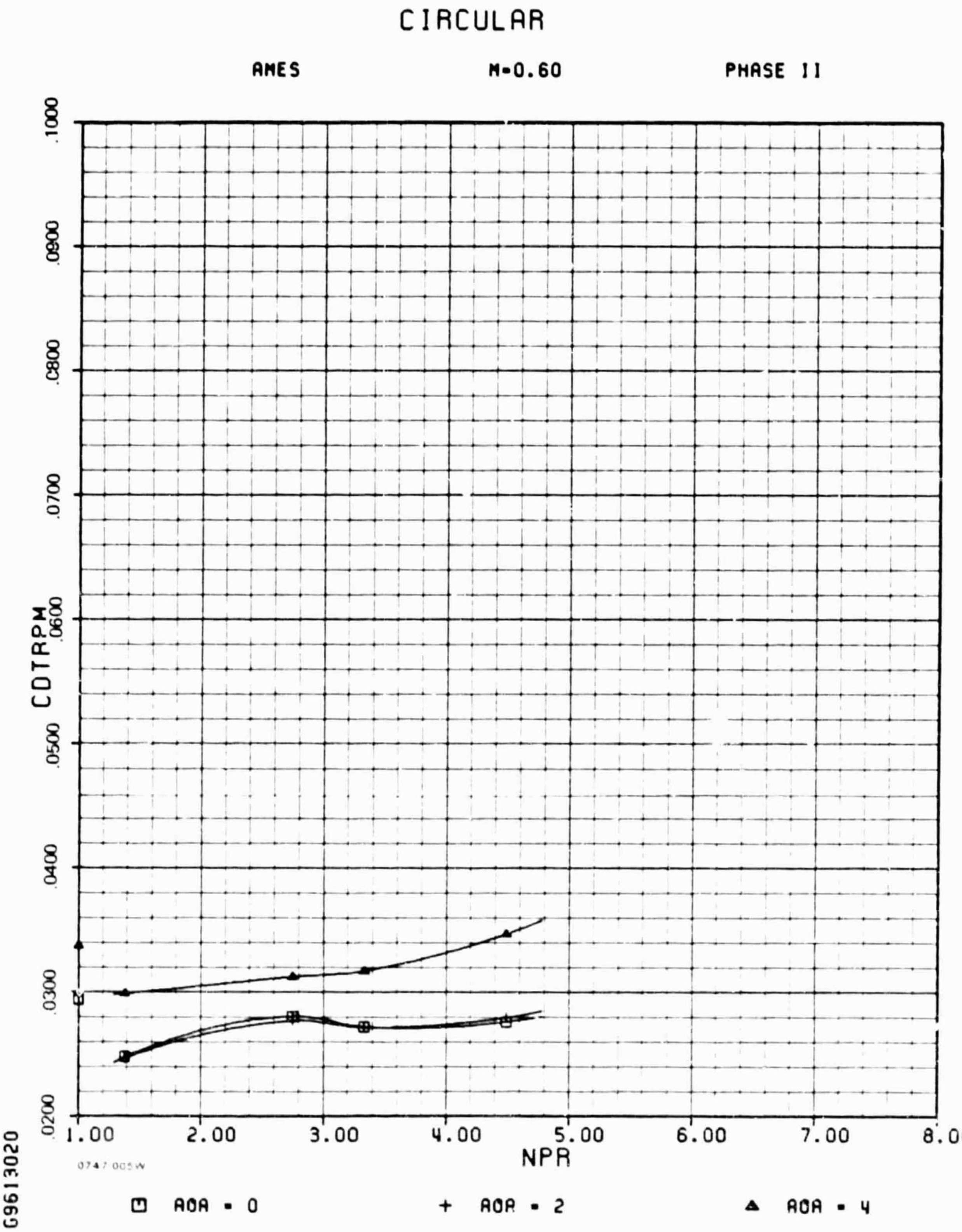
G9613020

B-1(a) (concl.)

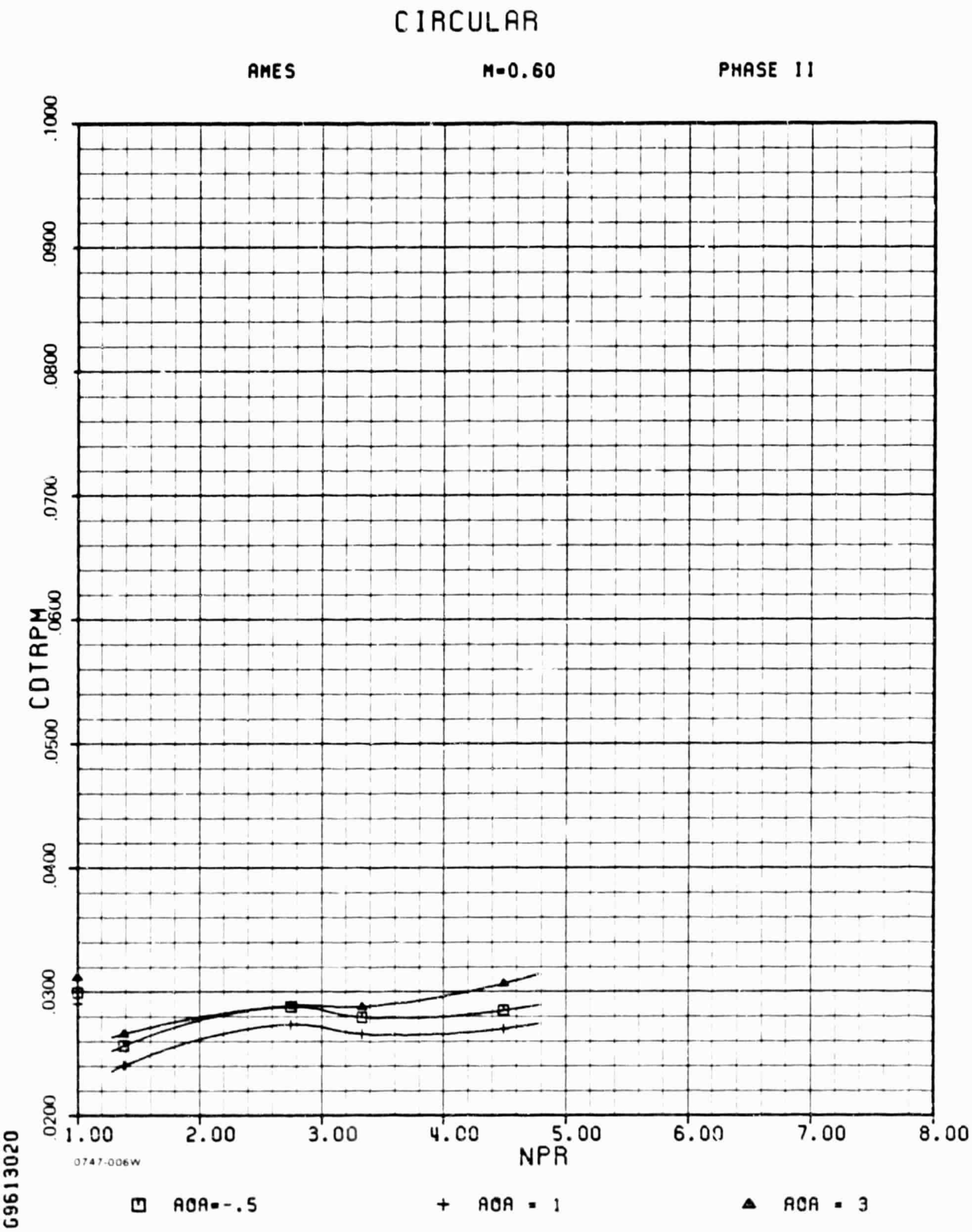

CIRCULAR
AMES
M=0.60
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-003W
G9613020
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8


CIRCULAR
AMES
M=0.60
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G9613020
0747-00190W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

B-1(b)(concl.)

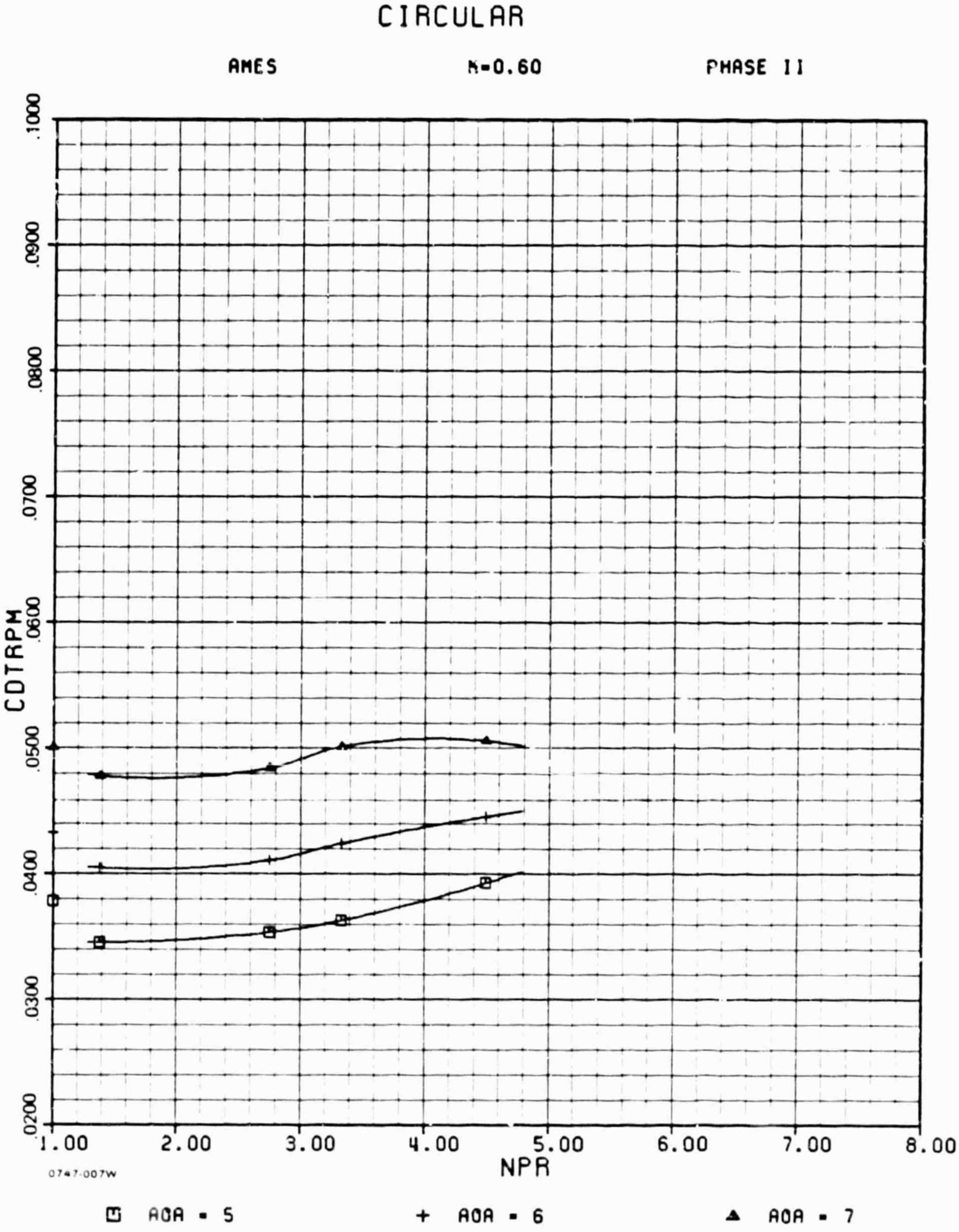


CIRCULAR
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G9613020
AOA = 0
+ AOA = 2
AOA = 4

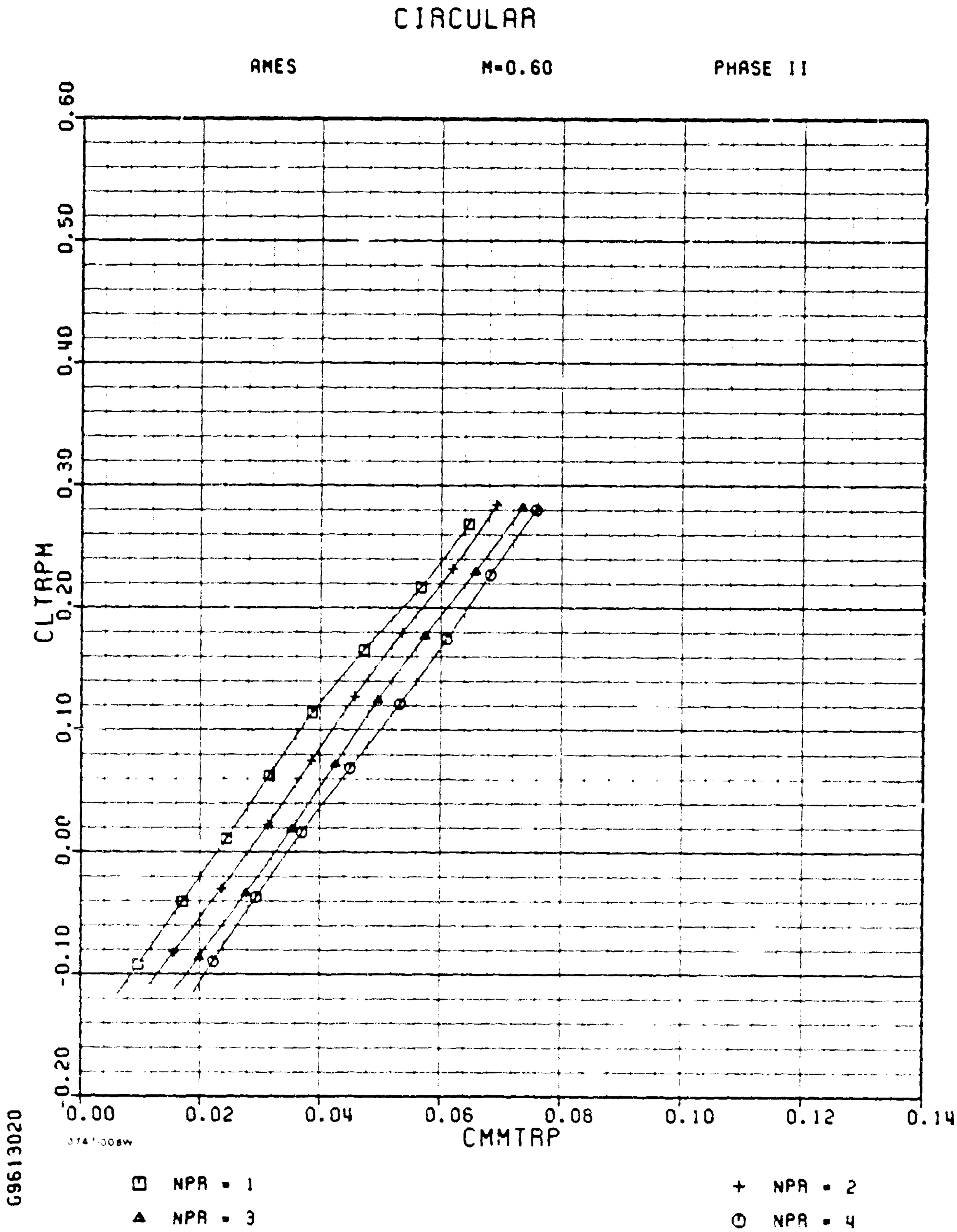


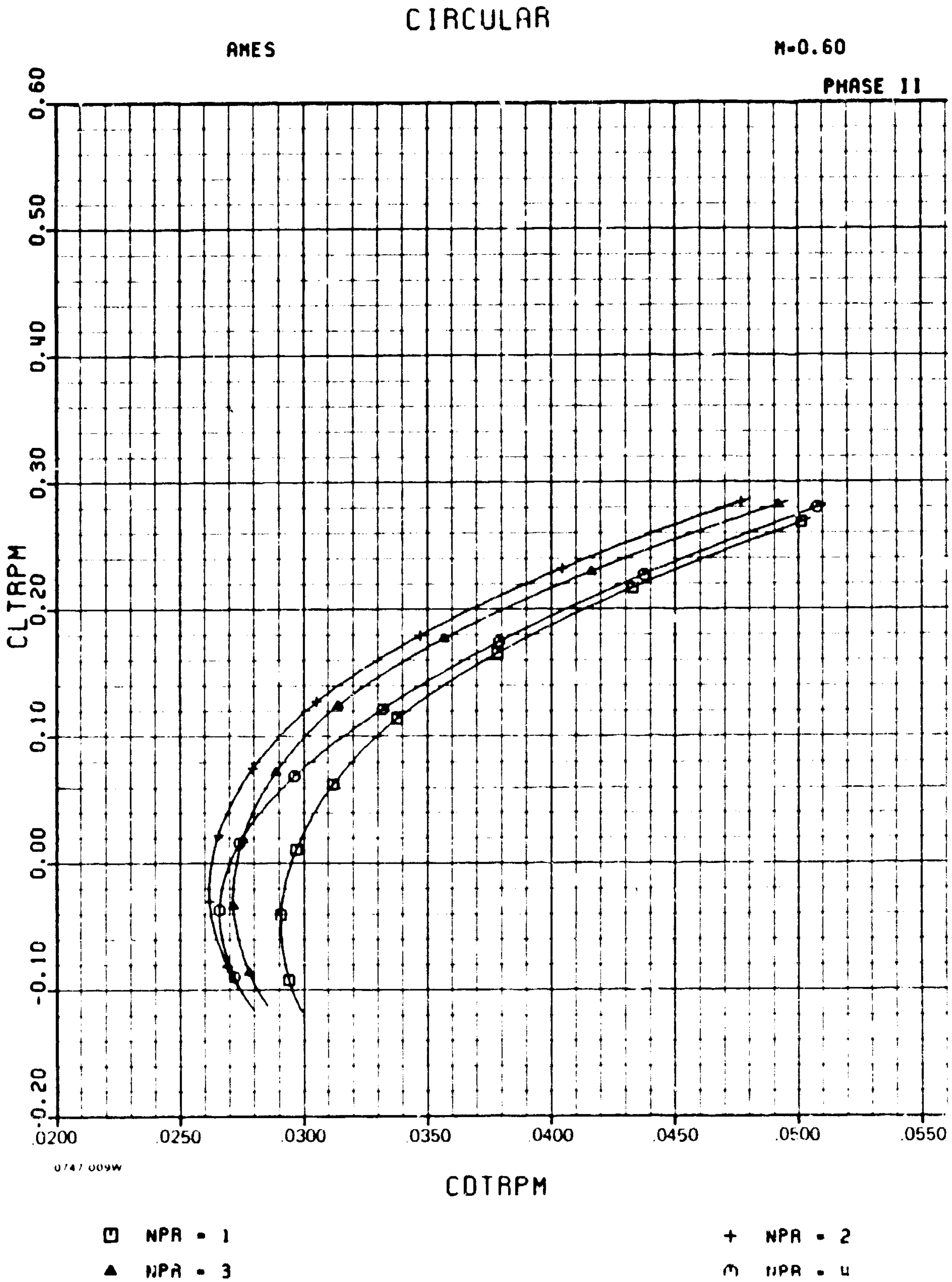
CIRCULAR
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-006W
G9613020
AOA=-.5
AOA = 1
AOA = 3

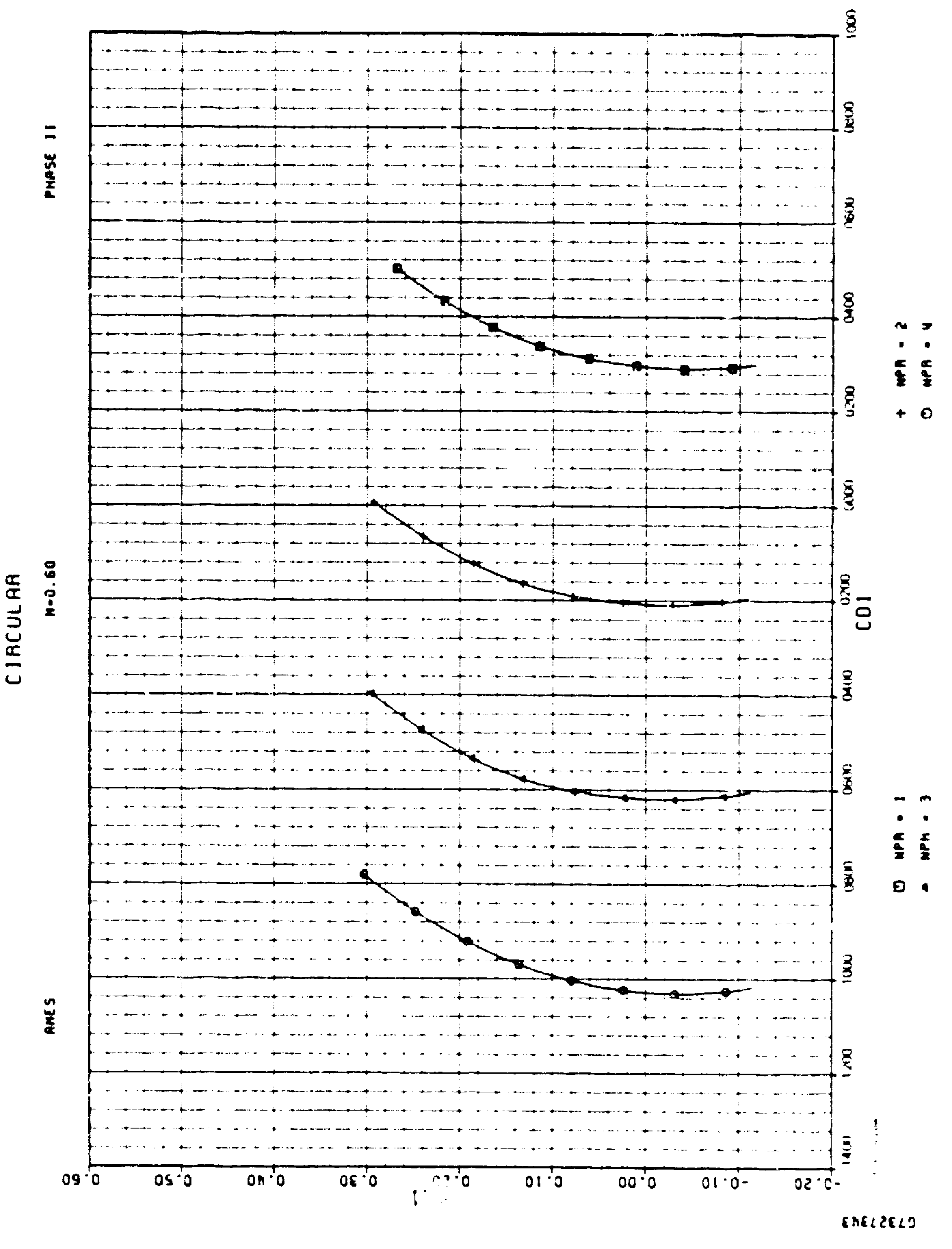
B-1(c) (cont.)

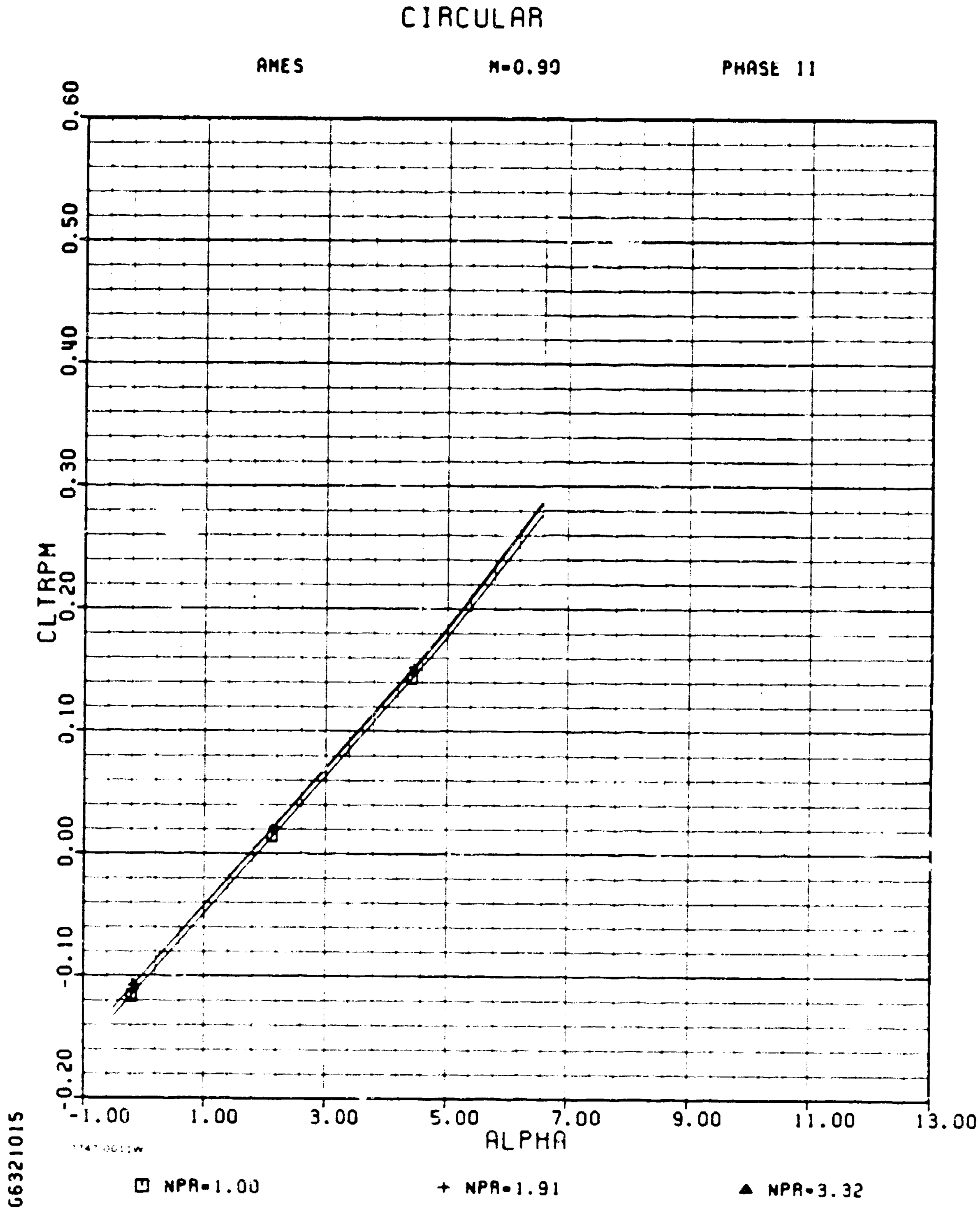

CIRCULAR
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-007W
AOA = 5
AOA = 6
AOA = 7

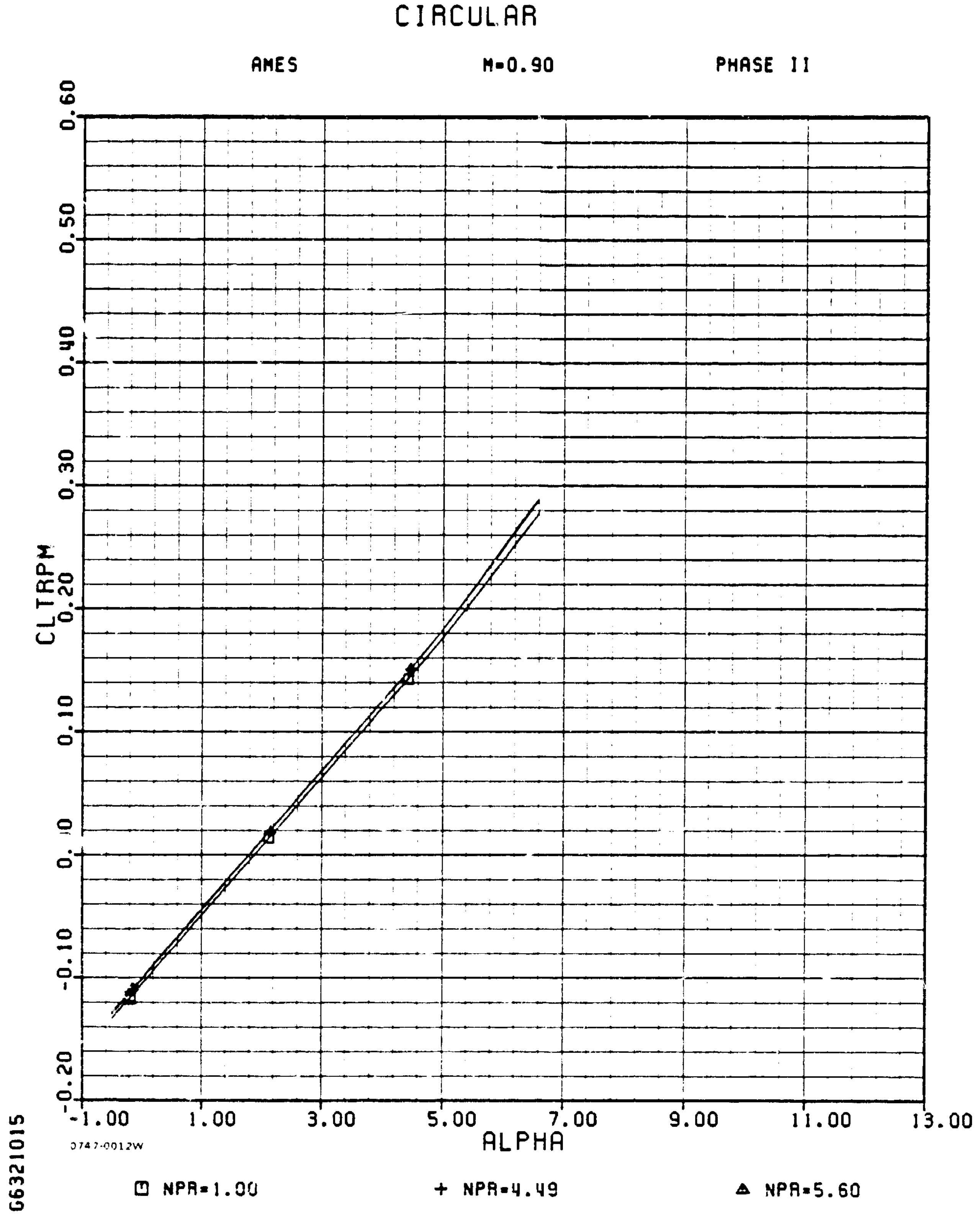
B-1(c) (concl.)


CIRCULAR
AMES
M=0.60
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
CMMTRP
NPR = 1
NPR = 2
NPR = 3
NPR = 4
G9613020

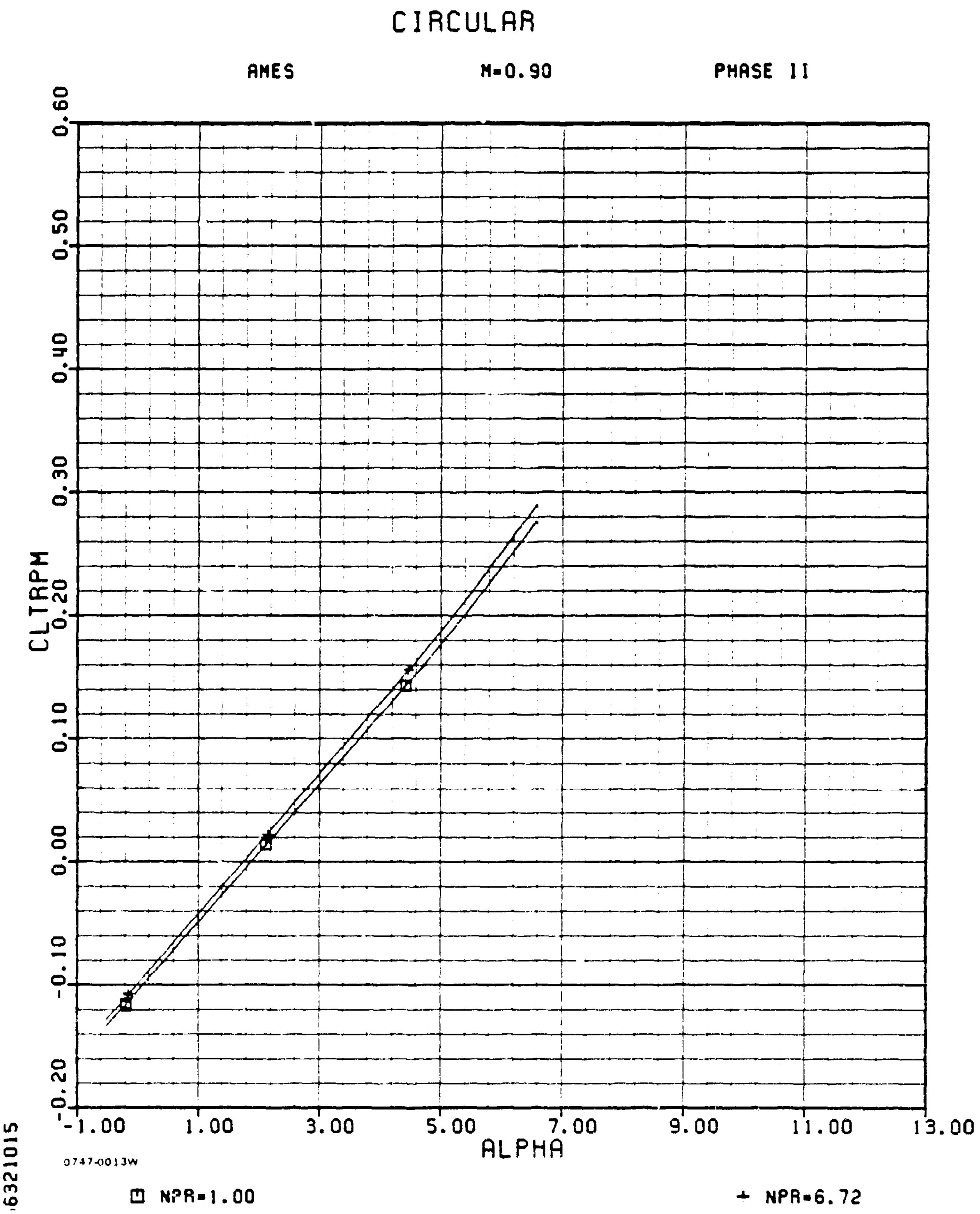

CIRCULAR
AMES
M=0.60
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0200
.0250
.0300
.0350
.0400
.0450
.0500
.0550
0747 009W
NPR = 1
NPR = 2
NPR = 3
NPR = 4


CIRCULAR
AMES
M=0.60
PHASE II
CD1
NPR = 1
NPR = 3
NPR = 2
NPR = 4

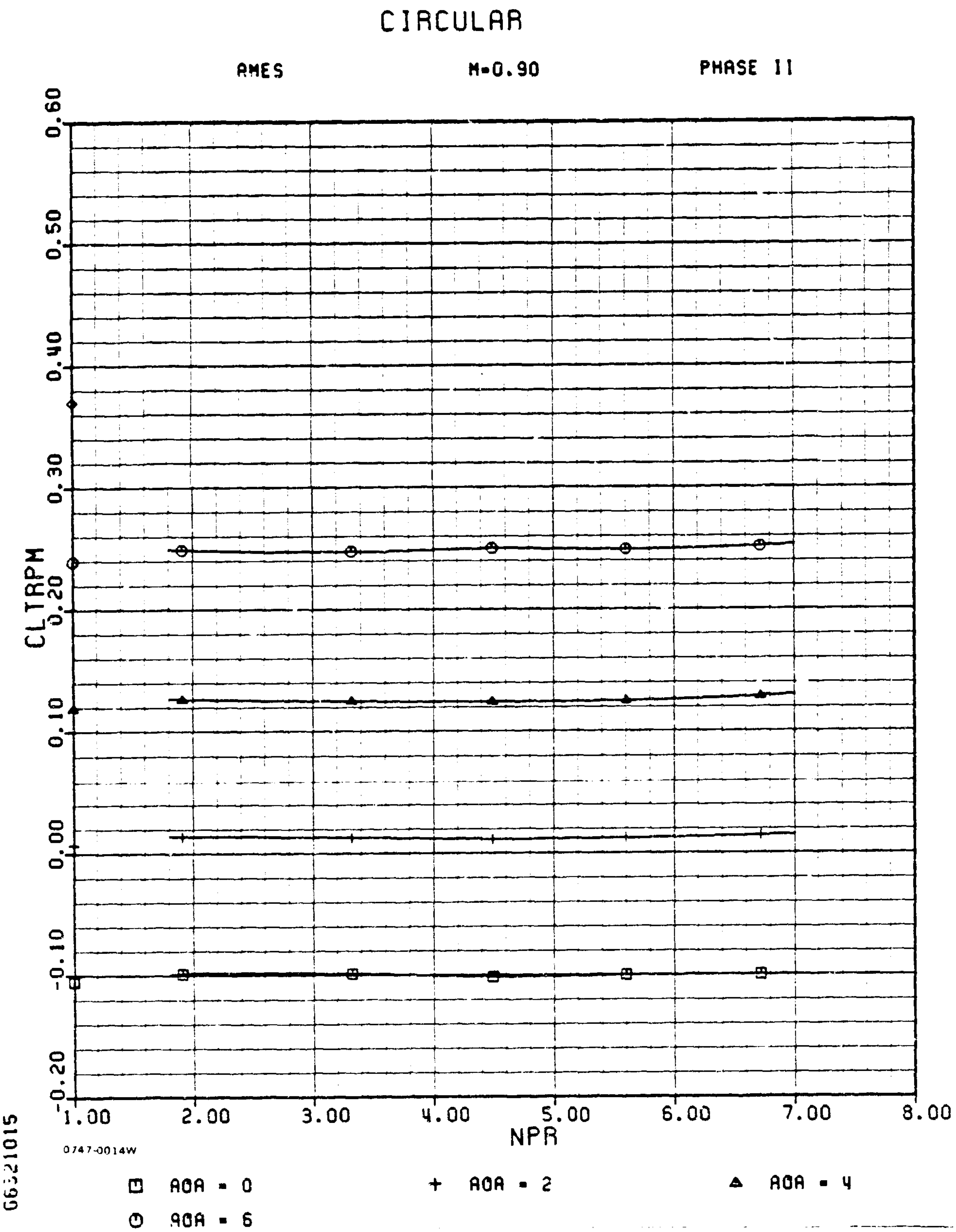

CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
ALPHA
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
G6321015
NPR=1.00
+ NPR=1.91
▲ NPR=3.32

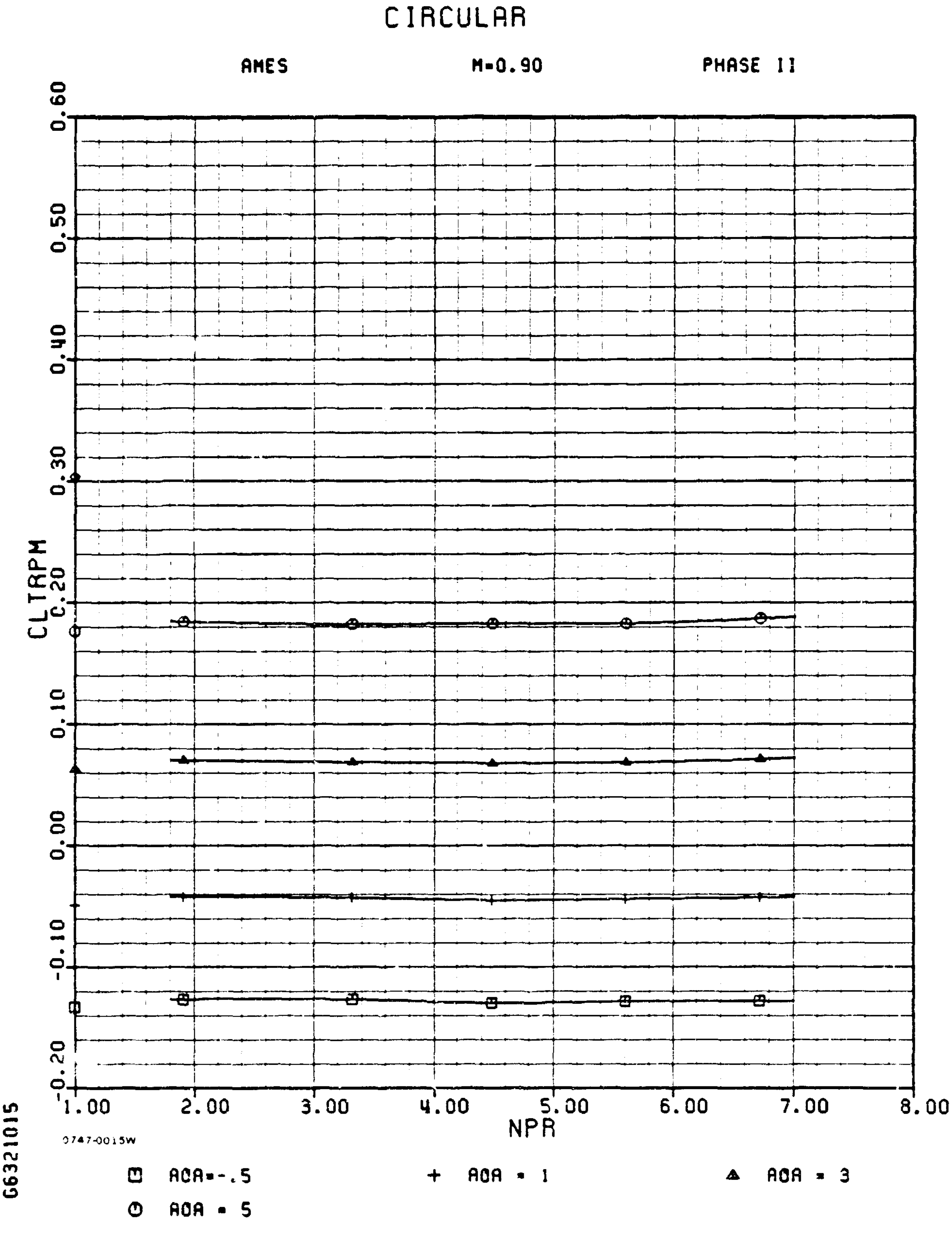

CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.0
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0012W
G6321015
NPR=1.00
+ NPR=4.49
NPR=5.60

B-2(a) (cont.)

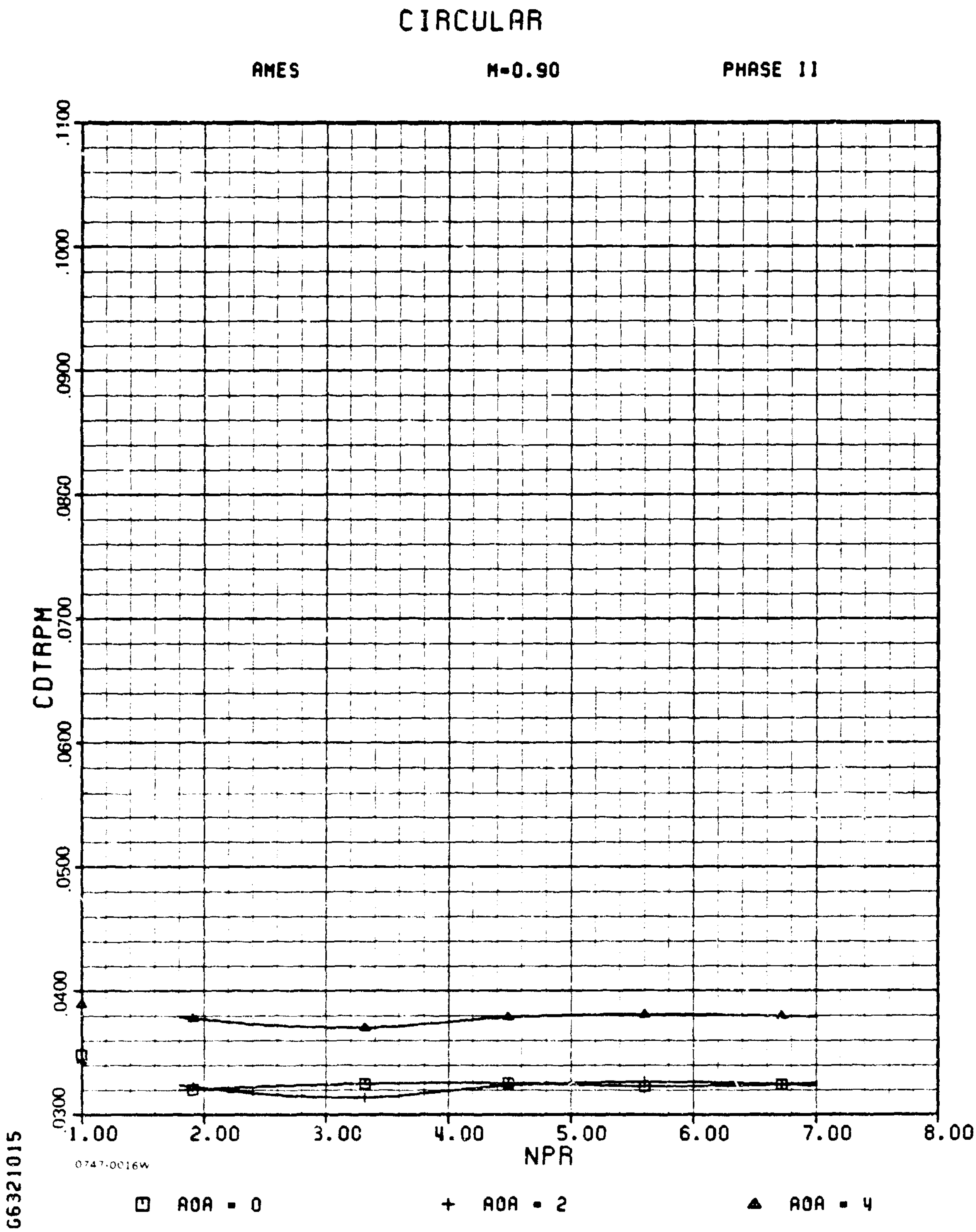

CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0013W
NPR=1.00
NPR=6.72
6321015

B-2(a) (concl.)


CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0014W
AOA = 0
AOA = 2
AOA = 4
AOA = 6
G6321015

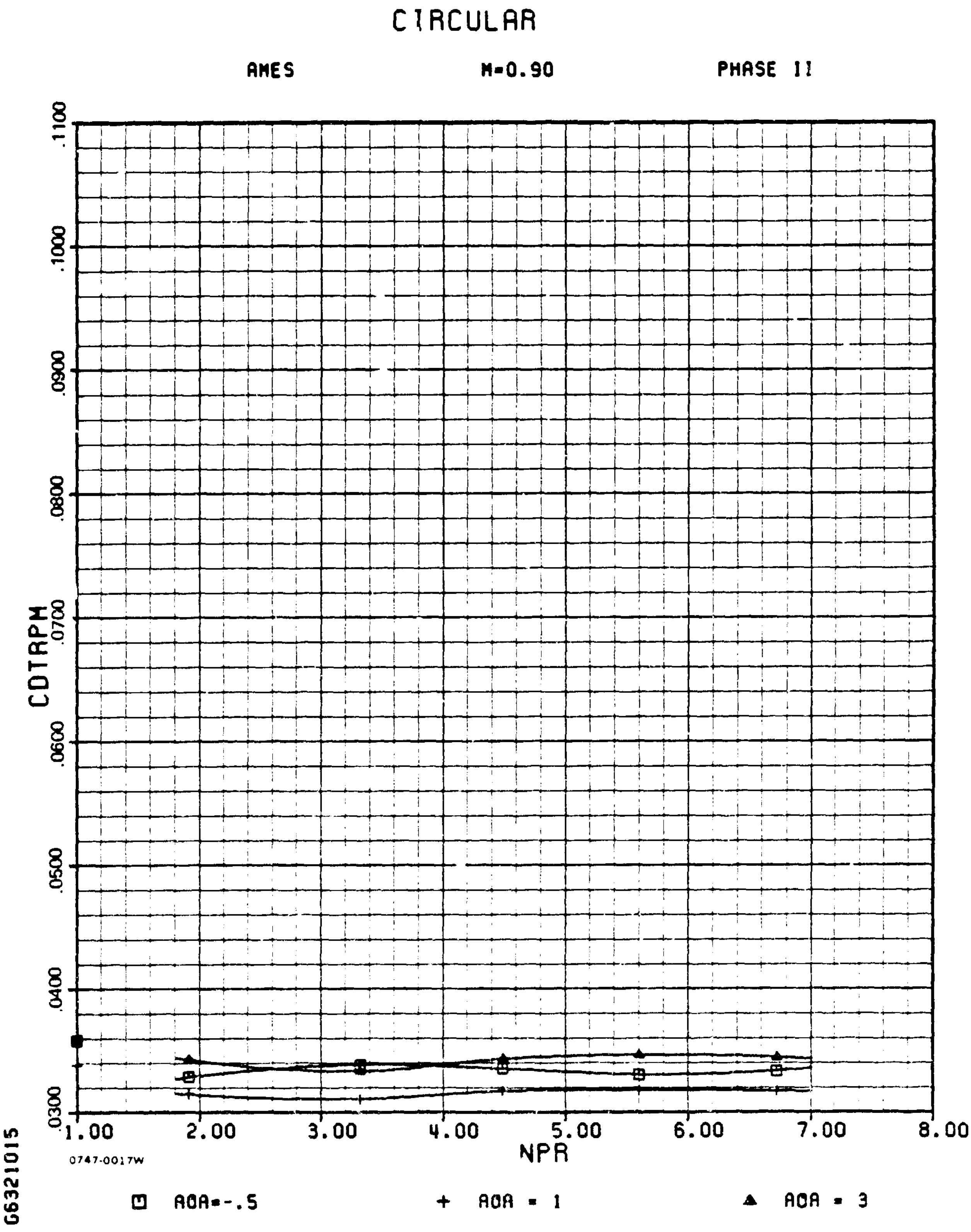

CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G6321015
0747-0015W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

B-2(b) (concl.)



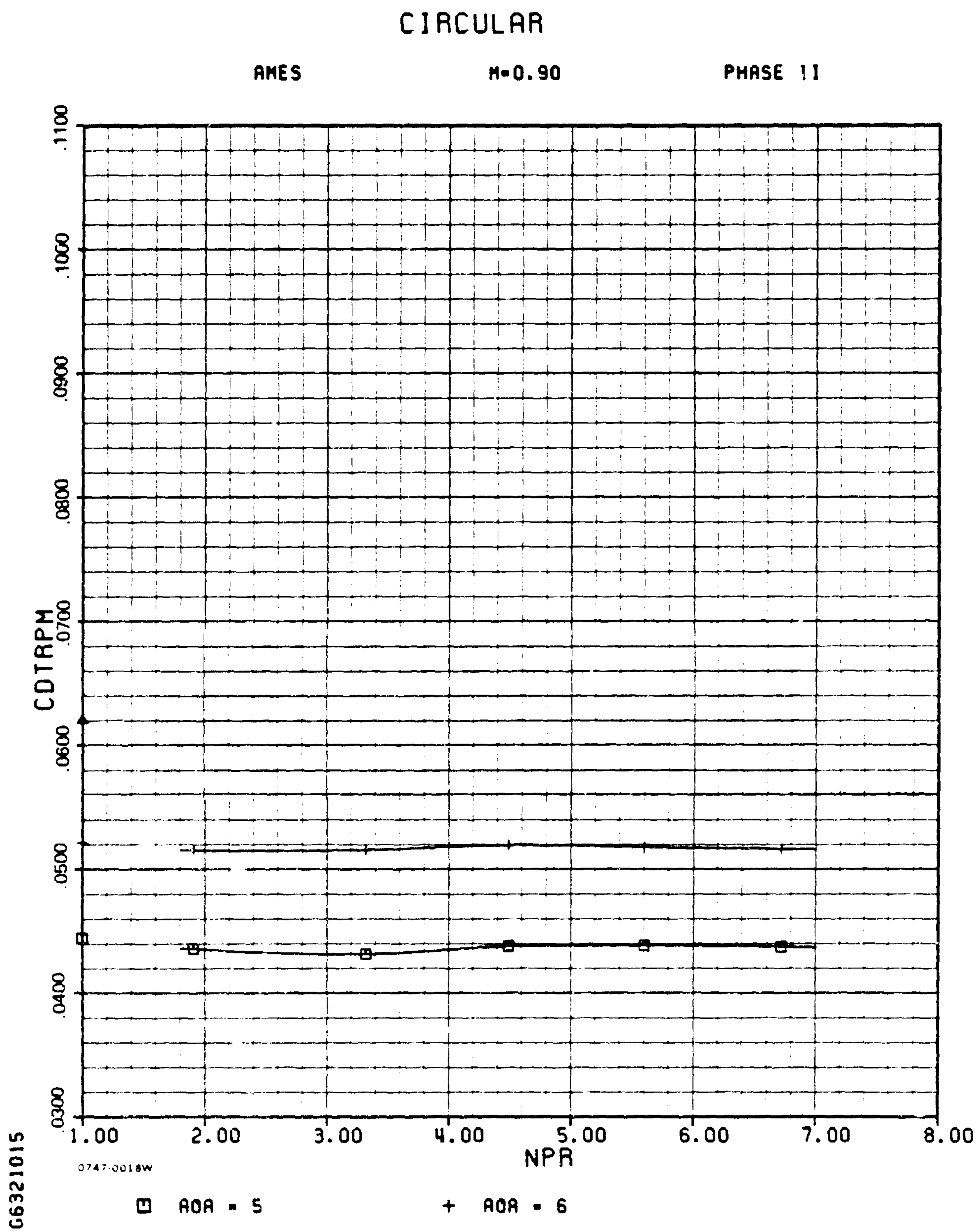
CIRCULAR
AMES
M=0.90
PHASE II
CDTRPM
.1100
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0016W
G6321015
AOA = 0
AOA = 2
AOA = 4

B-2(c)



CIRCULAR
AMES
M=0.90
PHASE II
CDTRPM
.1100
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0017W
G6321015
AOA=-.5
AOA = 1
AOA = 3

[illegible] (cont.)


CIRCULAR
AMES
M=0.90
PHASE II
CDTRPM
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.1000
.0900
.0800
.0700
.0600
.0500
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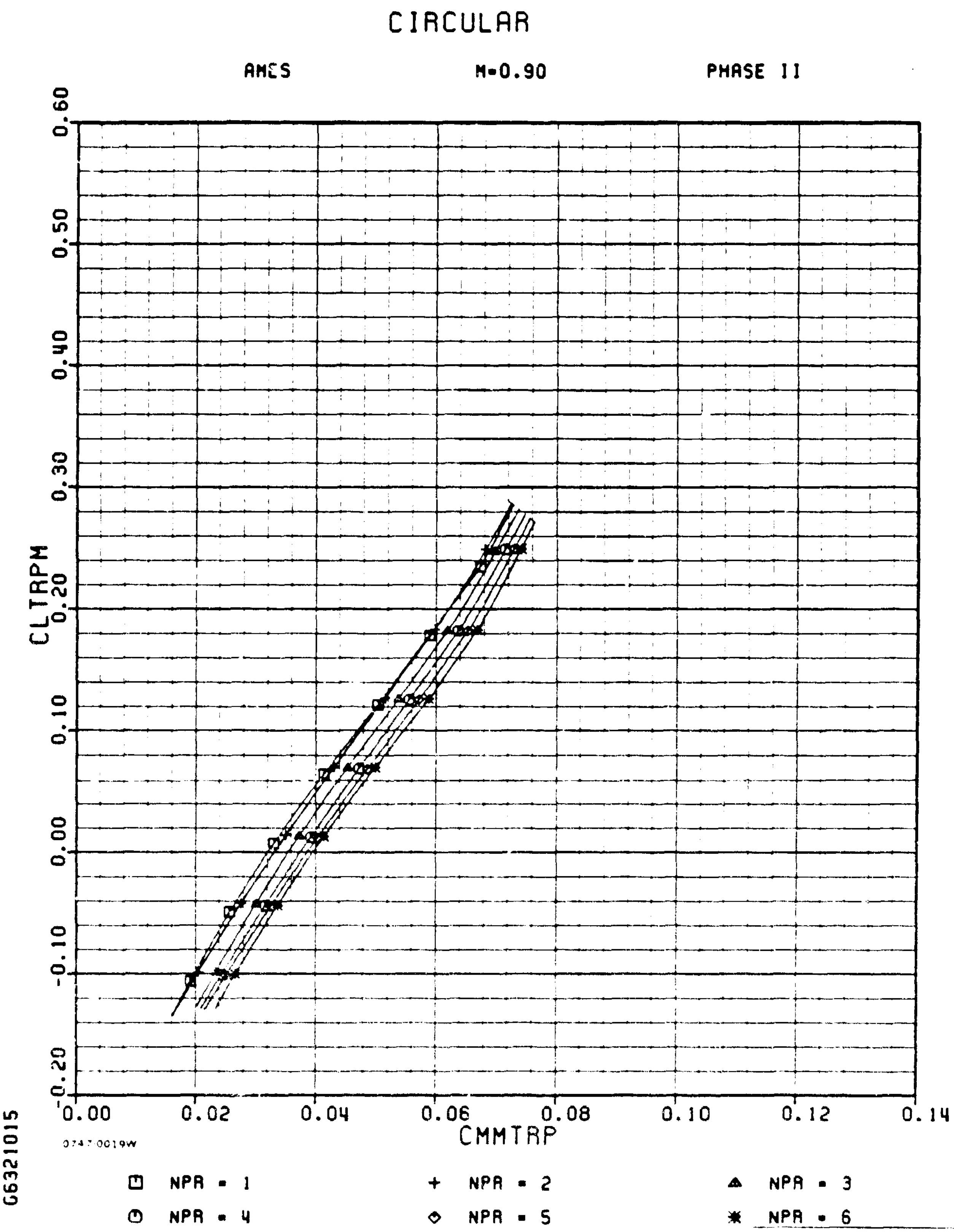
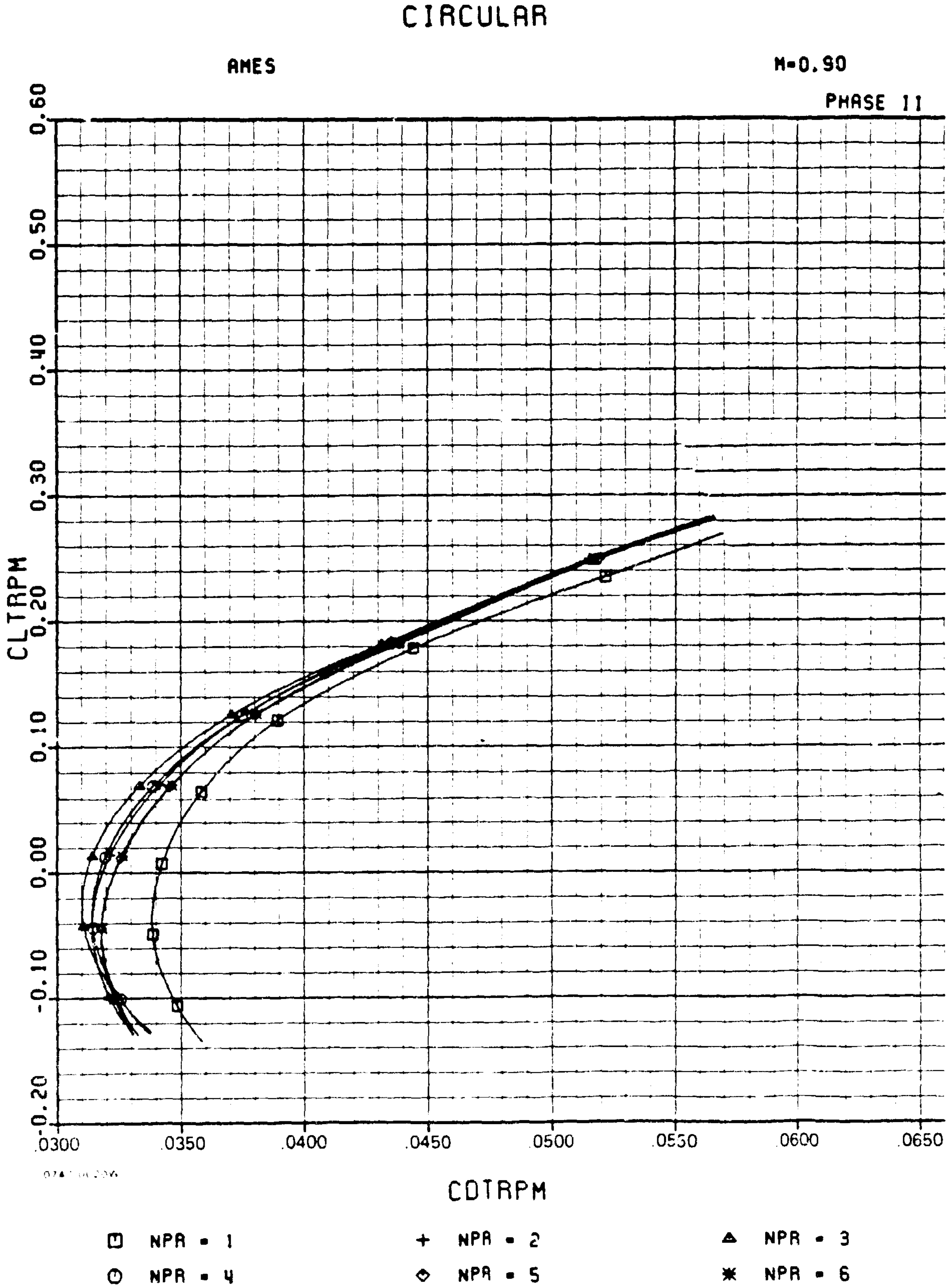
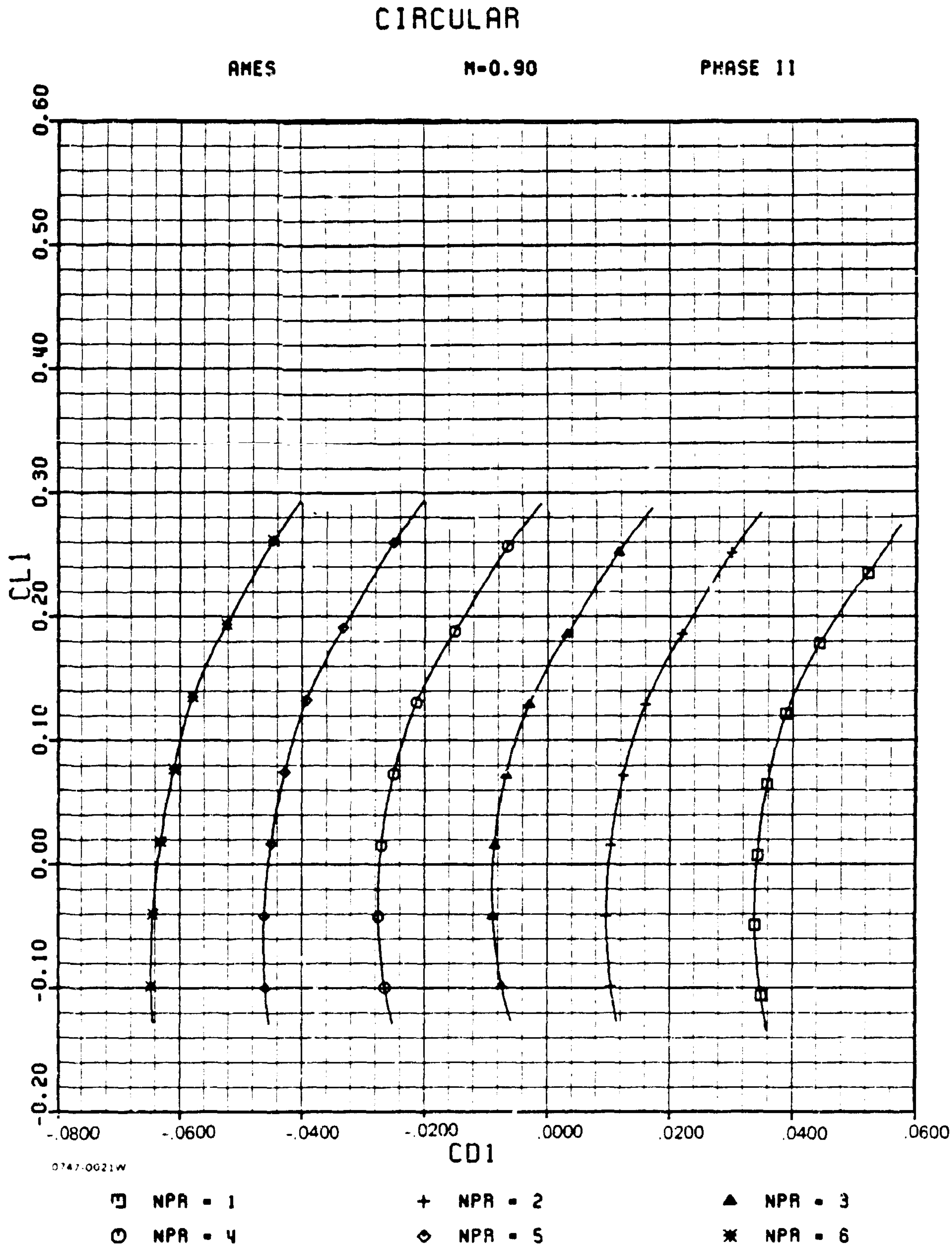
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0018W
G6321015
AOA = 5
AOA = 6

B-2(c) (concl.)


CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
CMMTRP
G6321015
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

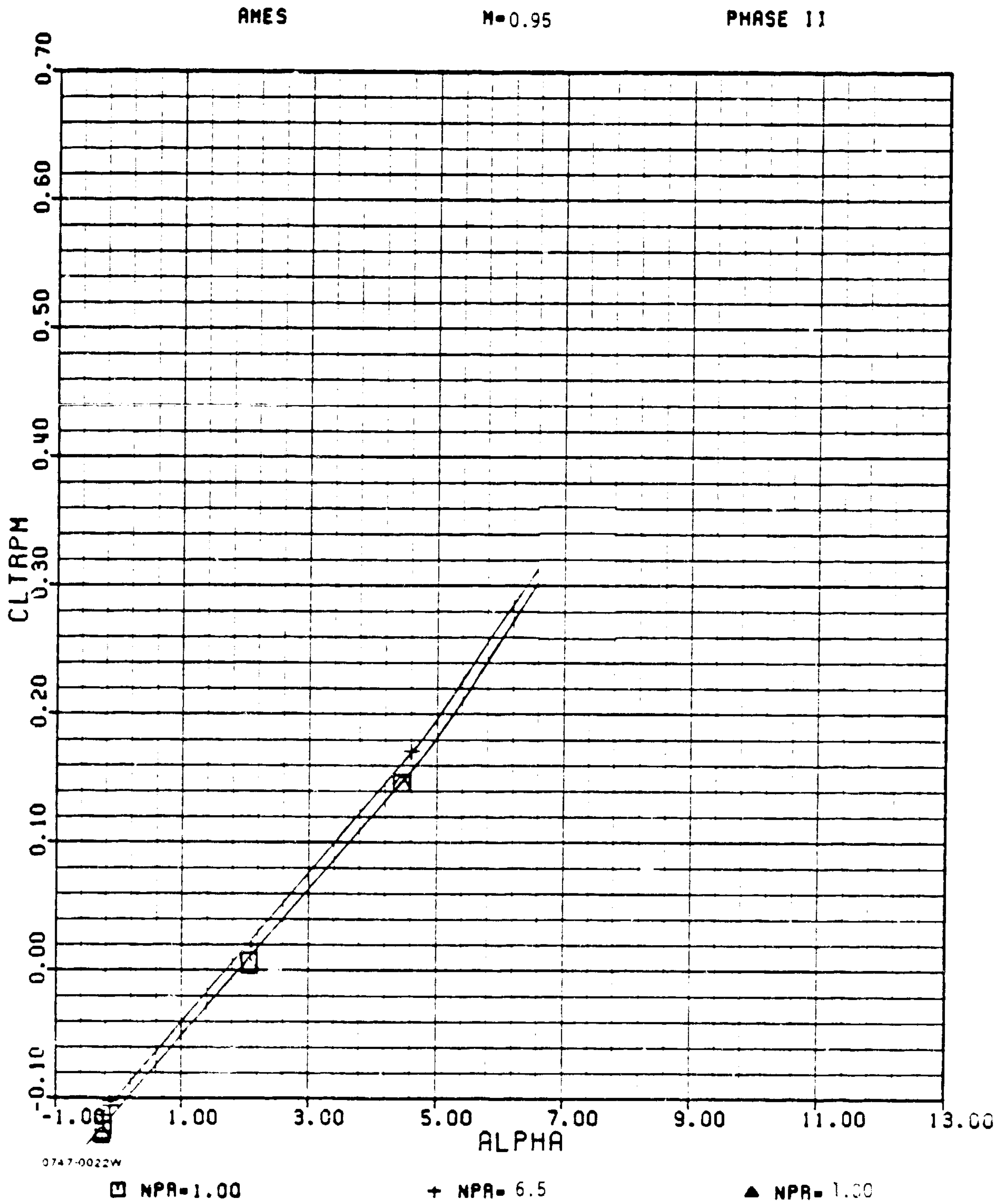


CIRCULAR
AMES
M=0.90
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0300
.0350
.0400
.0450
.0500
.0550
.0600
.0650
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

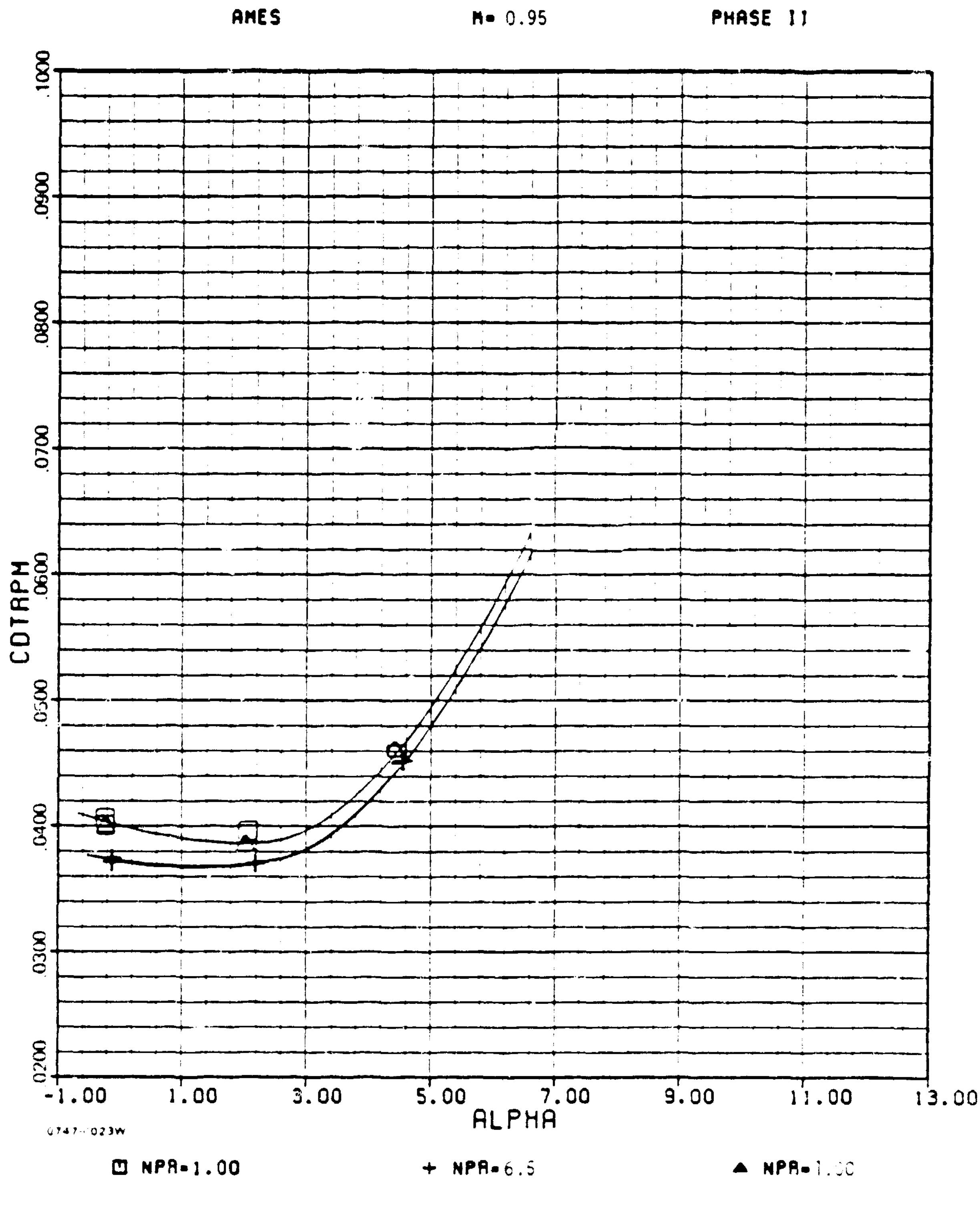

CIRCULAR
AMES
M=0.90
PHASE II
CL1
CD1
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-.0800
-.0600
-.0400
-.0200
.0000
.0200
.0400
.0600
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

G6048340

CIRCULAR NOZZLE

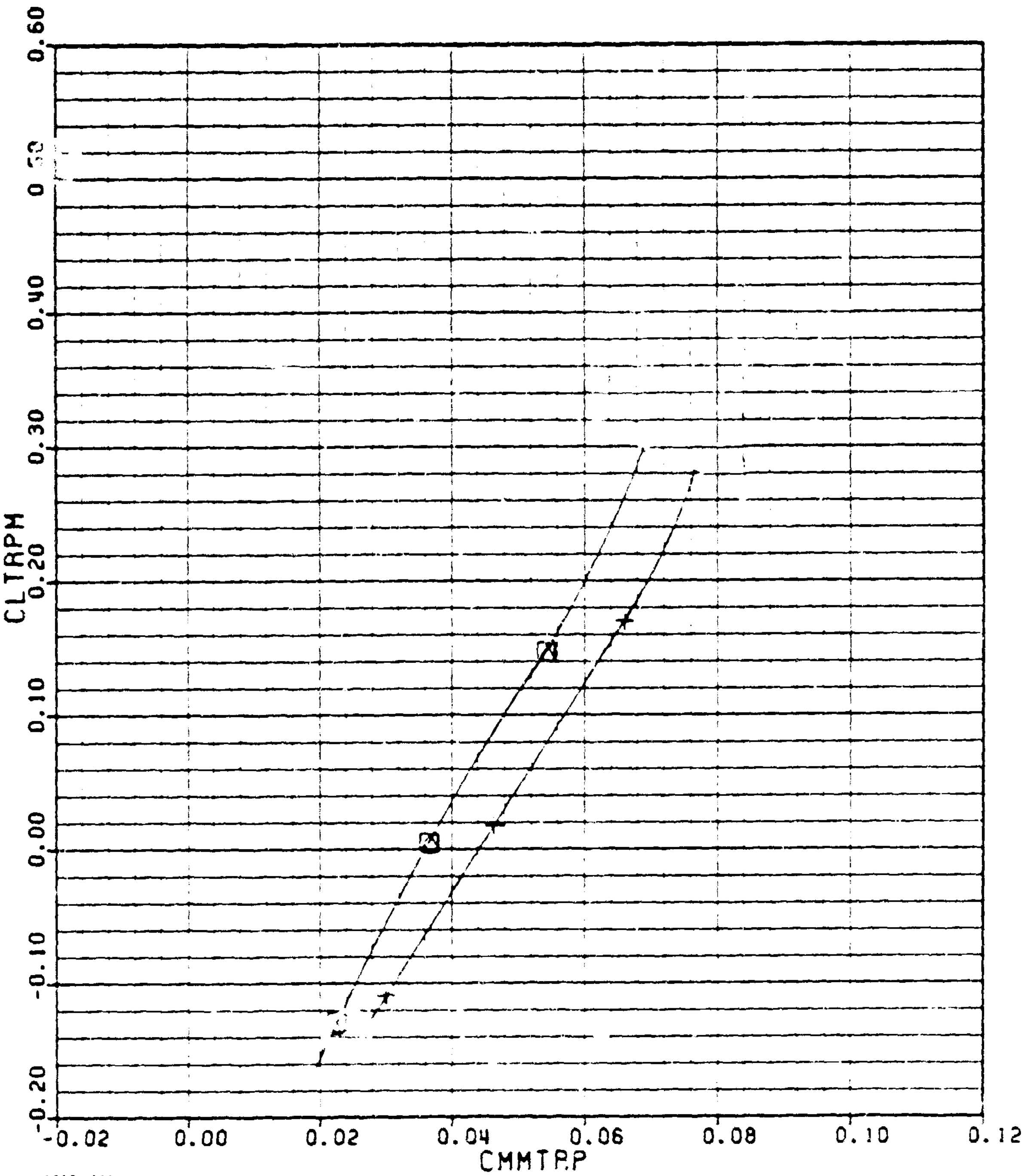


CIRCULAR NOZZLE



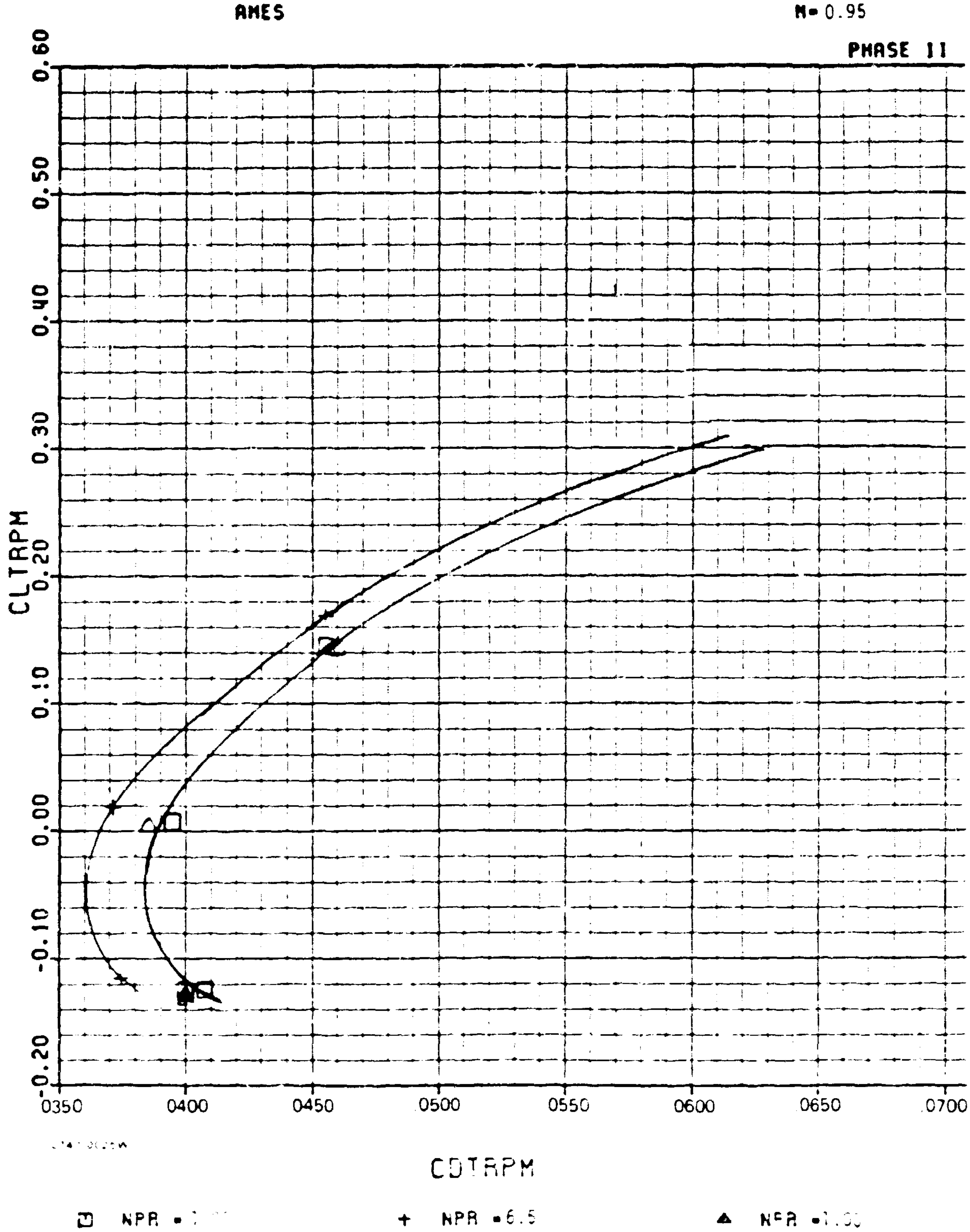
CIRCULAR NOZZLE

AMES M= 0.95 PHASE II

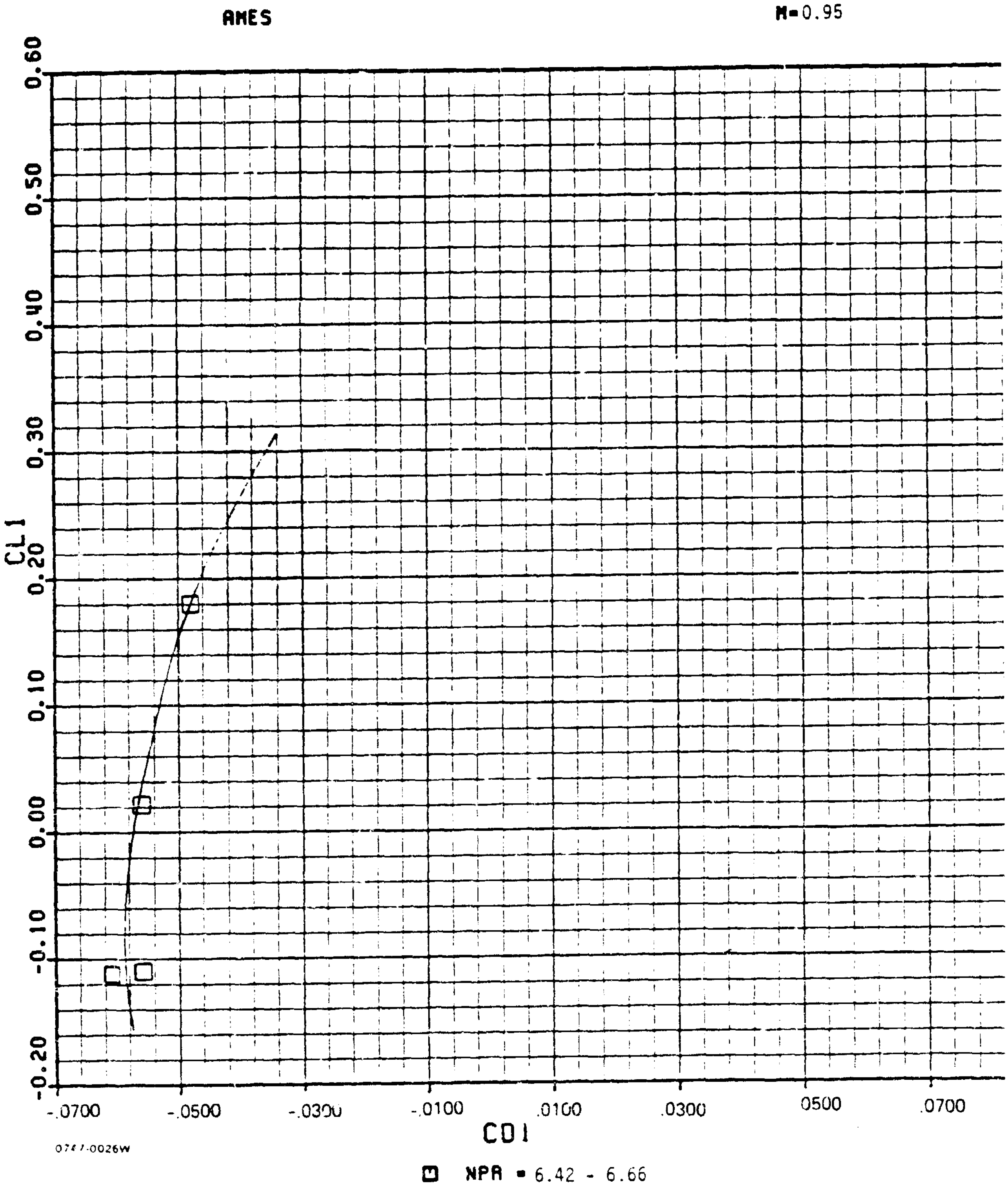


□ NPR = 1.00 + NPR = 6.5 ▲ NPR = 1.00

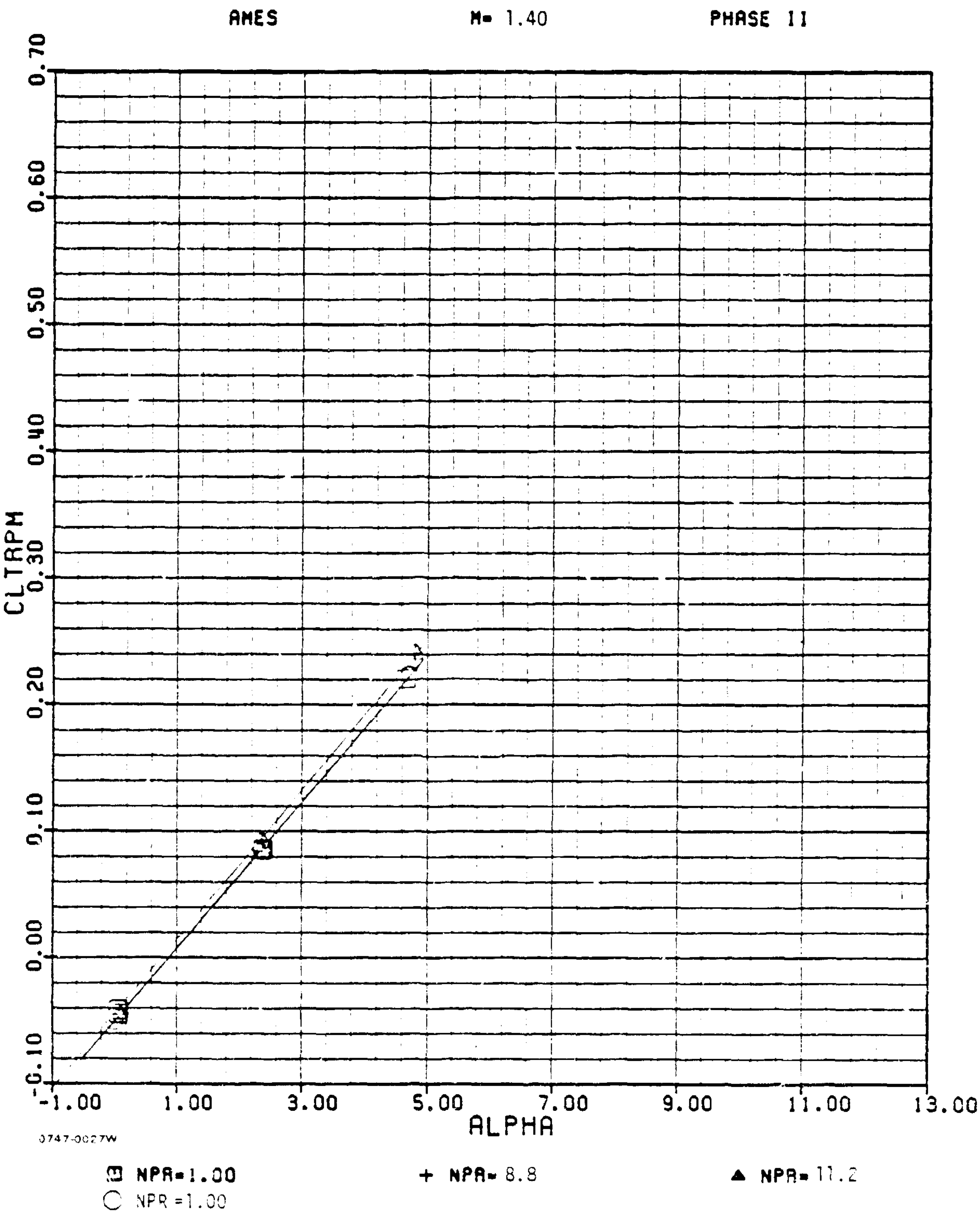
CIRCULAR NOZZLE



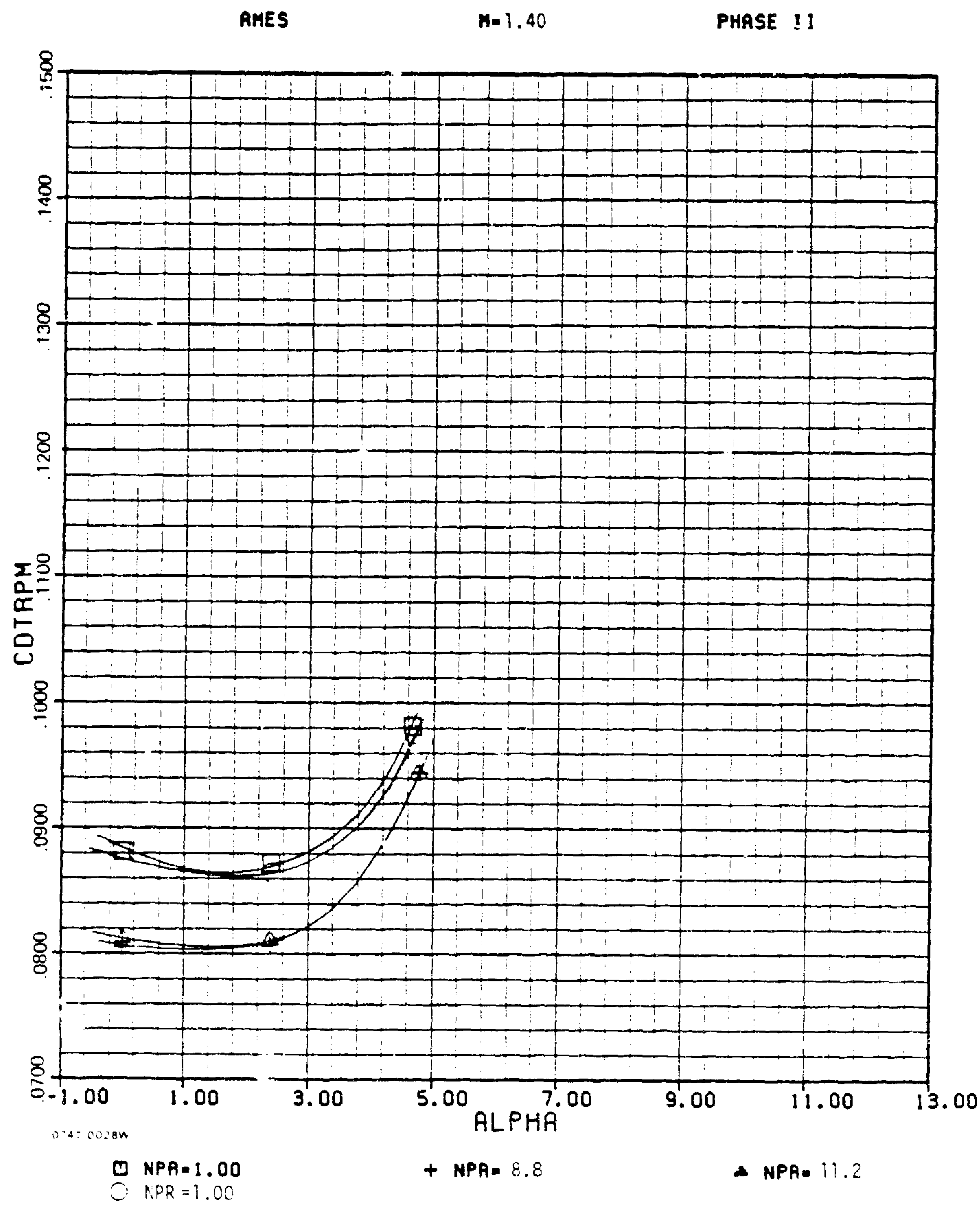
CIRCULAR NOZZLE



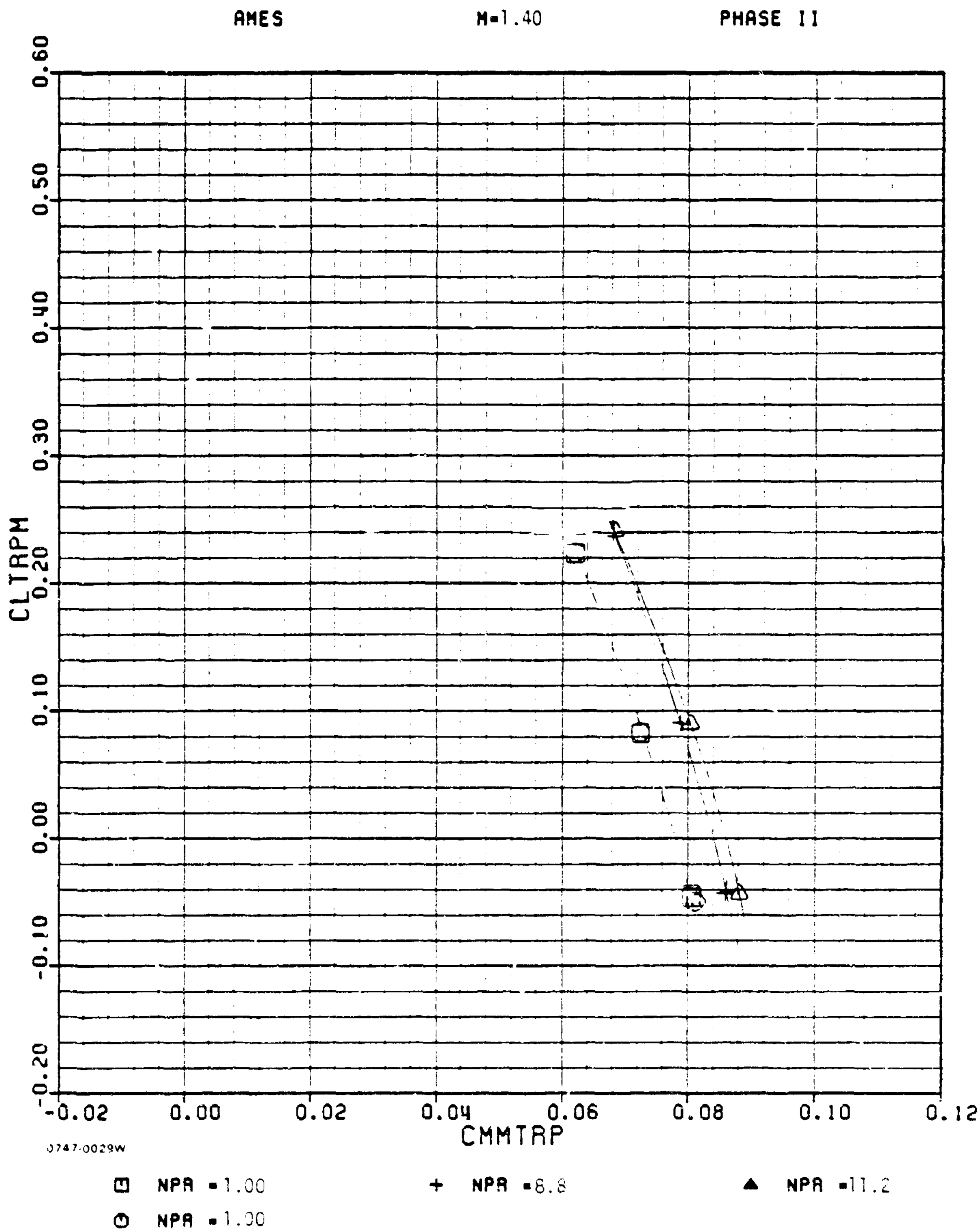
CIRCULAR NOZZLE



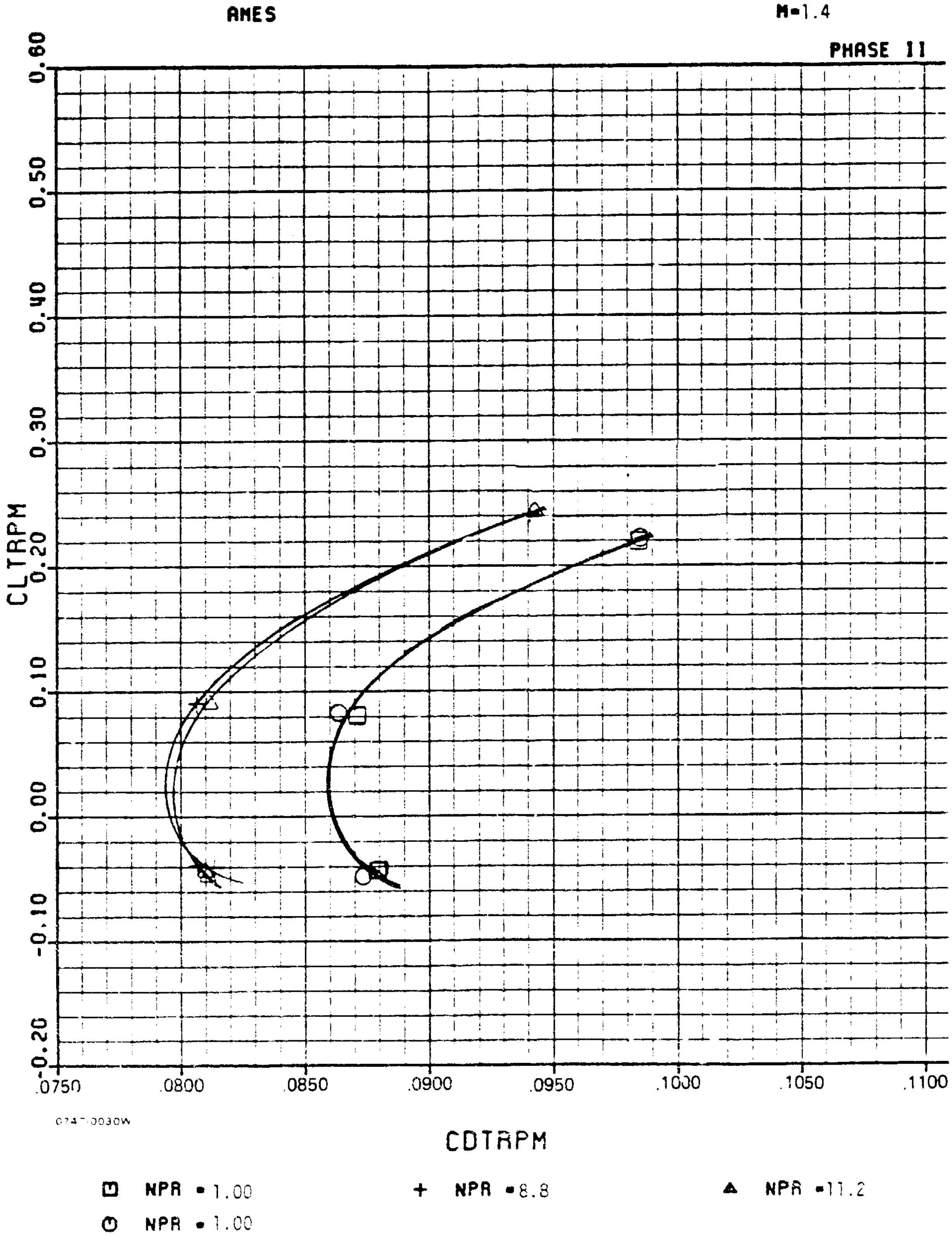
CIRCULAR NOZZLE



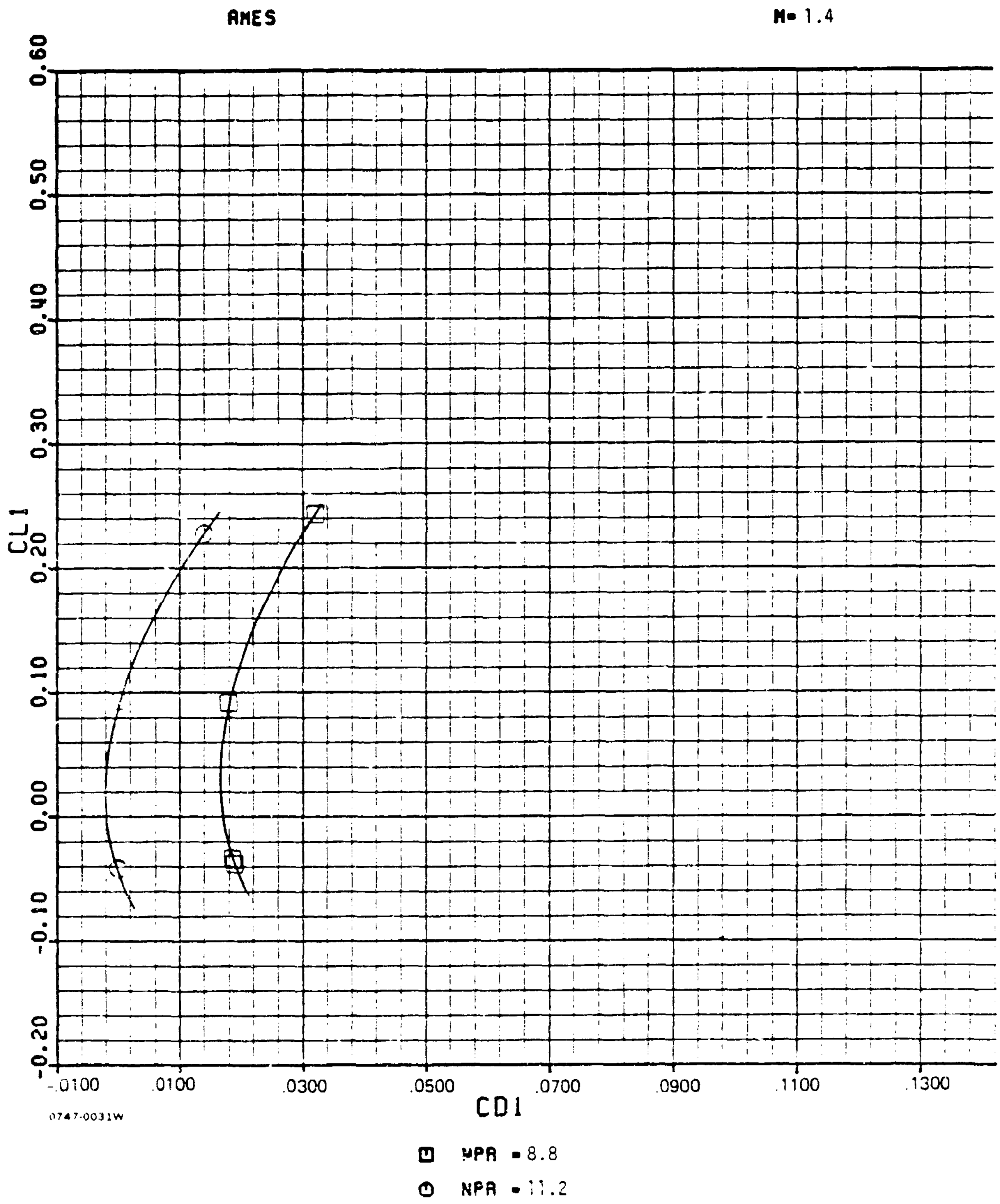
CIRCULAR NOZZLE



CIRCULAR NOZZLE



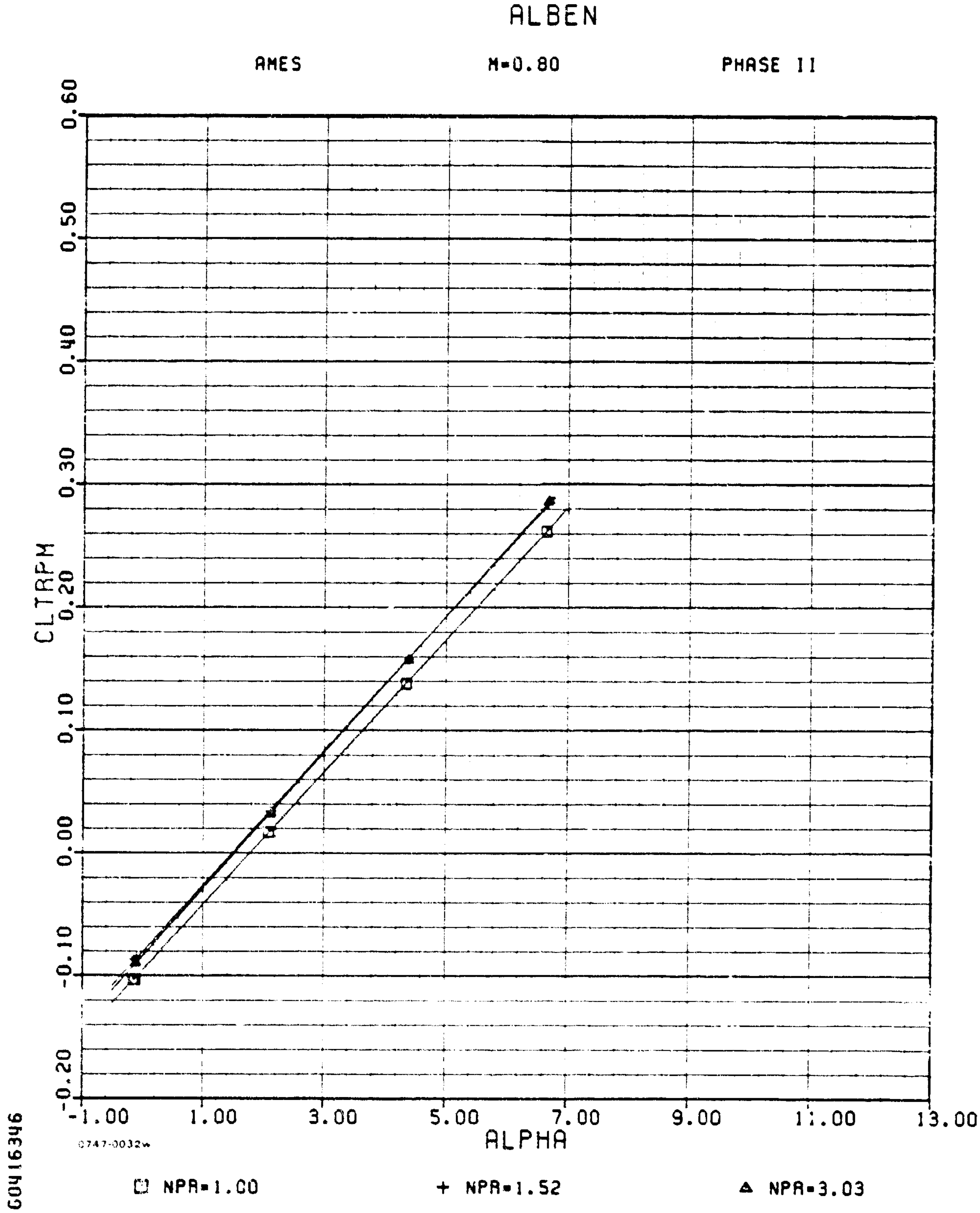
CIRCULAR NOZZLE

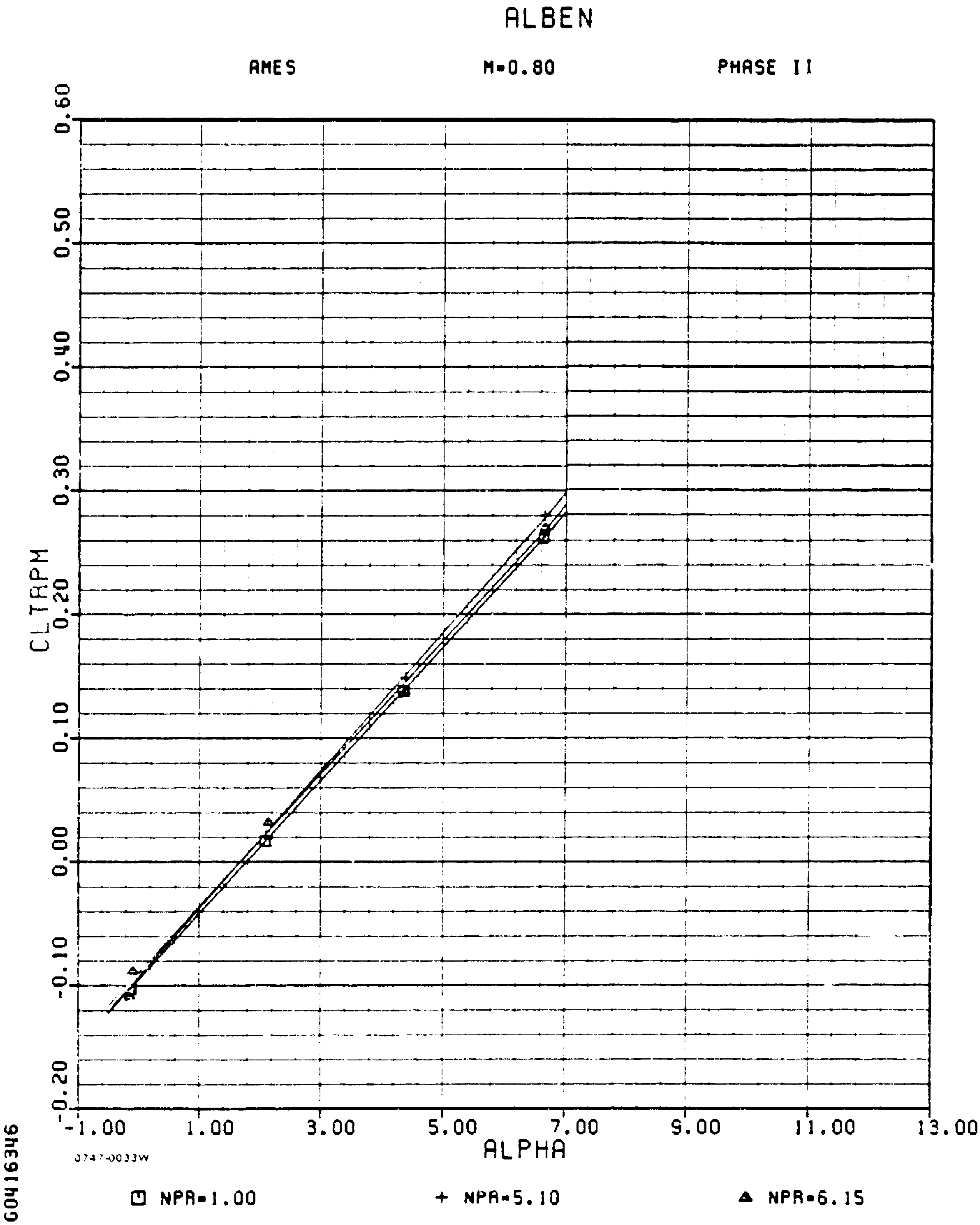


B-4(e)

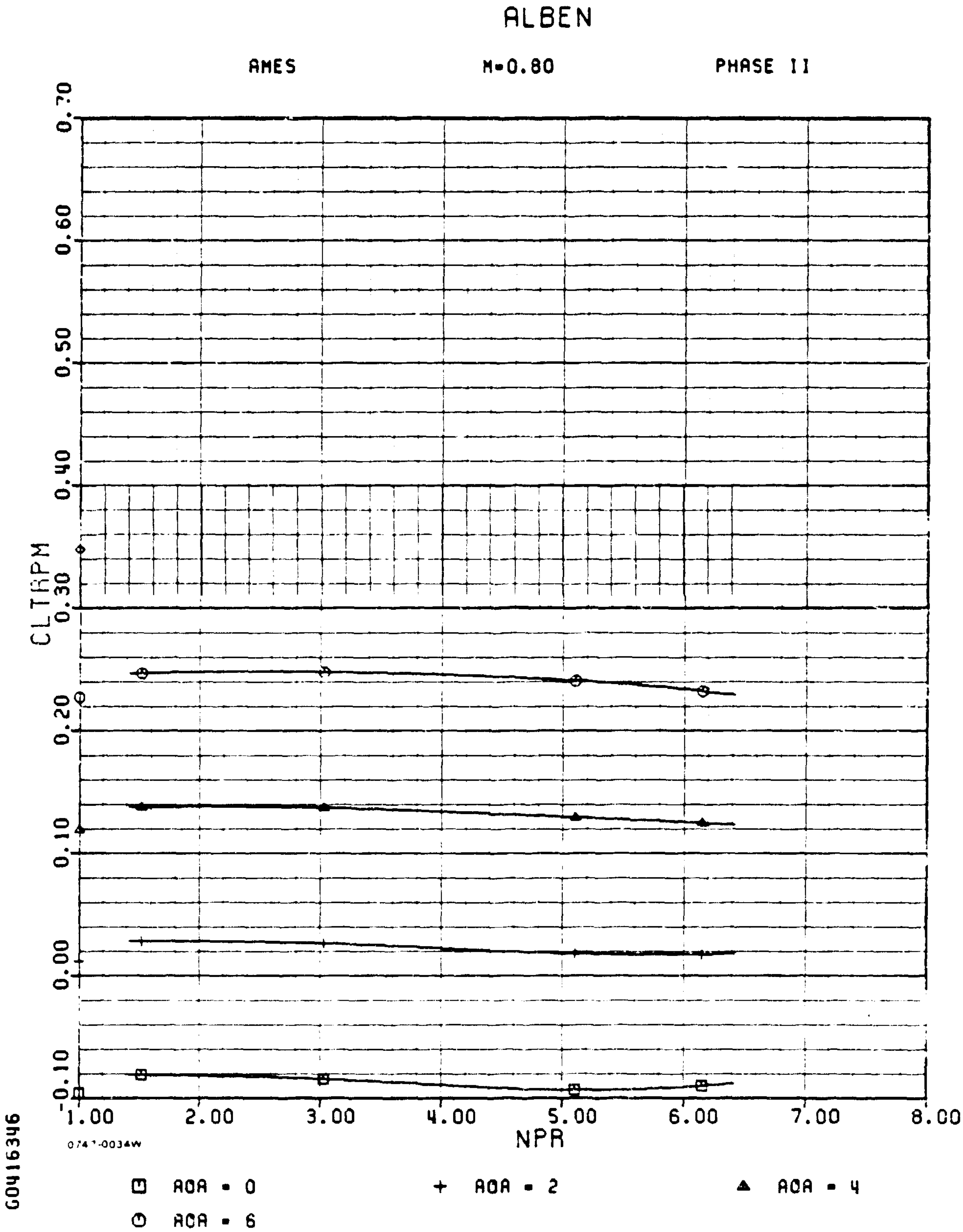
APPENDIX C

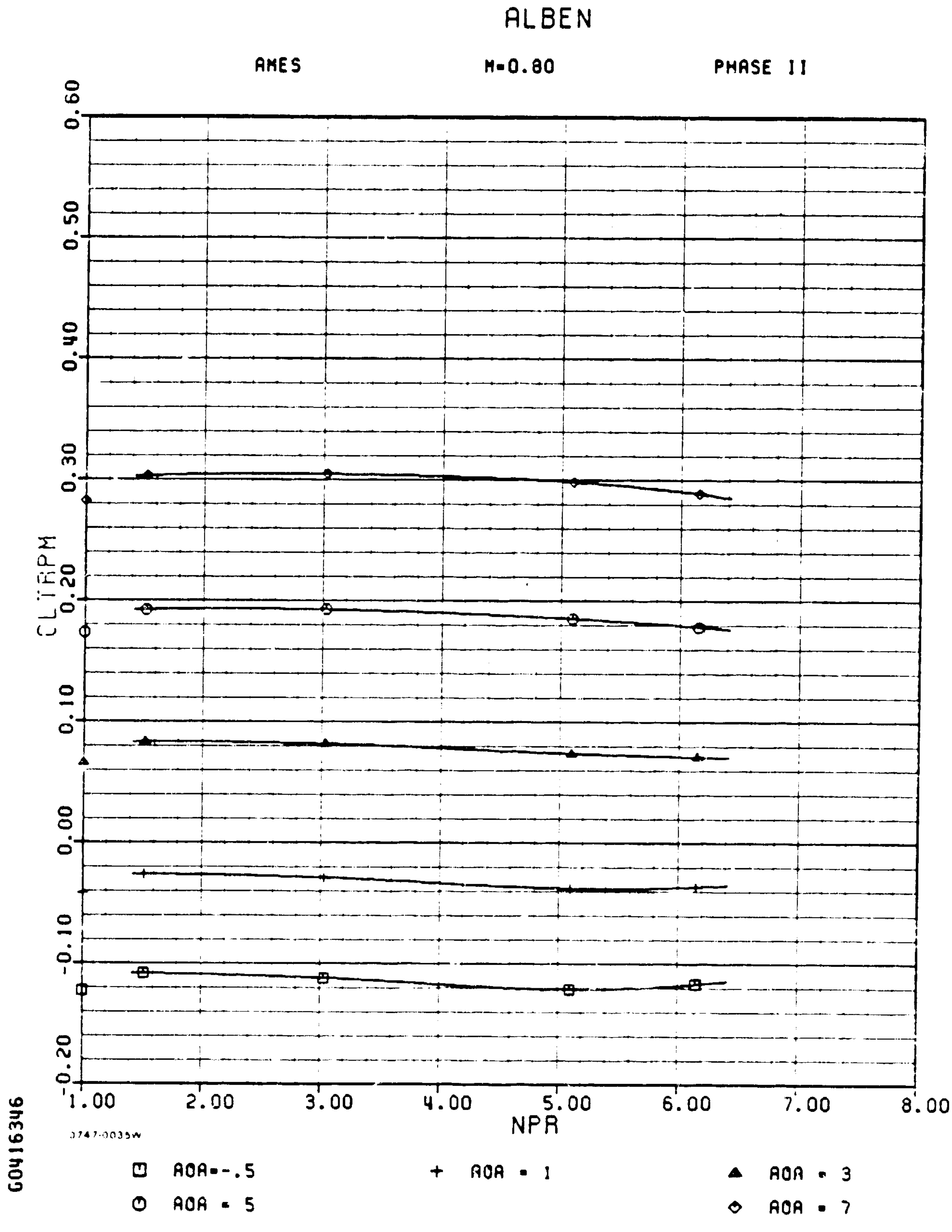
ALBEN WIND-ON DATA


ALBEN
AMES
M=0.80
PHASE II
CLTRPM
ALPHA
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0032w
□ NPR=1.00
+ NPR=1.52
△ NPR=3.03
G0416346


ALBEN
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
NPR=1.00
+ NPR=5.10
NPR=6.15
G0416346

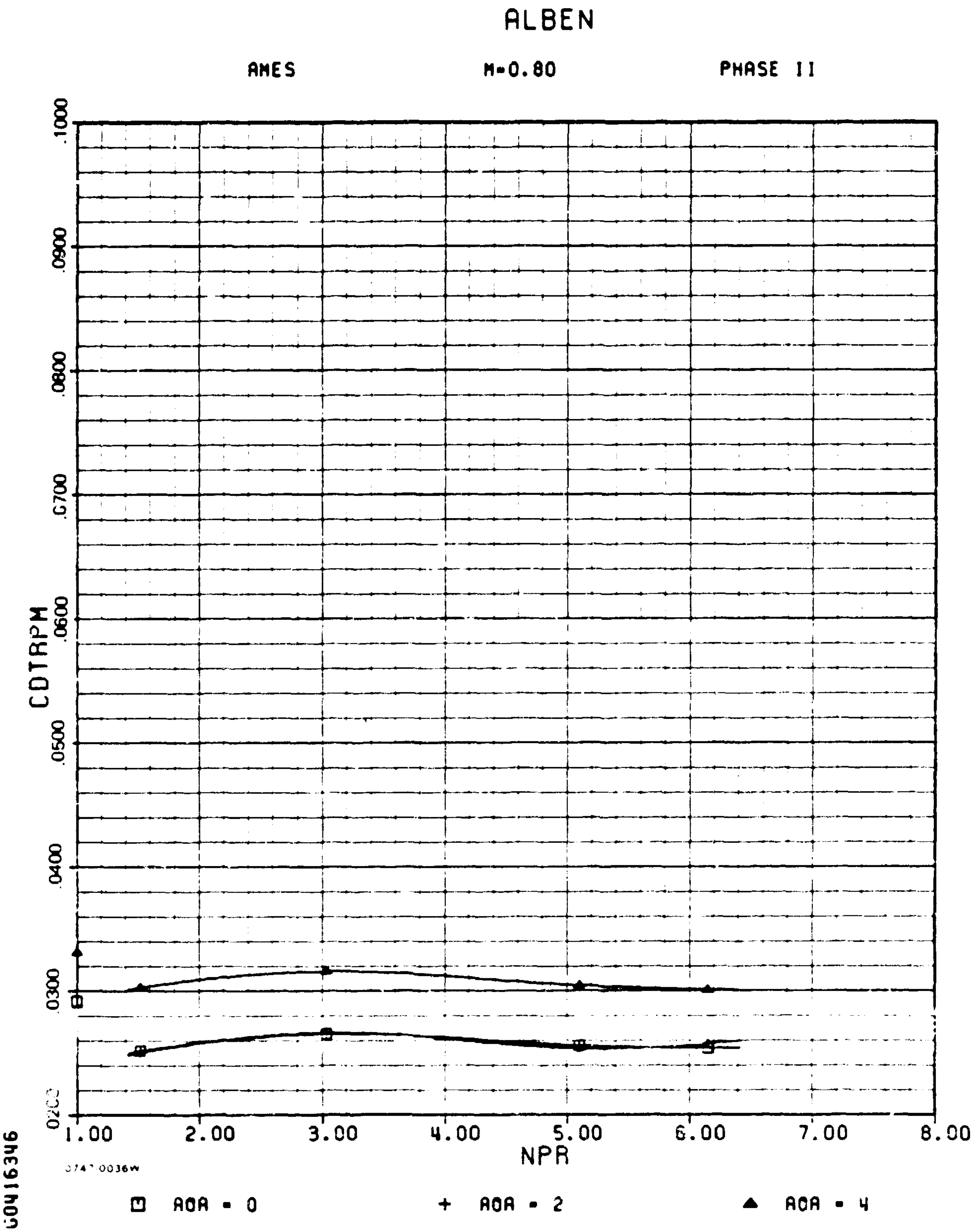
C-1(a) (concl.)

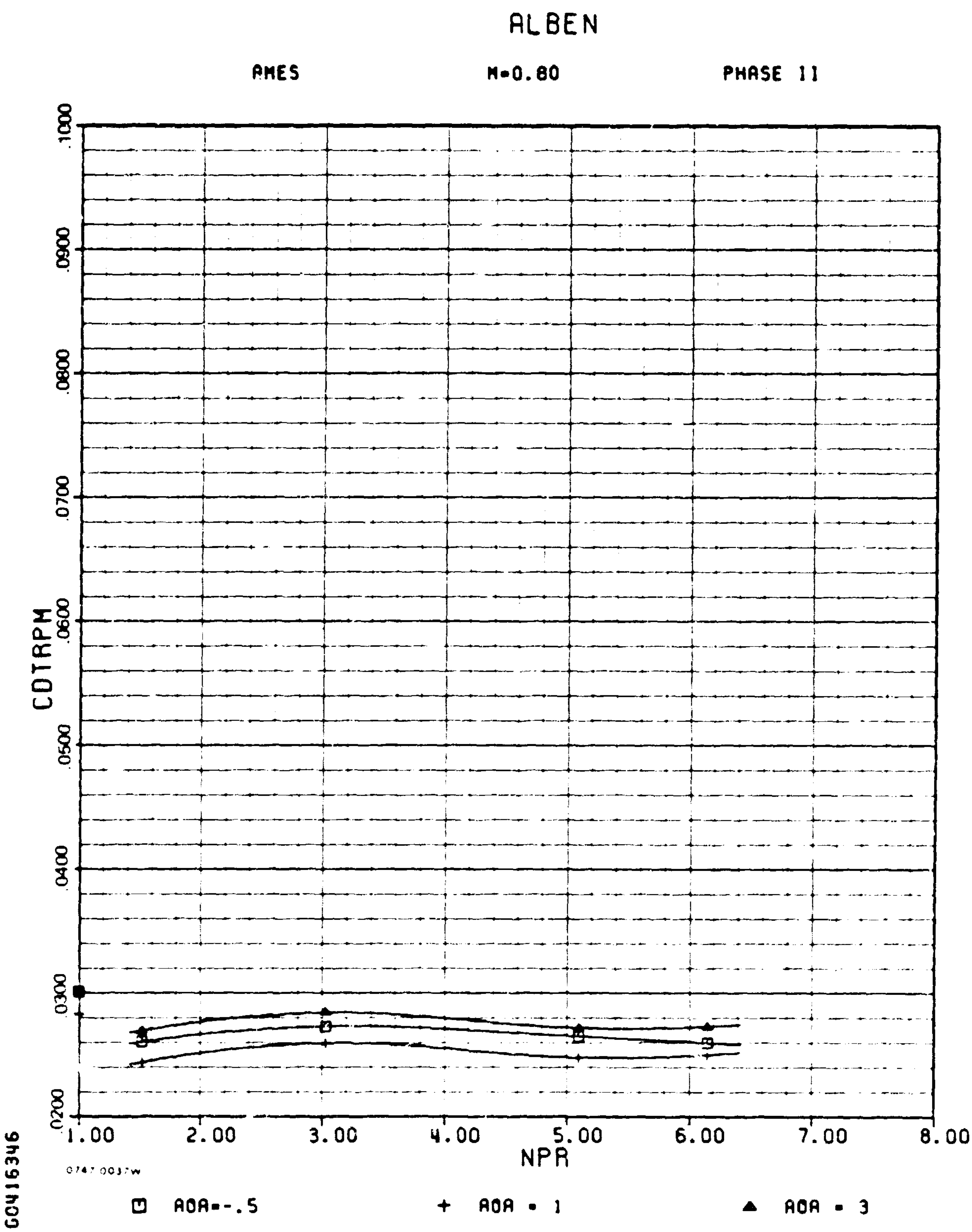

ALBEN
AMES
M=0.80
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0034W
G0416346
AOA = 0
AOA = 2
AOA = 4
AOA = 6



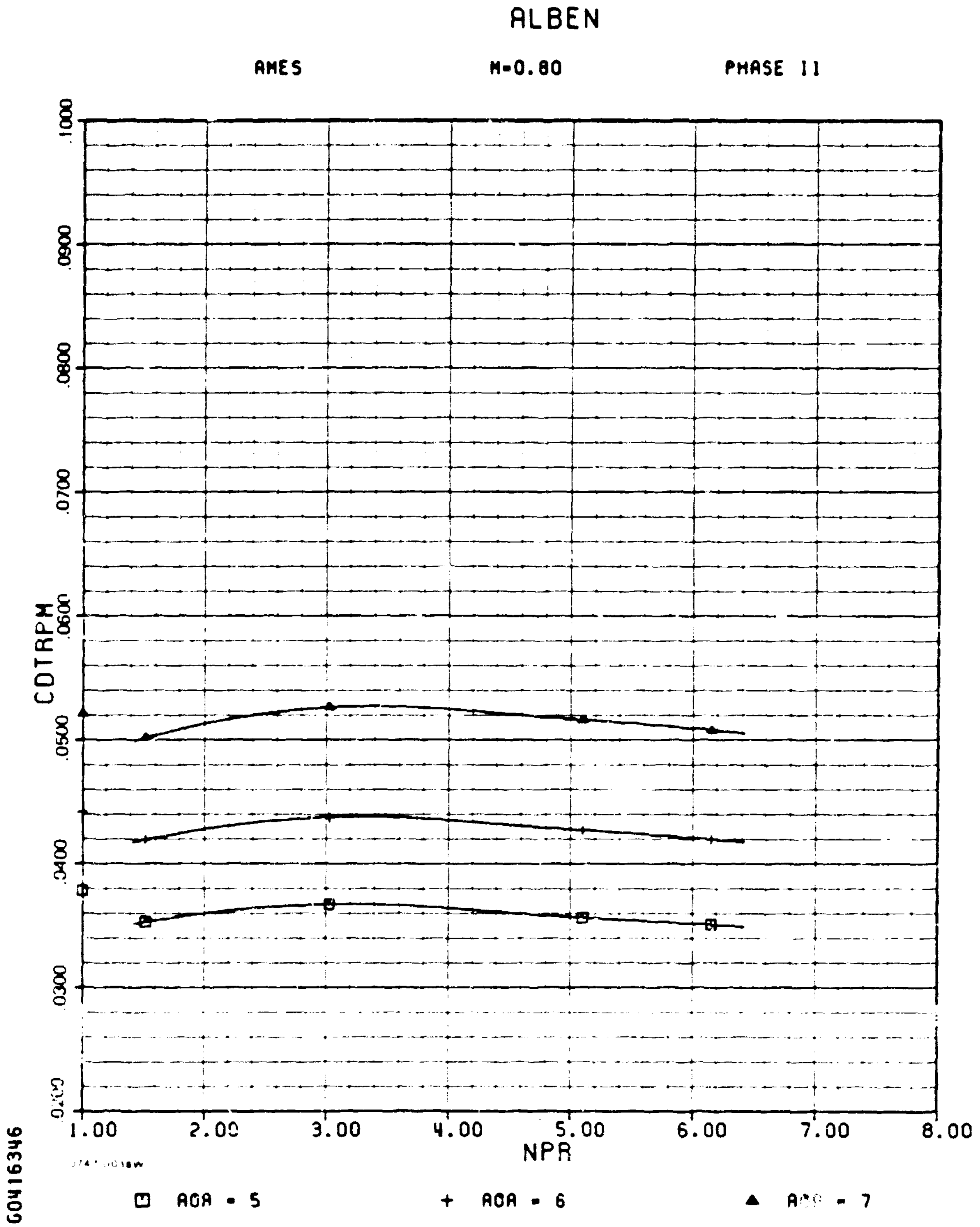
ALBEN
AMES
M=0.80
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G0416346
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

C-1(b) (concl.)

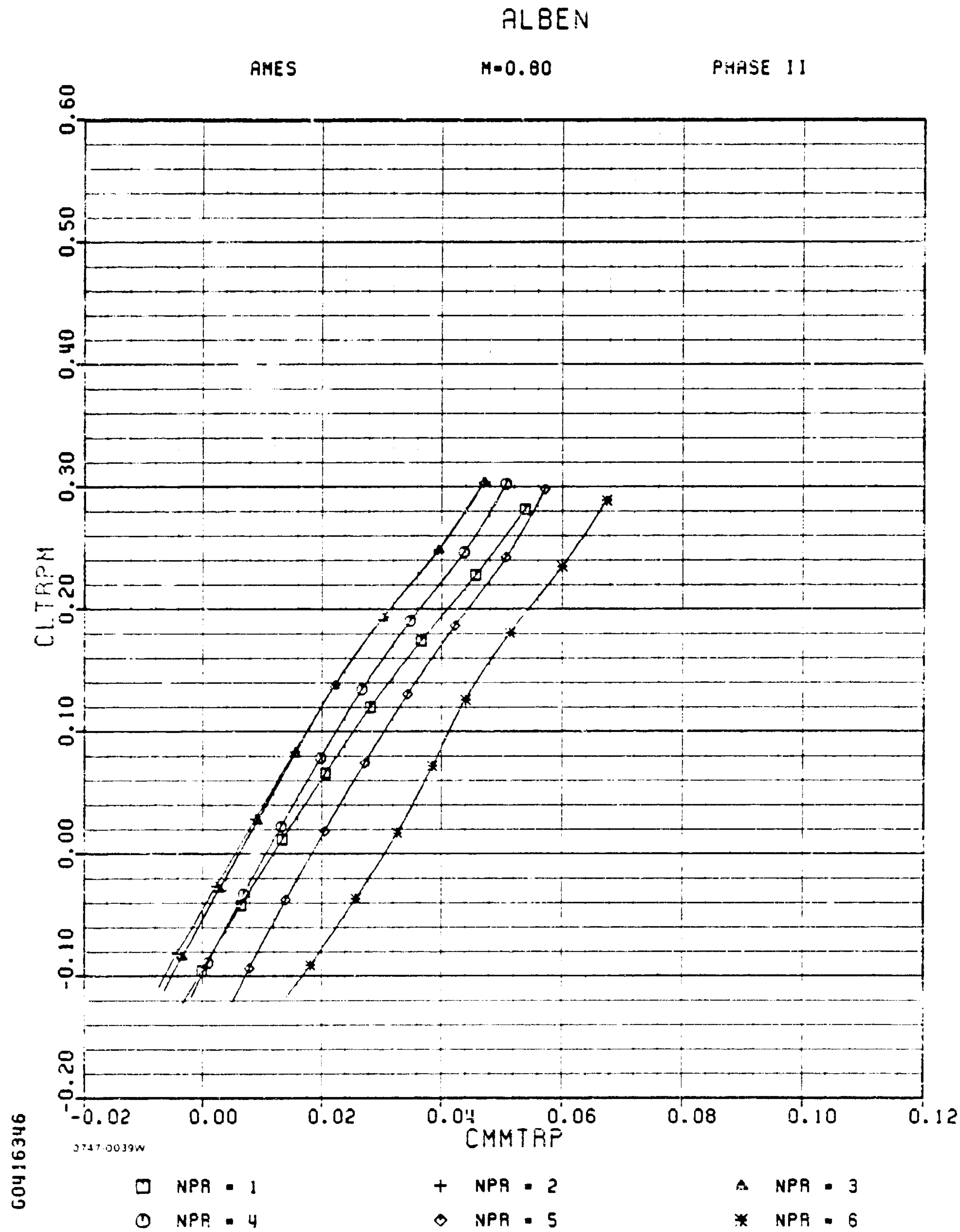

ALBEN
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 0
AOA = 2
AOA = 4
G0416346


ALBEN
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G0416346
AOA=-.5
AOA = 1
AOA = 3

C 1(c) (cont.)

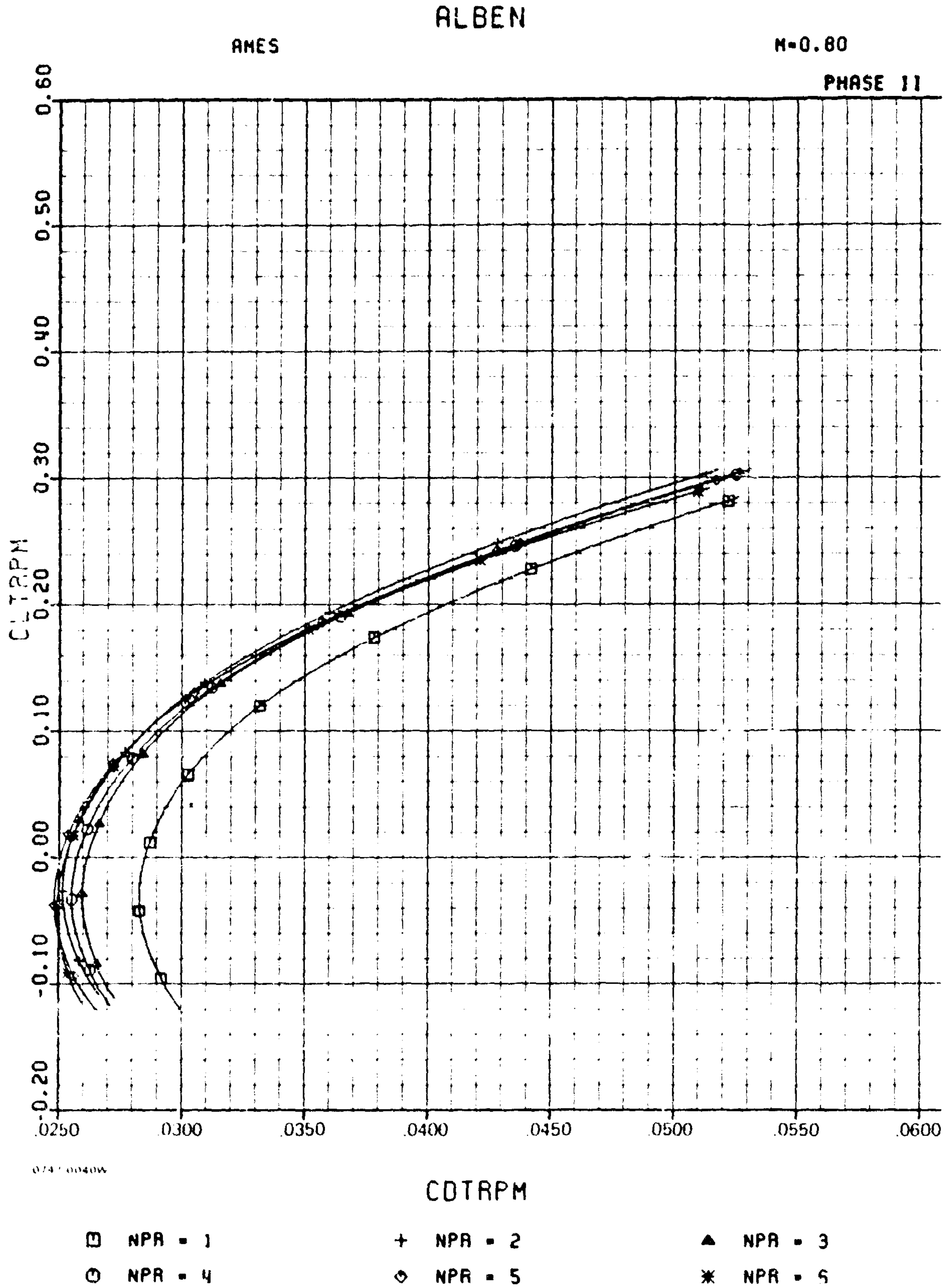

ALBEN
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G0416346
AOA = 5
AOA = 6
AOA = 7

C 1(e) (concl.)



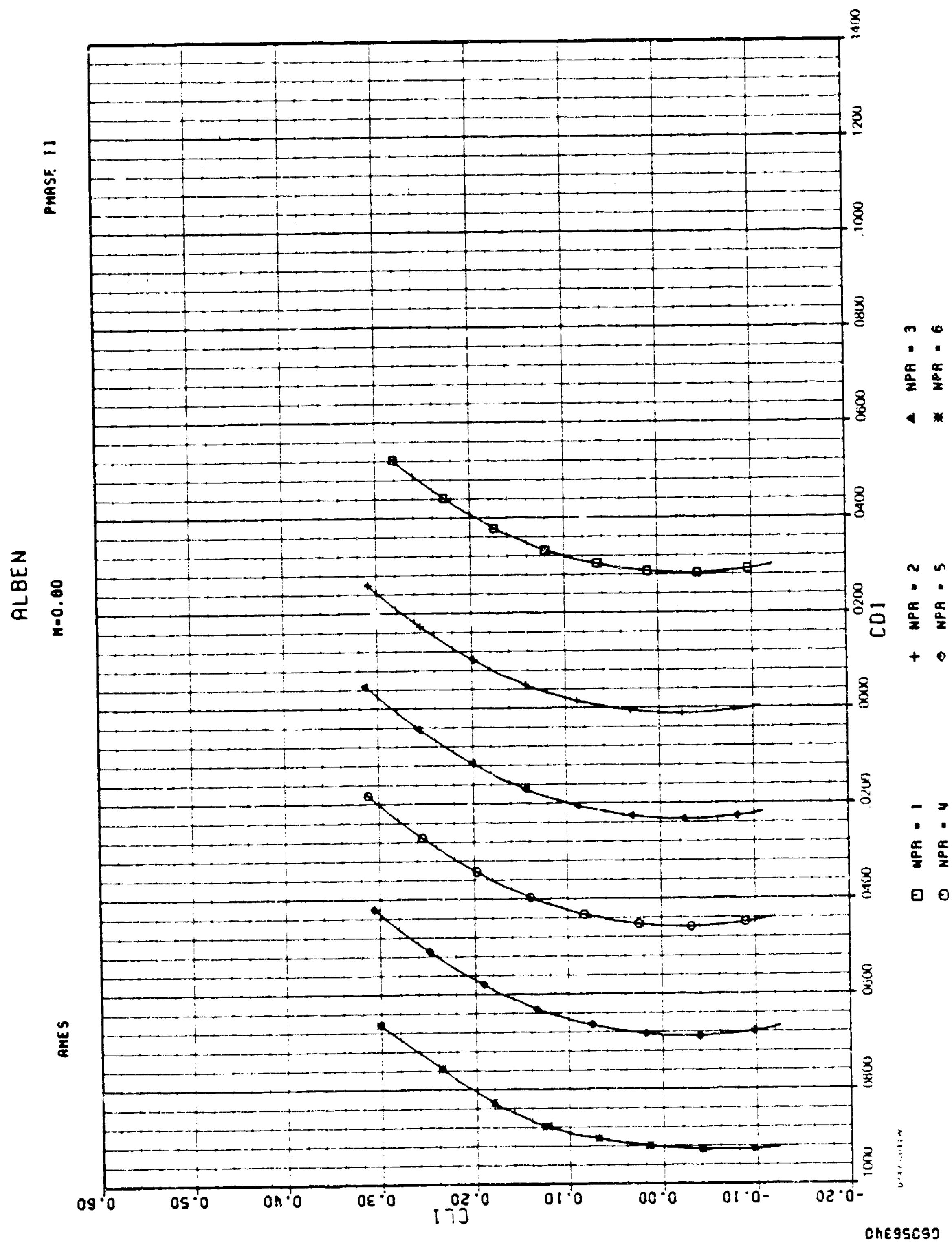
G0416346

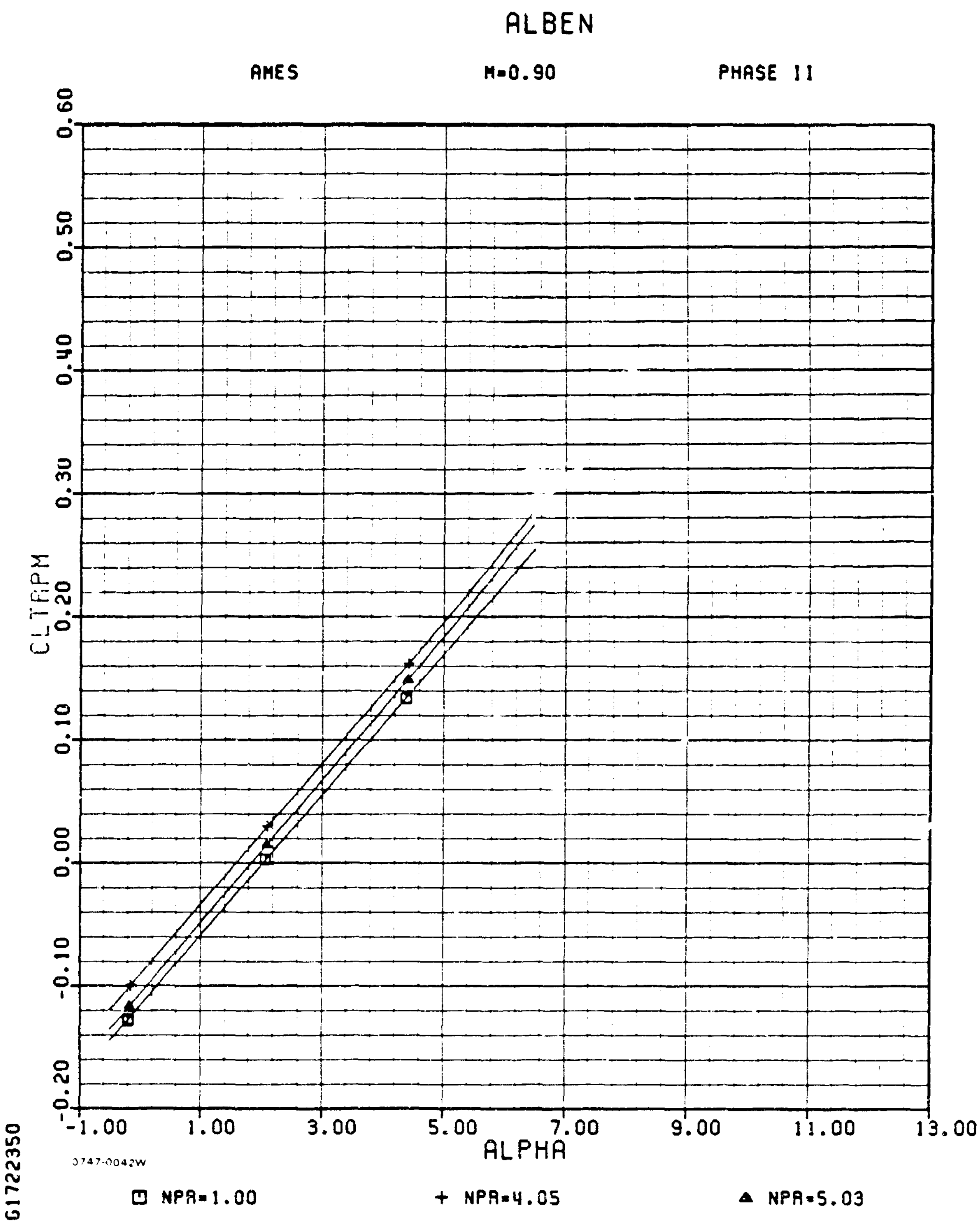
C-1(d)

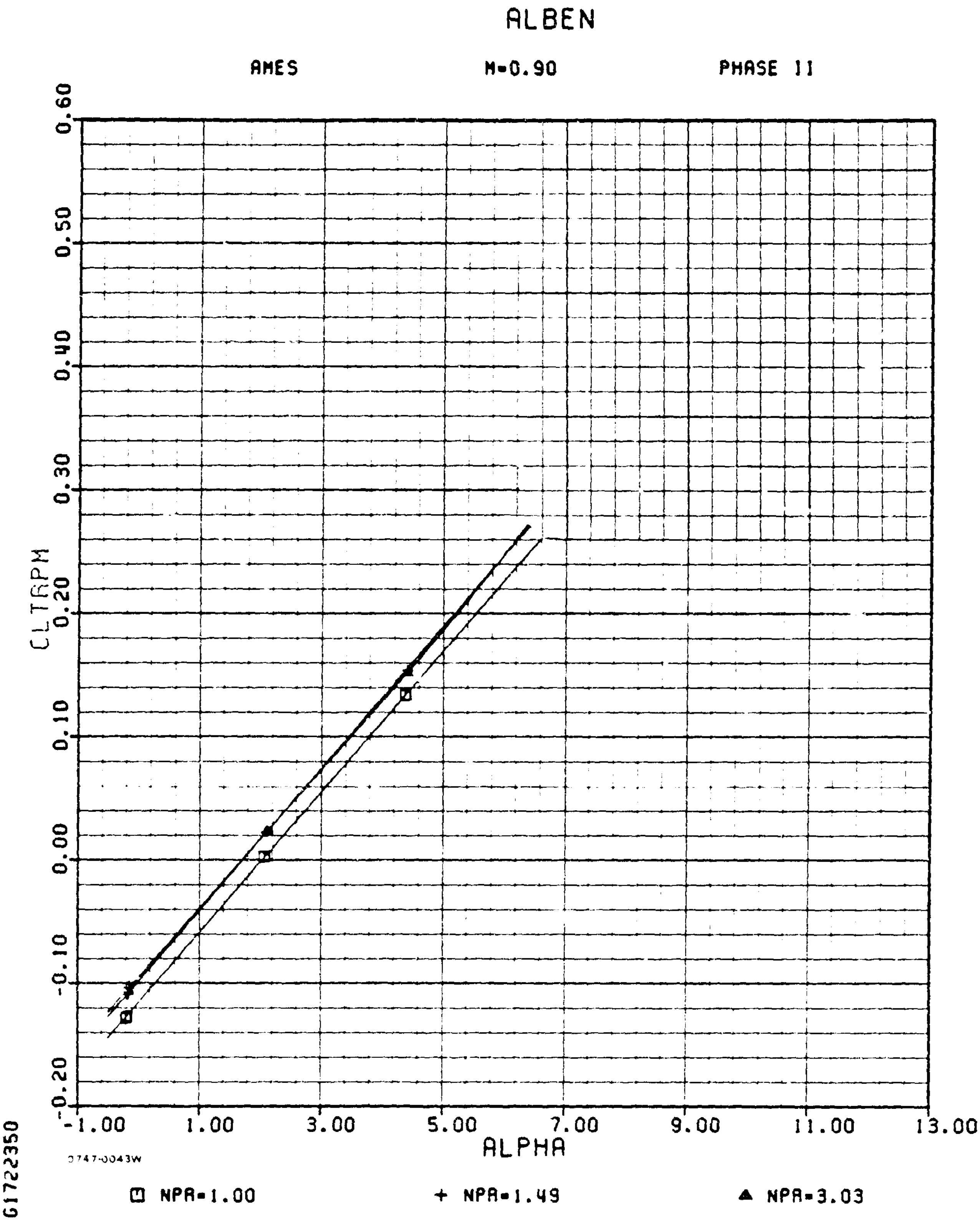


ALBEN
AMES
M=0.80
PHASE II
CLTRPM
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
CDTRPM
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

C 1(e)

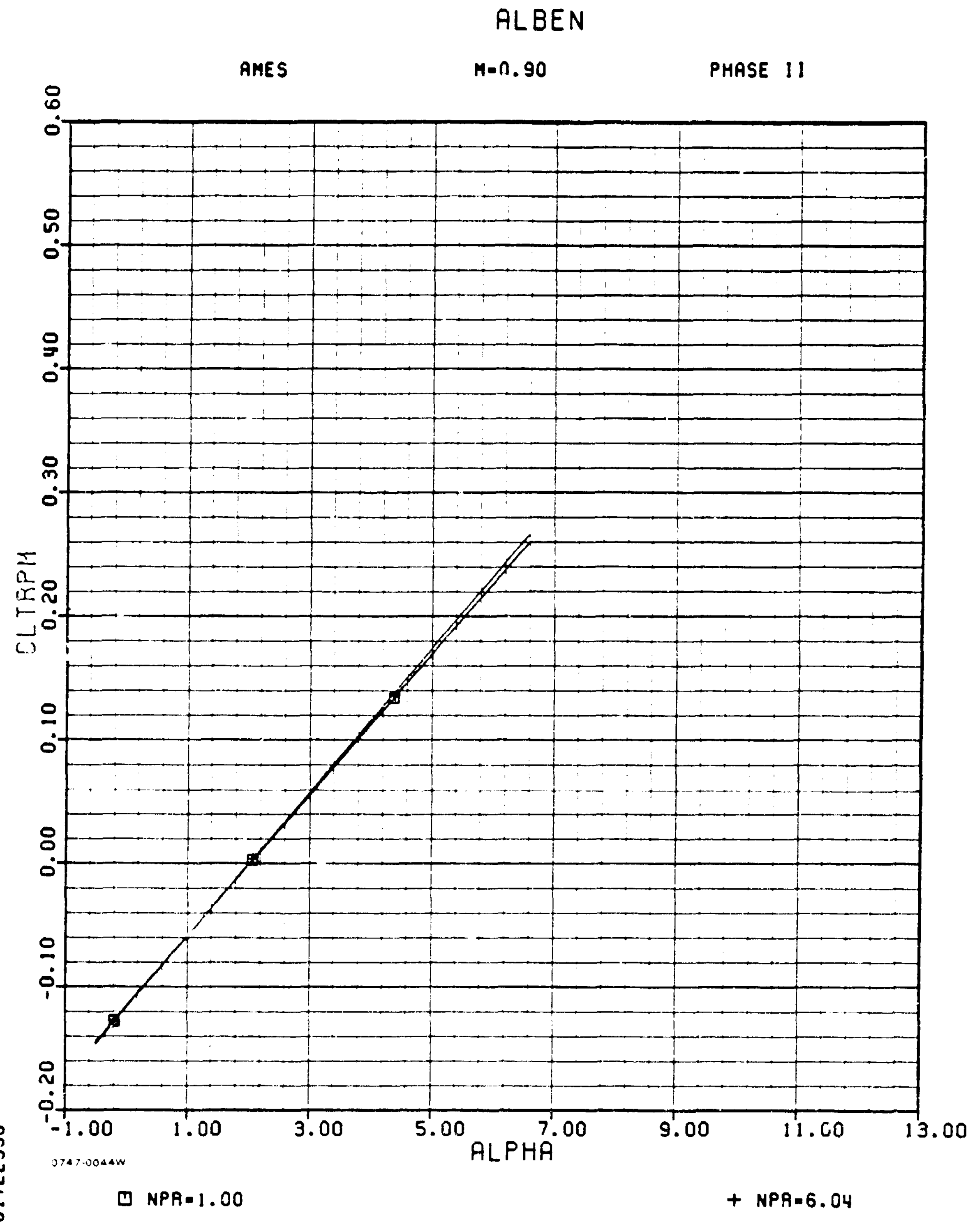

AMES
ALBEN
M=0.80
PHASE II
CD1
CL1
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
C6056940


ALBEN
AMES
M=0.90
PHASE II
CLTAPM
ALPHA
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
G1722350
0747-0042W
NPA=1.00
NPA=4.05
NPA=5.03



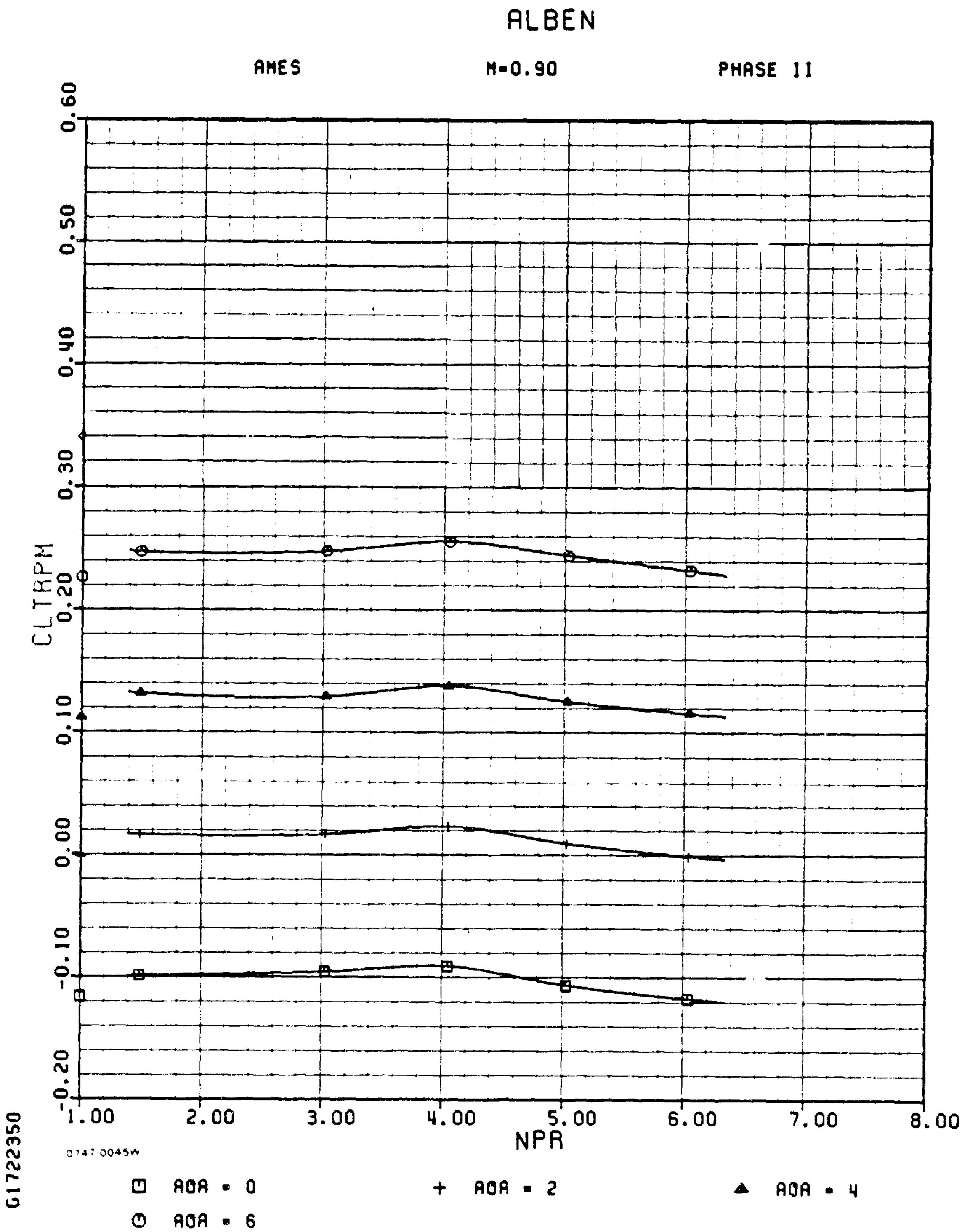
ALBEN
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0043W
G1722350
NPR=1.00
NPR=1.49
NPR=3.03

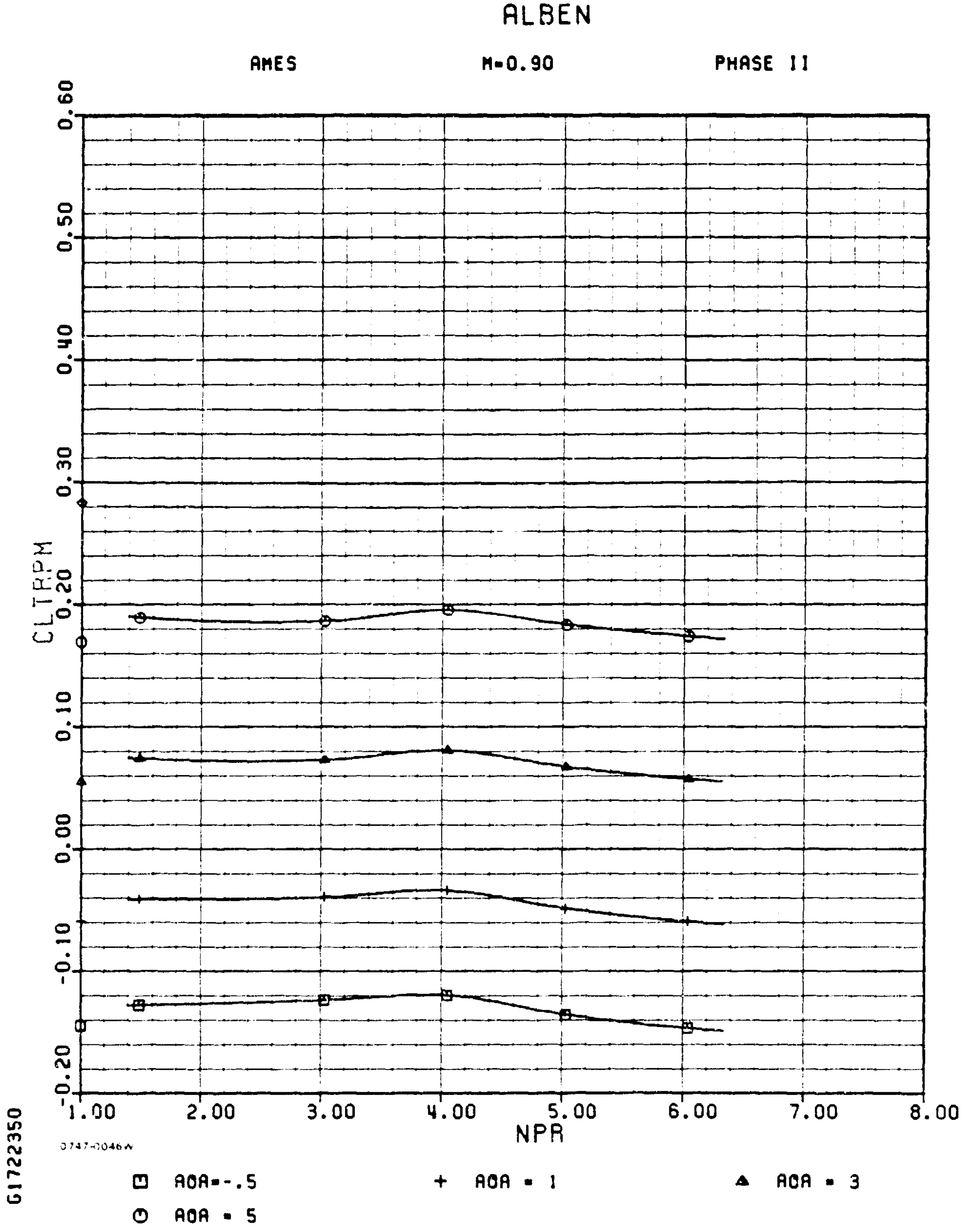
C-2(a) (cont.)



G1722350

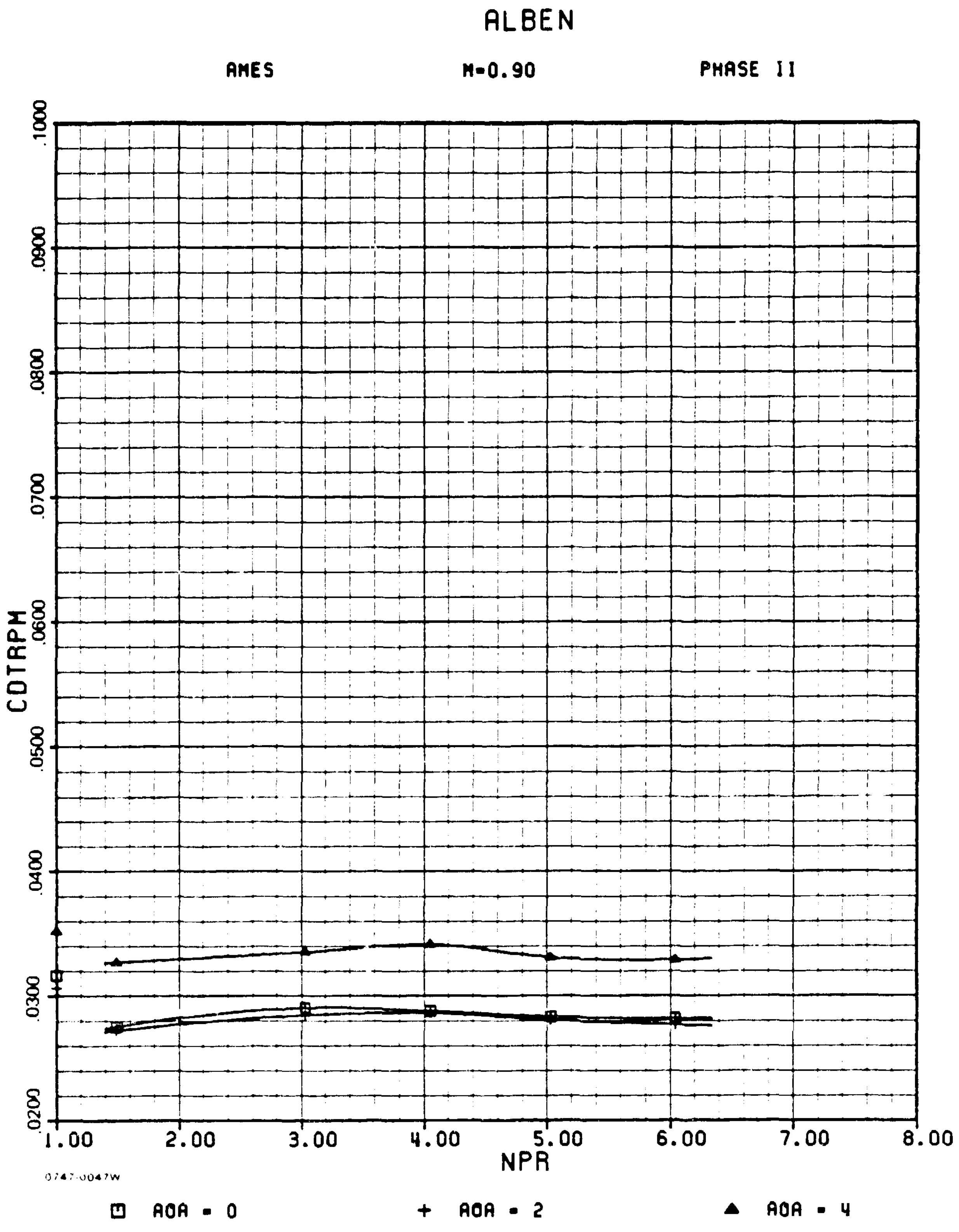
C-2(a) (concl.)


ALBEN
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0045W
G1722350
AOA = 0
AOA = 2
AOA = 4
AOA = 6



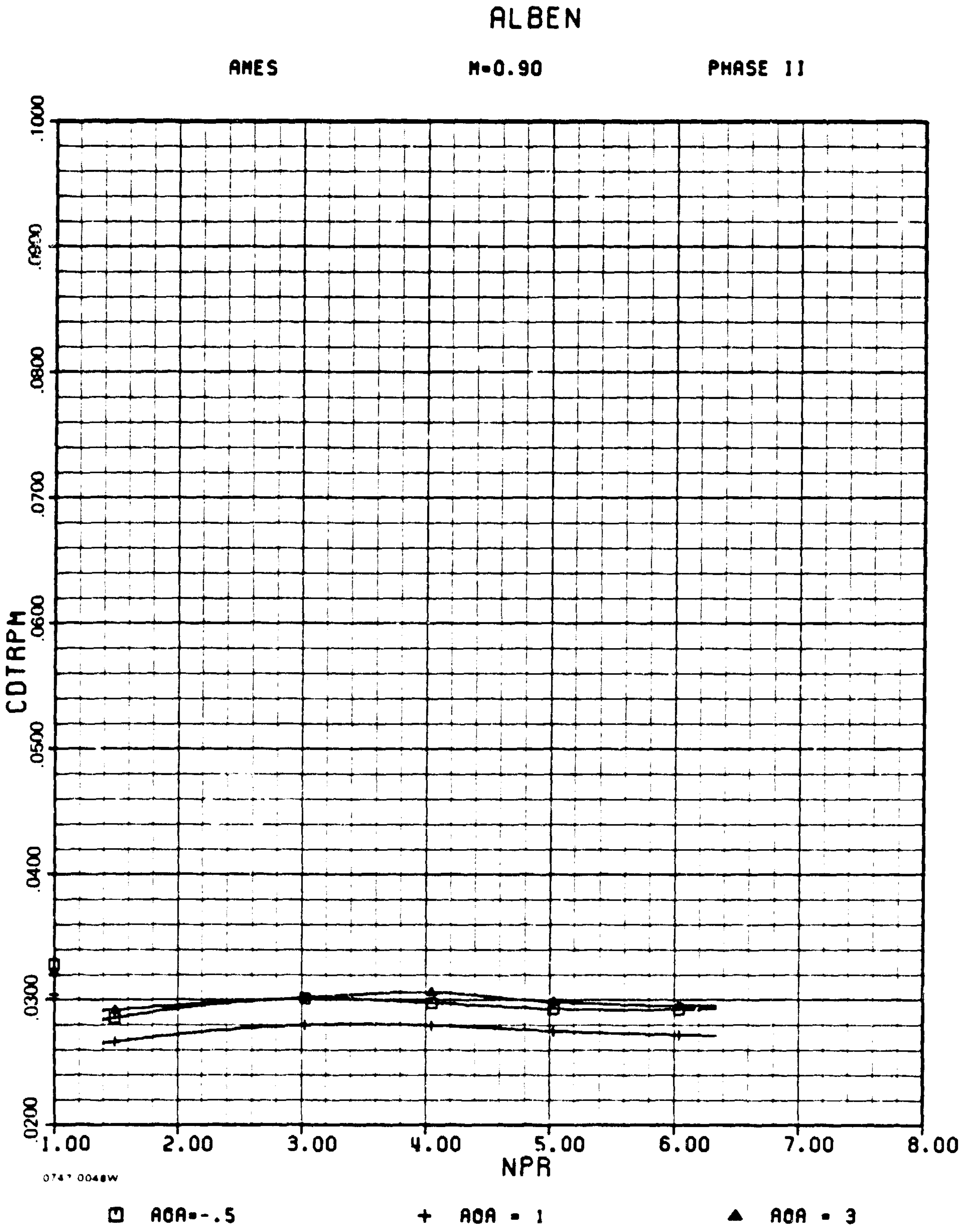
G1722350

C-2(b) (concl.)

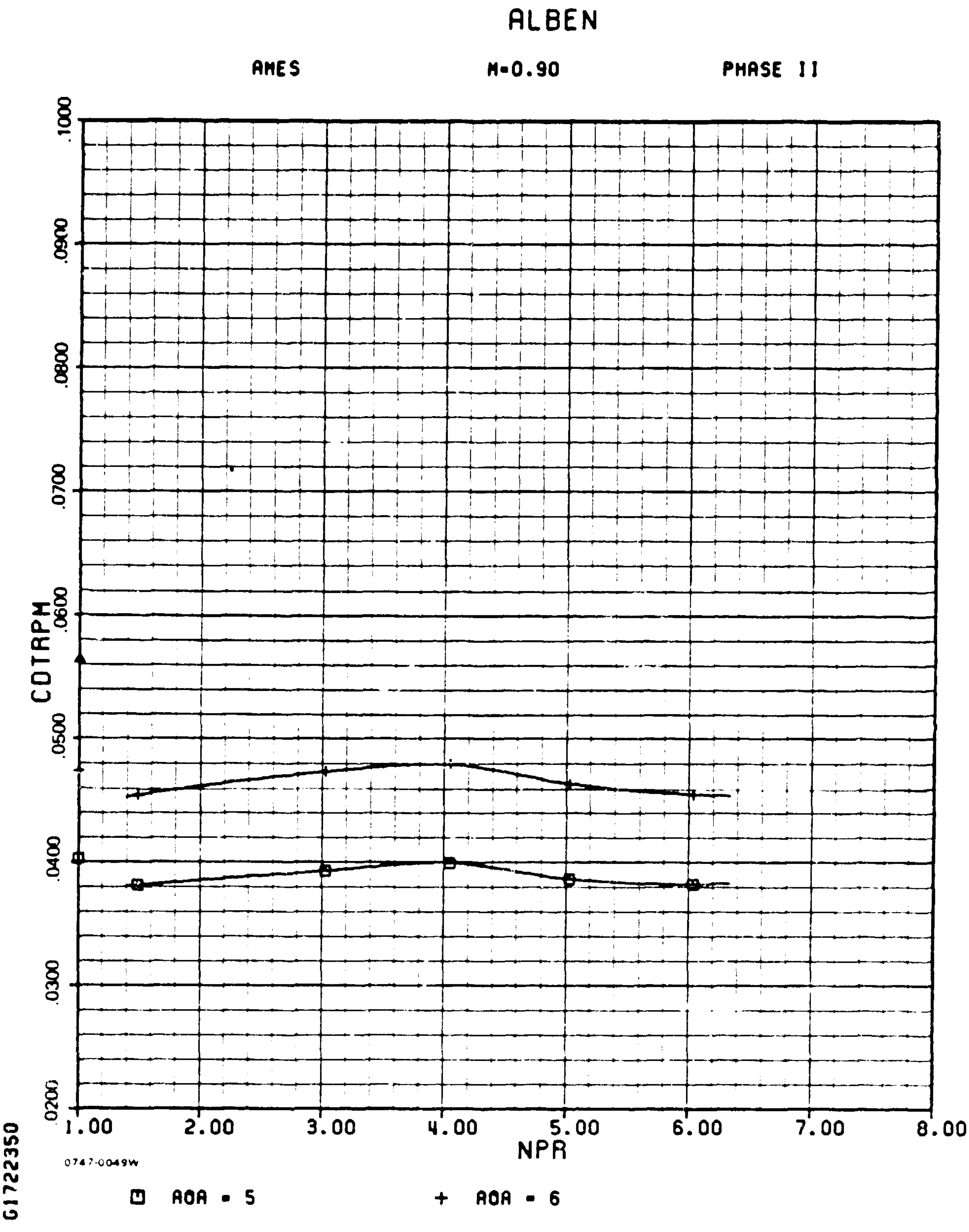


G1722350

0747-0047W


ALBEN
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
□ AOA=-.5
+ AOA = 1
▲ AOA = 3

C-2(c) (cont.)


ALBEN
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
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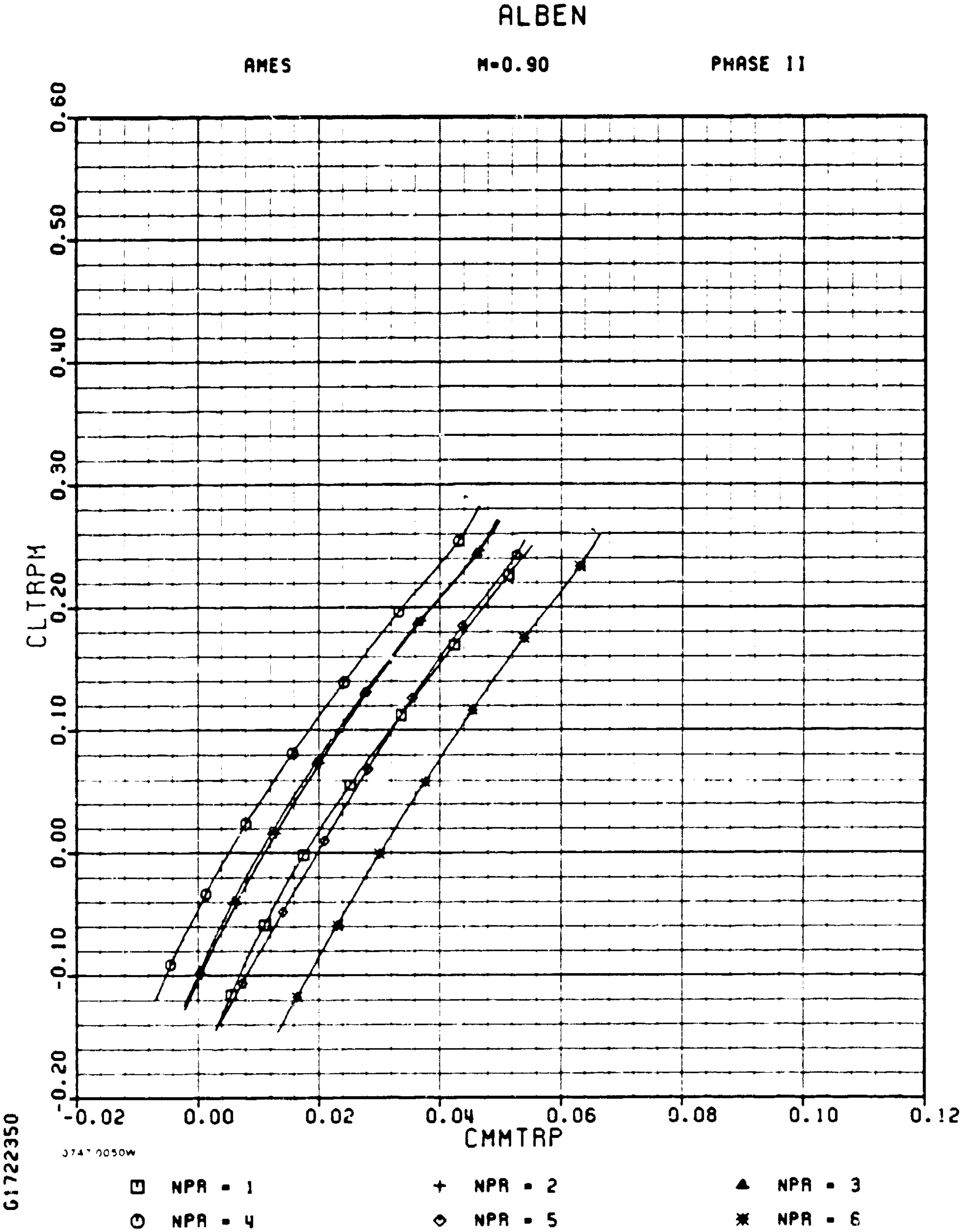
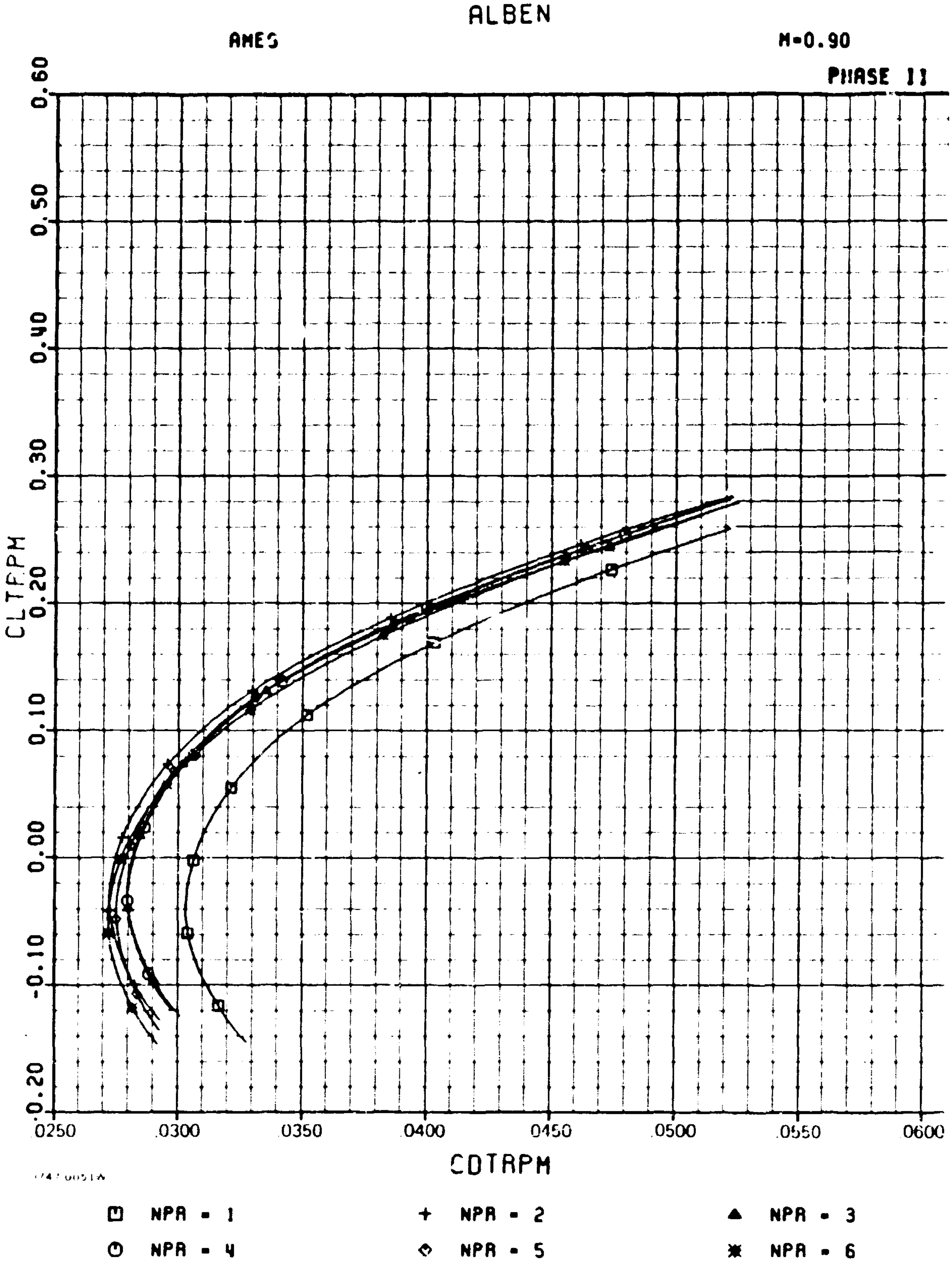
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0049W
G1722350
AOA = 5
AOA = 6

C-2(c) (concl.)

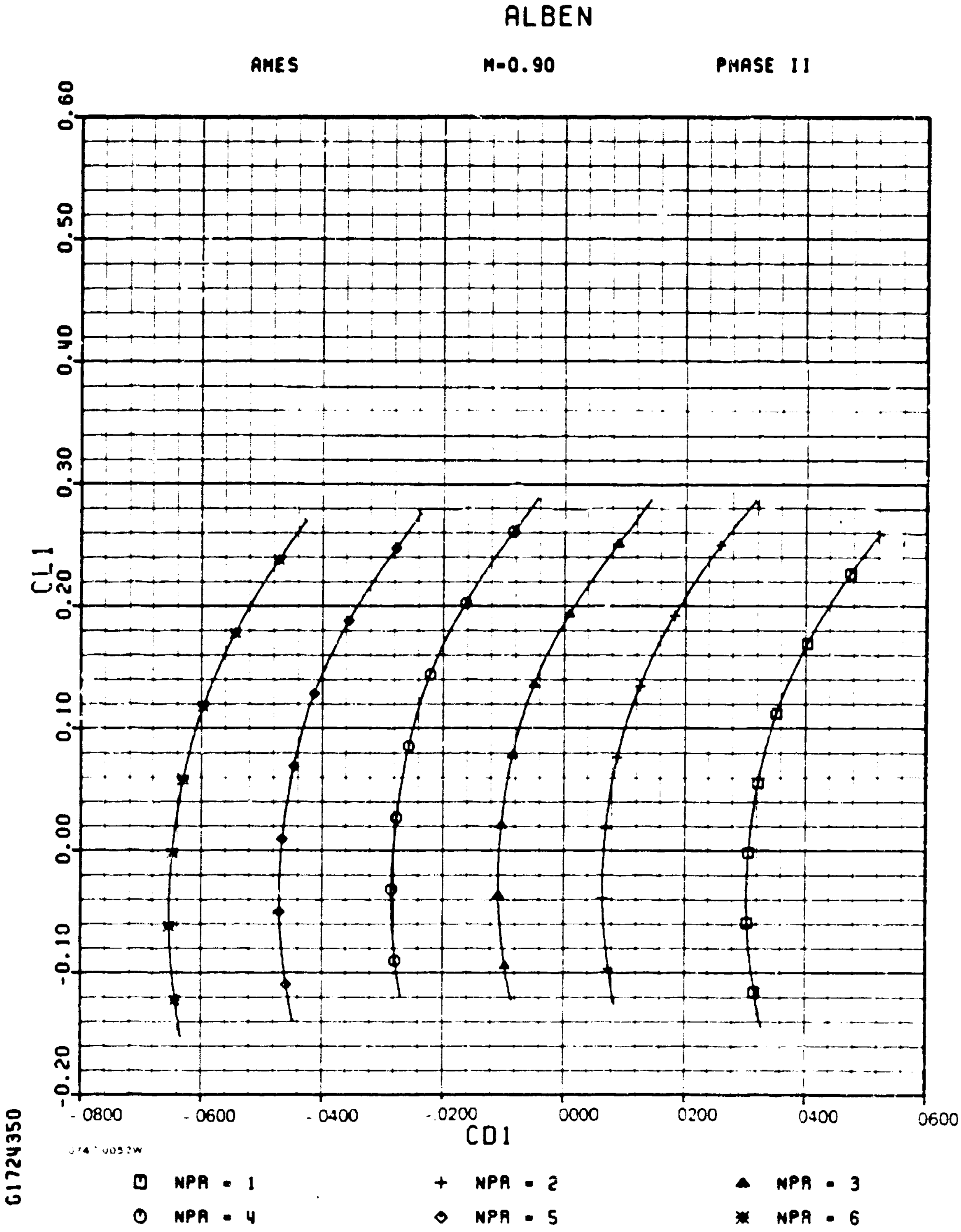


ALBEN
AMES
M=0.90
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
G1722350
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

C-2(d)

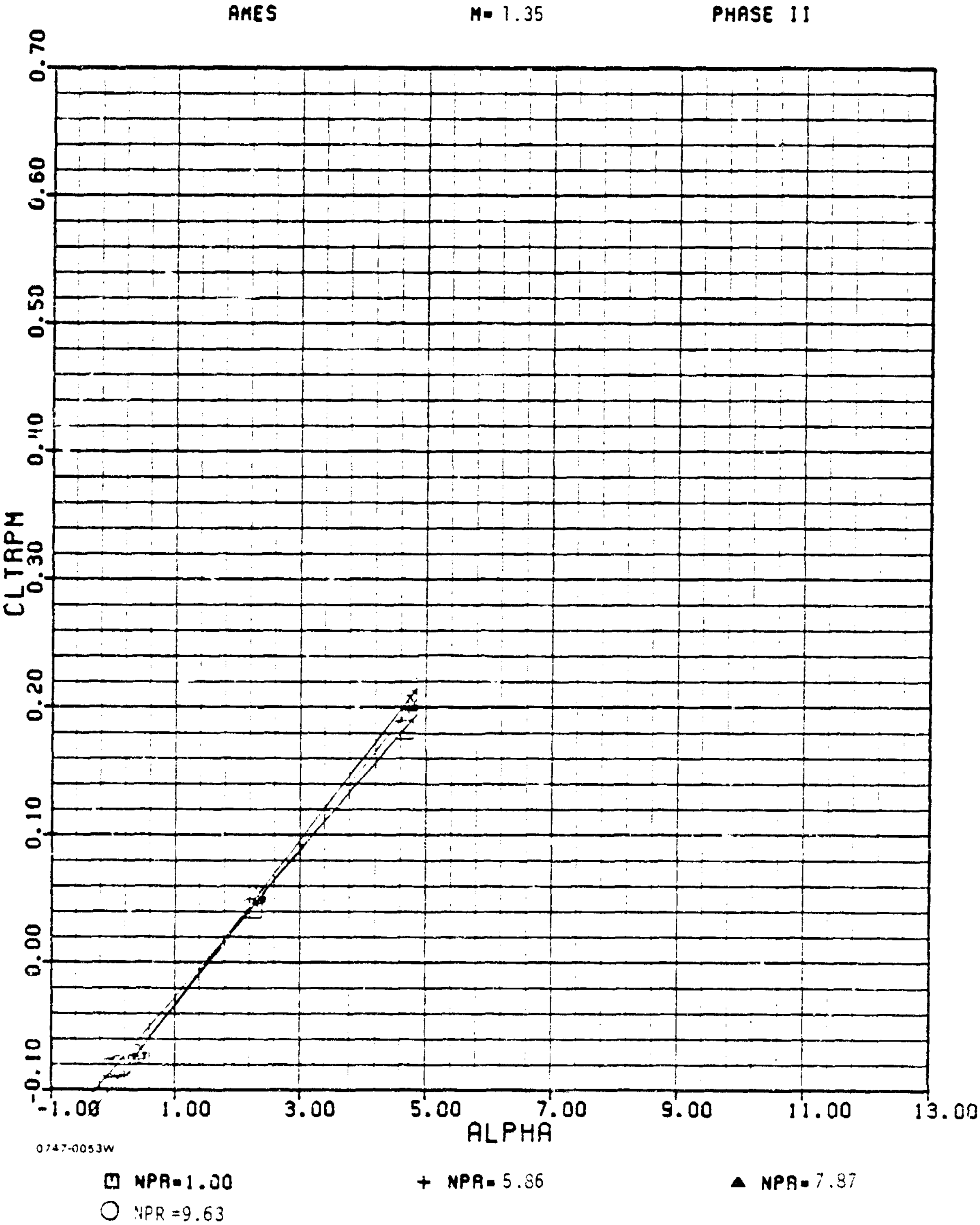


ALBEN
AMES
M=0.90
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

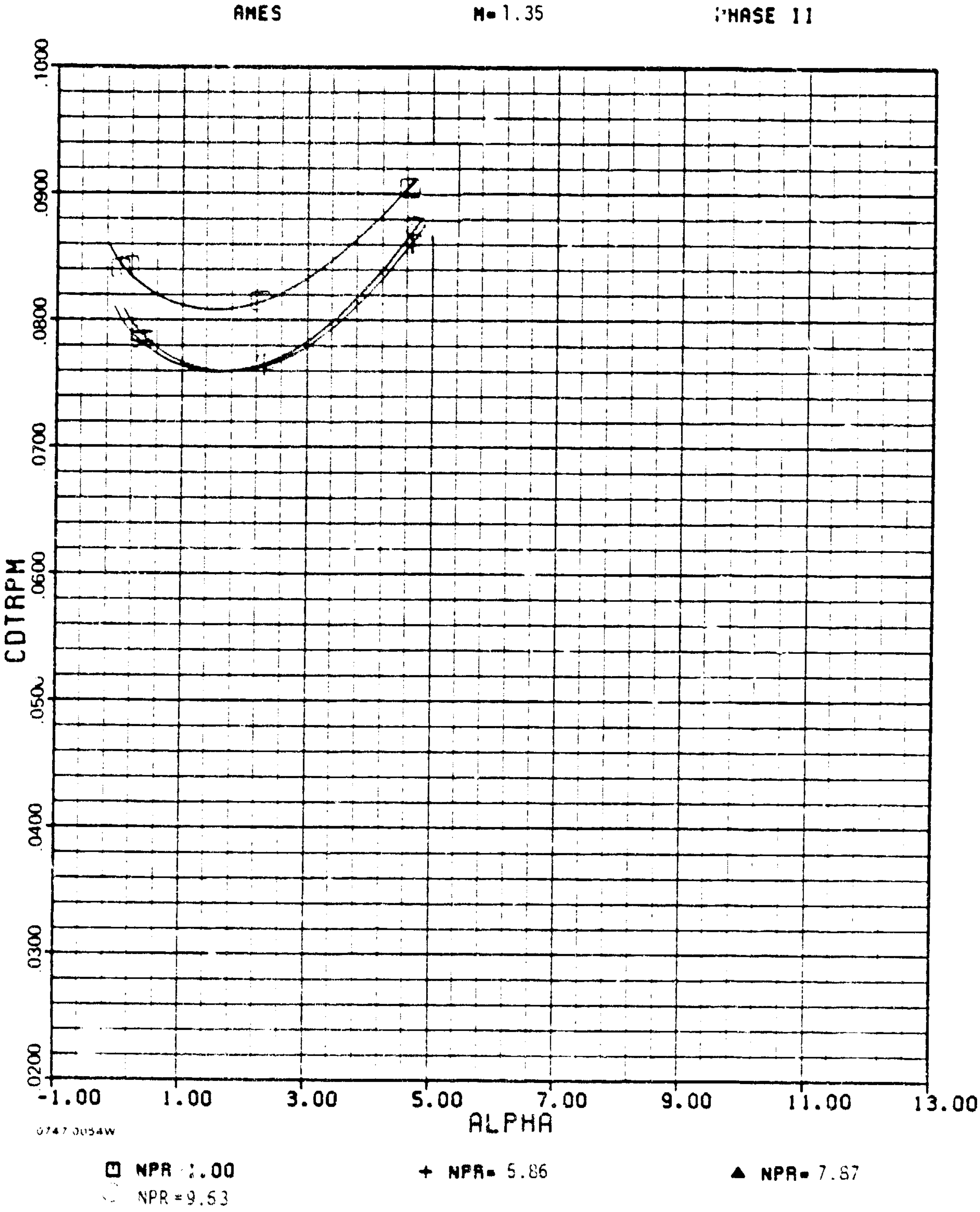


ALBEN
AMES
M=0.90
PHASE II
CL1
CD1
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-.0800
-.0600
-.0400
-.0200
.0000
.0200
.0400
.0600
G1724350
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ALBEN

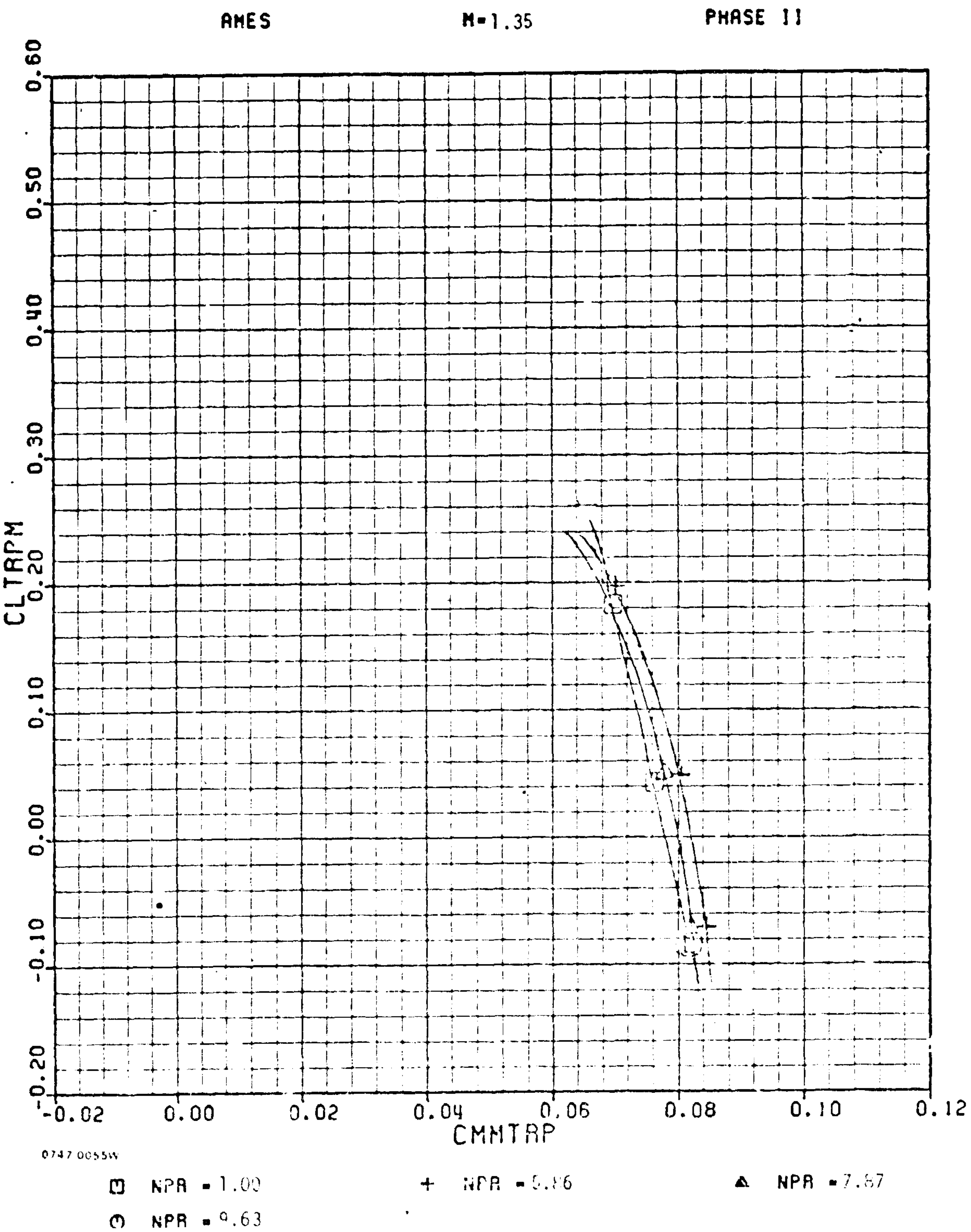

AMES
M= 1.35
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0053W
NPR=1.00
NPR=5.86
NPR=7.87
NPR=9.63

ALBEN

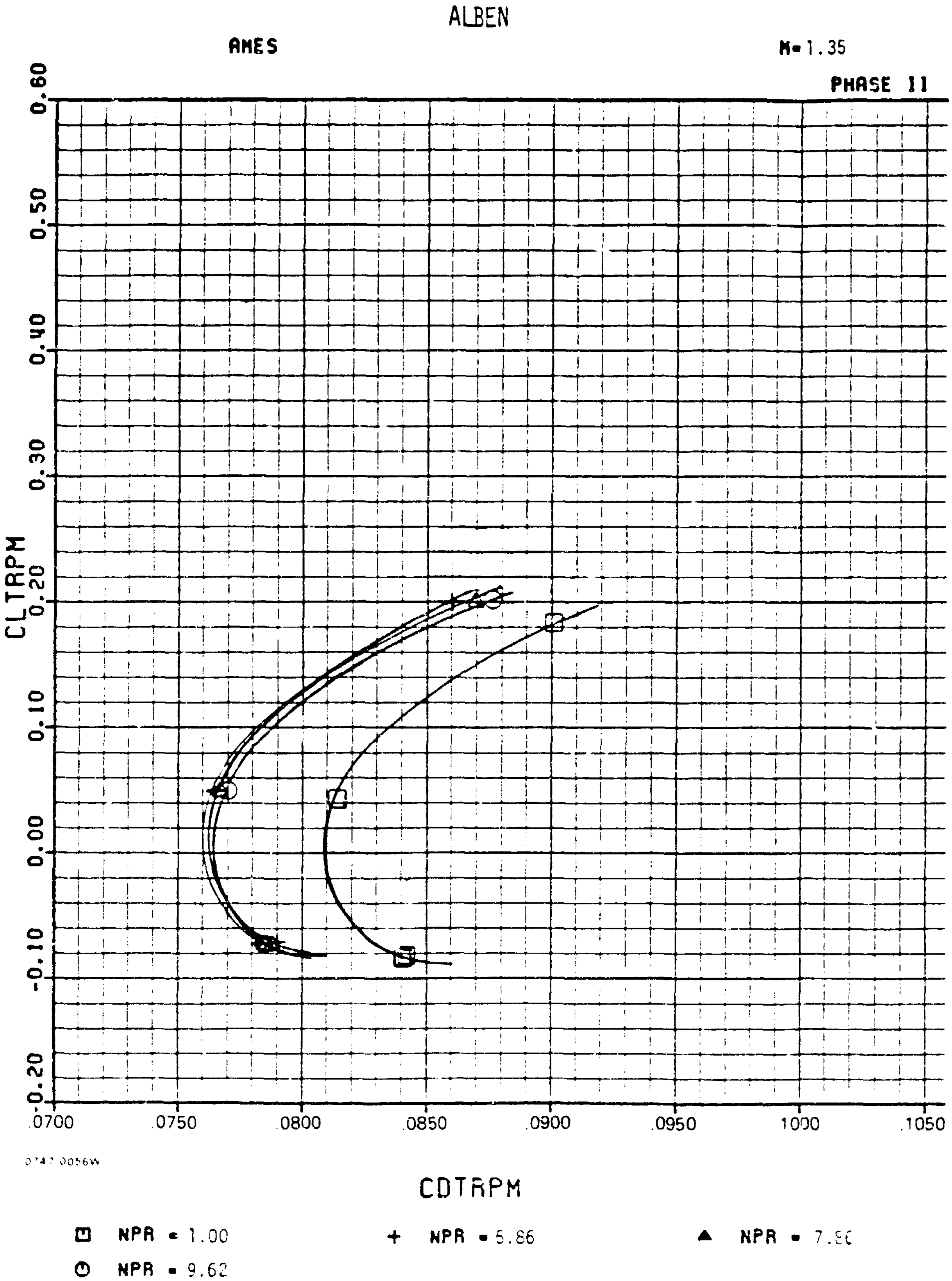


AMES
M= 1.35
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
NPR = 1.00
+ NPR = 5.86
▲ NPR = 7.87
NPR = 9.53

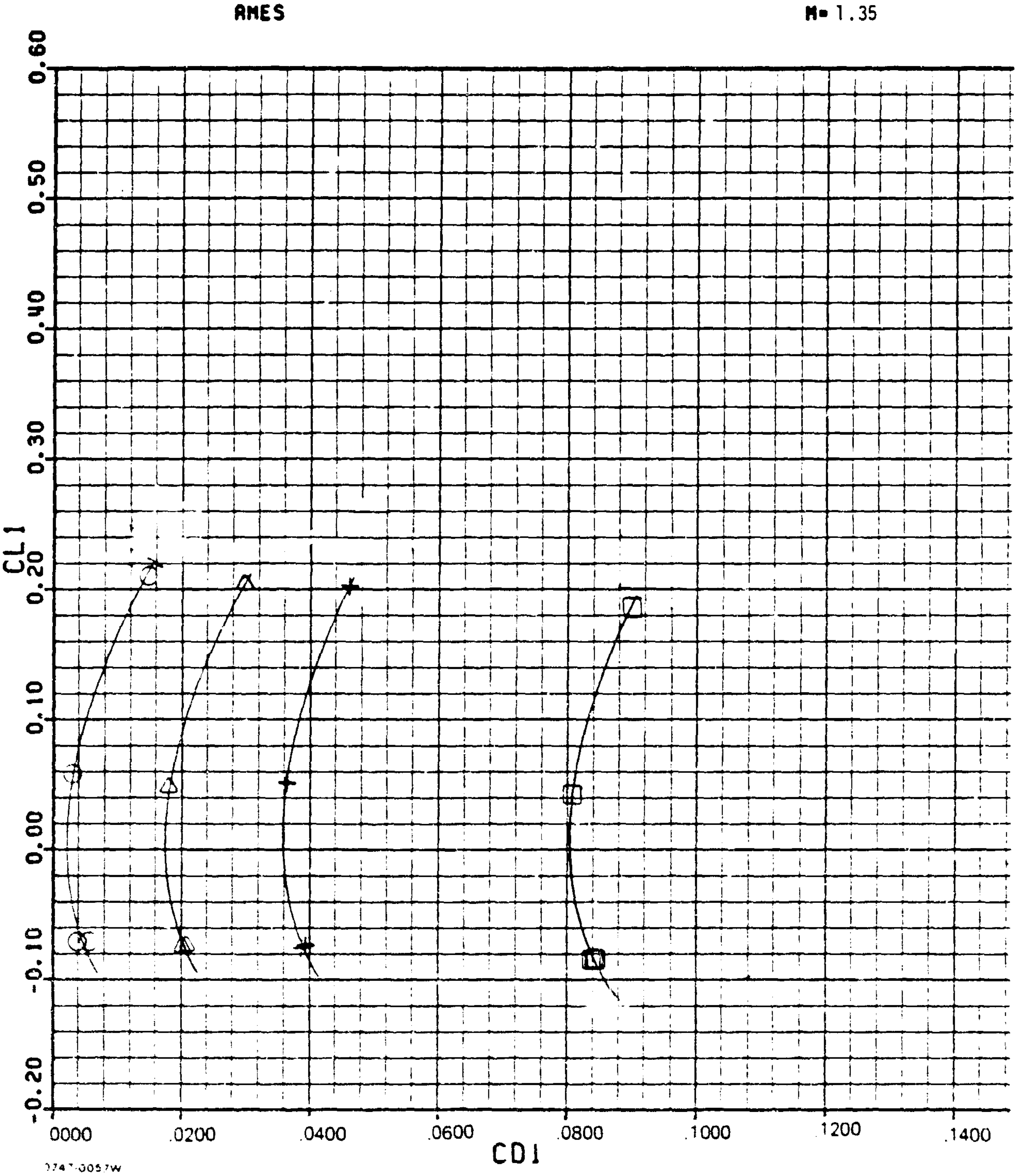
ALBEN



AMES
M=1.35
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
CMMTRP
0747 0055W
NPR = 1.00
NPR
NPR
NPR = 9.63


ALBEN
AMES
M= 1.35
PHASE II
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CLTRPM
.0700
.0750
.0800
.0850
.0900
.0950
.1000
.1050
CDTRPM
NPR = 1.00
NPR = 5.86
NPR = 7.9C
NPR = 9.62

ALBEN



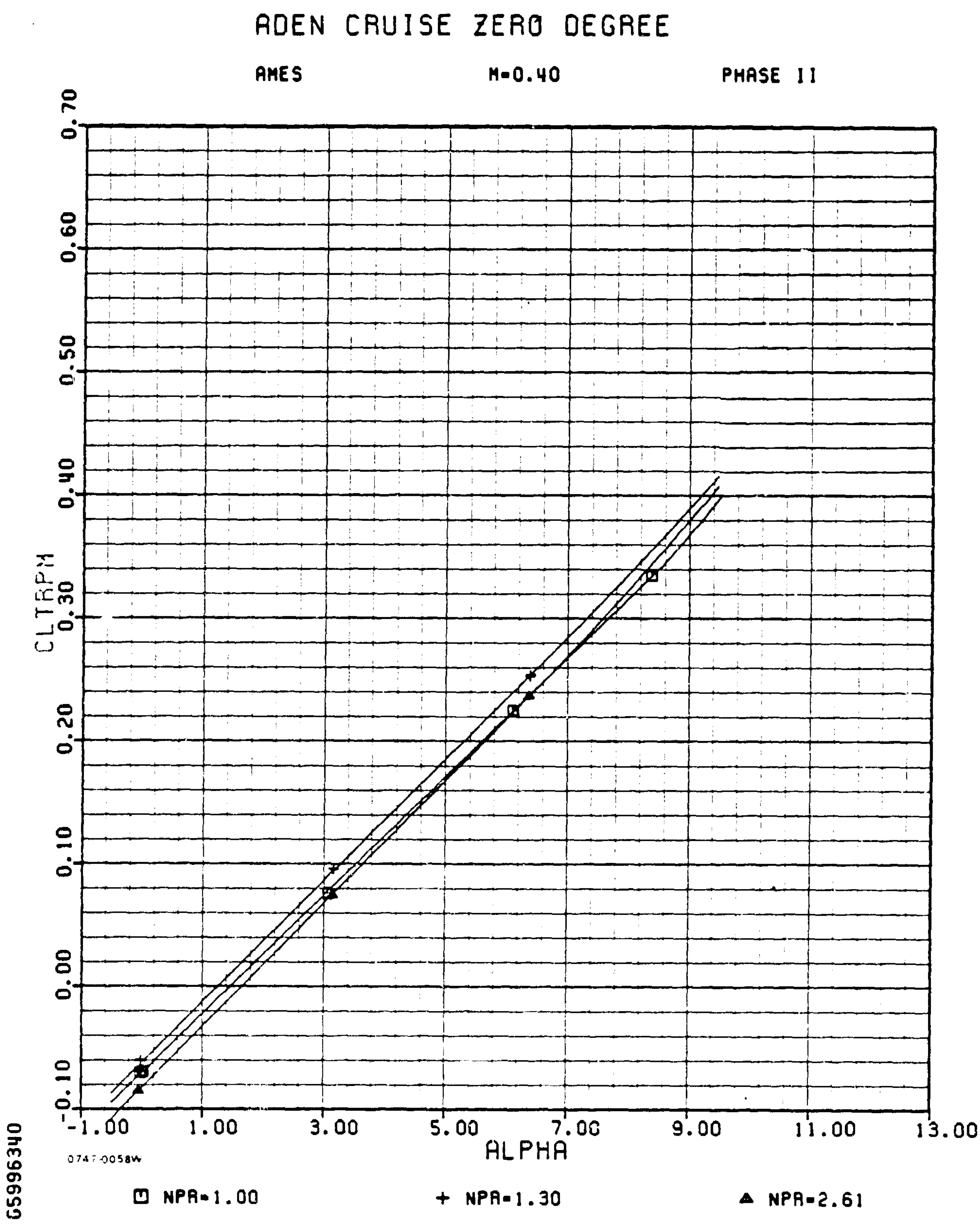
0747-0057W

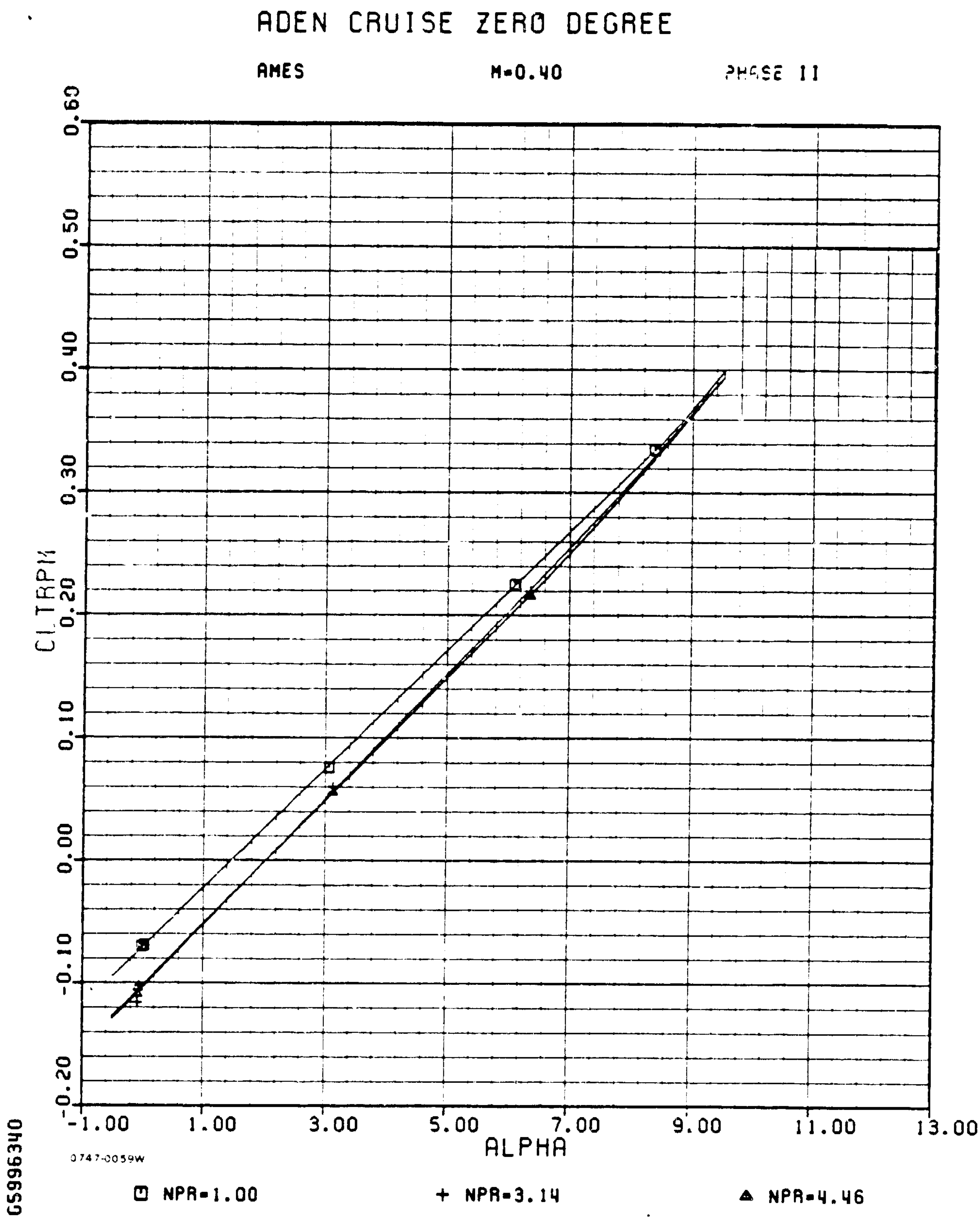
△ NPR = 7.79 - 7.93 ☐ NPR = 1.00 + NPR = 5.85 - 5.87

○ NPR = 9.54 - 9.71

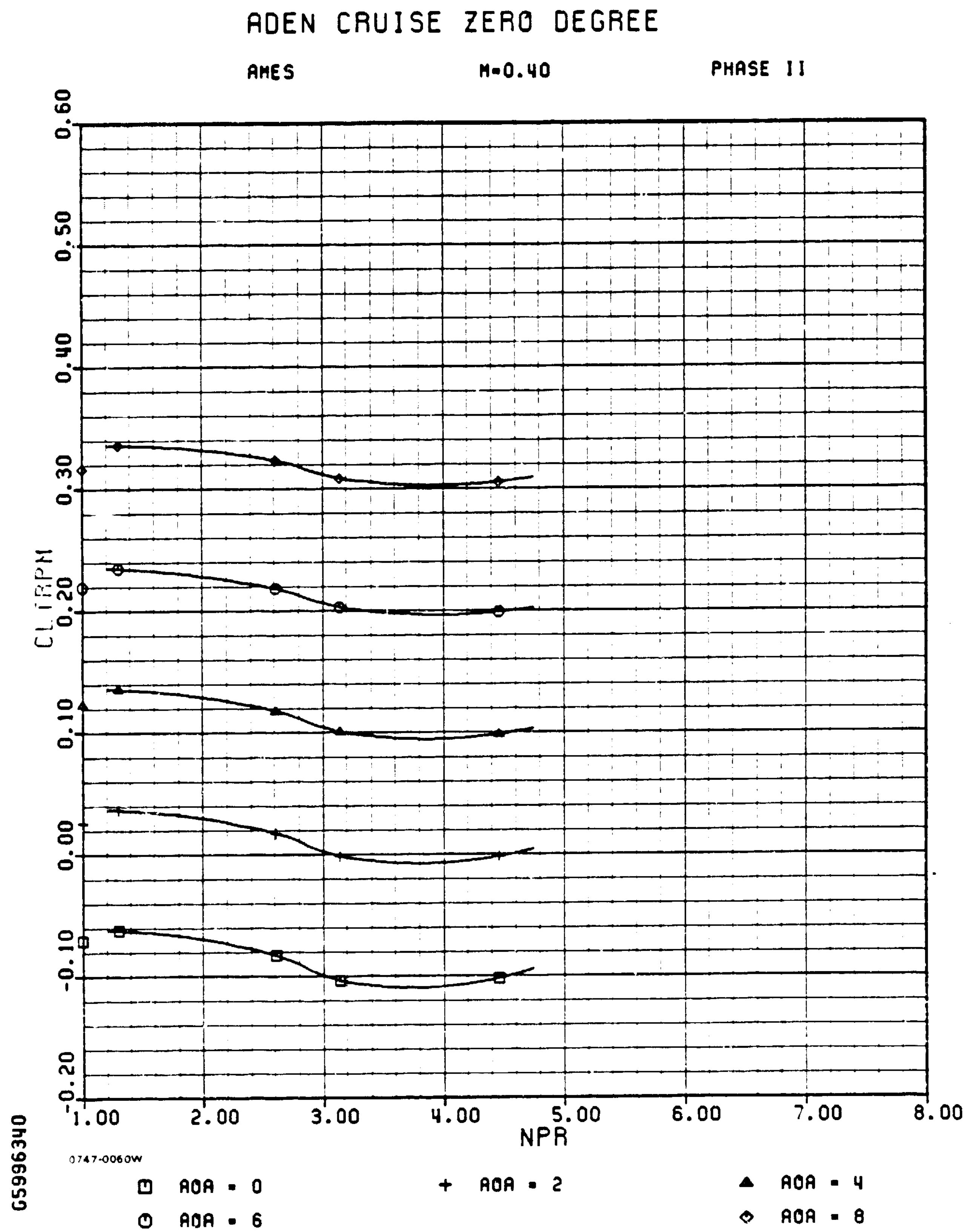
APPENDIX D

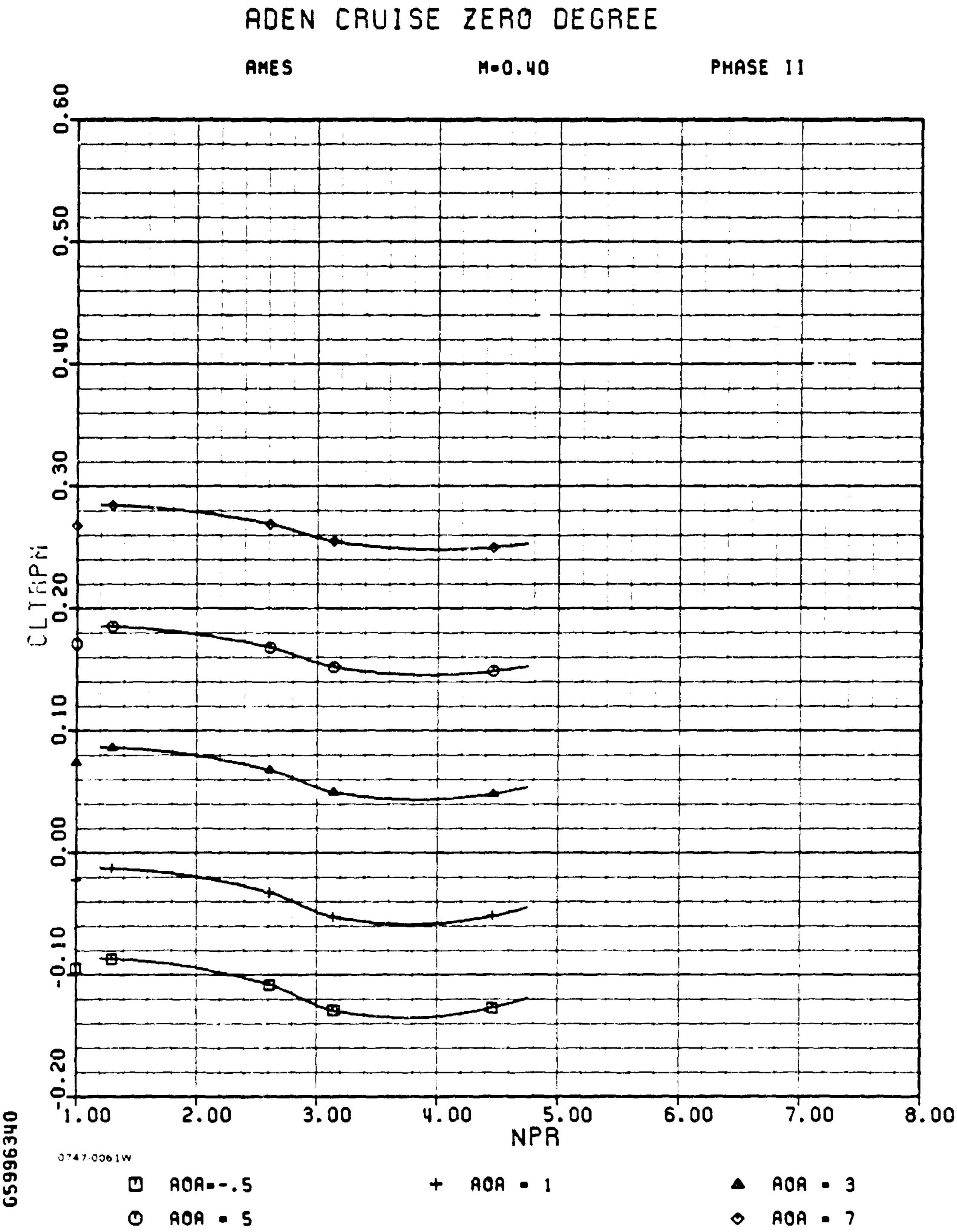
ALDEN CRUISE 0^{o} WIND-ON DATA


ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0058W
NPR=1.00
NPR=1.30
NPR=2.61
G5996340


ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0059W
NPR=1.00
+ NPR=3.14
NPR=4.46
G5996340

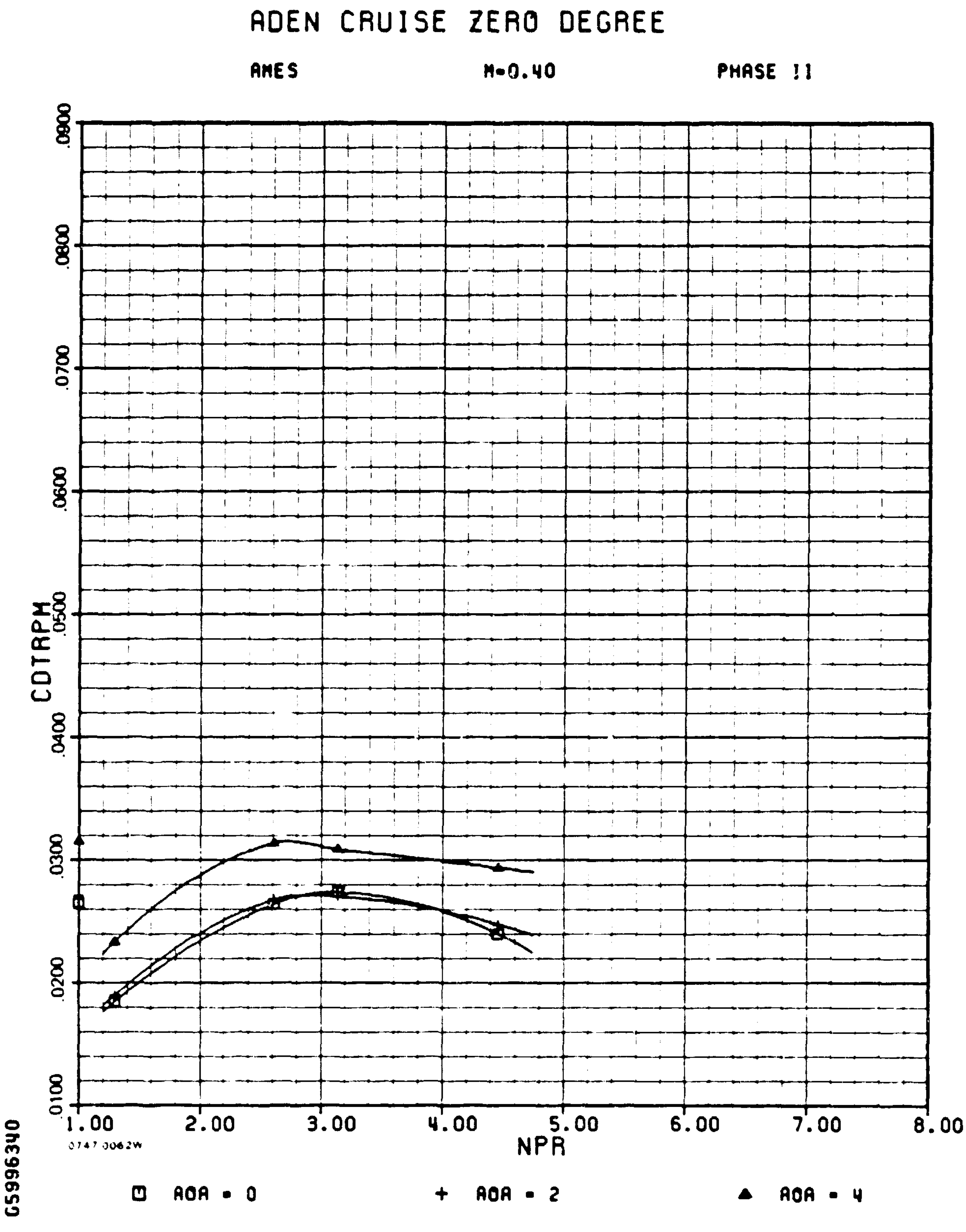
D-1(a) (concl.)


ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G5996340
0747-0060W
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8



G5996340

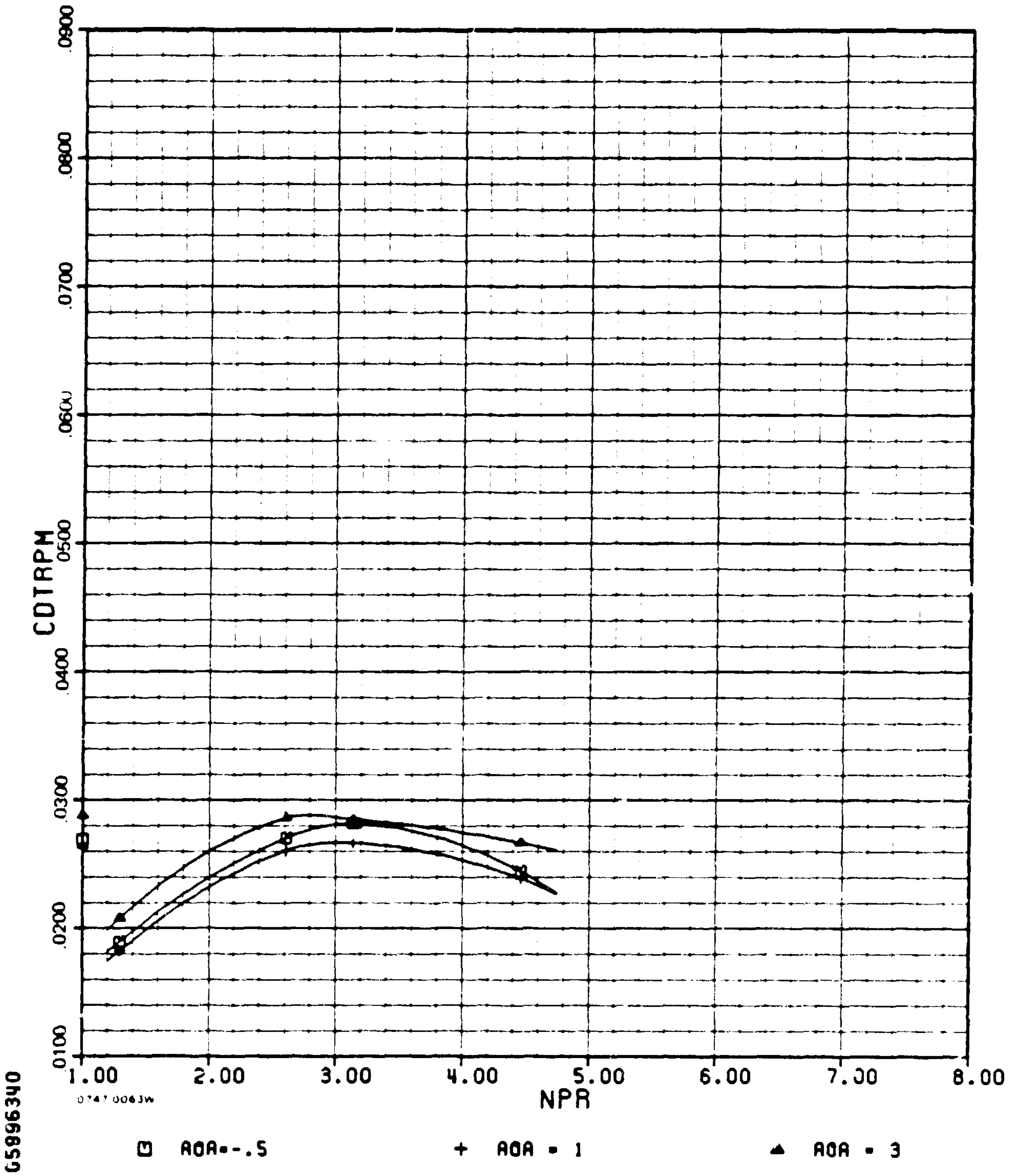
D-1(b) (concl.)

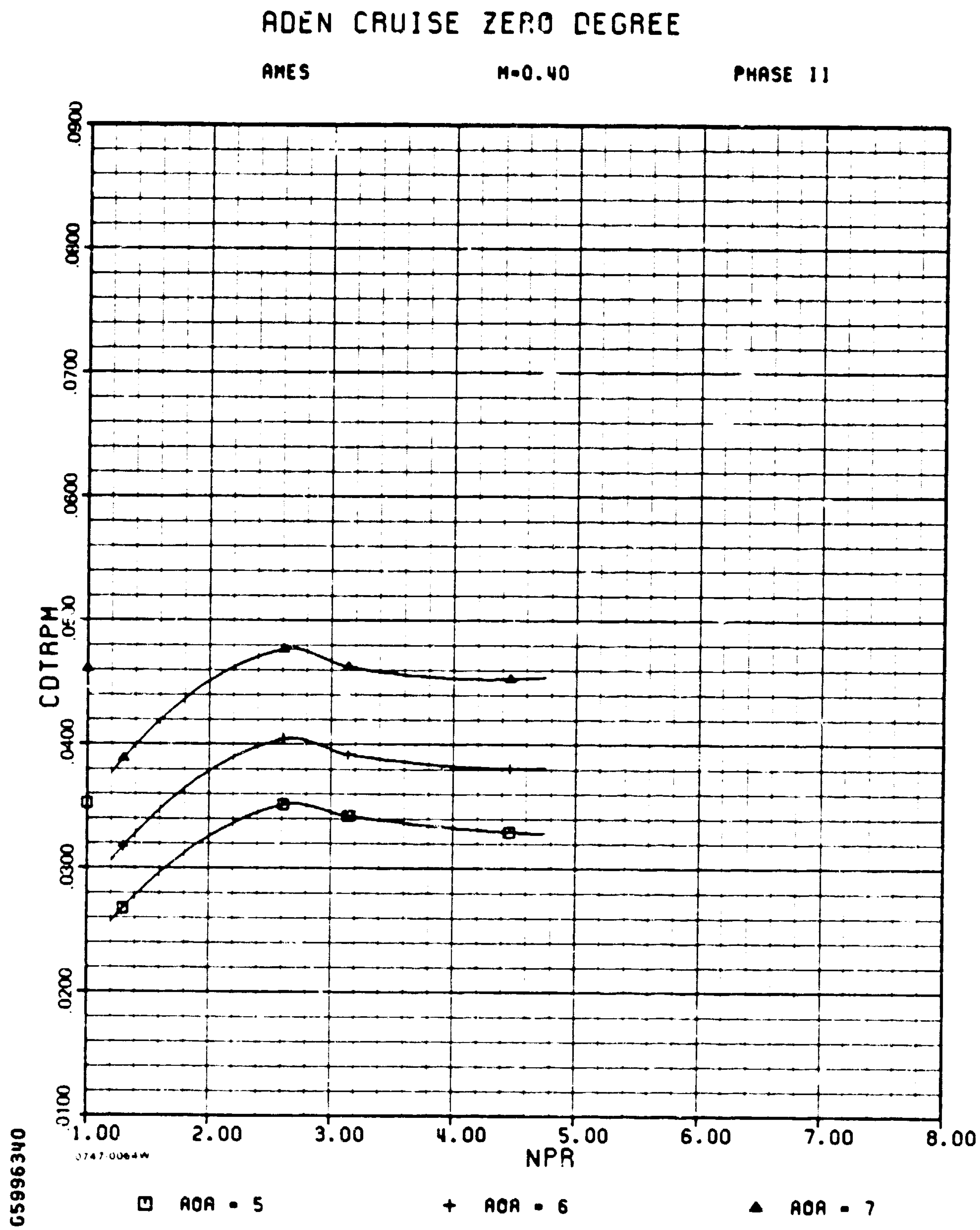

ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
CDTRPM
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0062W
G5996340
AOA = 0
AOA = 2
AOA = 4

D 1(c)

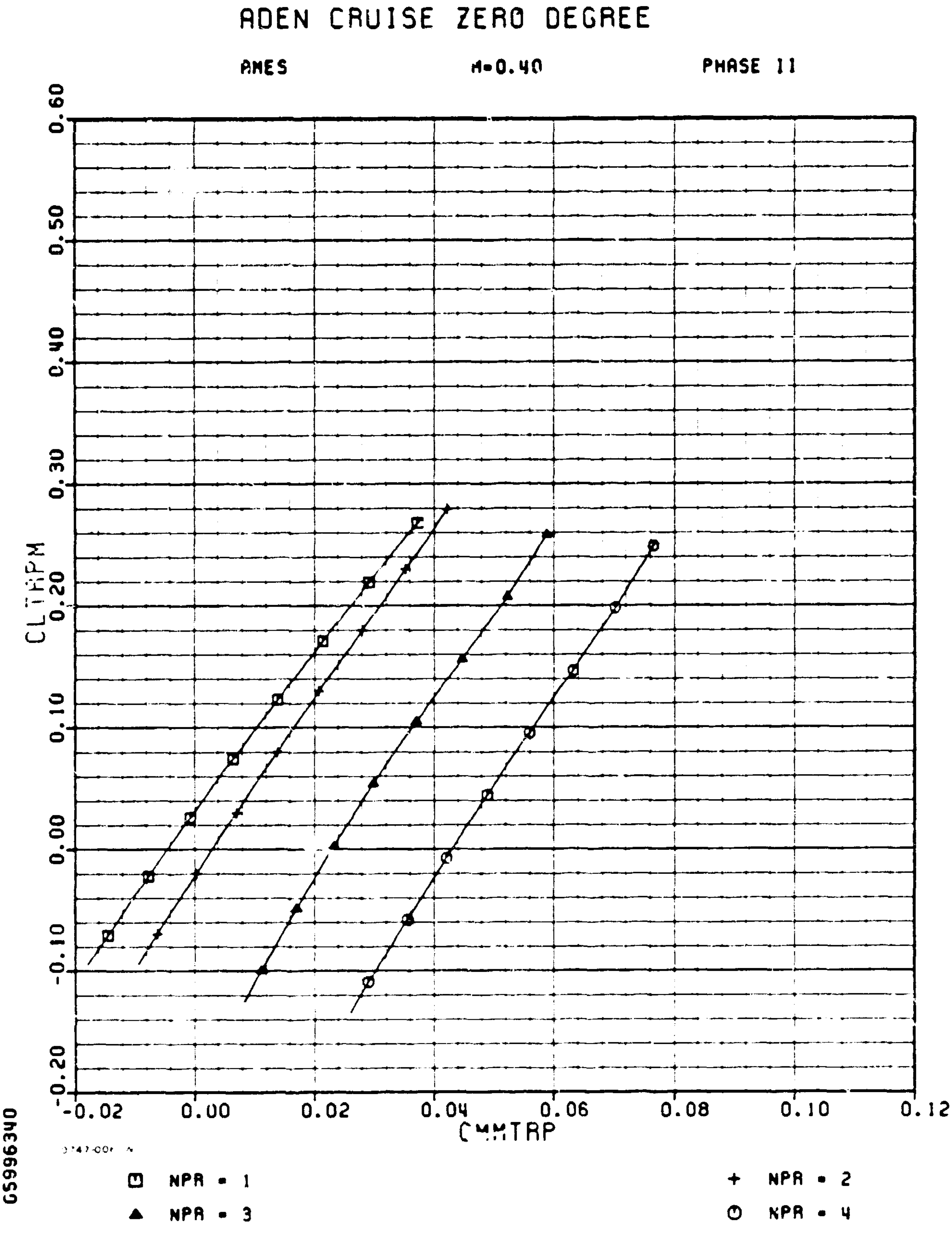
ADEN CRUISE ZERO DEGREE

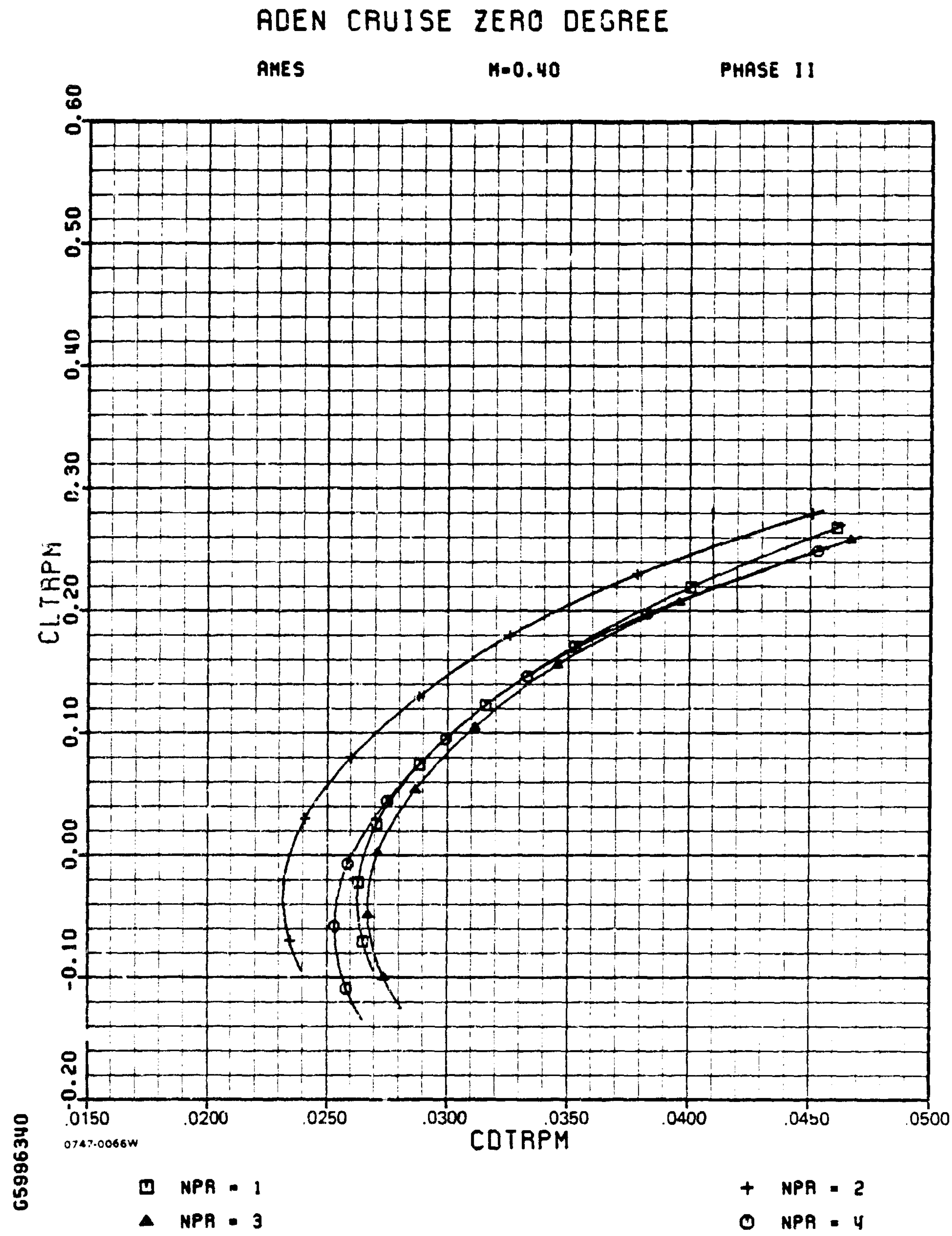
AMES M=0.40 PHASE II



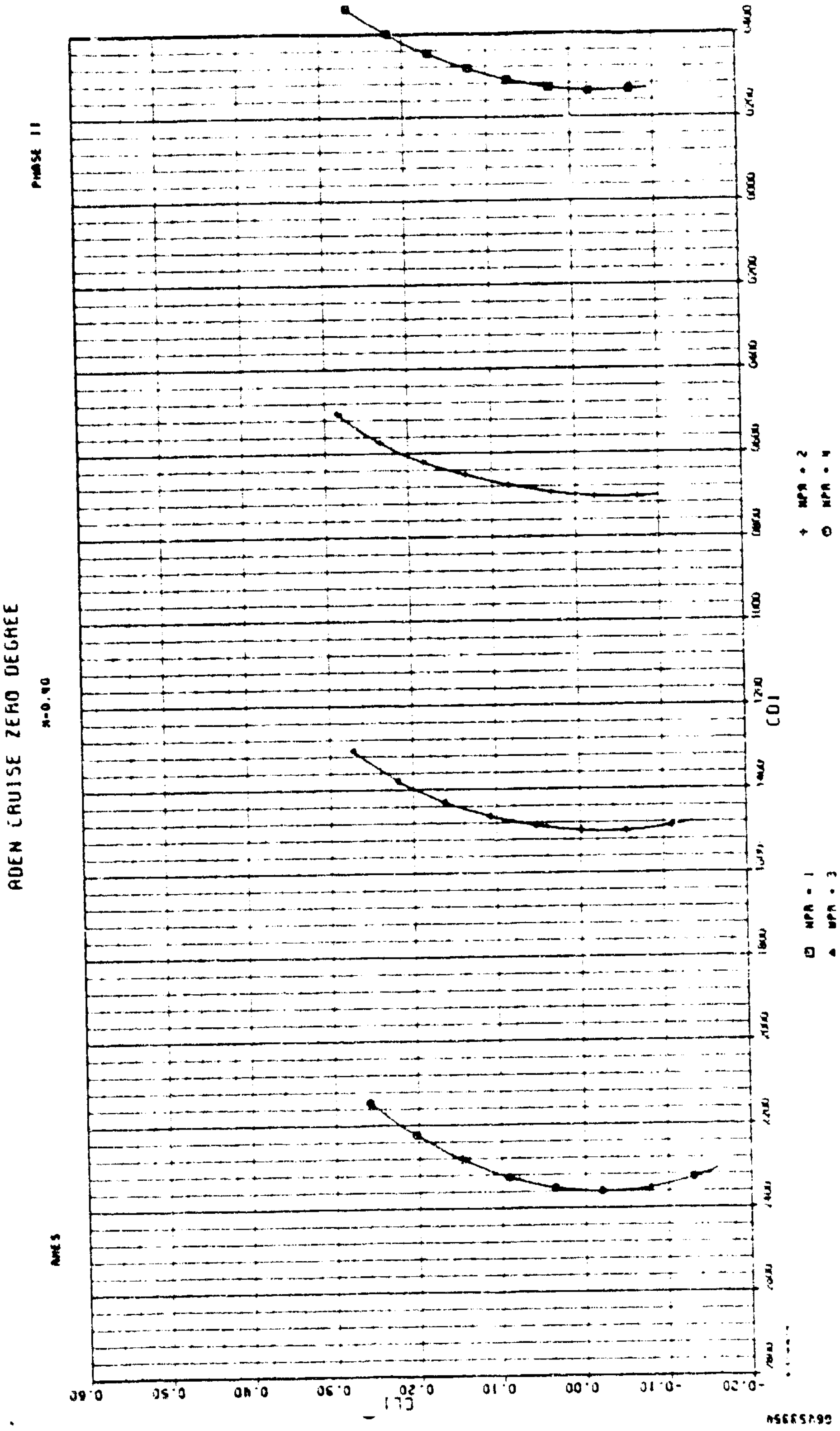

ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0064W
G5996340
AOA = 5
+ AOA = 6
▲ AOA = 7

D 1(c)(concl.)


ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
NPR = 1
NPR = 2
NPR = 3
NPR = 4
GS996340



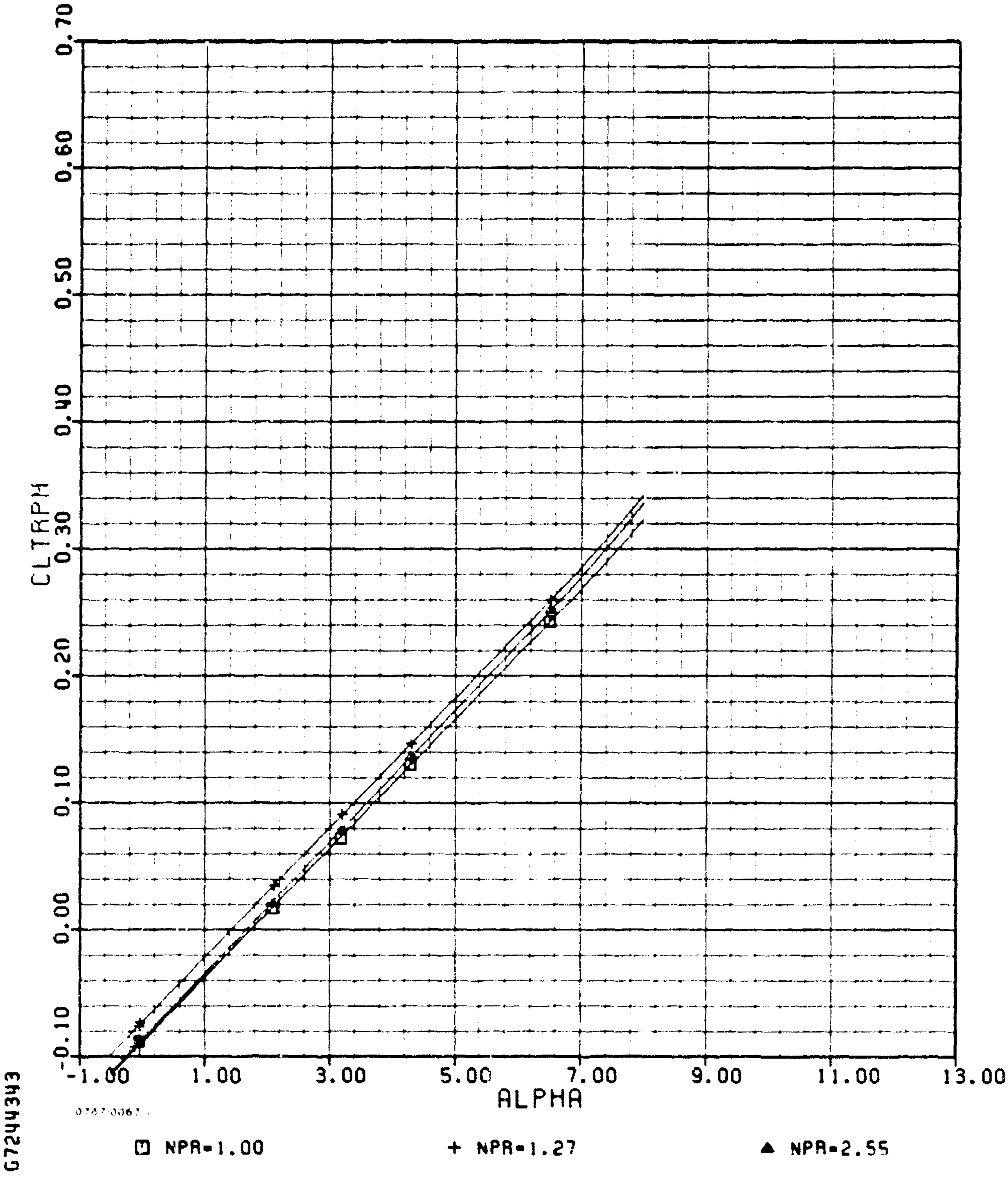
ADEN CRUISE ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0150
.0200
.0250
.0300
.0350
.0400
.0450
.0500
0747-0066W
G5996340
NPR = 1
NPR = 2
NPR = 3
NPR = 4

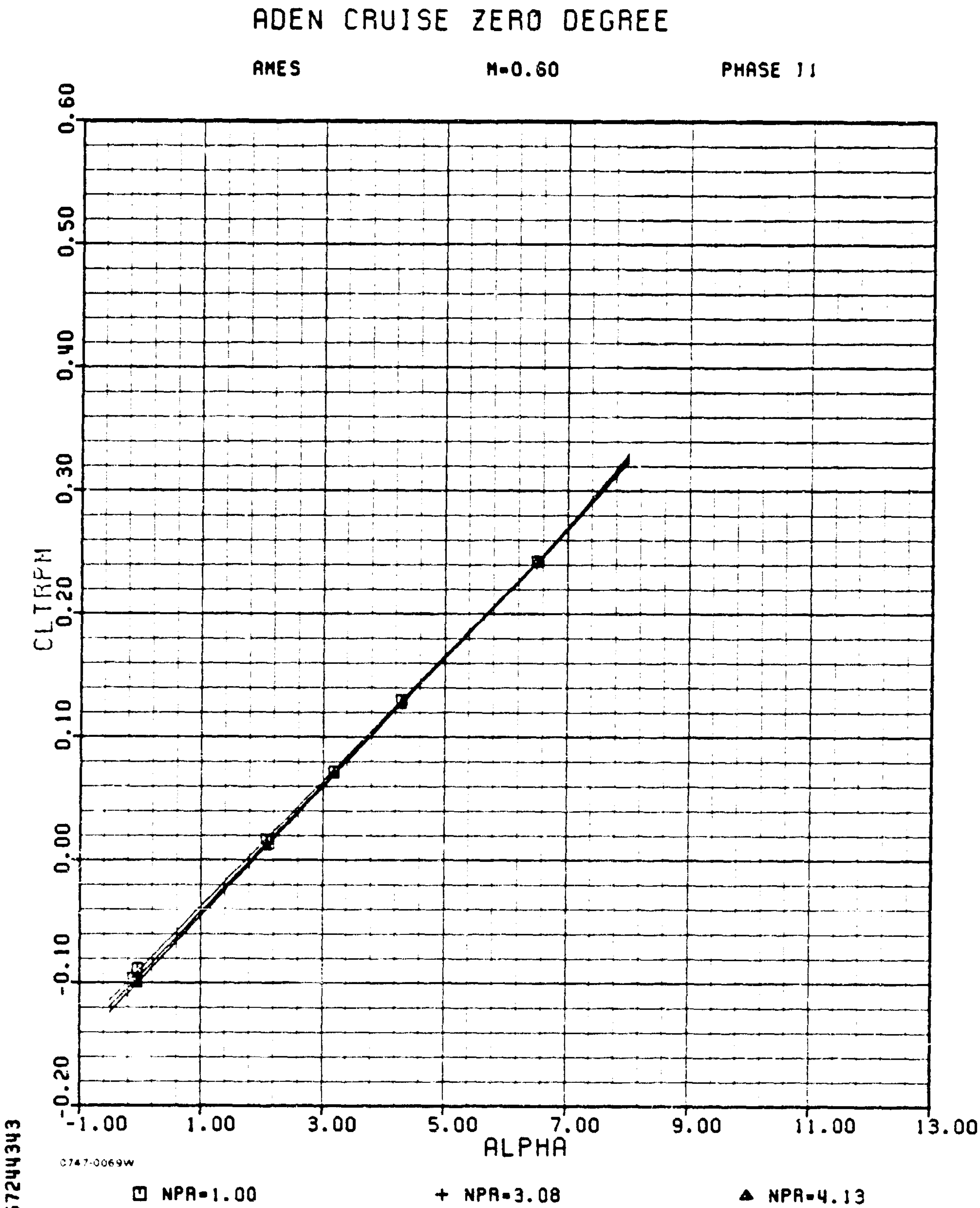


ADEN CRUISE ZERO DEGREE
M=0.90
PHASE II
AMES
CDI
CLI
□ NPR = 1
△ NPR = 3
+ NPR = 2
⊙ NPR = 4

ADEN CRUISE ZERO DEGREE

AMES M=0.60 PHASE II



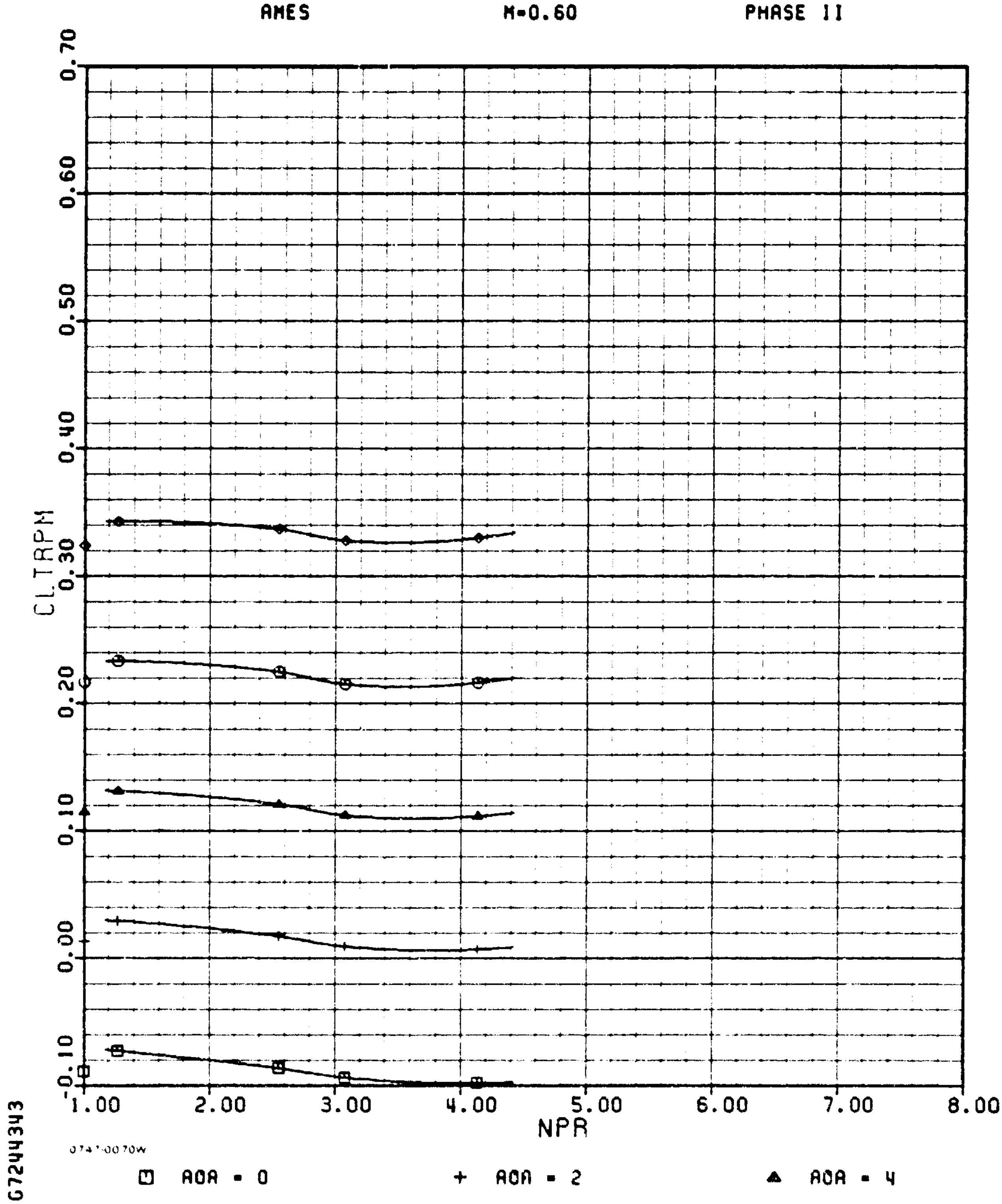


ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G7244343
C747-0069W
NPR=1.00
+ NPR=3.08
NPR=4.13

D-2(a) (concl.)

ADEN CRUISE ZERO DEGREE

AMES M=0.60 PHASE II

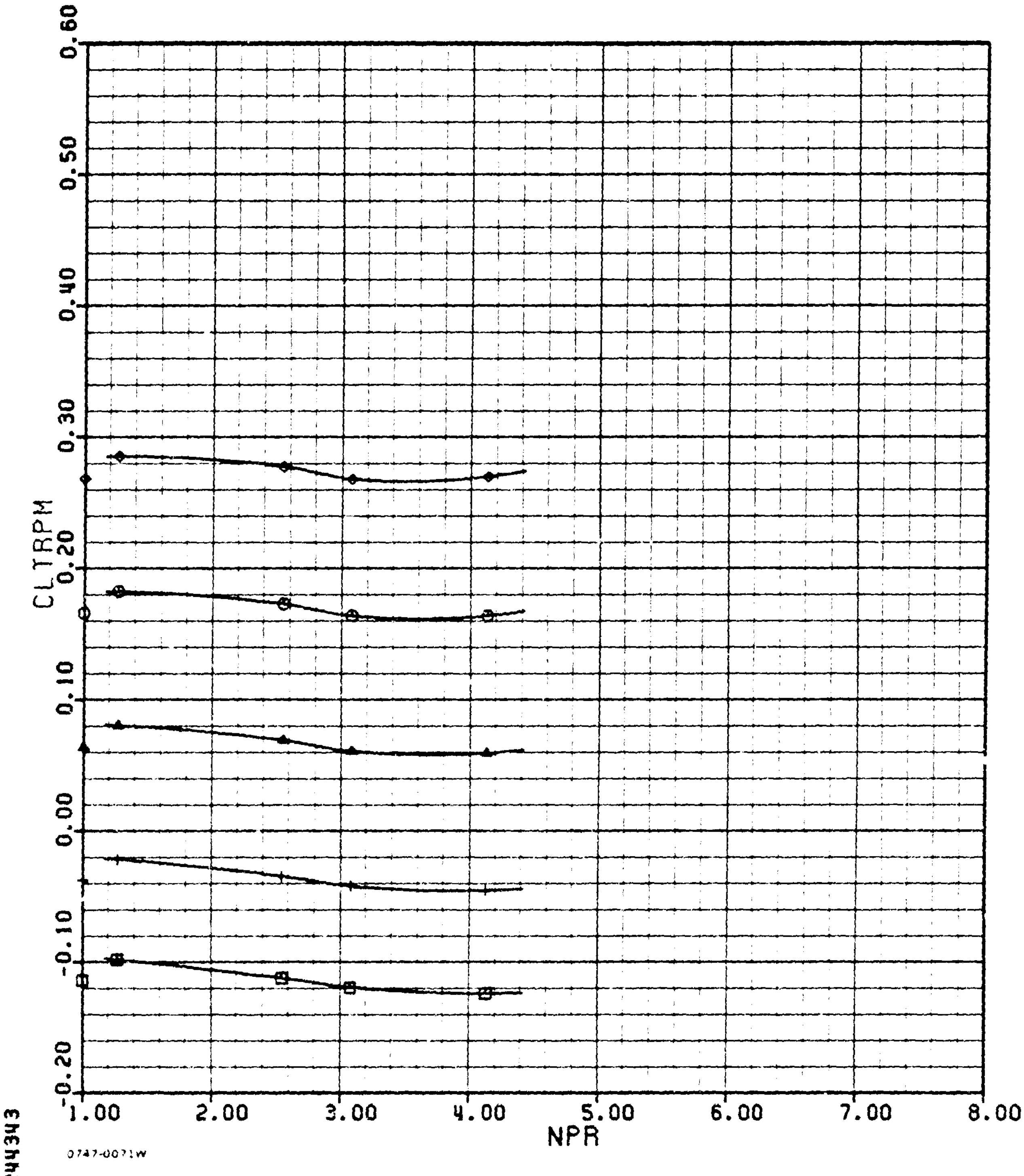


□ AOA = 0 + AOA = 2 ▲ AOA = 4

○ AOA = 6 ◇ AOA = 8

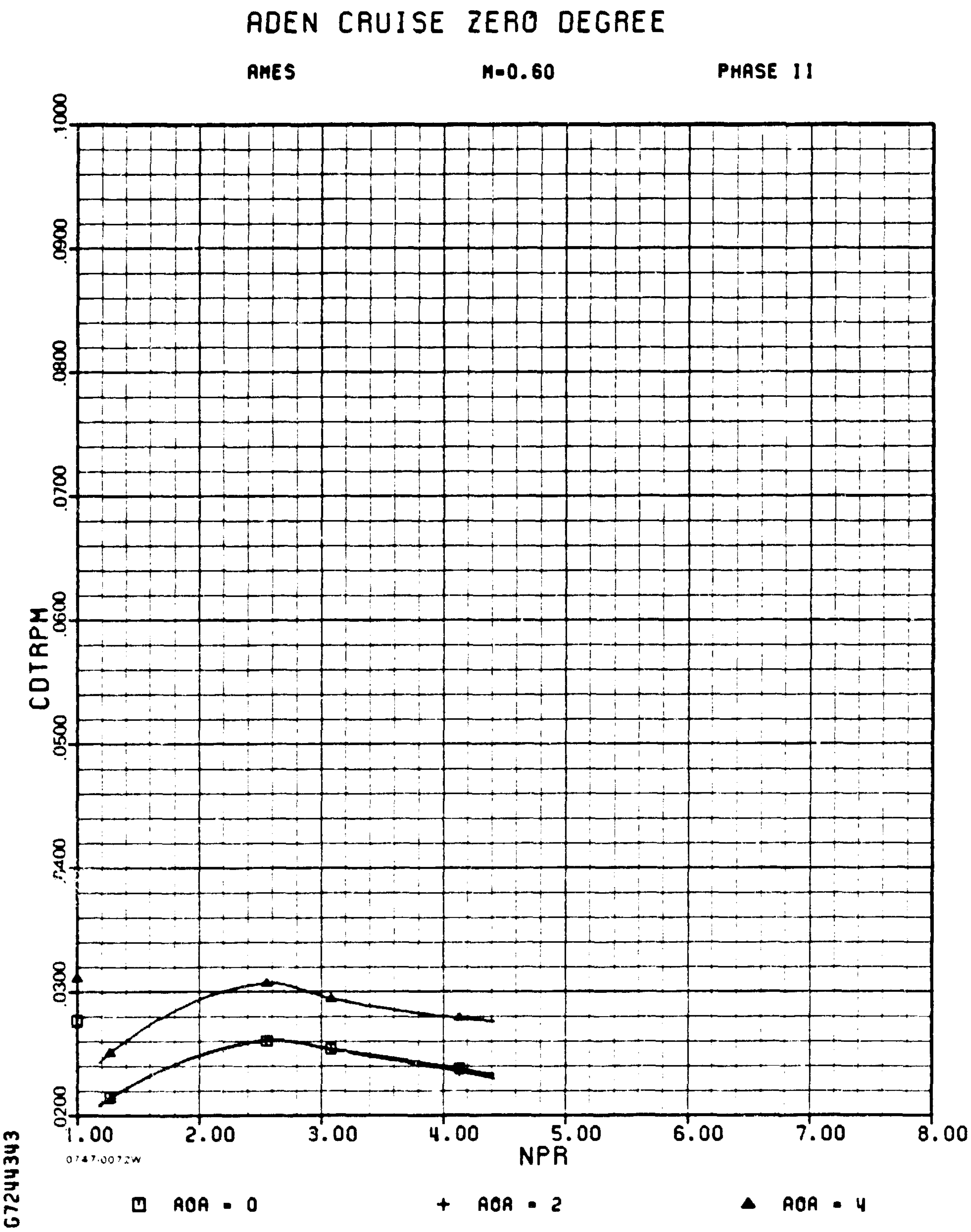
ADEN CRUISE ZERO DEGREE

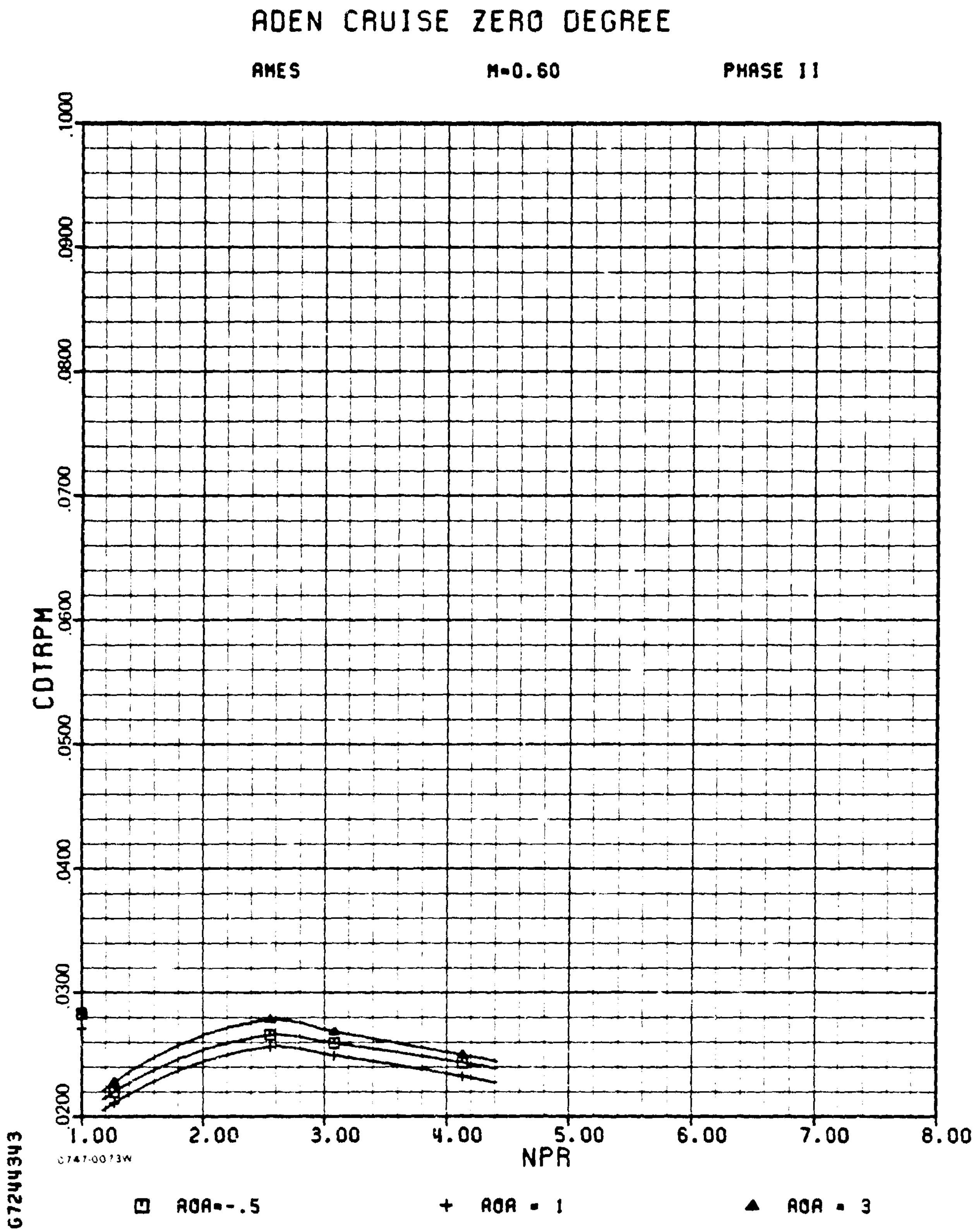
AMES M=0.60 PHASE II



AOA=-.5 + AOA = 1 ▲ AOA = 3
AOA = 5 ◇ AOA = 7

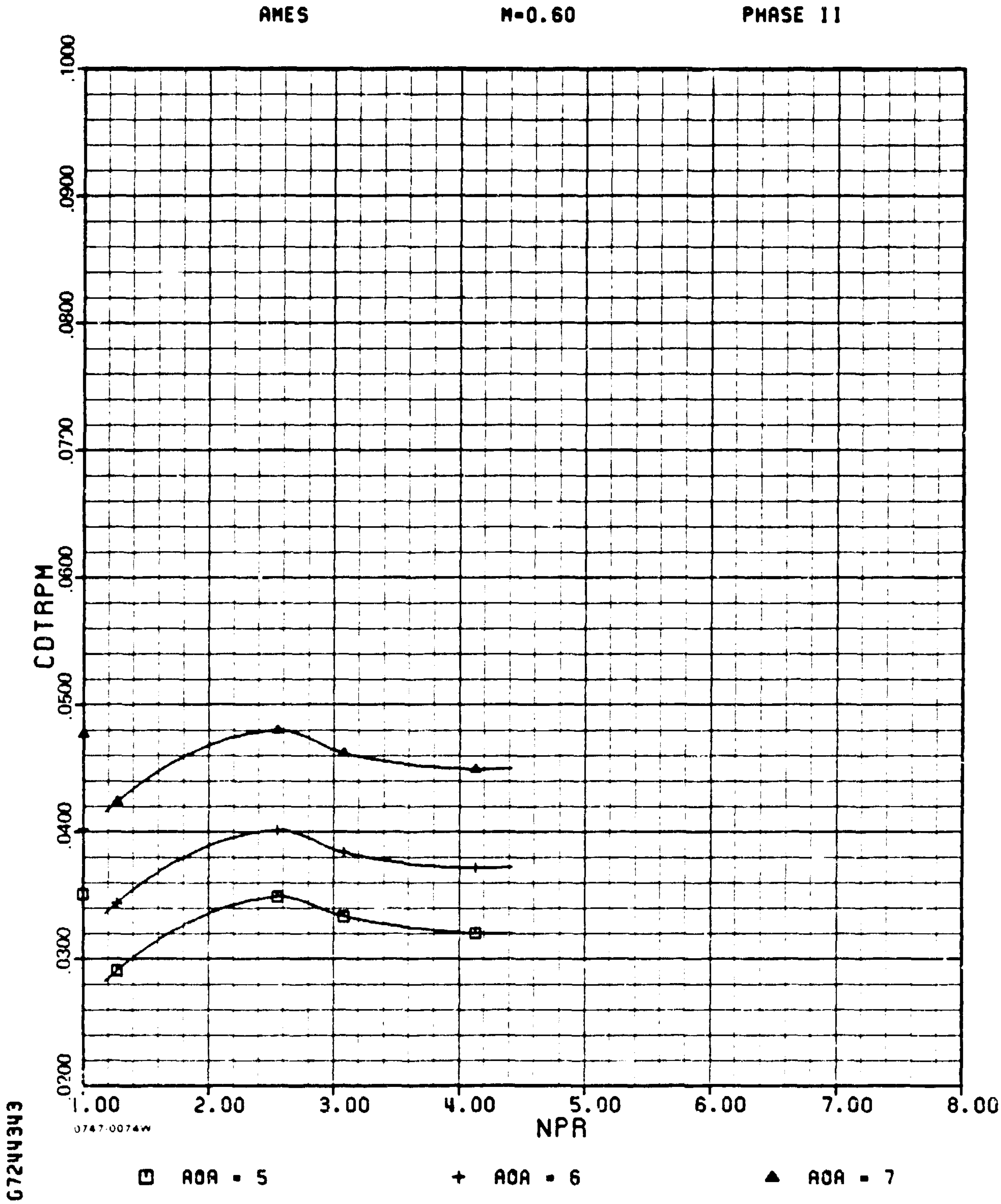
D-2(b) (concl.)

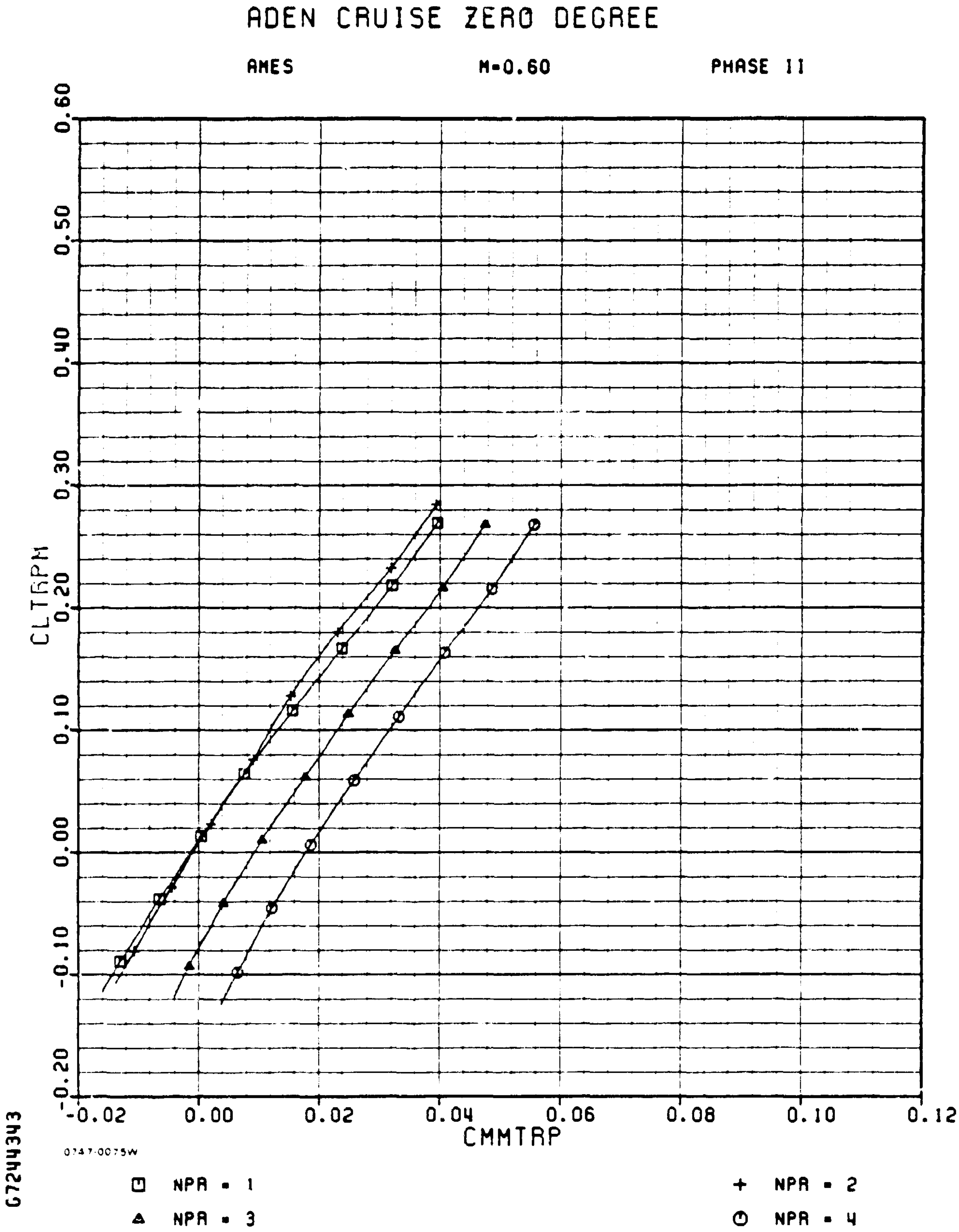

ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0072W
G7244343
AOA = 0
AOA = 2
AOA = 4

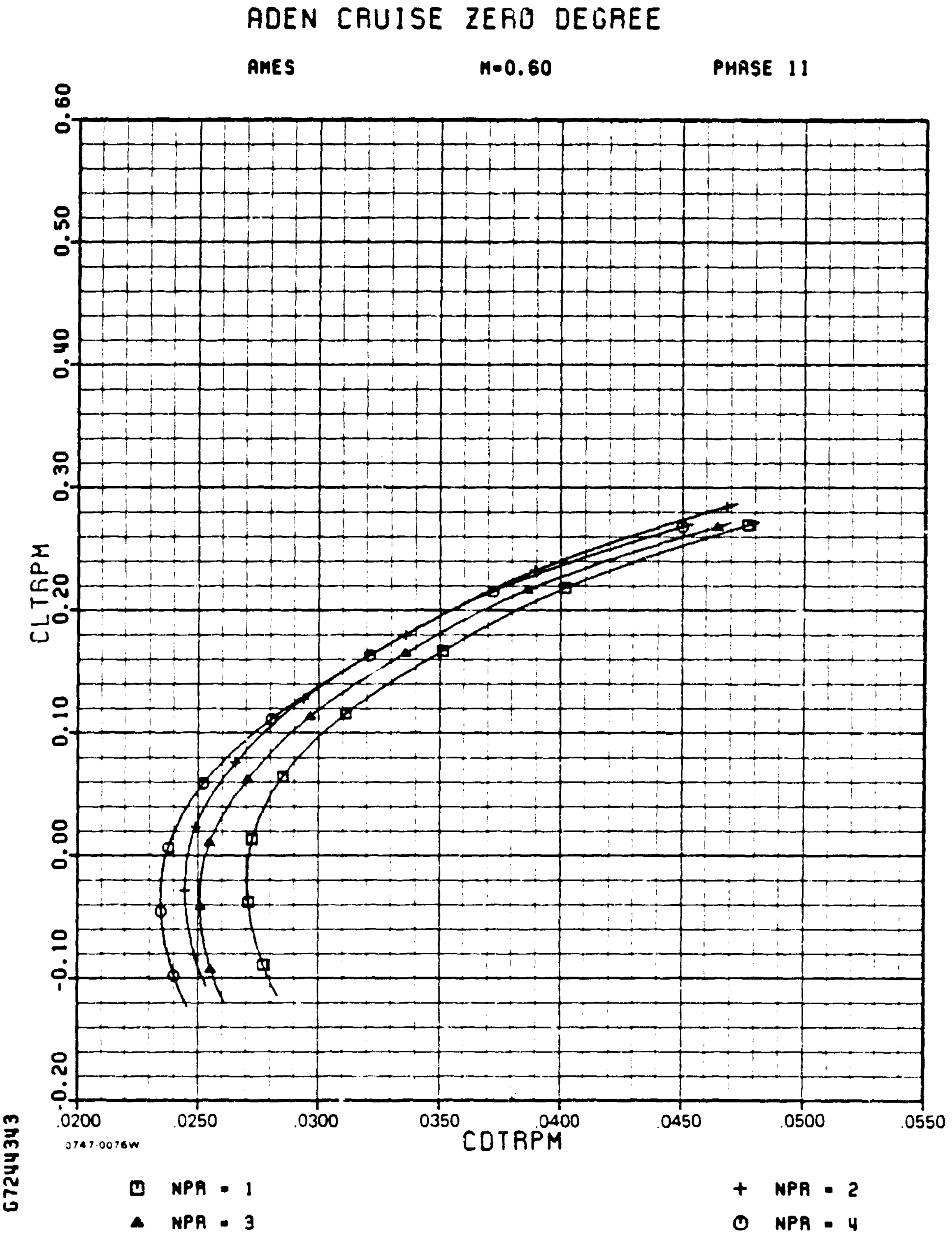

ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G7244343
AOA=-.5
+ AOA = 1
AOA = 3

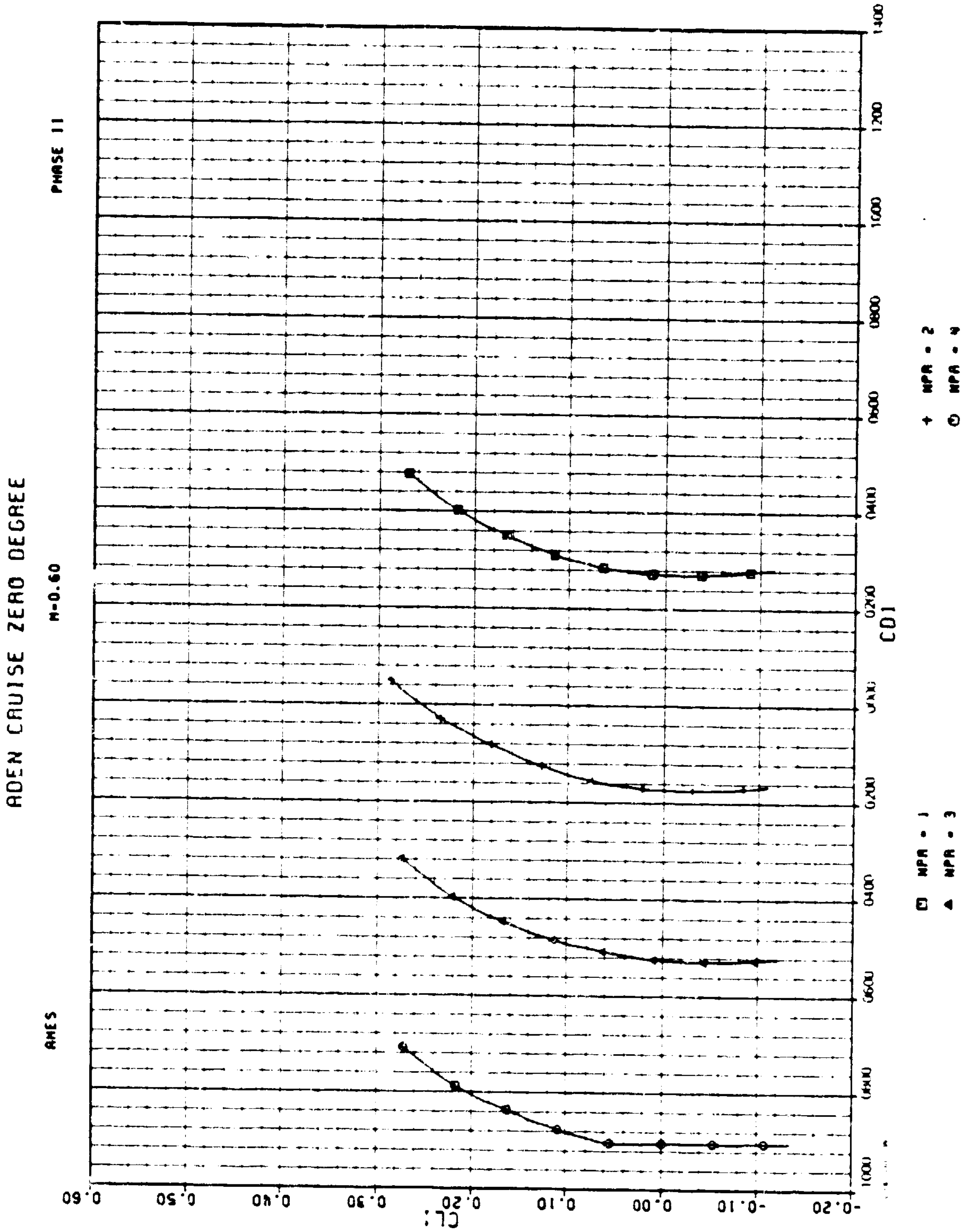
D-2(c)(cont.)

ADEN CRUISE ZERO DEGREE



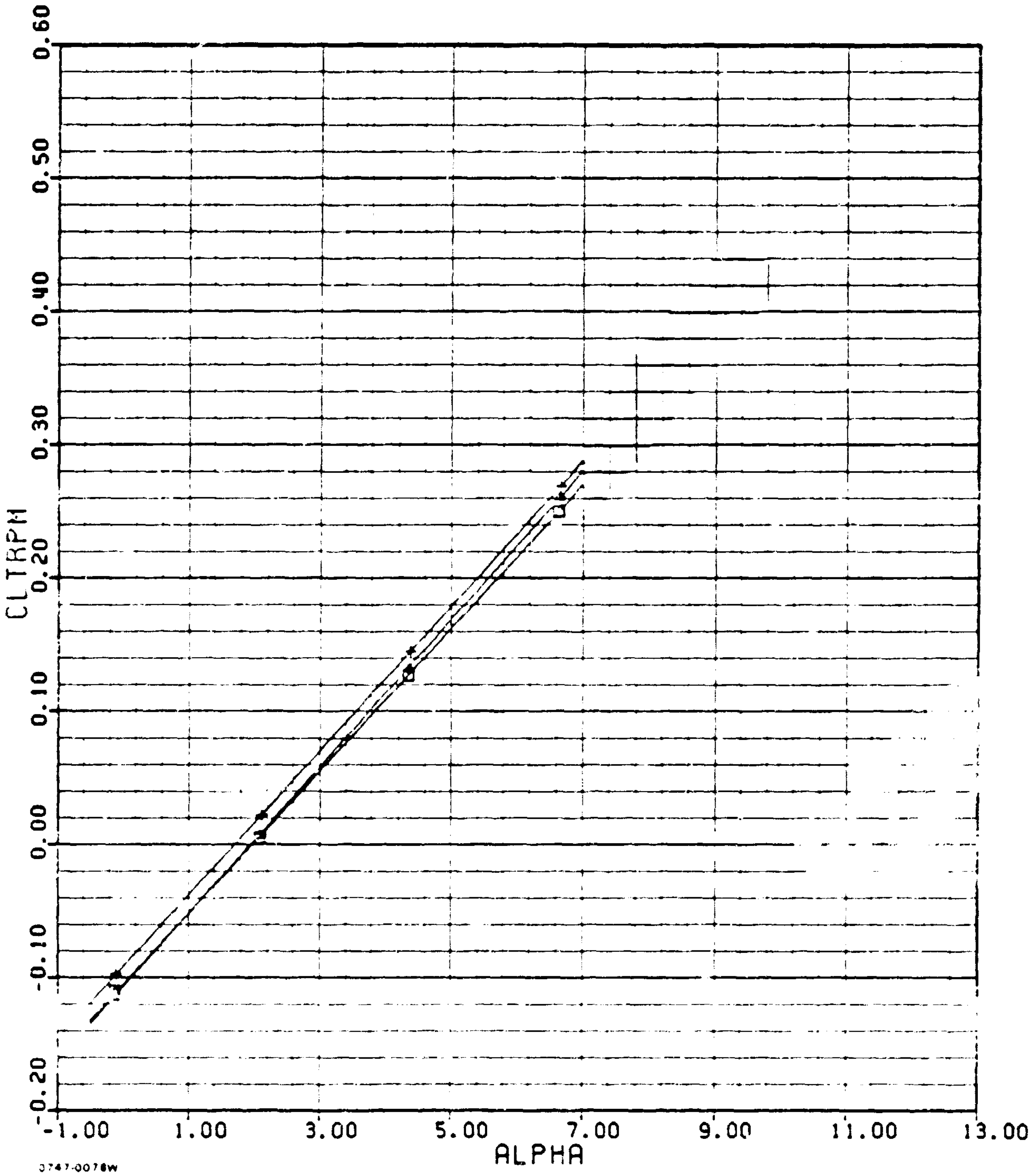

ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CLTRPM
CMMTRP
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
G7244343
0747-0075W
NPR = 1
NPR = 2
NPR = 3
NPR = 4


ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0200
.0250
.0300
.0350
.0400
.0450
.0500
.0550
0747-0076W
G7244343
NPR = 1
NPR = 2
NPR = 3
NPR = 4


ADEN CRUISE ZERO DEGREE
AMES
M=0.60
PHASE II
CDI
CL:
NPR = 1
NPR = 3
NPR = 2
NPR = 4

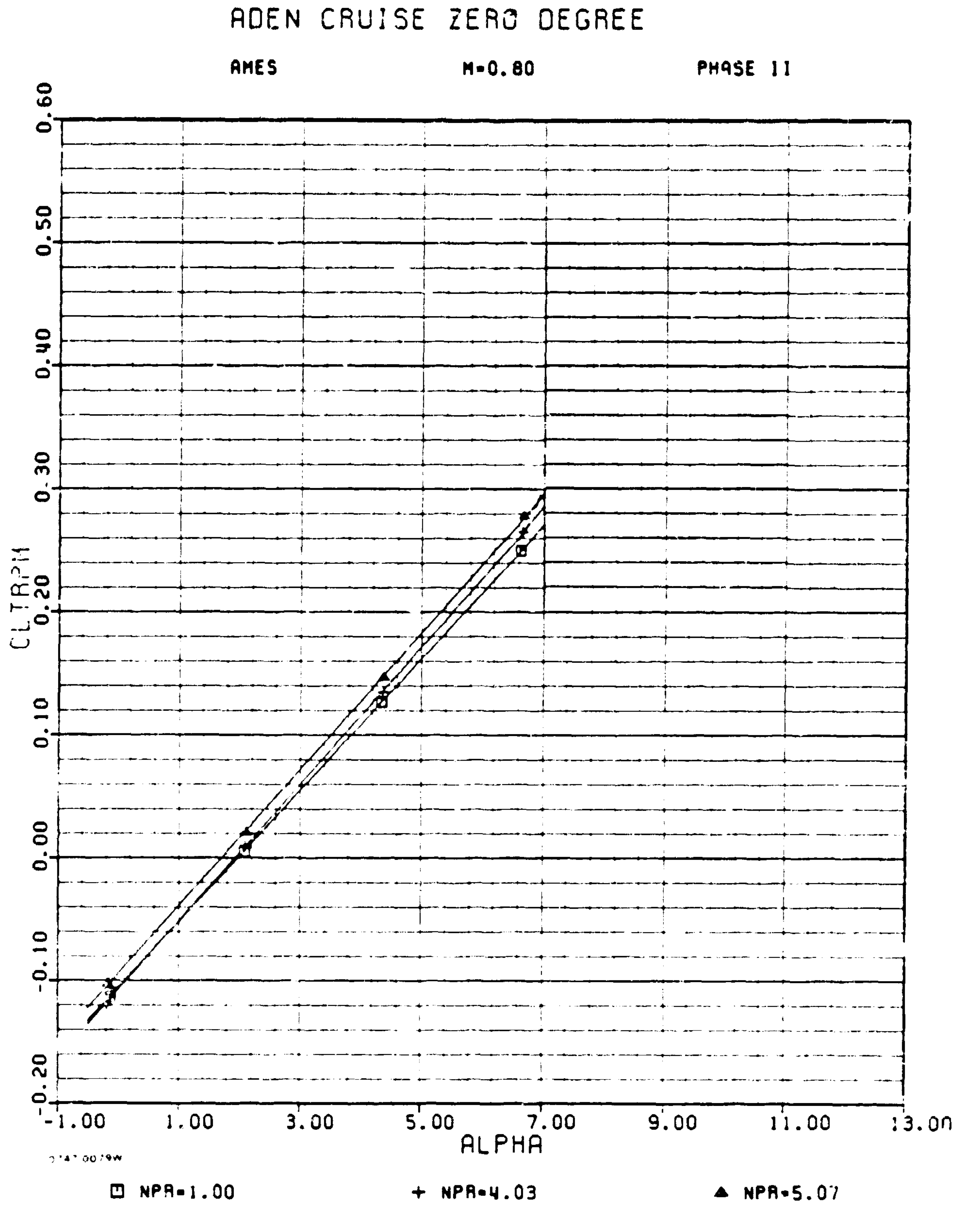
ADEN CRUISE ZERO DEGREE

AMES M=0.80 PHASE II

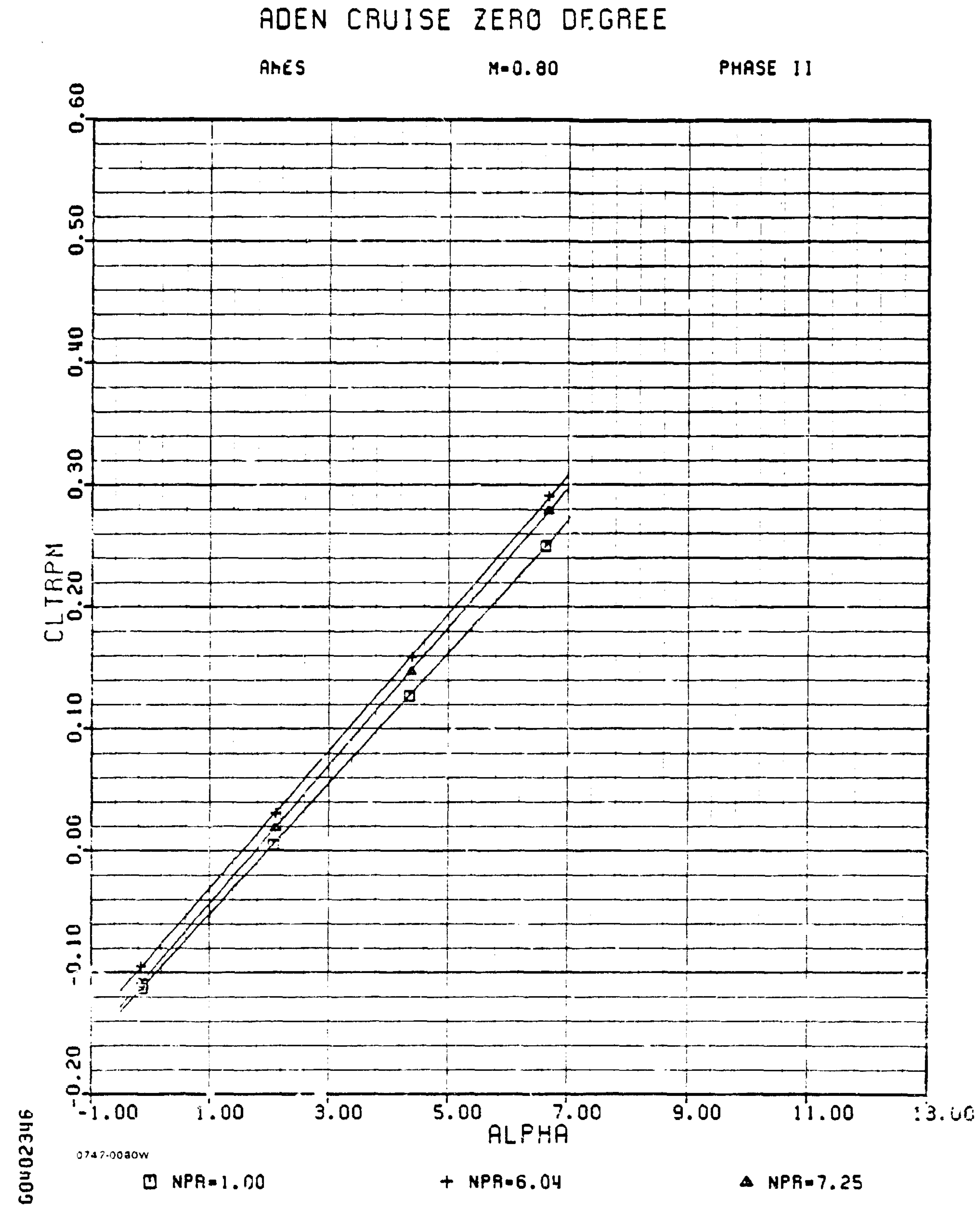


G0402346

□ NPR=1.00 + NPR=1.53 ▲ NPR=3.02


ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
□ NPR=1.00
+ NPR=4.03
▲ NPR=5.07
G0402346

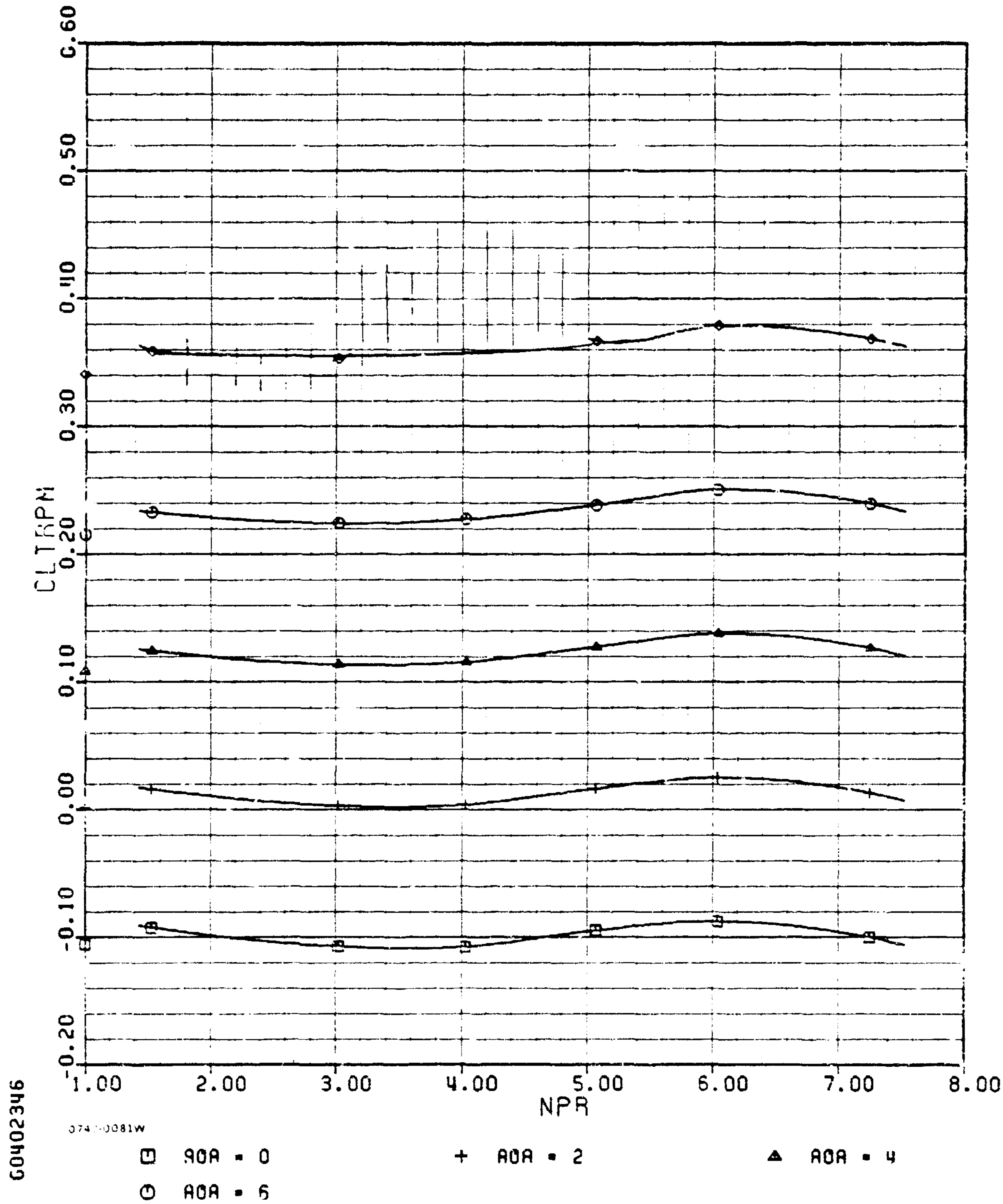
D-3(a) (cont.)

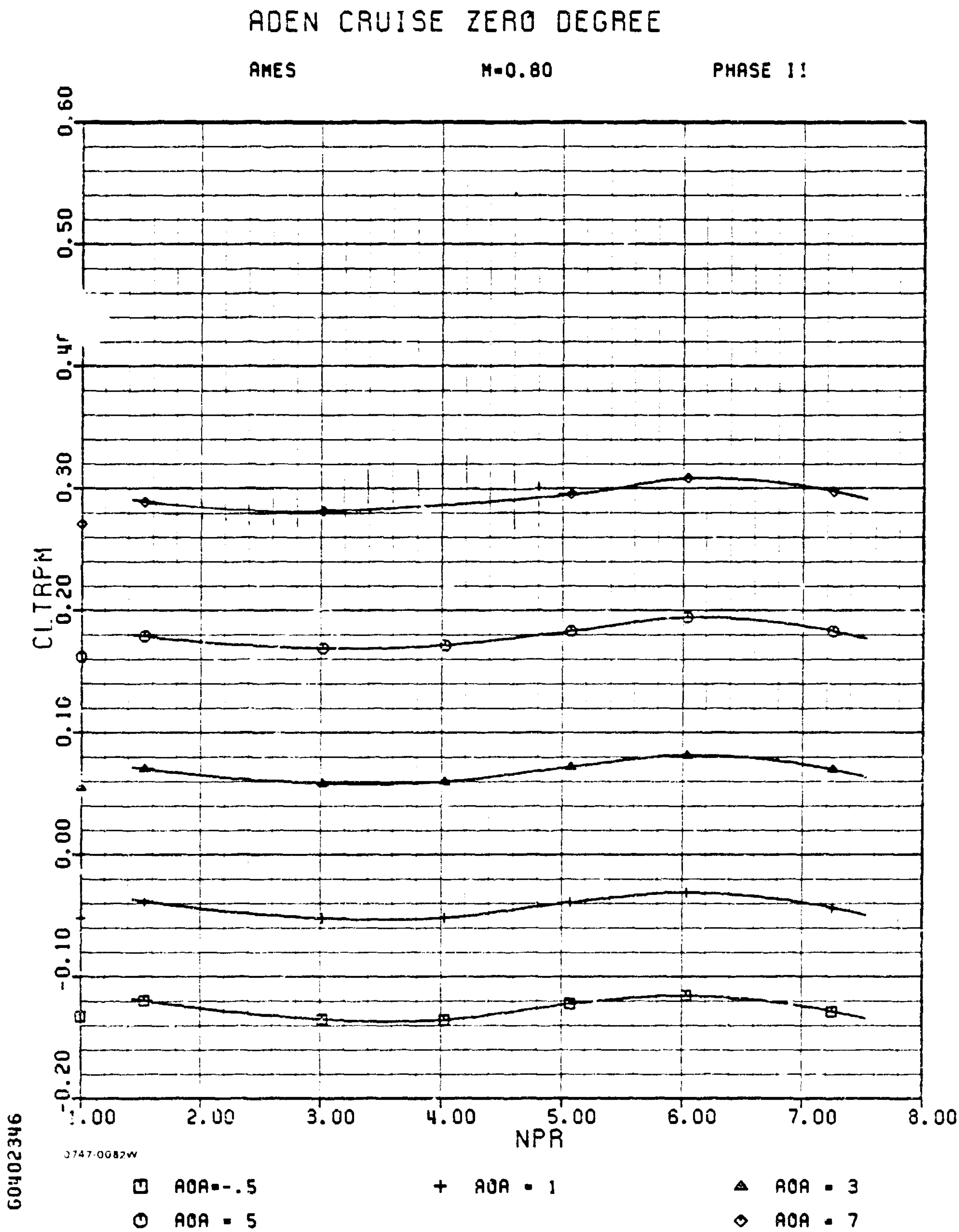

ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
ALPHA
0747-0080W
NPR=1.00
NPR=6.04
NPR=7.25
G0402346

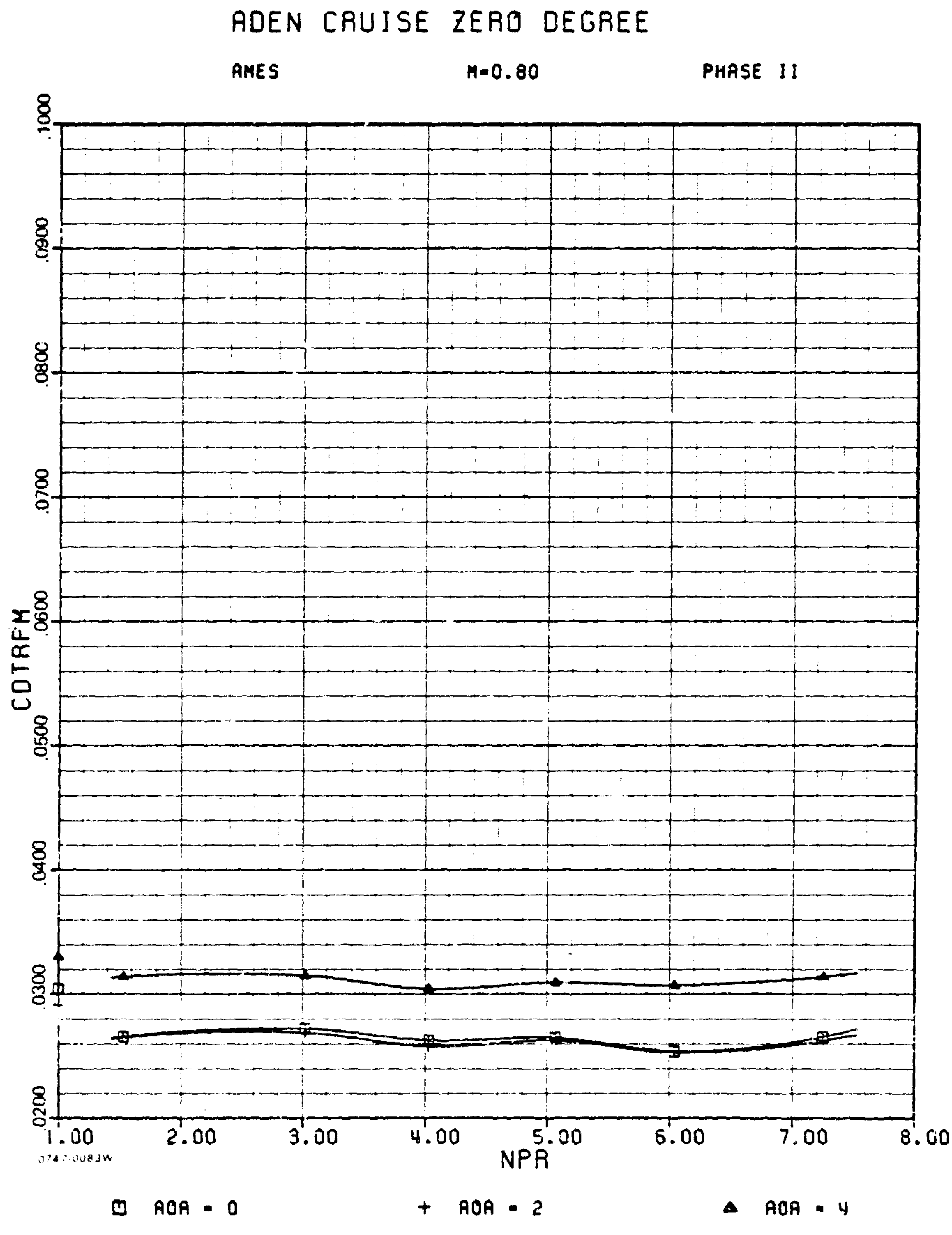
D-3(a) (concl.)

ADEN CRUISE ZERO DEGREE

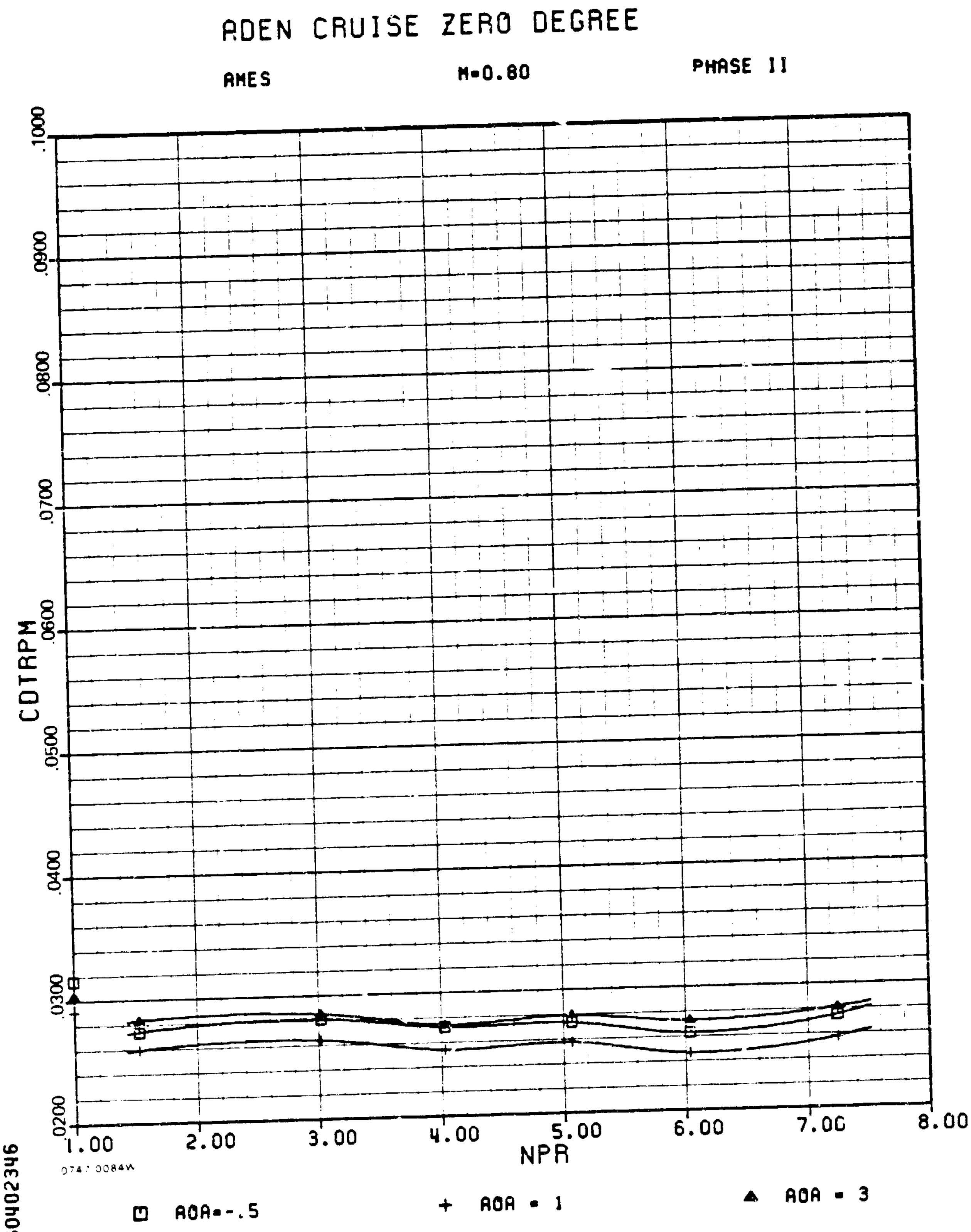
AMES M=0.80 PHASE II




ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0082W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7
G0402346

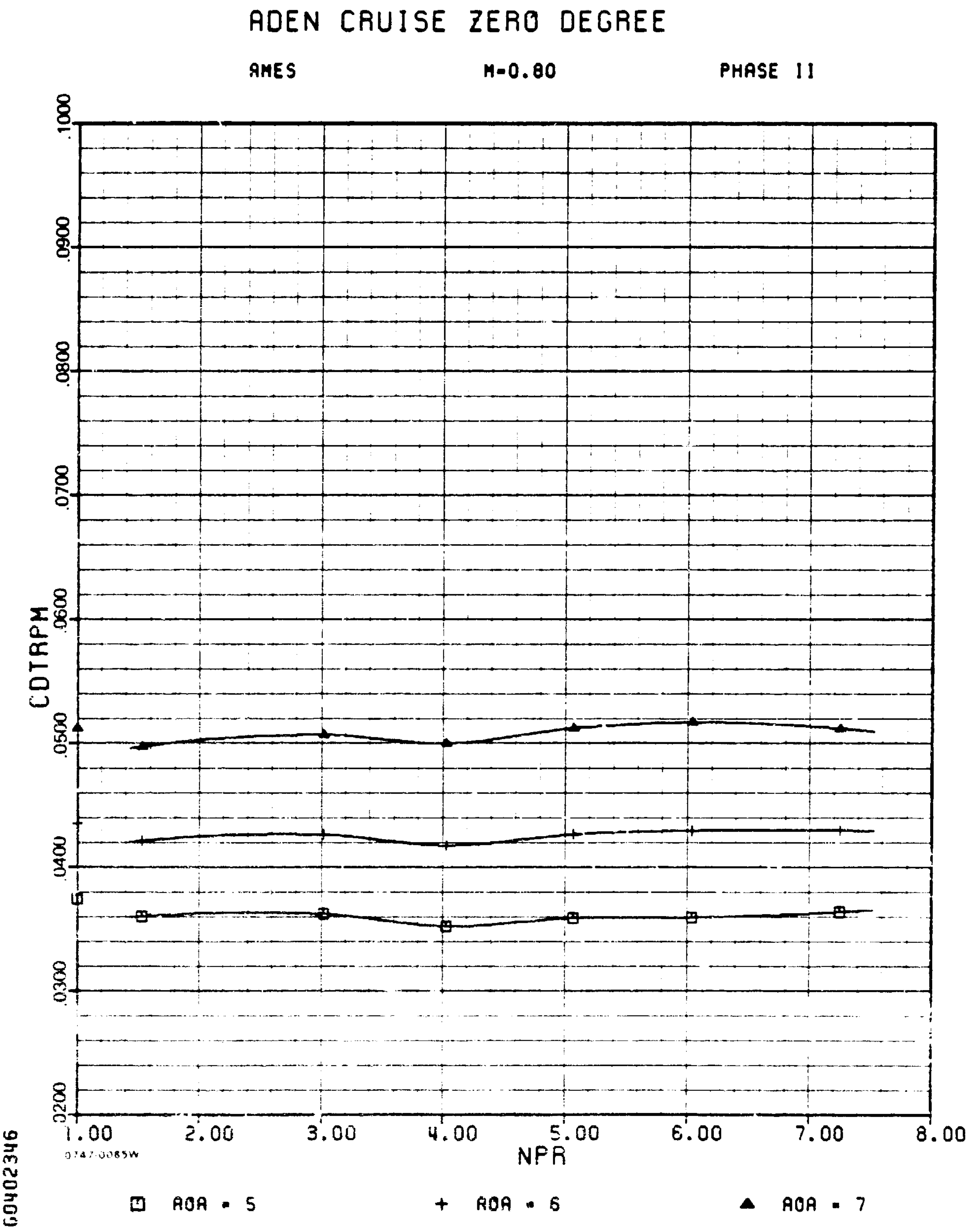

ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CDTRFM
.0200
.0300
.0400
.0500
.0600
.0700
.0800
.0900
.1000
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 0
AOA = 2
AOA = 4

G0402346



G0402346

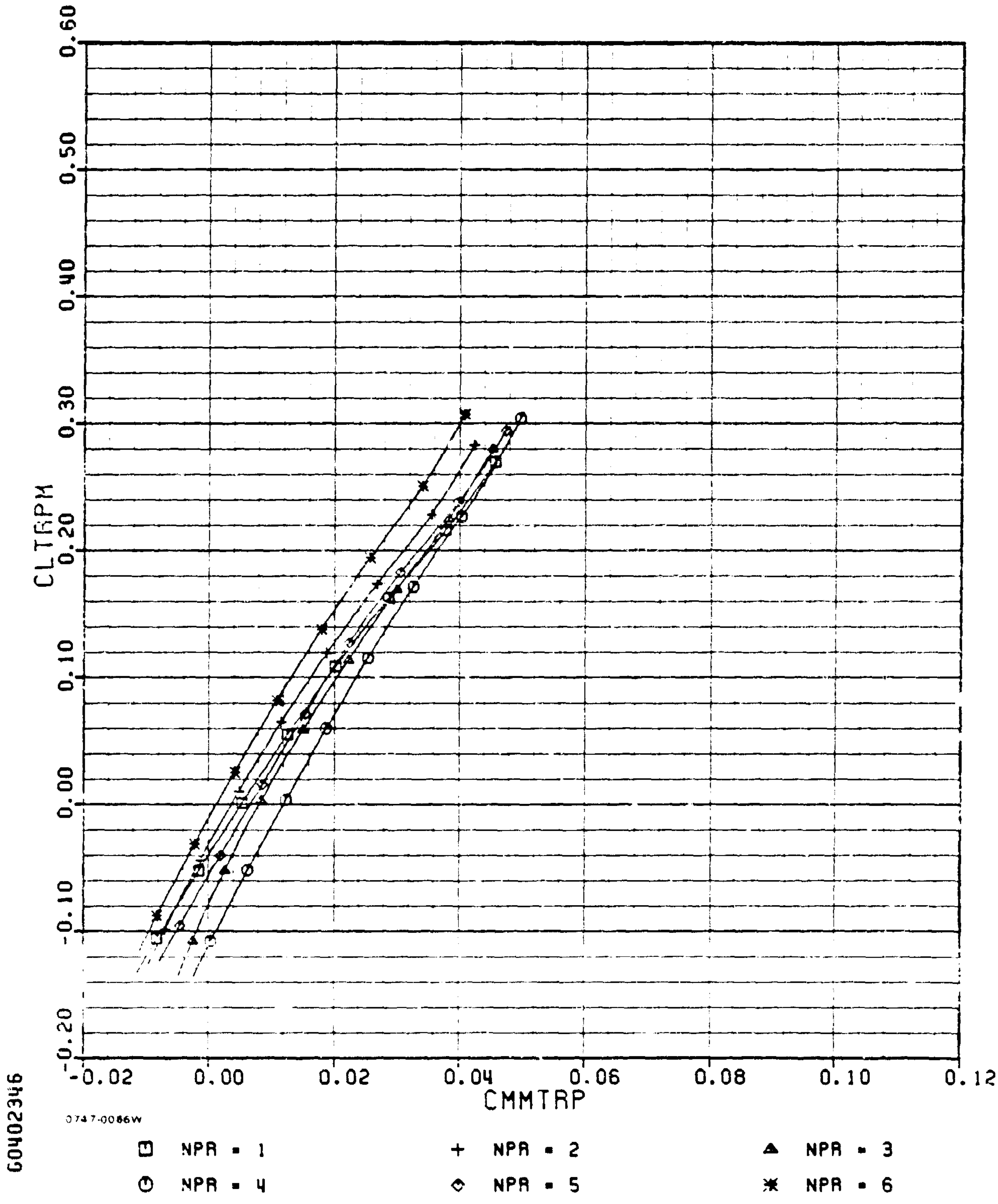
D-3(c)(cont.)


ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 5
AOA = 6
AOA = 7
G0402346

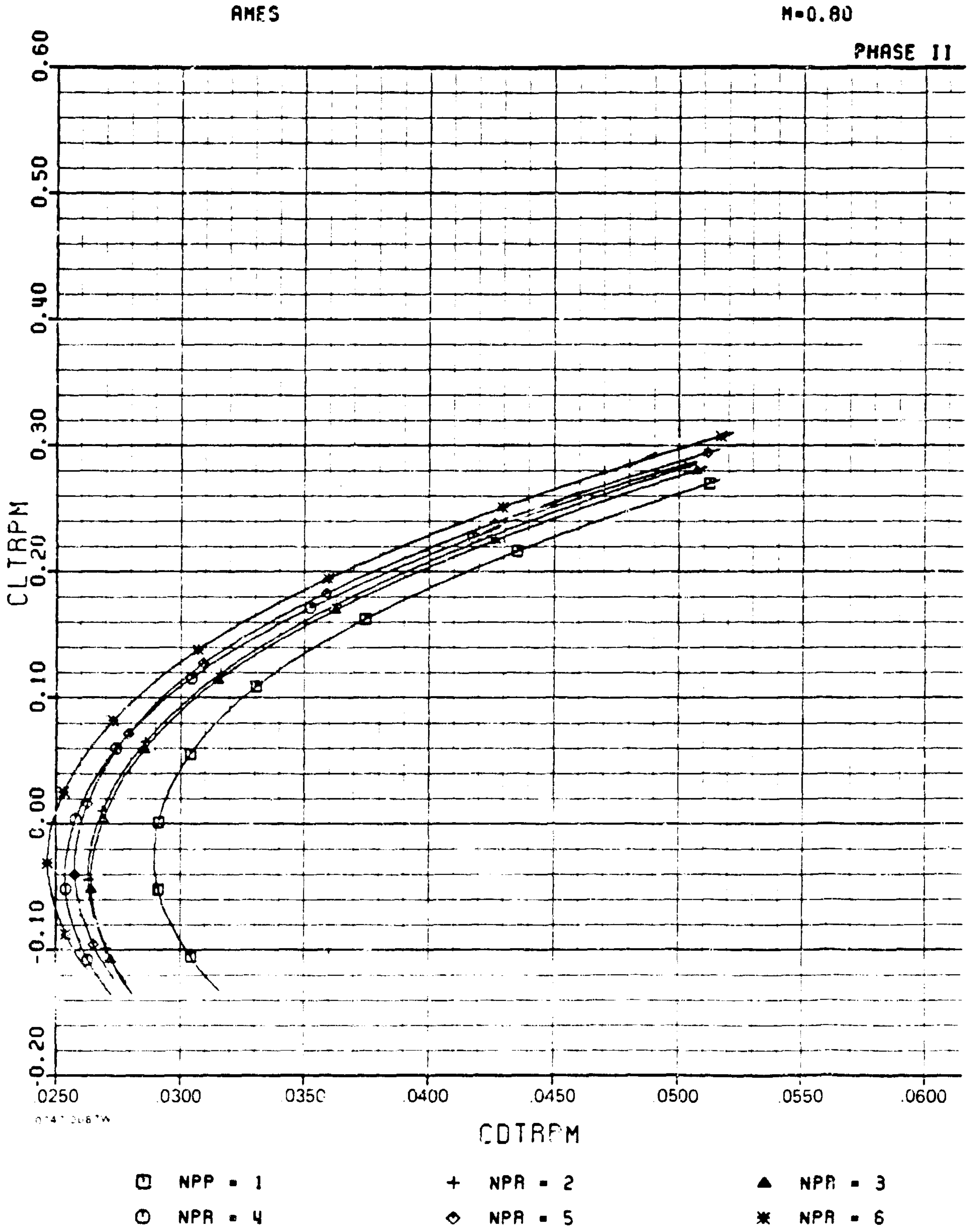
D-3(e)(concl.)

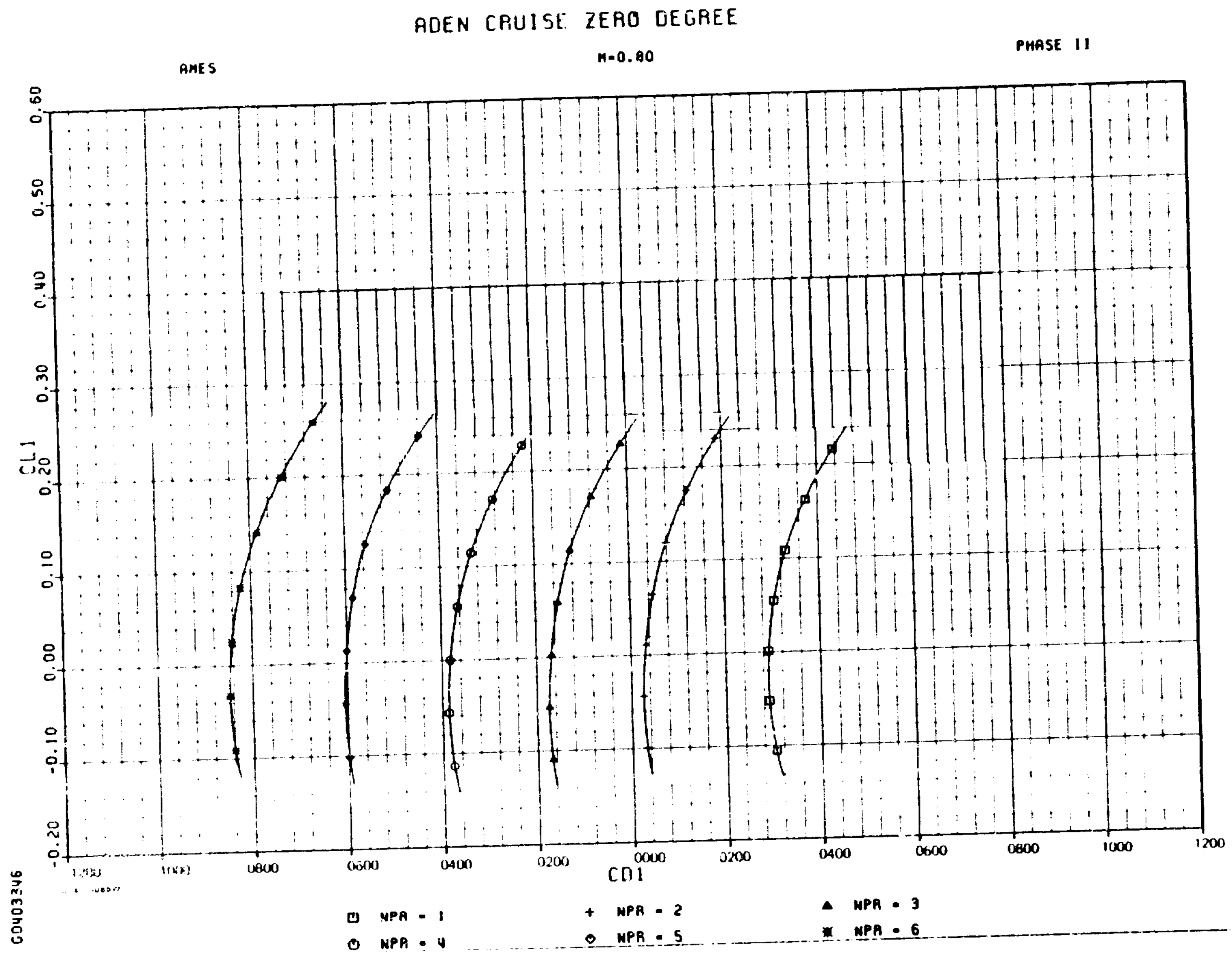
ADEN CRUISE ZERO DEGREE

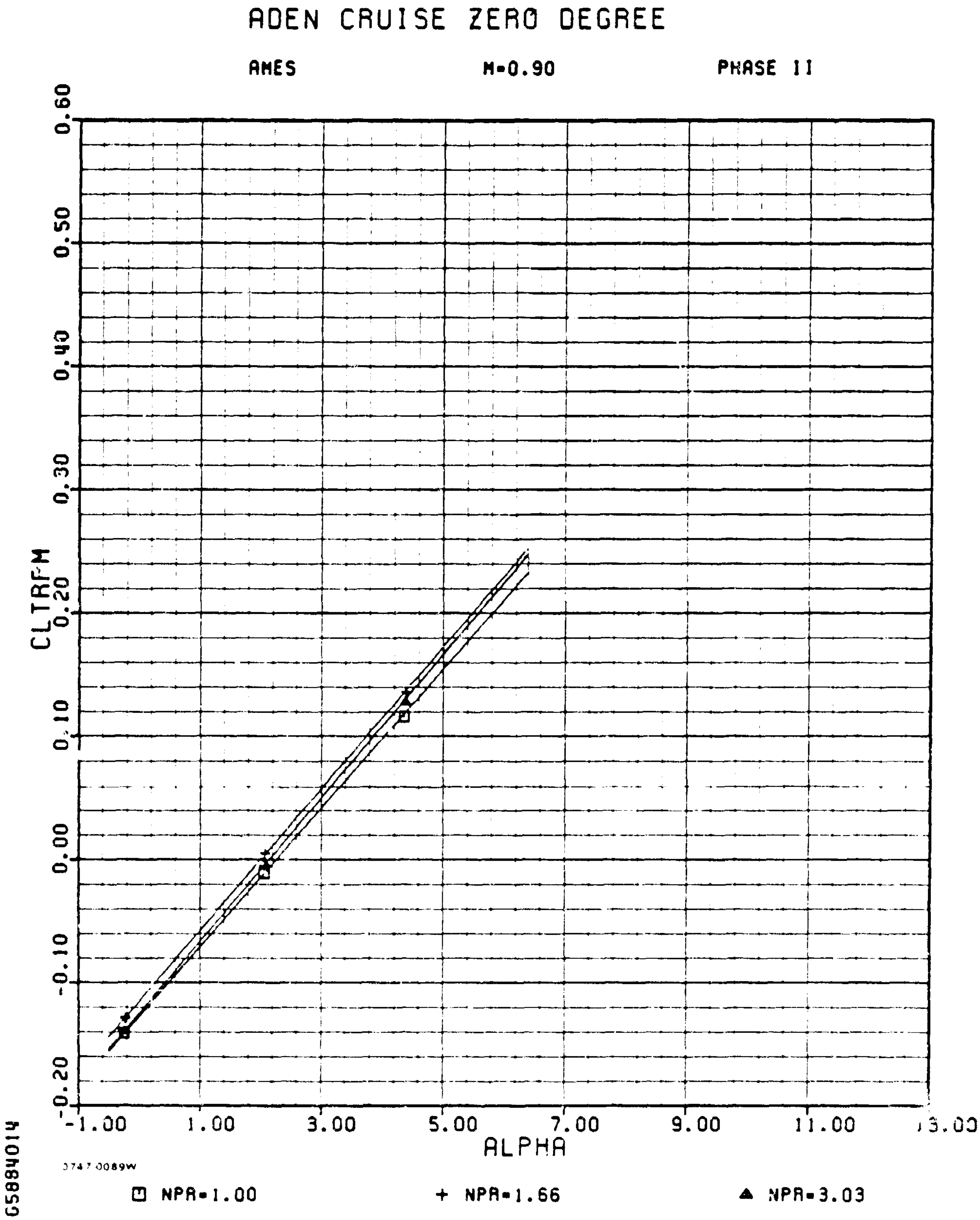
AMES M=0.80 PHASE II



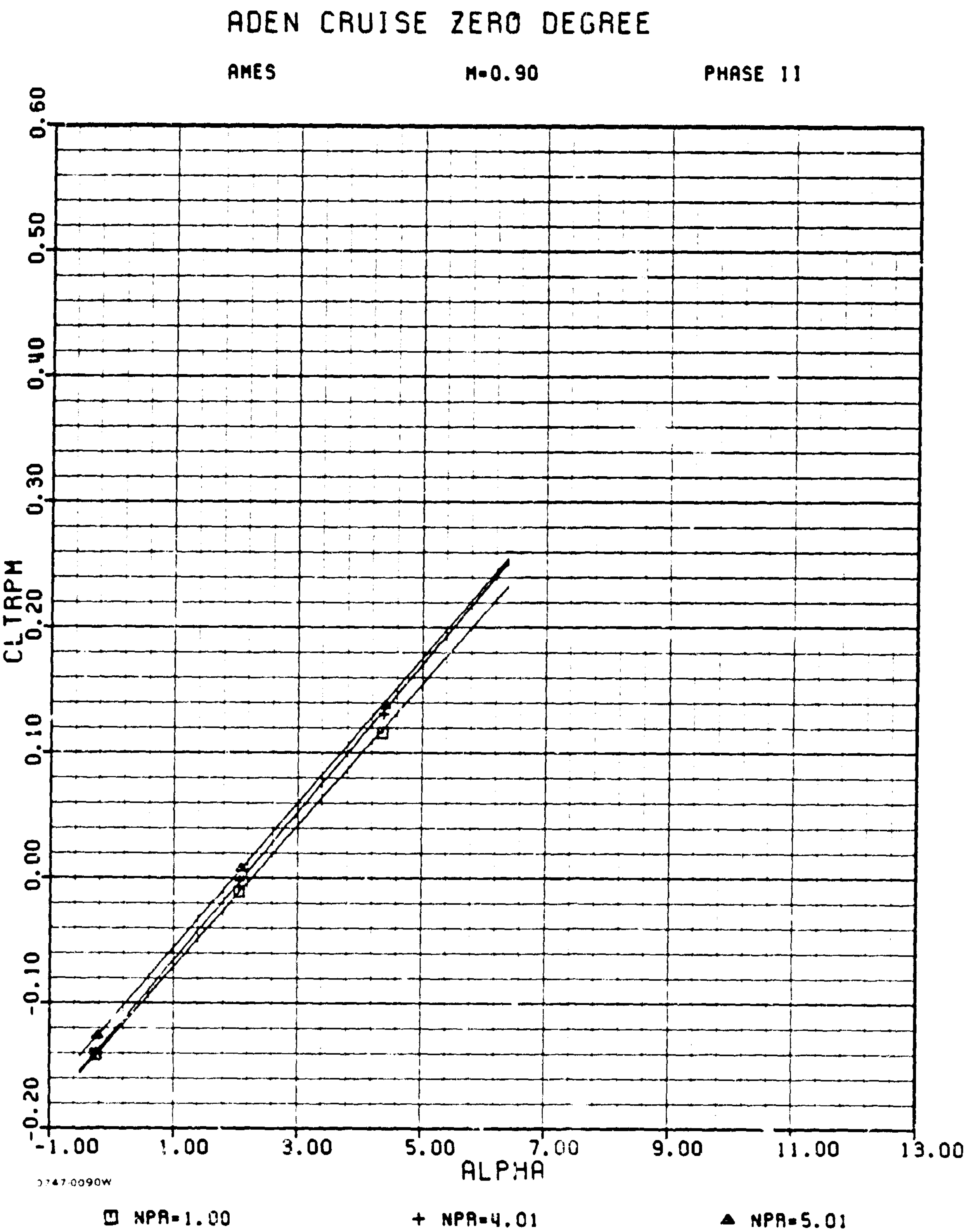
ADEN CRUISE ZERO DEGREE




ADEN CRUISE ZERO DEGREE
AMES
M=0.80
PHASE II
CL1
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CD1
1200
1000
0800
0600
0400
0200
0000
0200
0400
0600
0800
1000
1200
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
G0403346



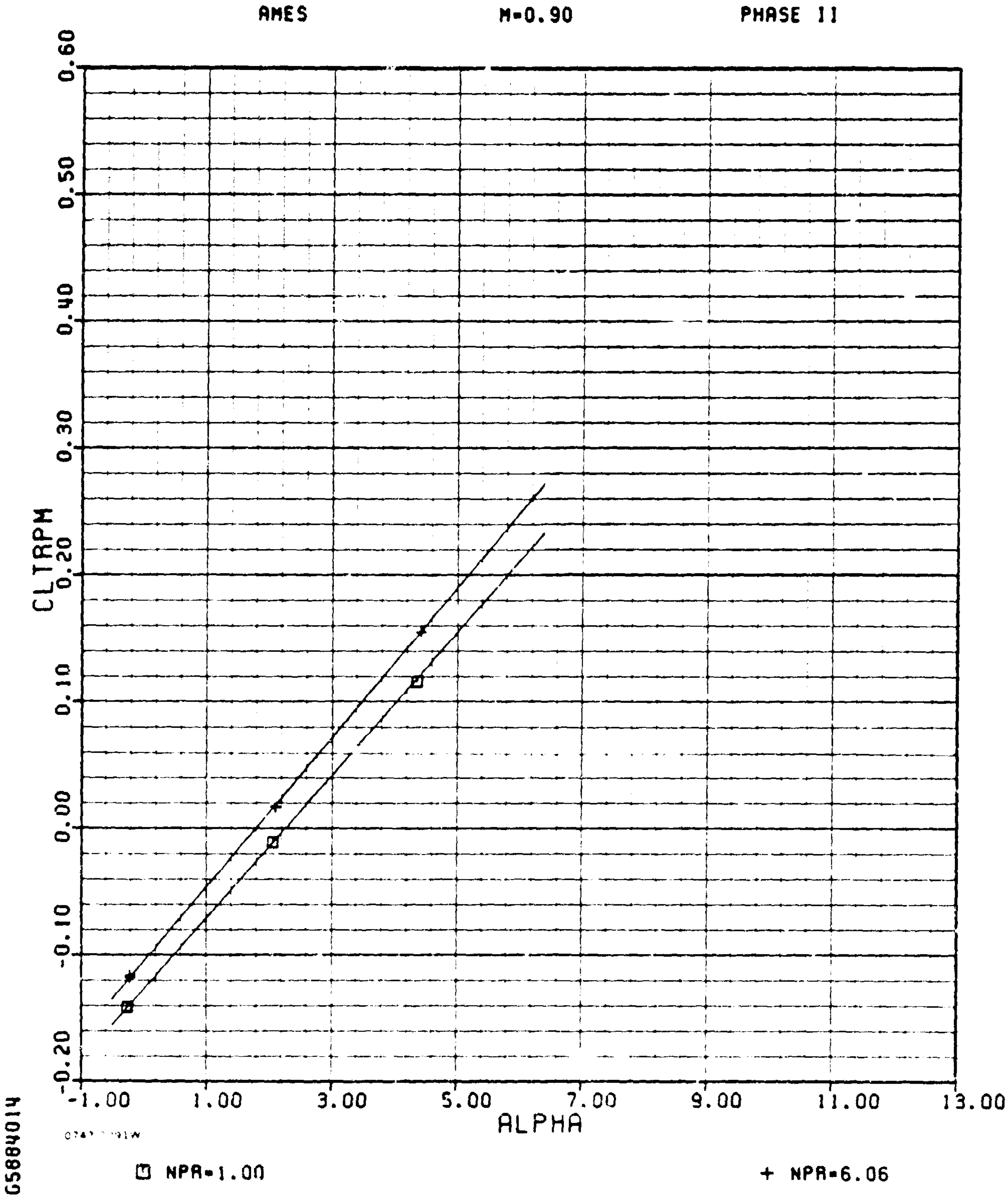
ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRFM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G5884014
0747.0089W
NPR=1.00
+ NPR=1.66
NPR=3.03



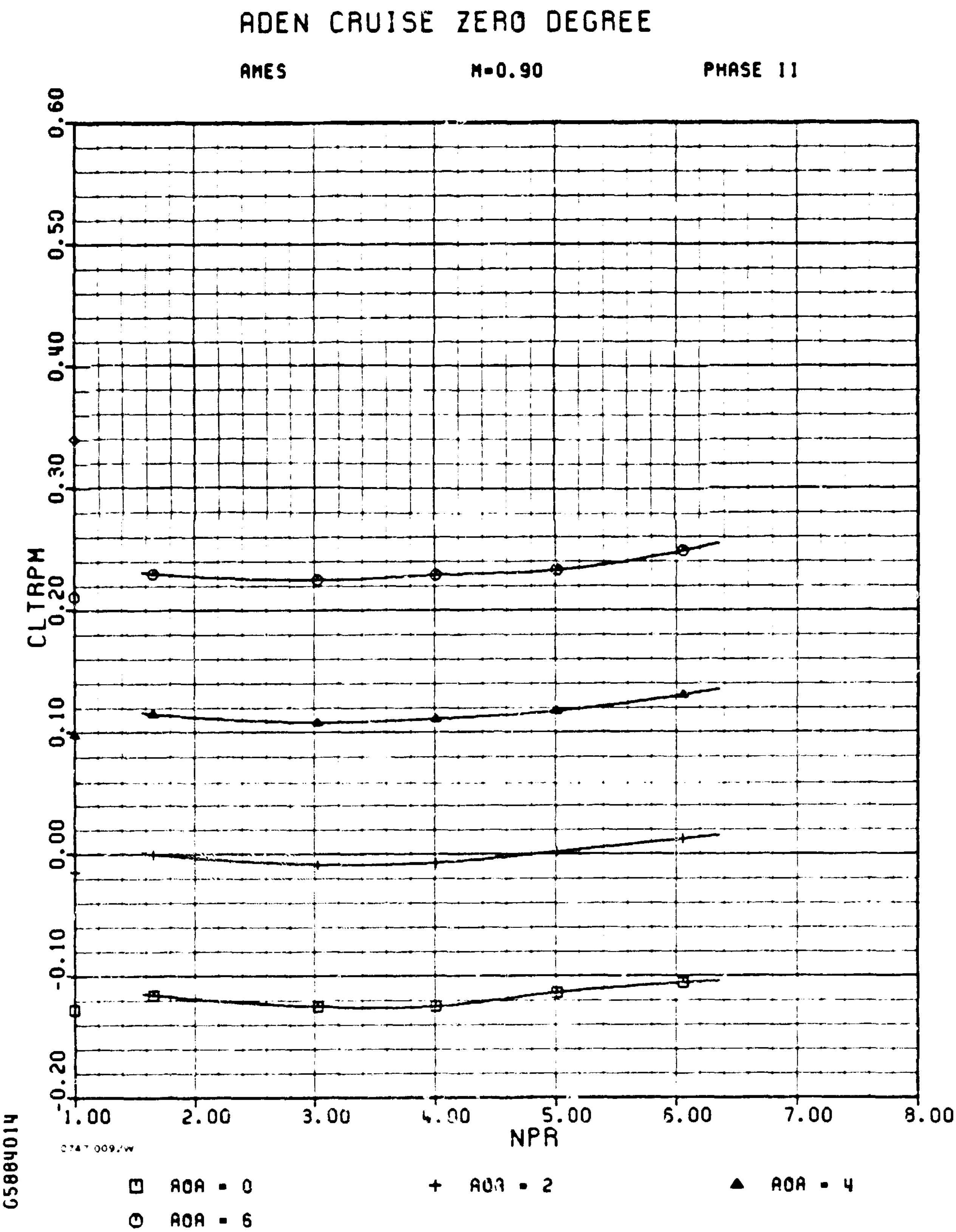
G5881014

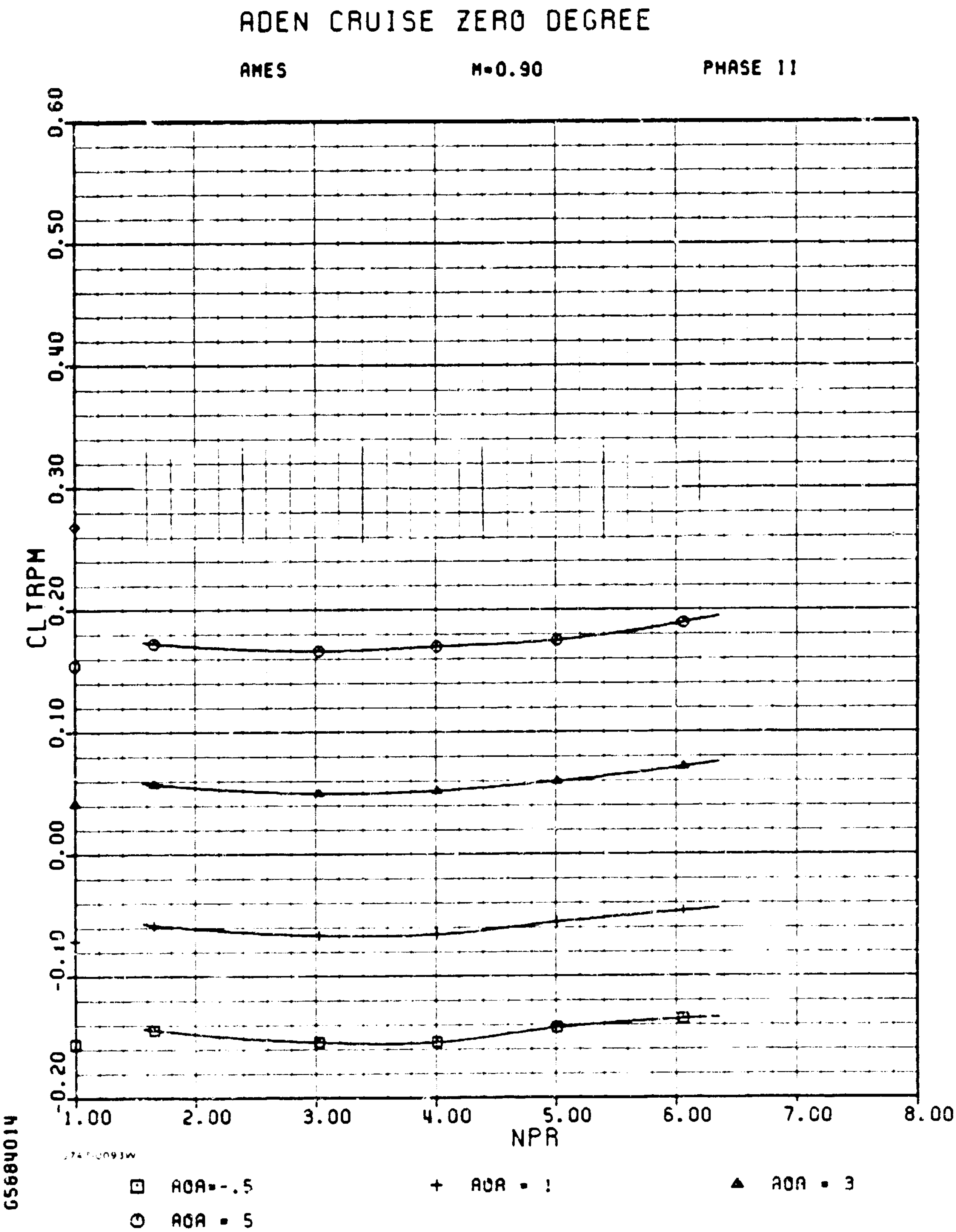
D-4(a) (cont.)

ADEN CRUISE ZERO DEGREE

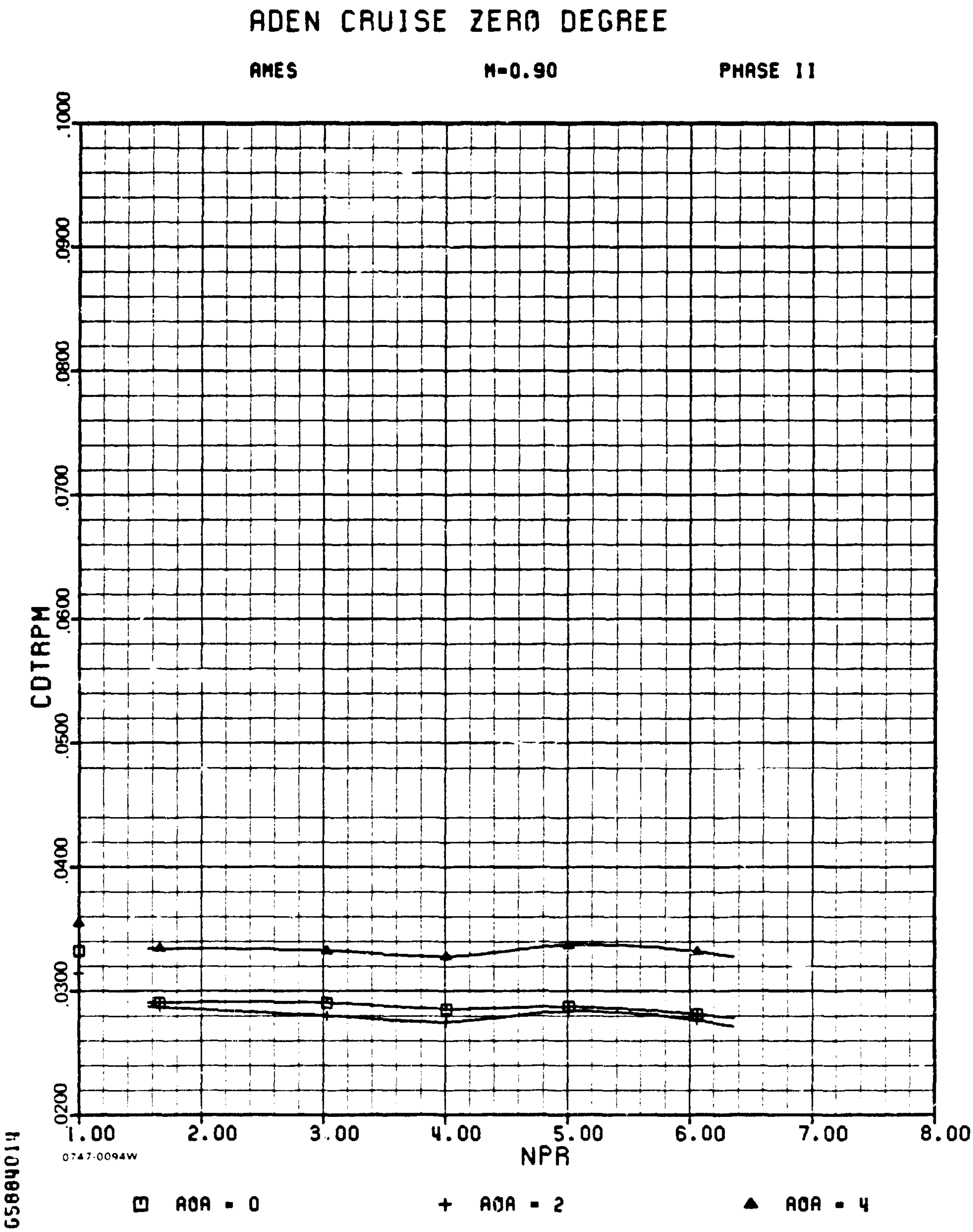


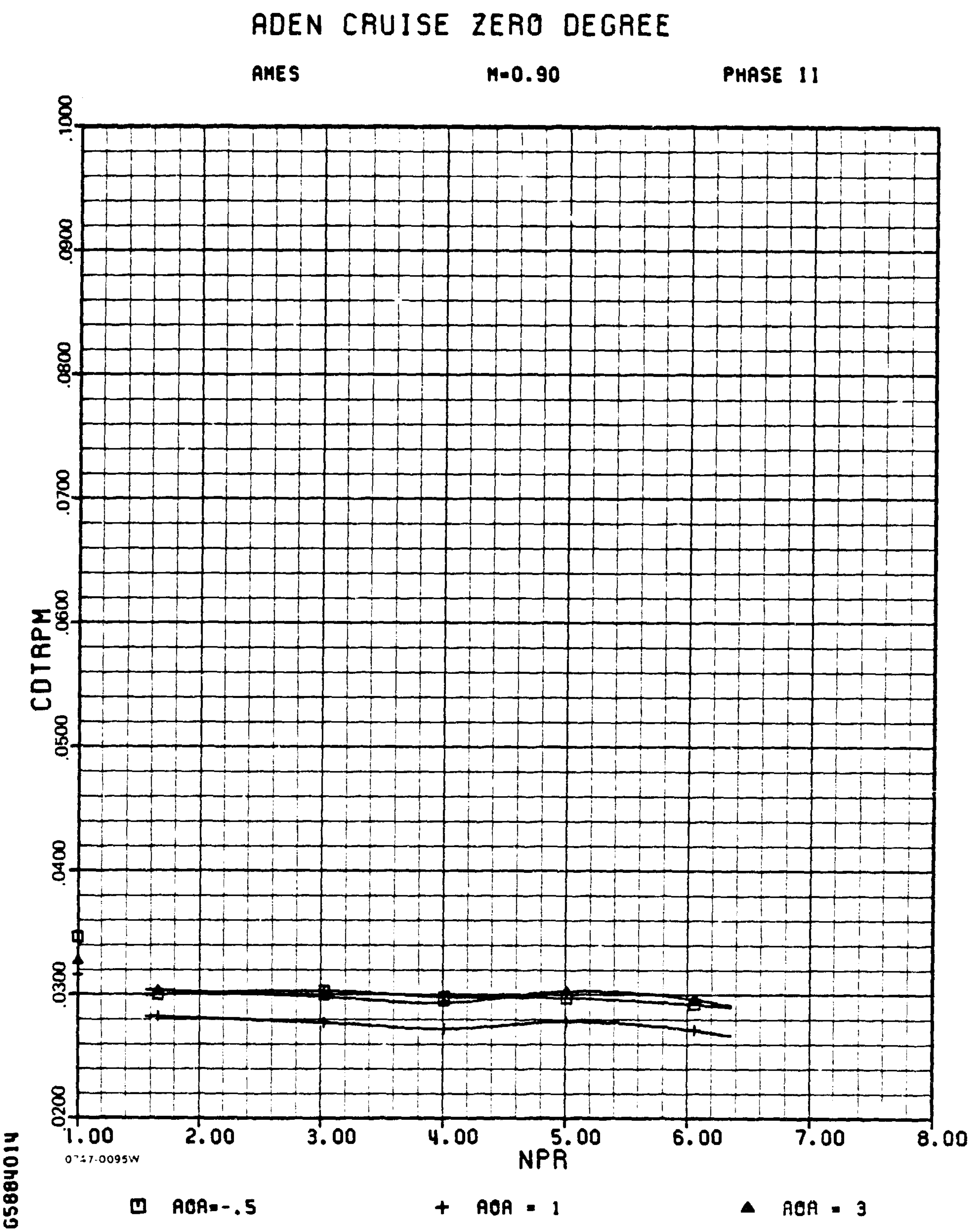
D-4(a) (concl.)


ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 0
AOA = 2
AOA = 4
AOA = 6
G5884014


ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
G5684014

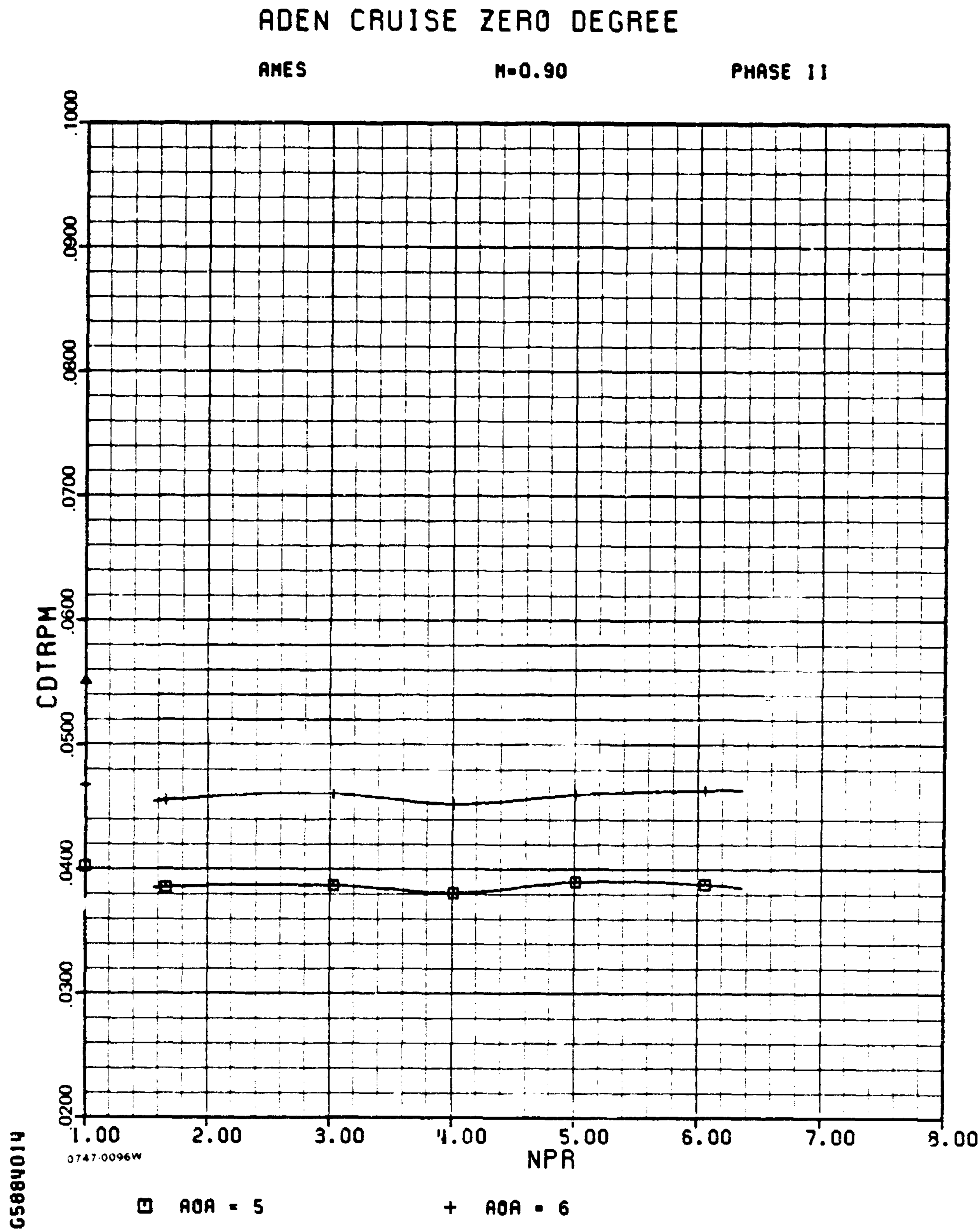
D-4(b) (concl.)


ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0094W
G5884014
AOA = 0
AOA = 2
AOA = 4



ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0095W
G5884014
AOA=-.5
AOA = 1
AOA = 3

D-4(c)(cont.)

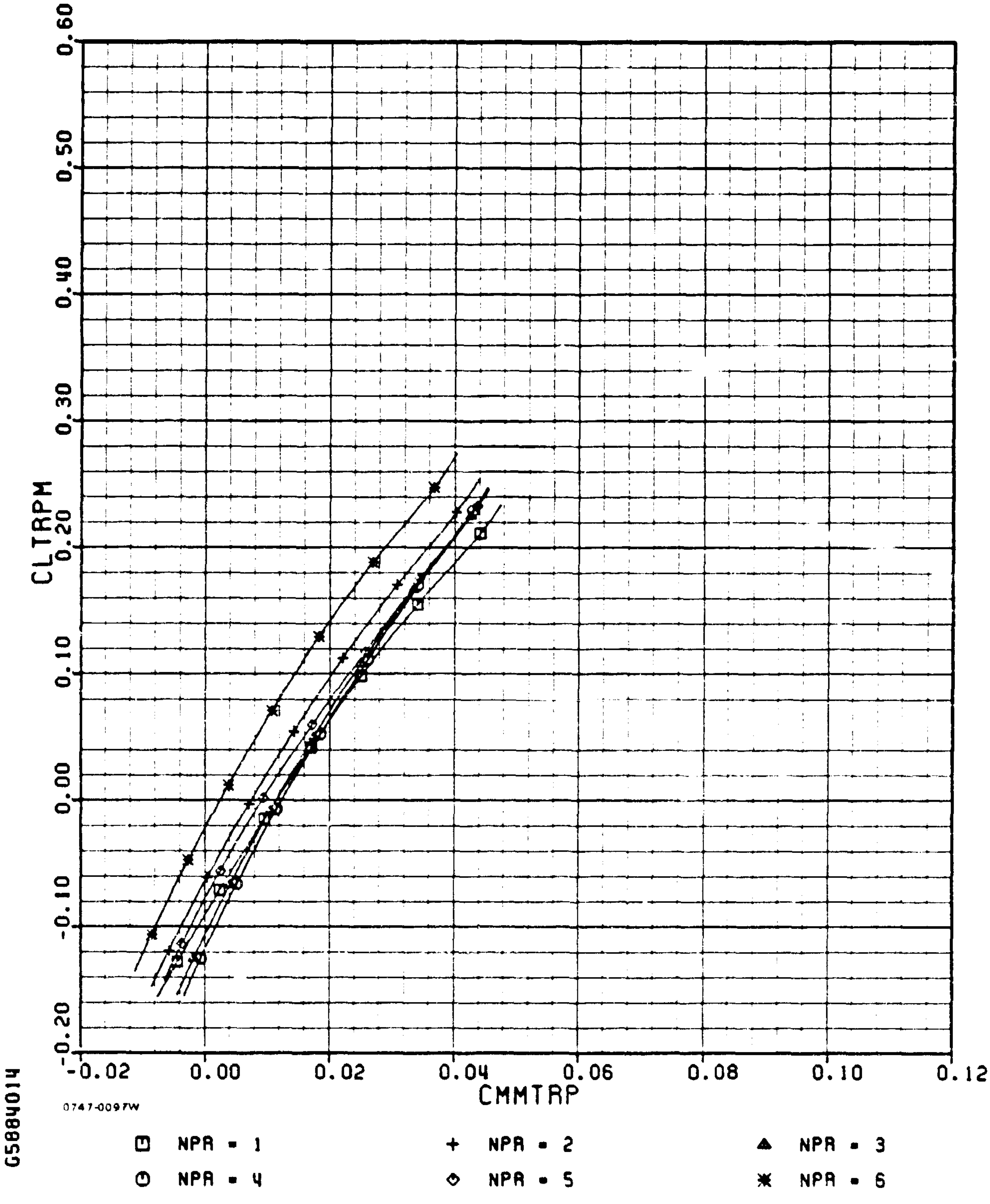


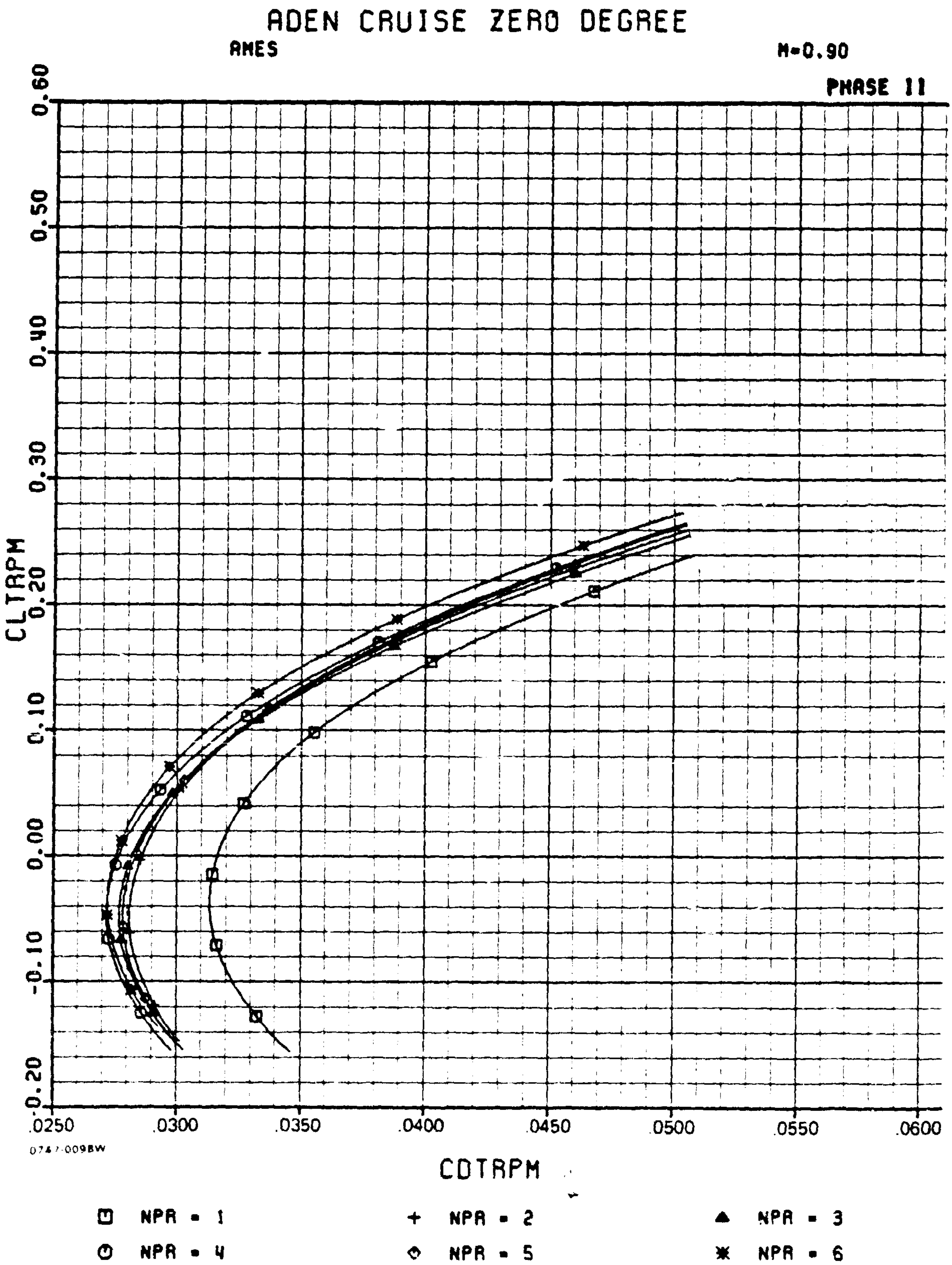
ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0096W
G5884014
AOA = 5
+ AOA = 6

D-4(c)(concl.)

ADEN CRUISE ZERO DEGREE

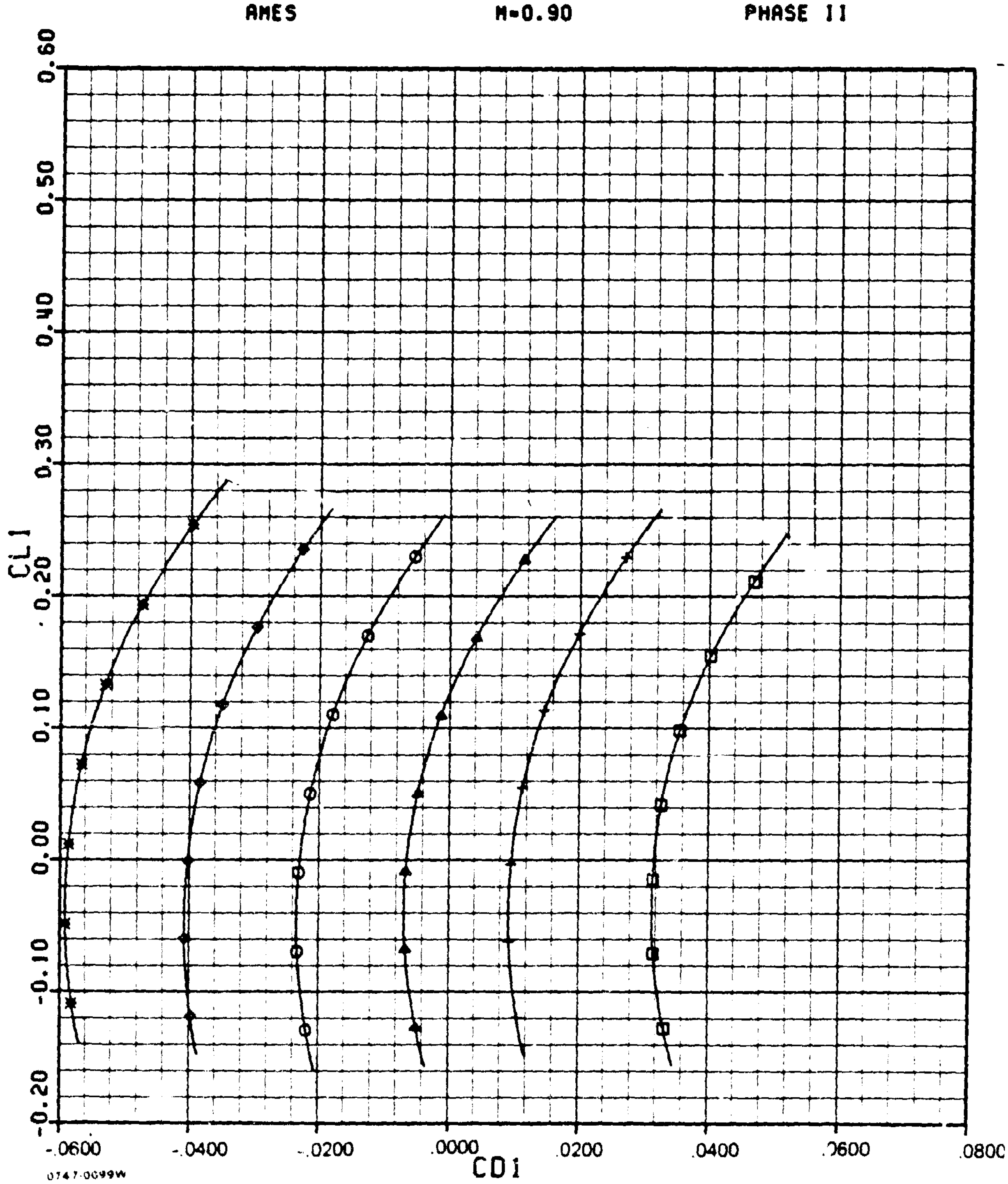
AMES M=0.90 PHASE II




ADEN CRUISE ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
0747-009BW
CDTRPM
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN CRUISE ZERO DEGREE

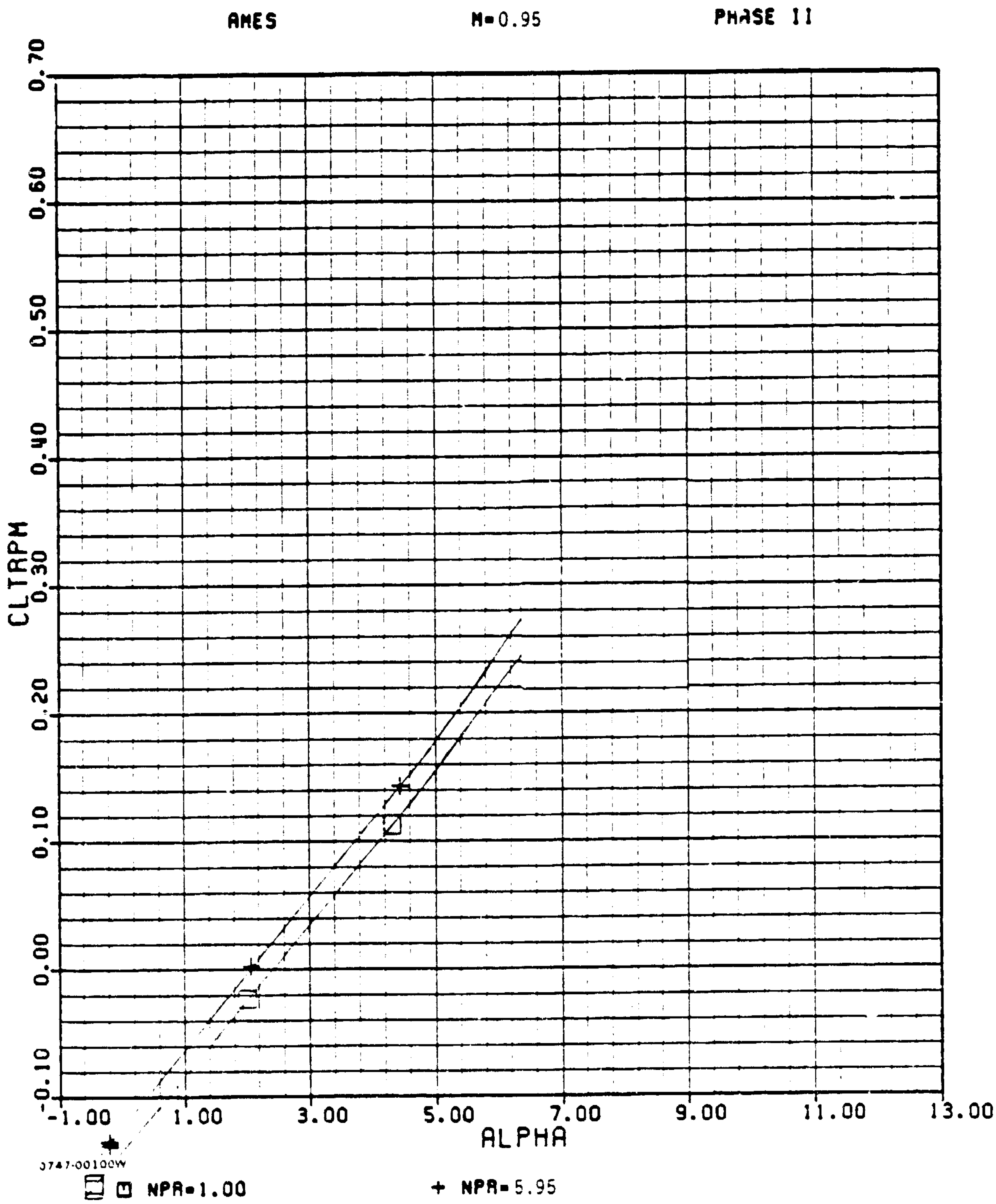
AMES M=0.90 PHASE II



□ NPR = 1 + NPR = 2 ▲ NPR = 3

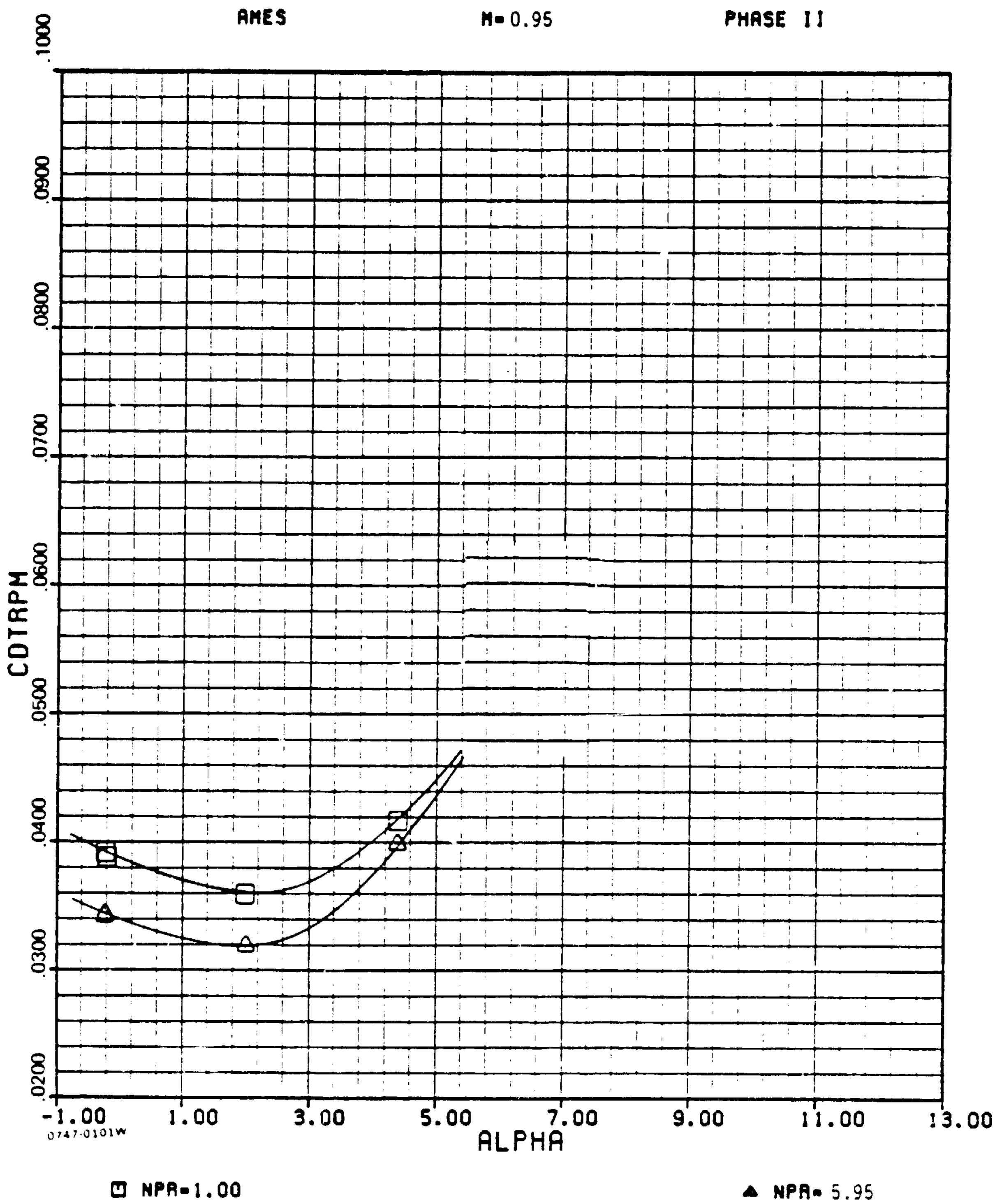
ʘ NPR = 4 ◇ NPR = 5 ✱ NPR = 6

ADEN CRUISE ZERO DEGREE

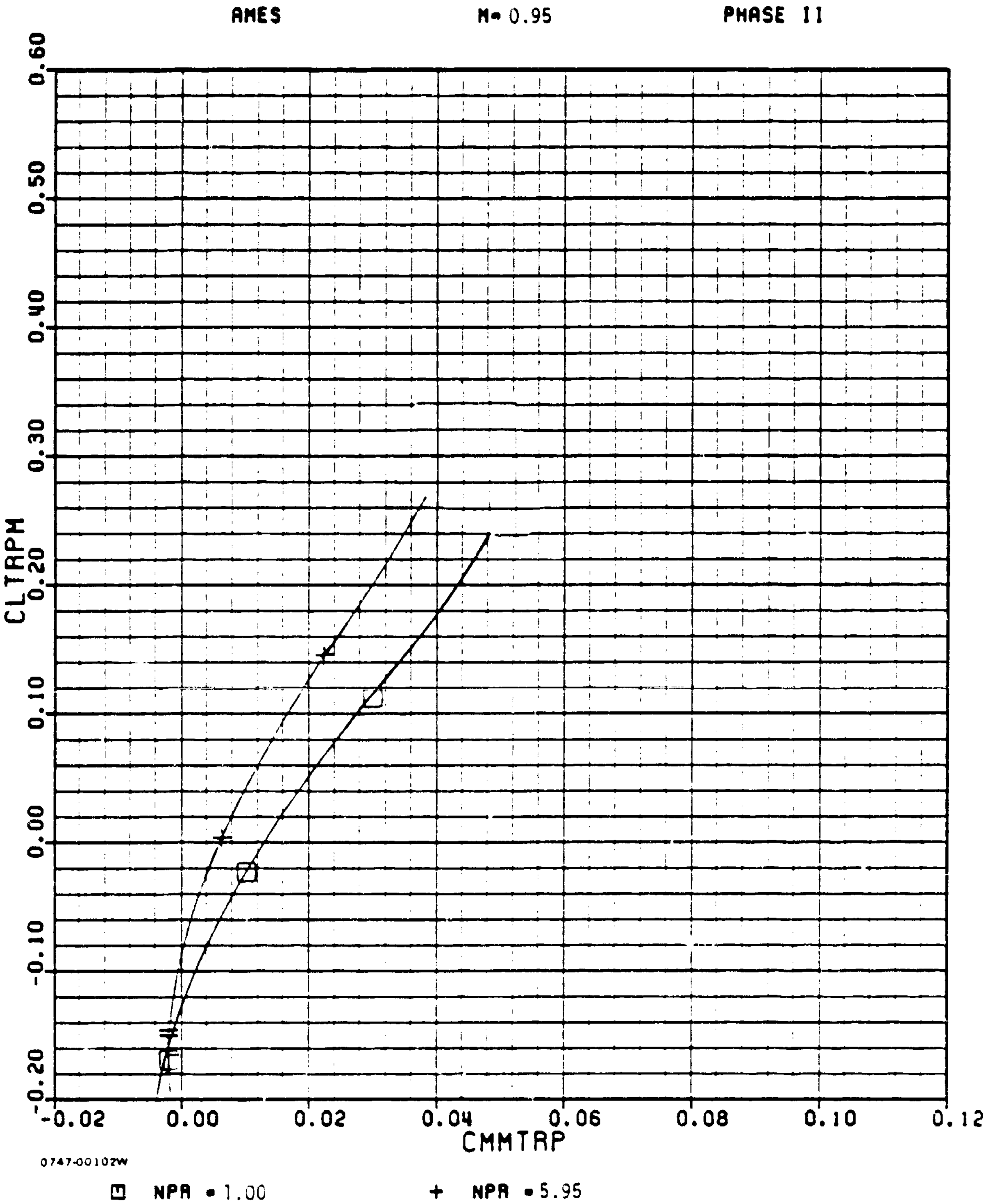


ORIGINAL PAGE IS
OF POOR QUALITY

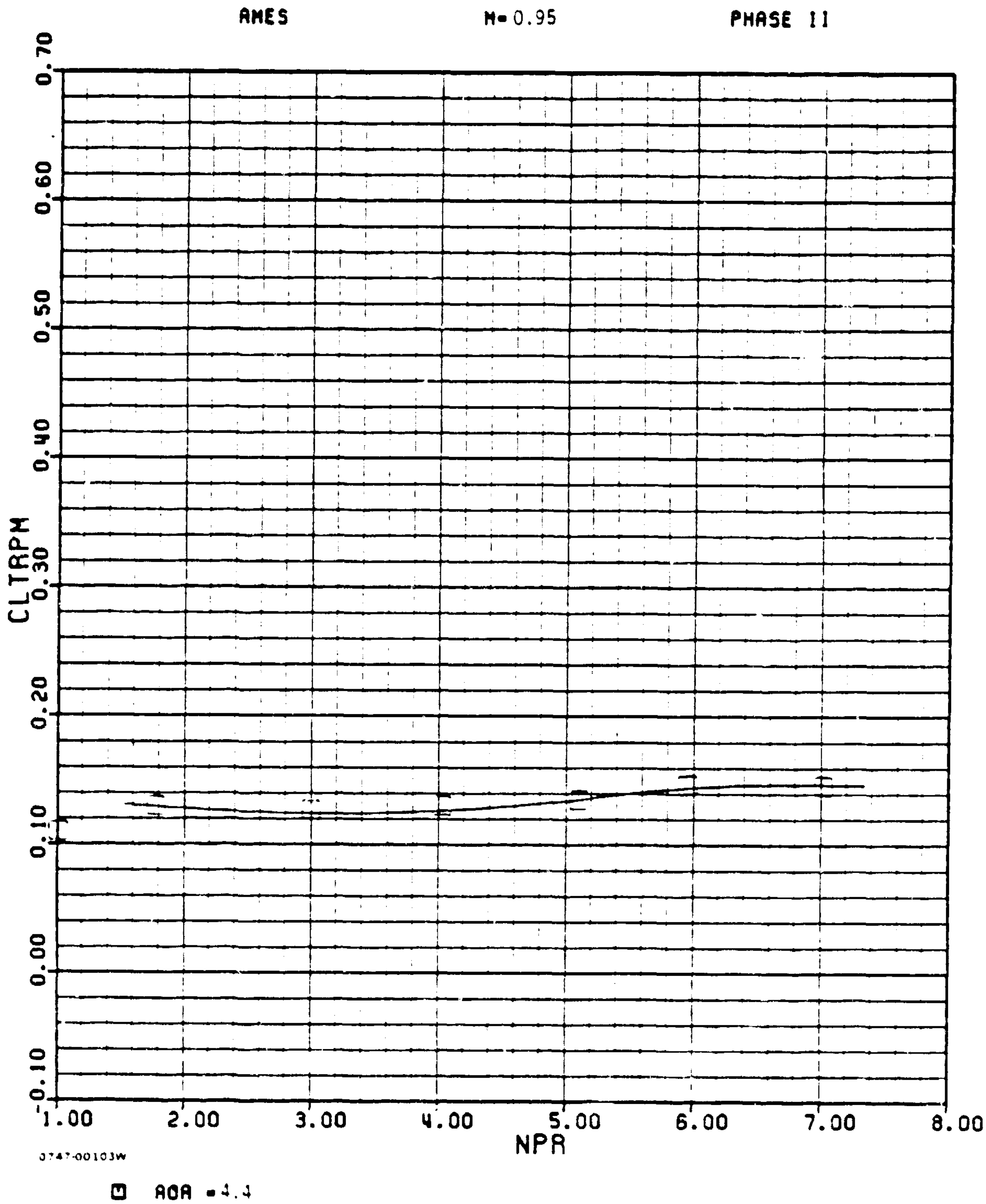
ADEN CRUISE ZERO DEGREE



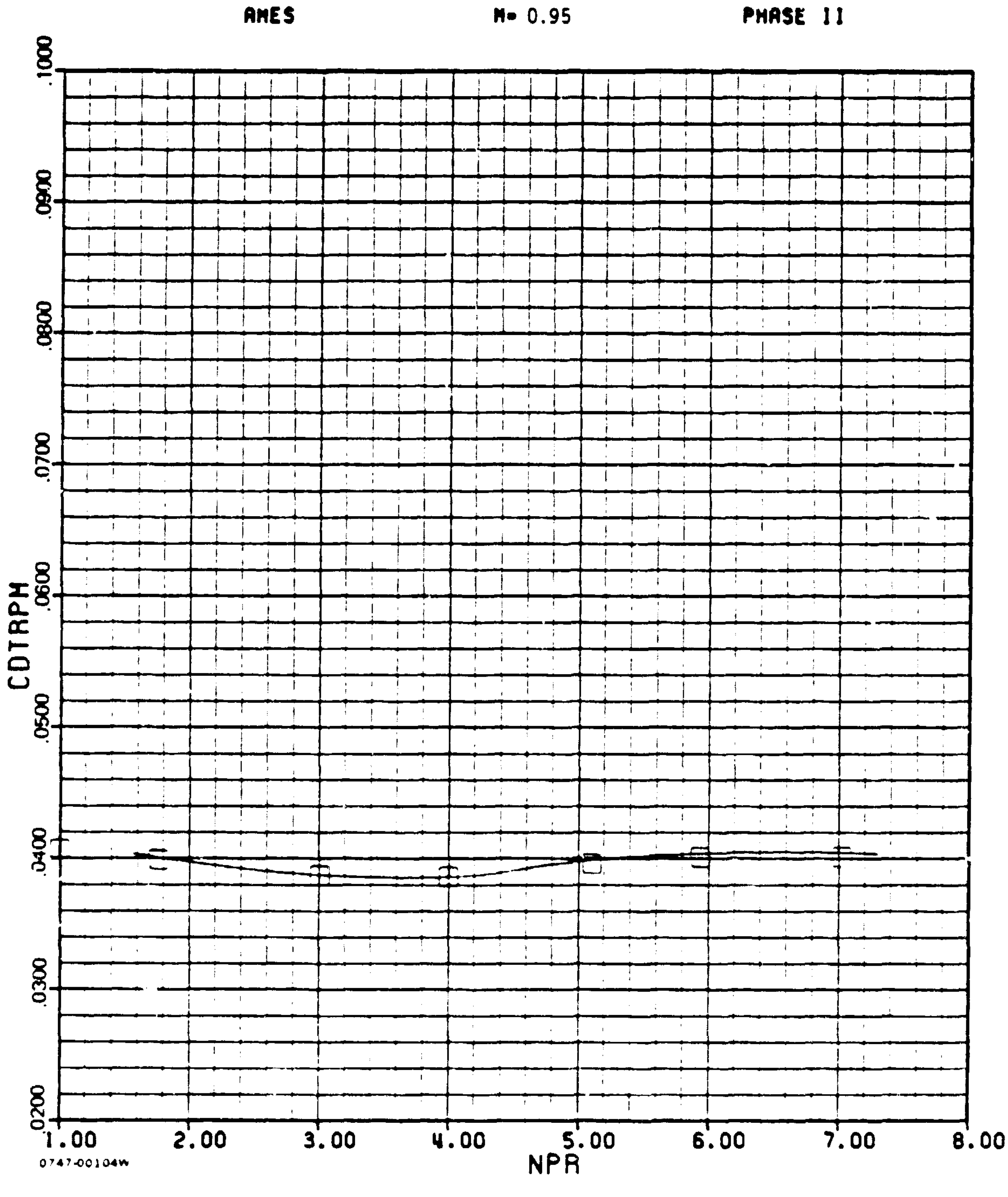
ADEN CRUISE ZERO DEGREE



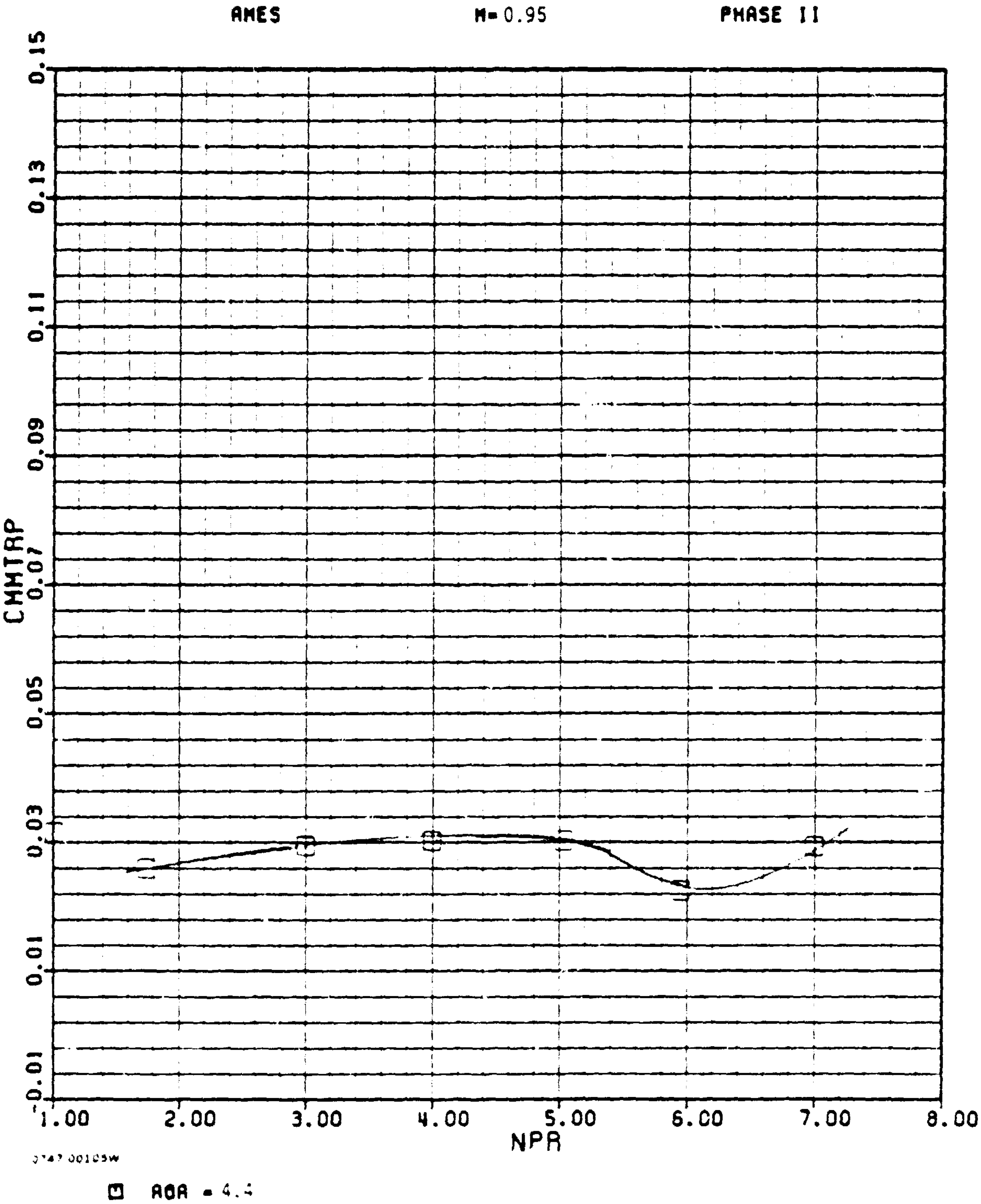
ADEN CRUISE ZERO DEGREE

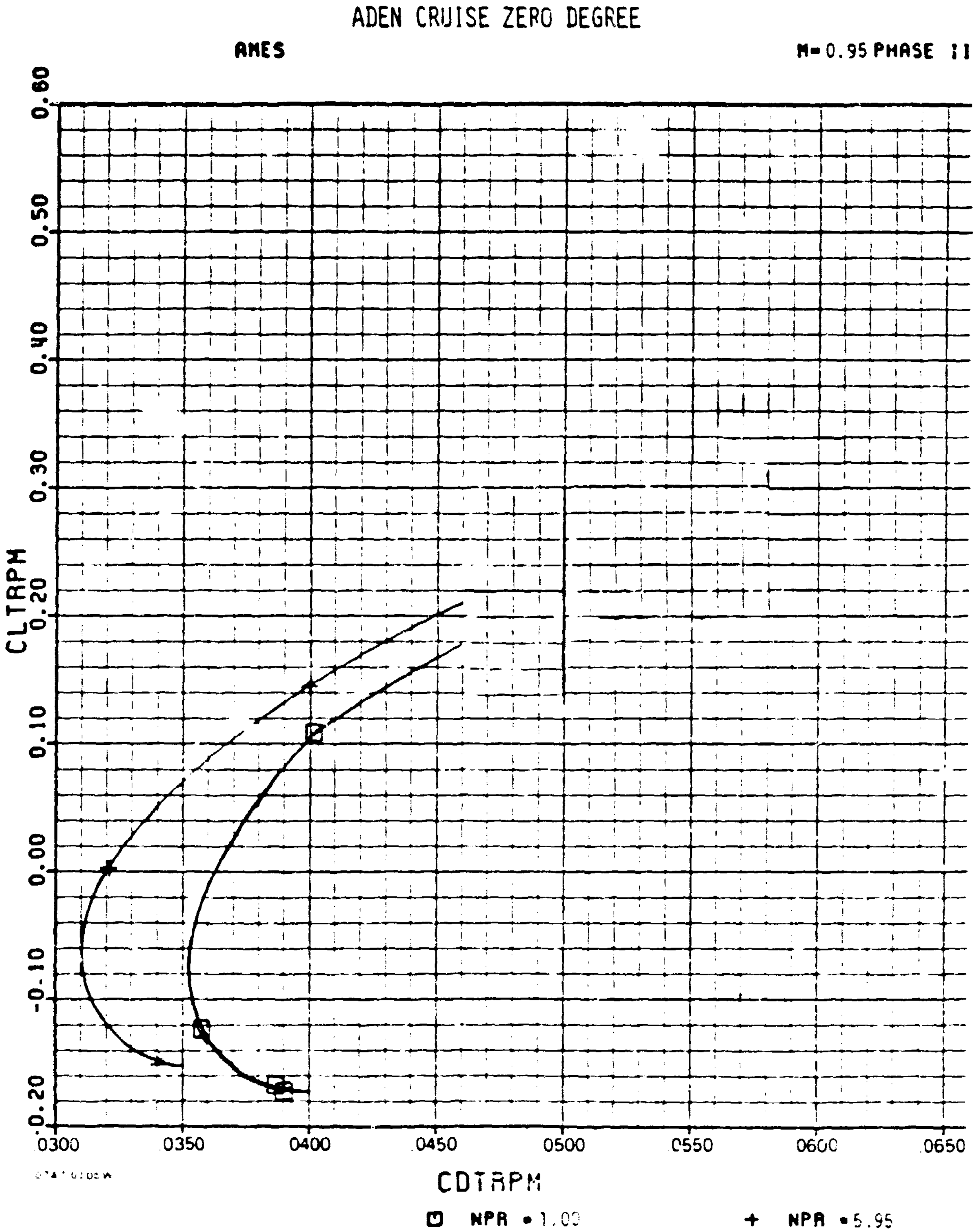


ADEN CRUISE ZERO DEGREE



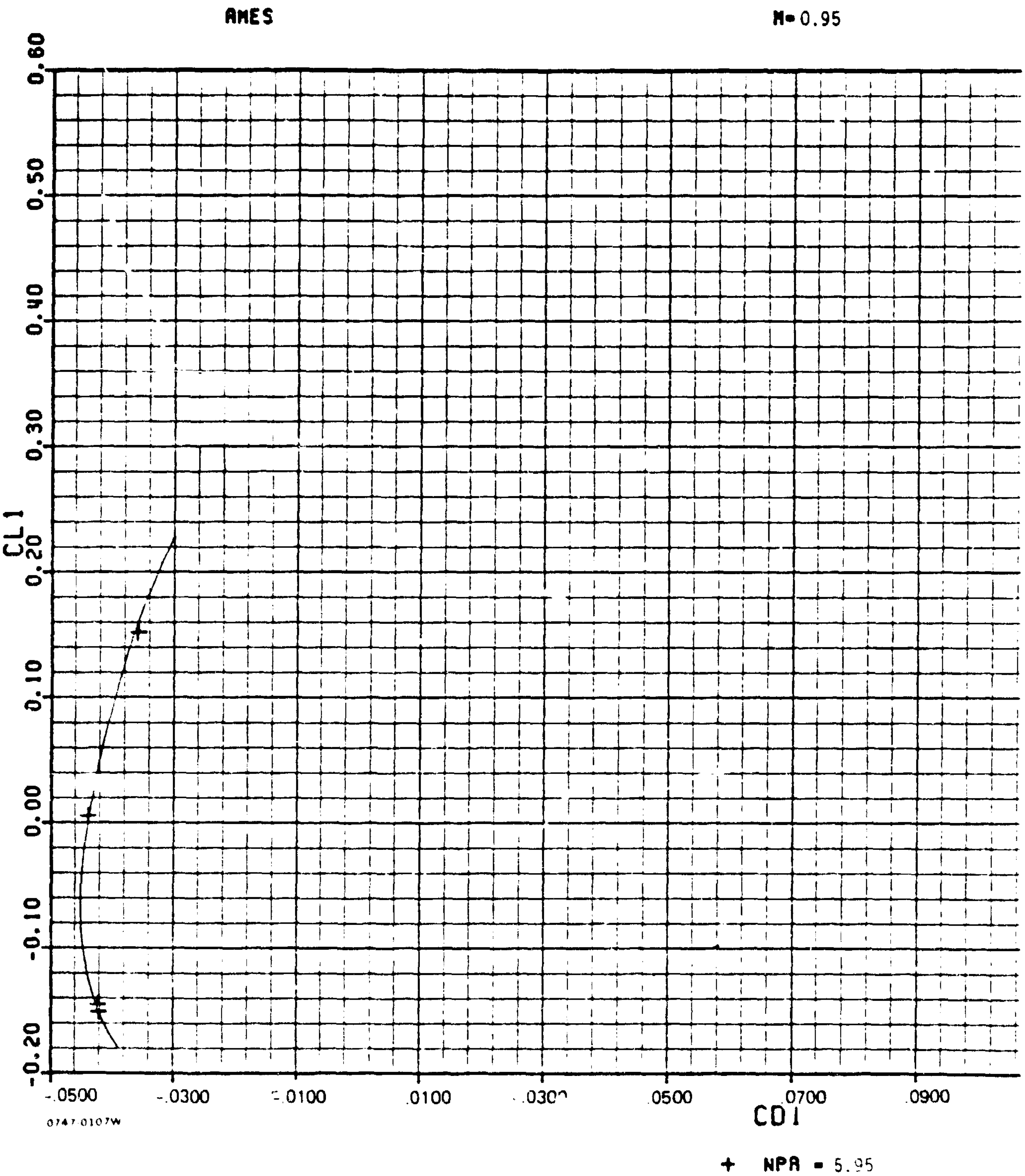
ADEN CRUISE ZERO DEGREE



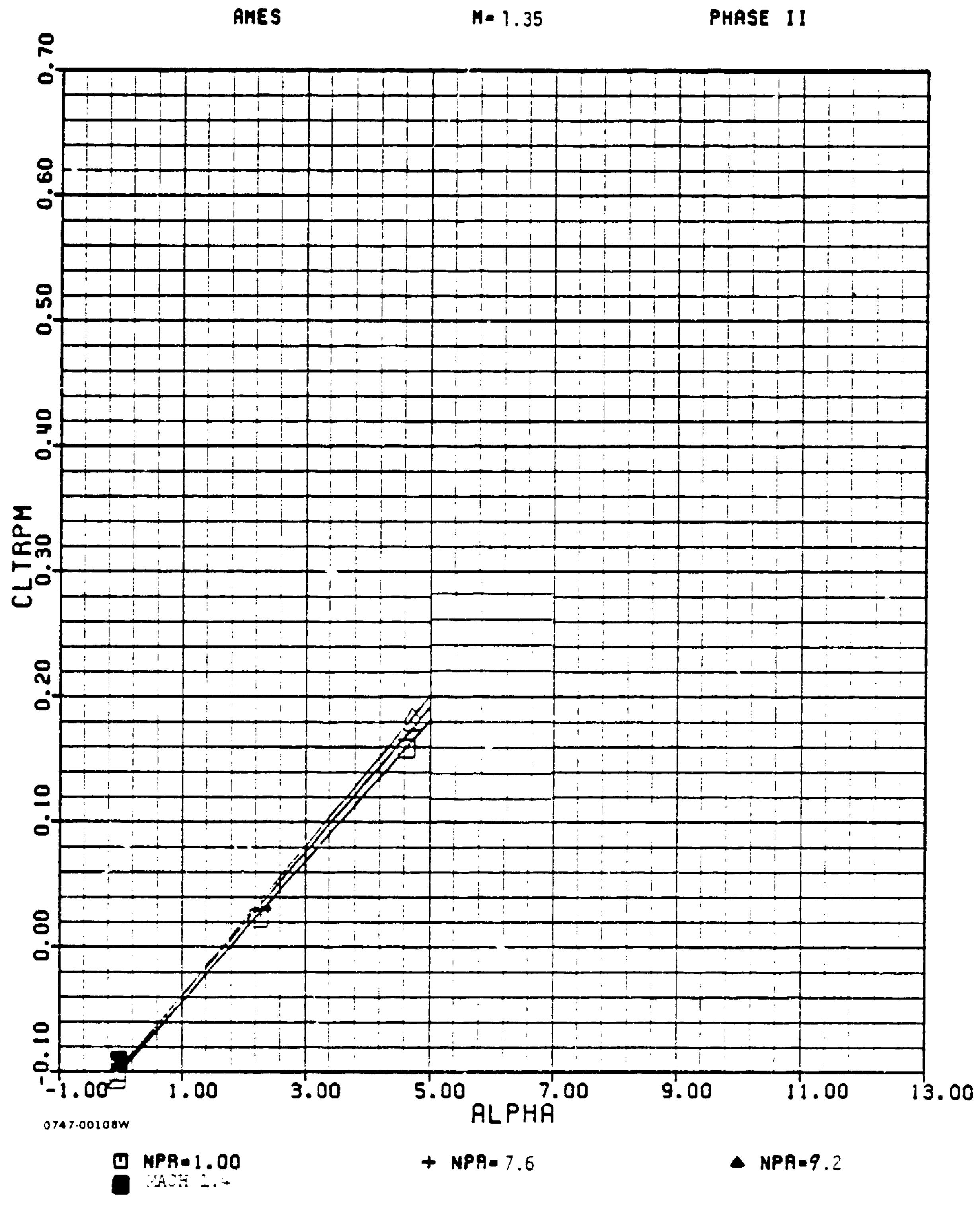


ADEN CRUISE ZERO DEGREE
AMES
M= 0.95 PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0300
.0350
.0400
.0450
.0500
.0550
.0600
.0650
CDTRPM
NPR = 1.00
NPR = 5.95

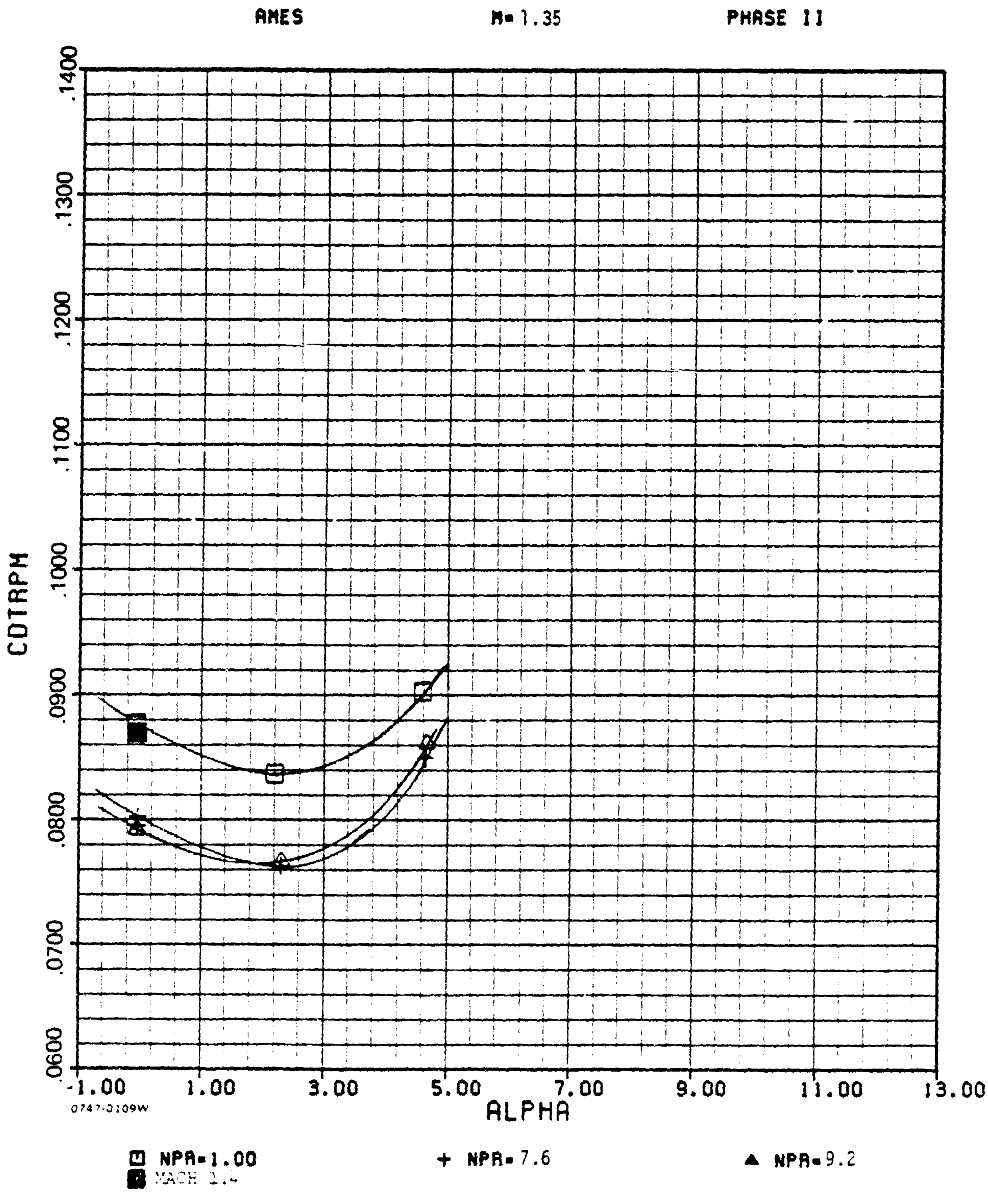
ADEN CRUISE ZERO DEGREE



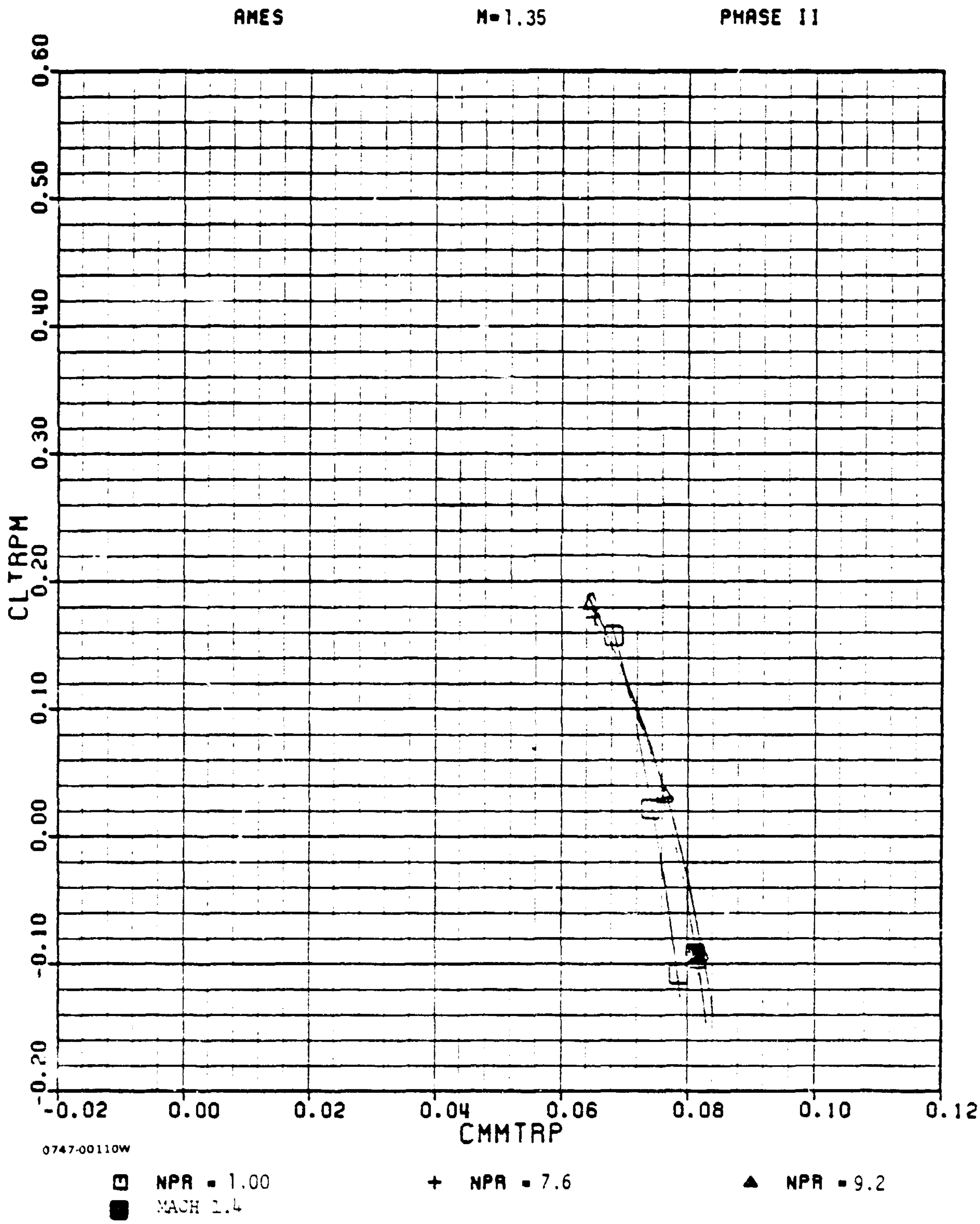
ADEN CRUISE ZERO DEGREE

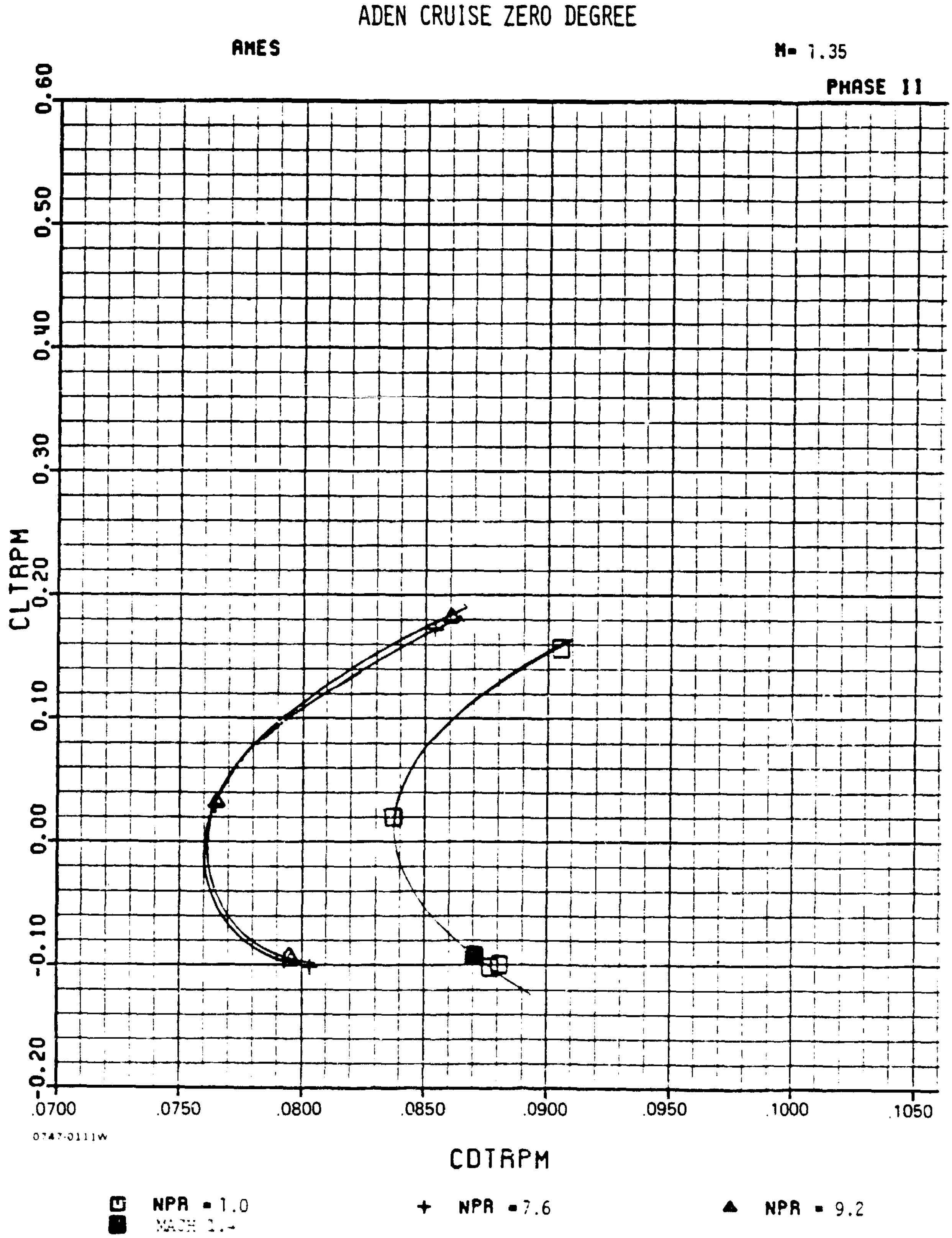


ADEN CRUISE ZERO DEGREE

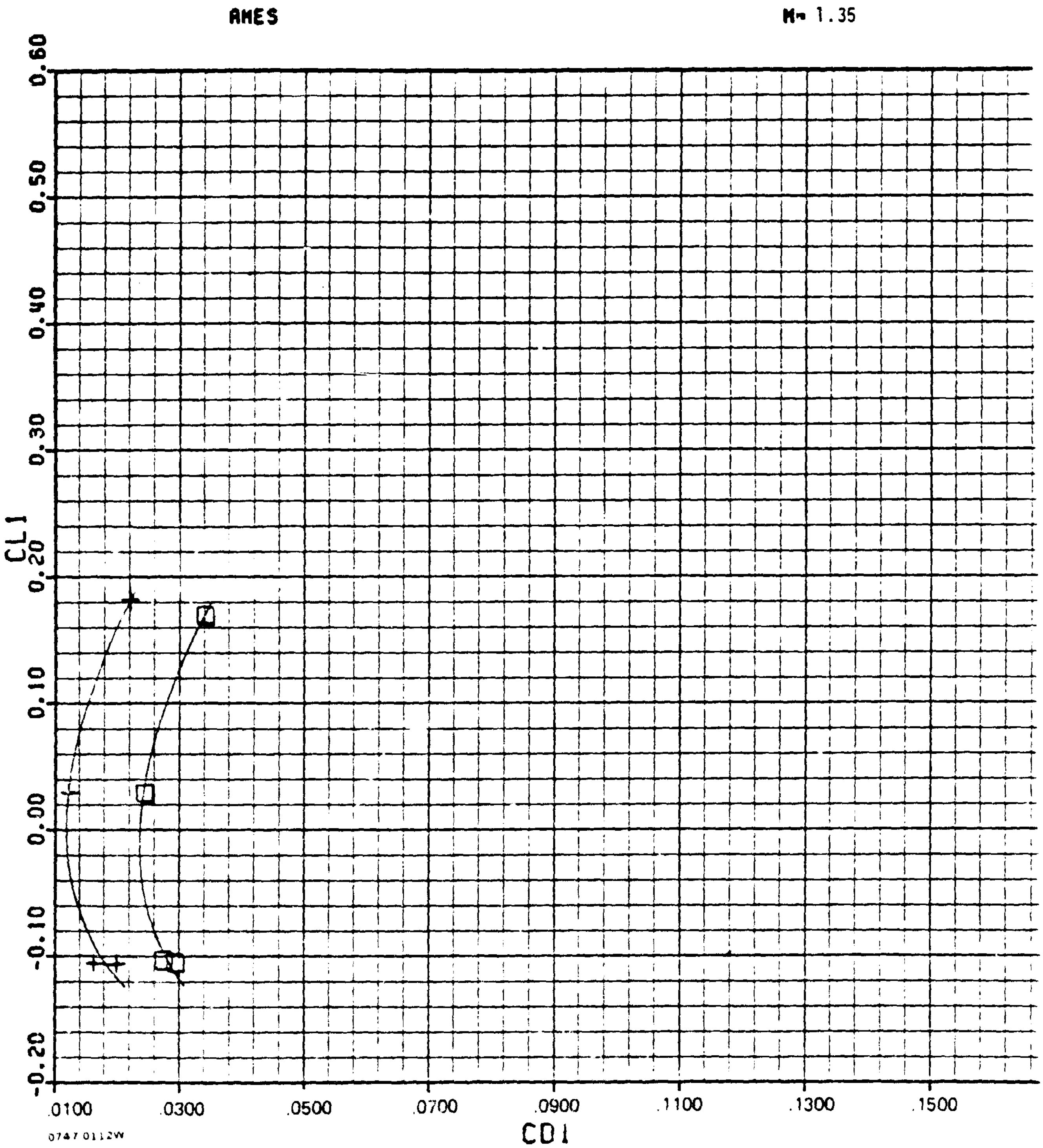


ADEN CRUISE ZERO DEGREE




ADEN CRUISE ZERO DEGREE
AMES
M= 1.35
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0700
.0750
.0800
.0850
.0900
.0950
.1000
.1050
0747-0111W
CDTRPM
NPR = 1.0
MACH 1.4
NPR = 7.6
NPR = 9.2

ADEN CRUISE ZERO DEGREE

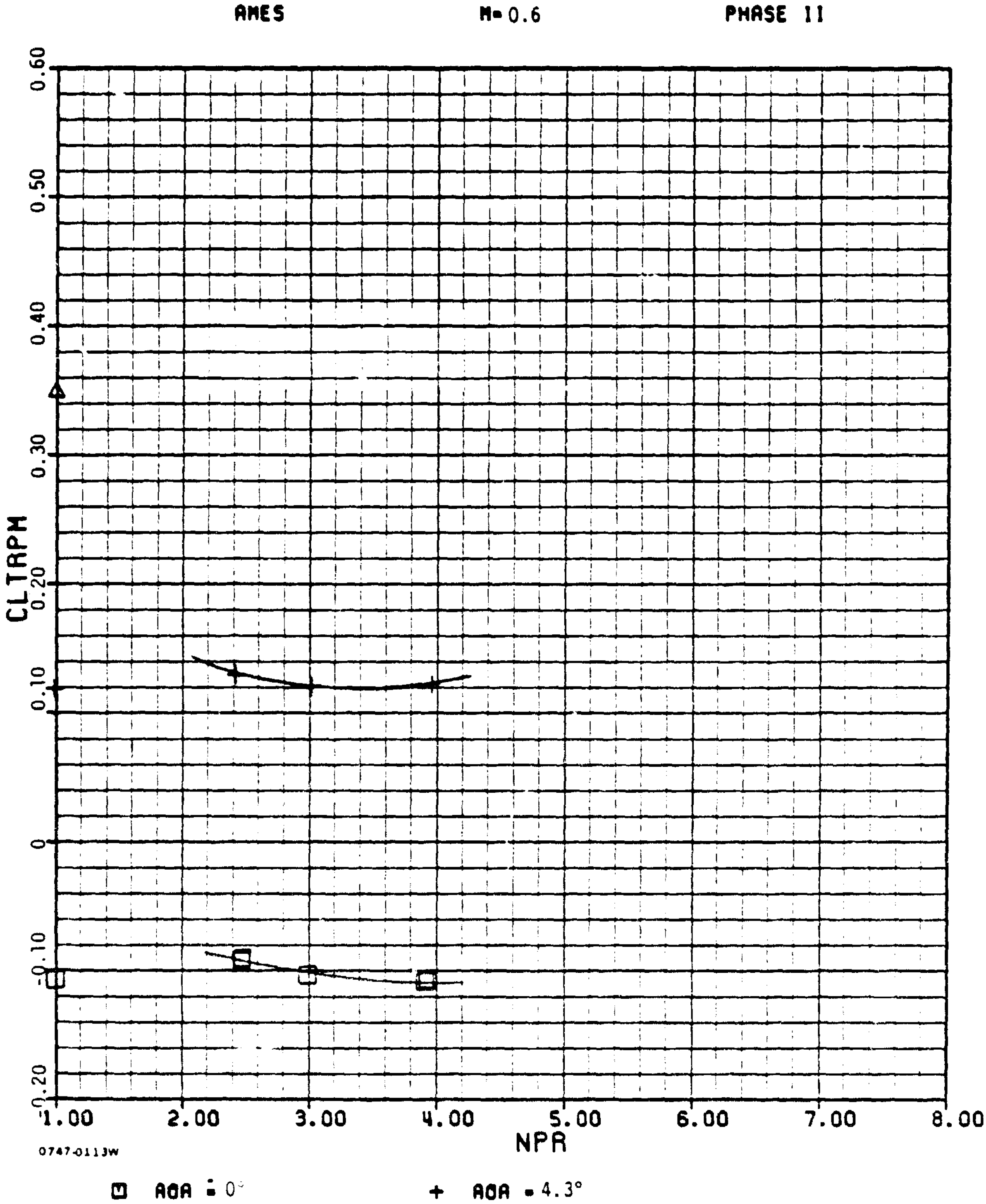


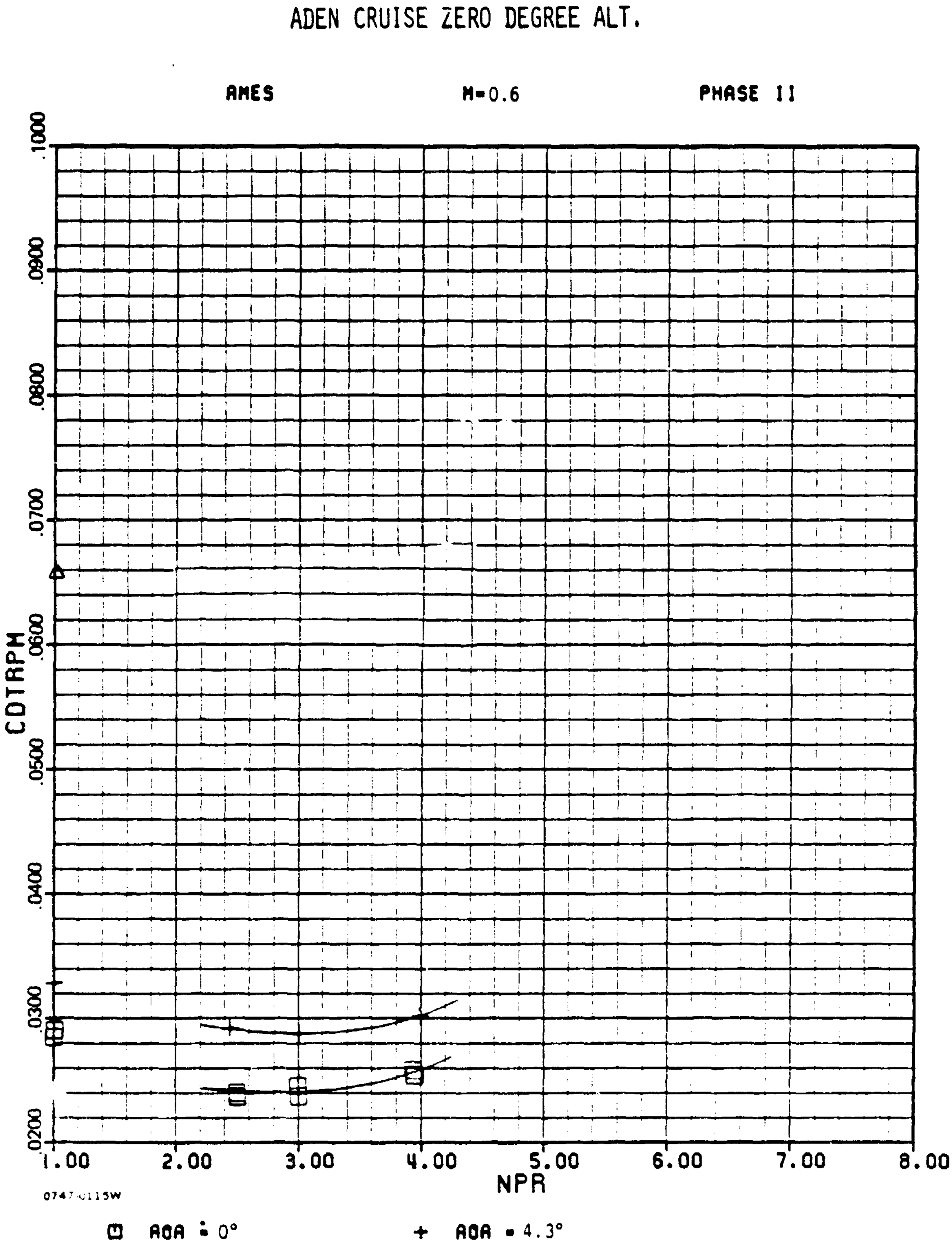
NPR = 7.50 - 7.70   + NPR = 9.01 - 9.27

APPENDIX E

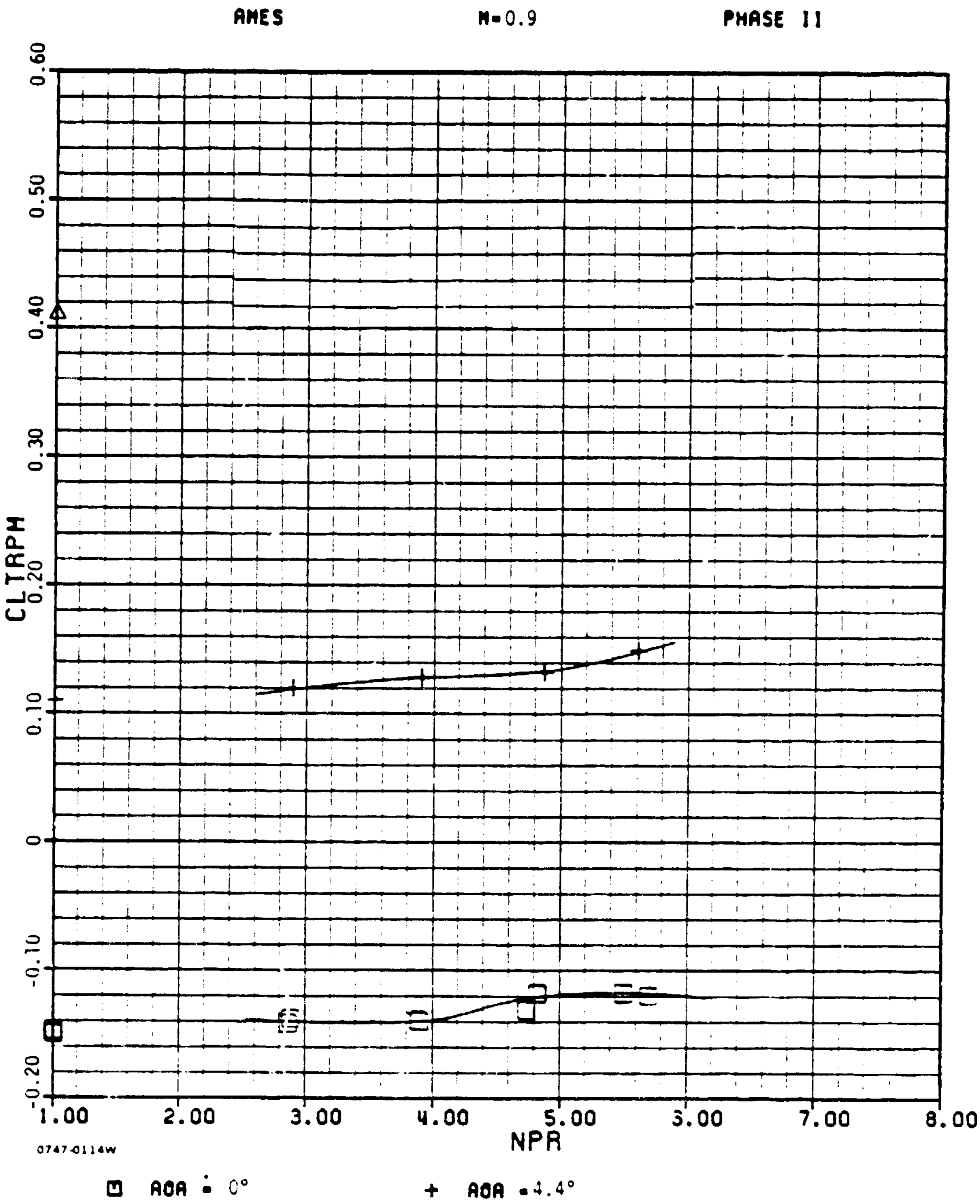
ADEN CRUISE 0^o ALT WIND-ON DATA

ADEN CRUISE ZERO DEGREE ALT.

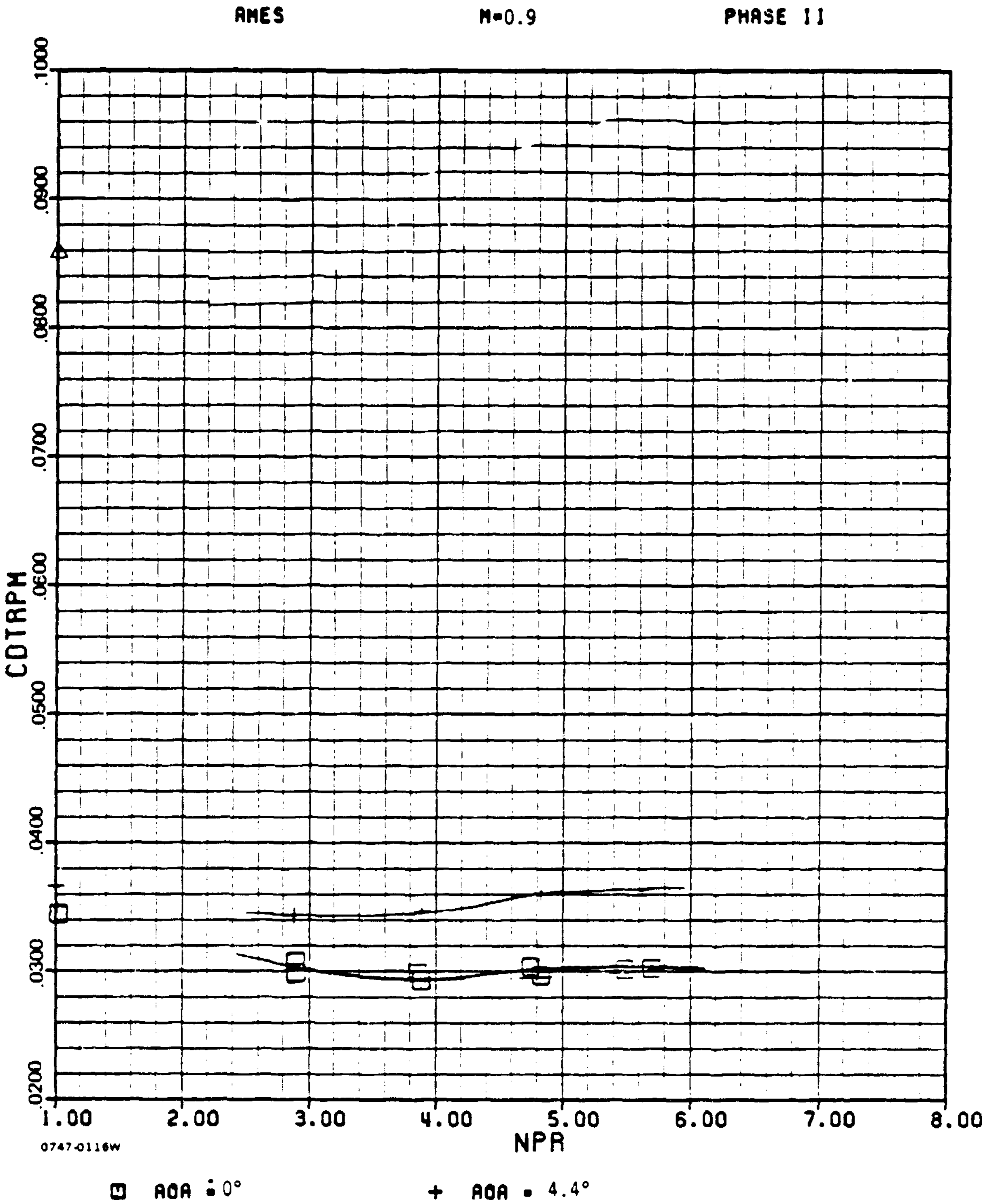



ADEN CRUISE ZERO DEGREE ALT.
AMES
M=0.6
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0115W
AOA = 0°
AOA = 4.3°

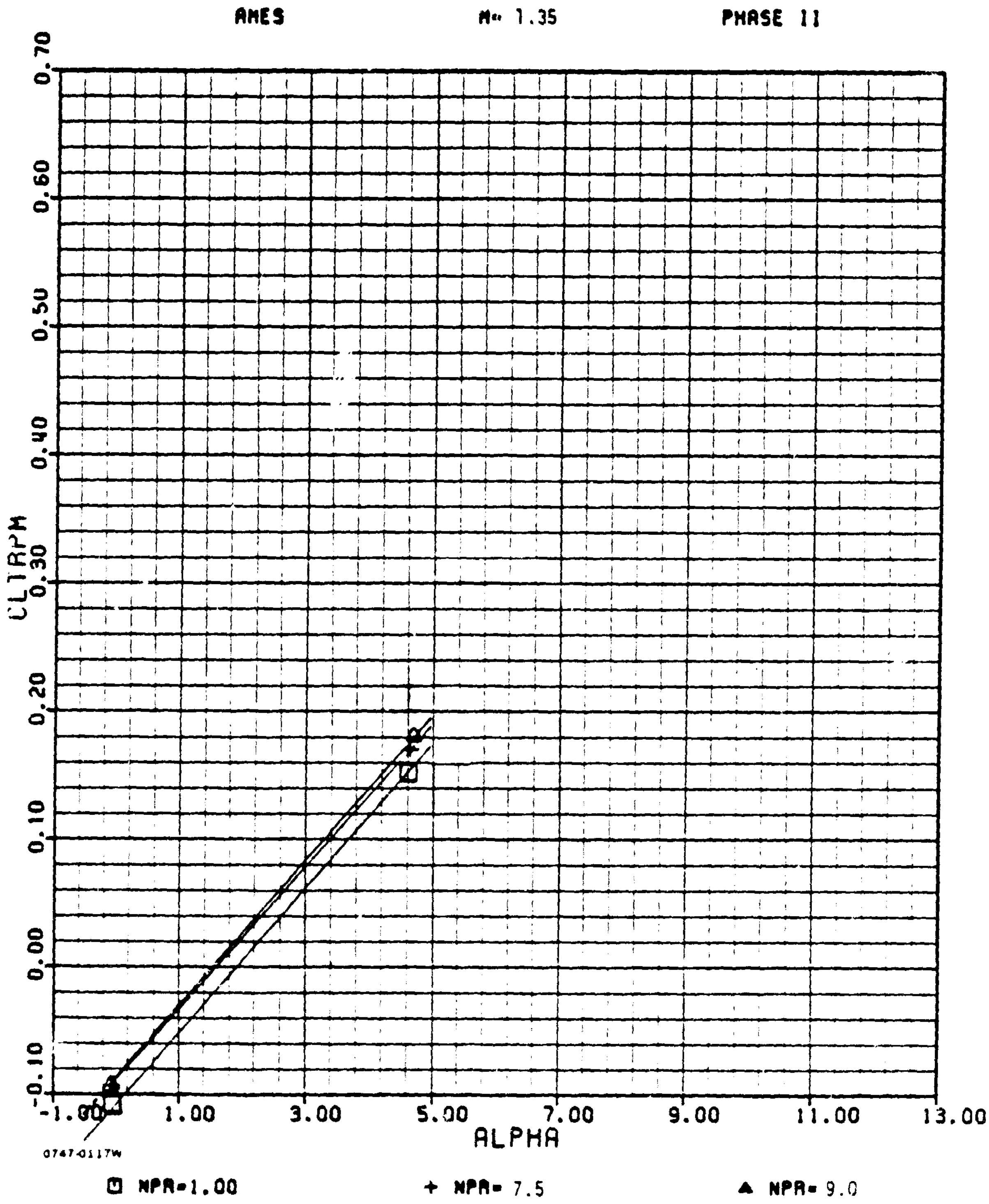
ADEN CRUISE ZERO DEGREE ALT.



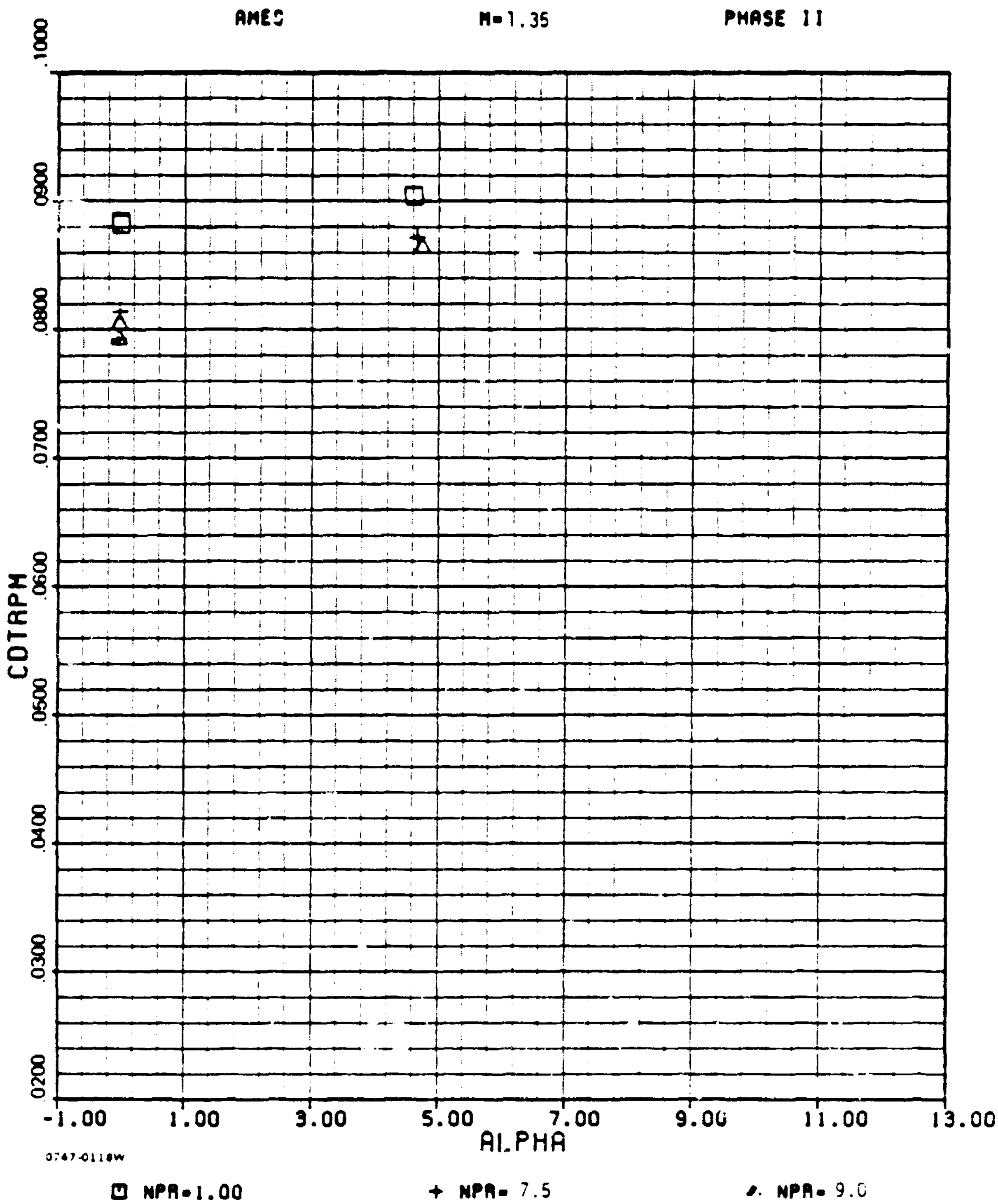
ADEN CRUISE ZERO DEGREE ALT.



ADEN CRUISE ZERO DEGREE ALT.



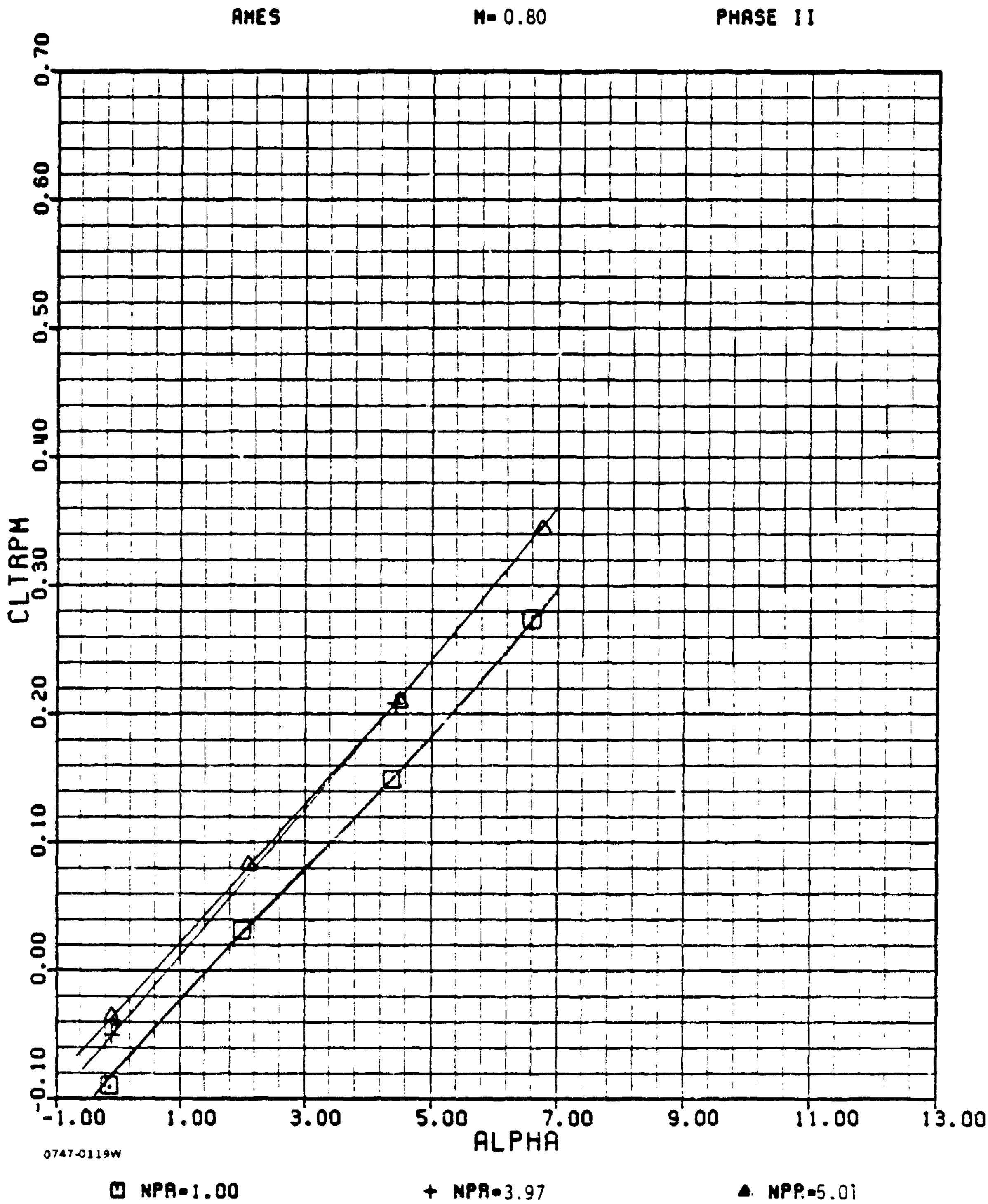
ADEN CRUISE ZERO DEGREE ALT.

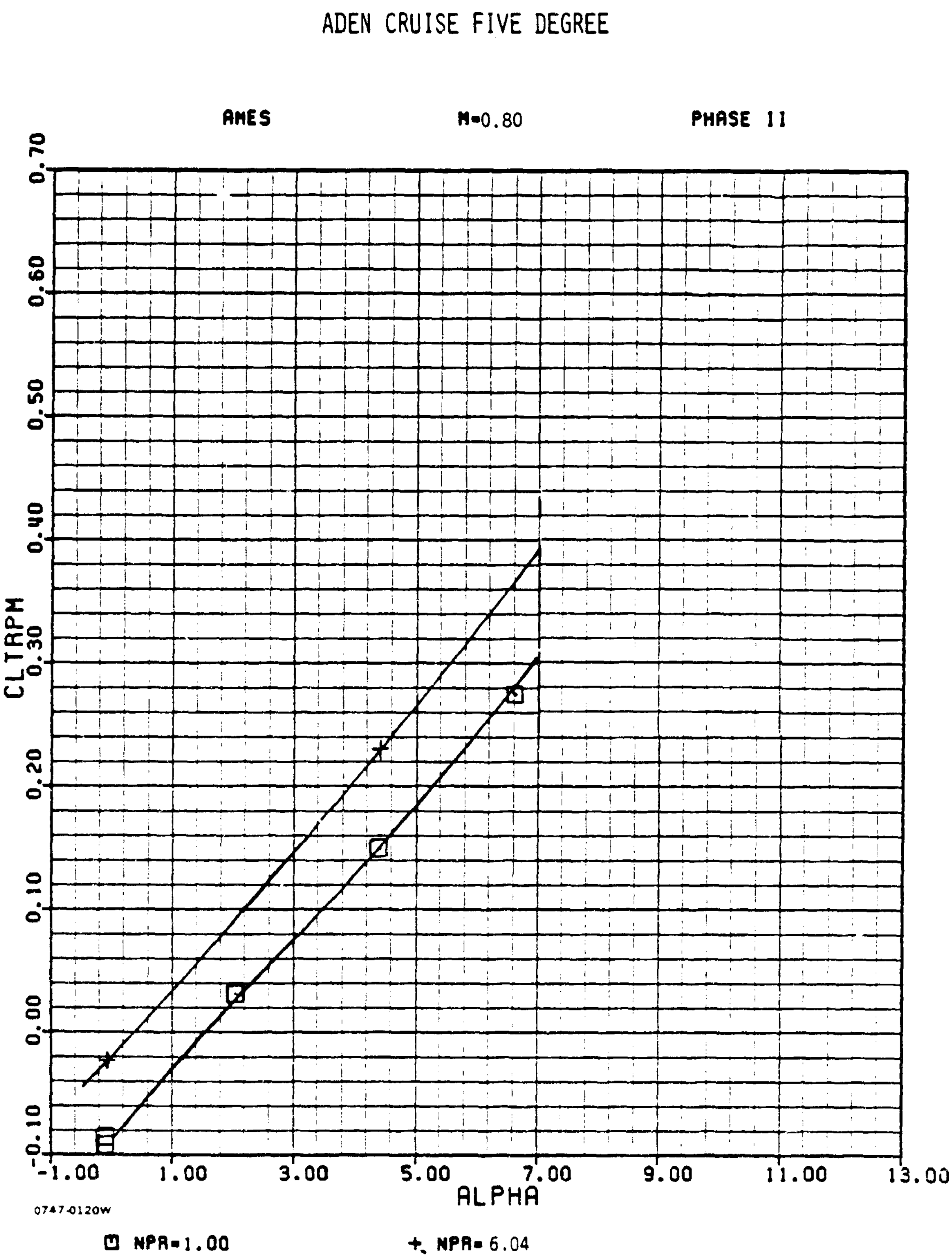


APPENDIX F

ADEN CRUISE 5^{o} WIND-ON DATA

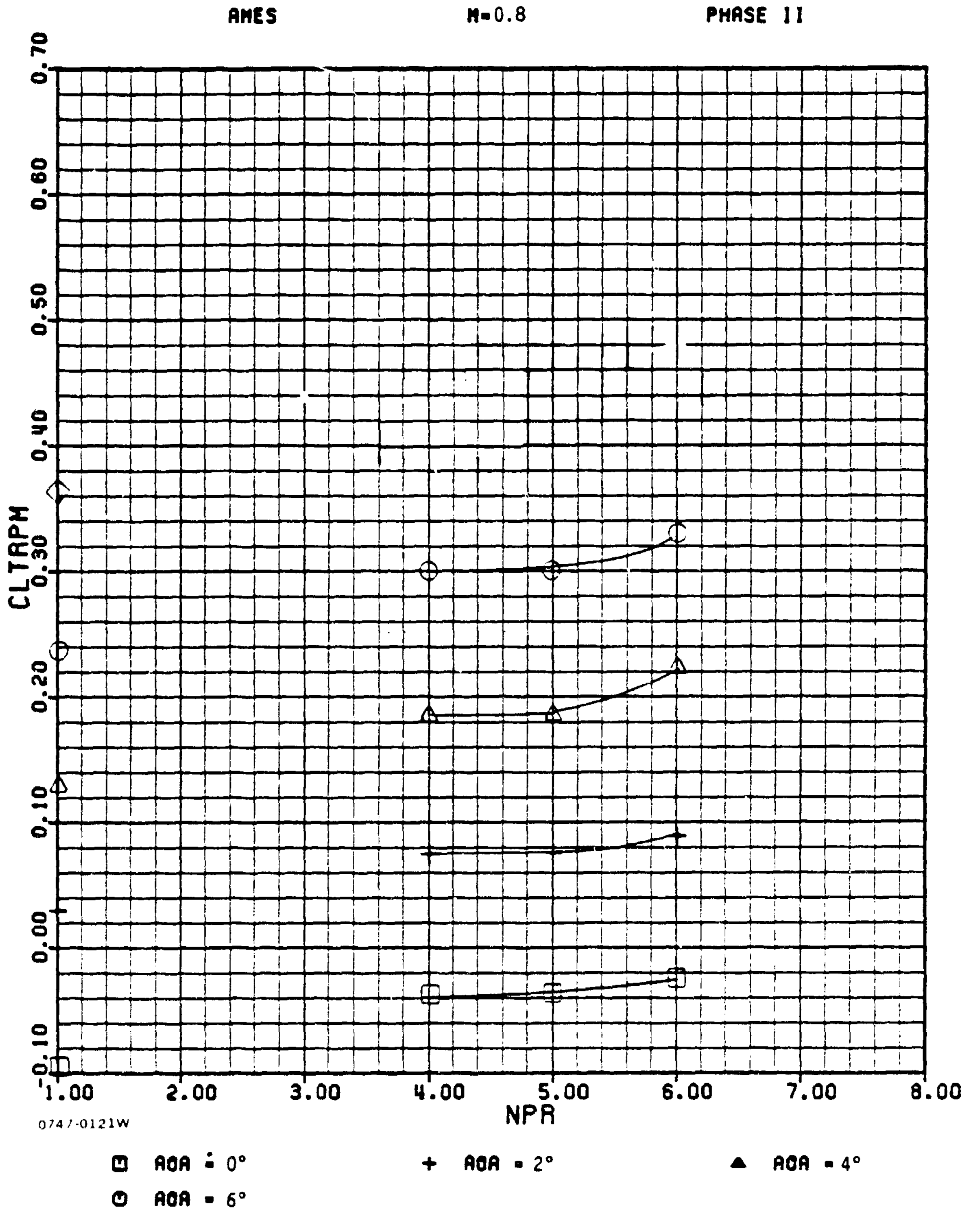
ADEN CRUISE FIVE DEGREE



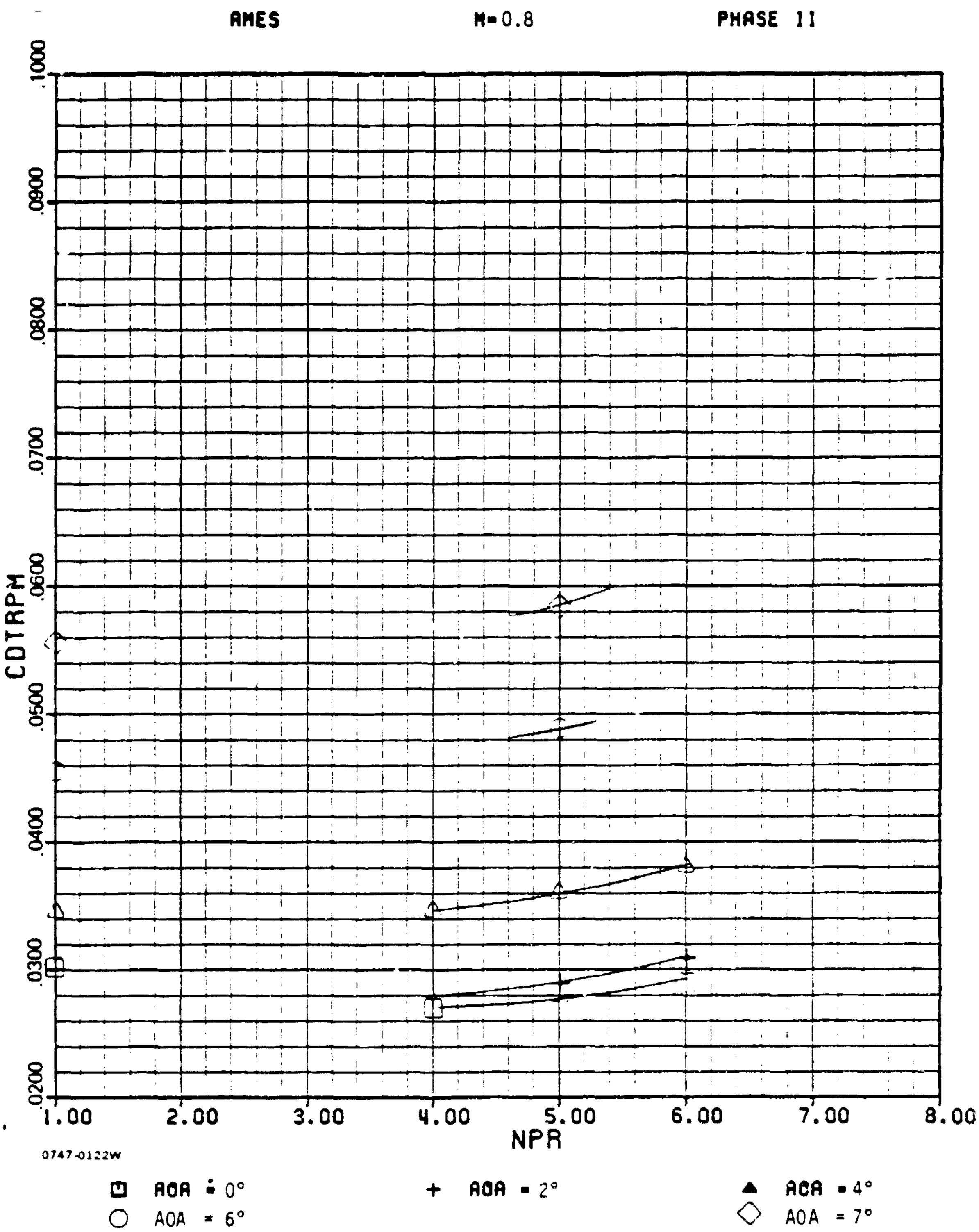

ADEN CRUISE FIVE DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0120W
NPR=1.00
NPR=6.04

F-1(a) (concl.)

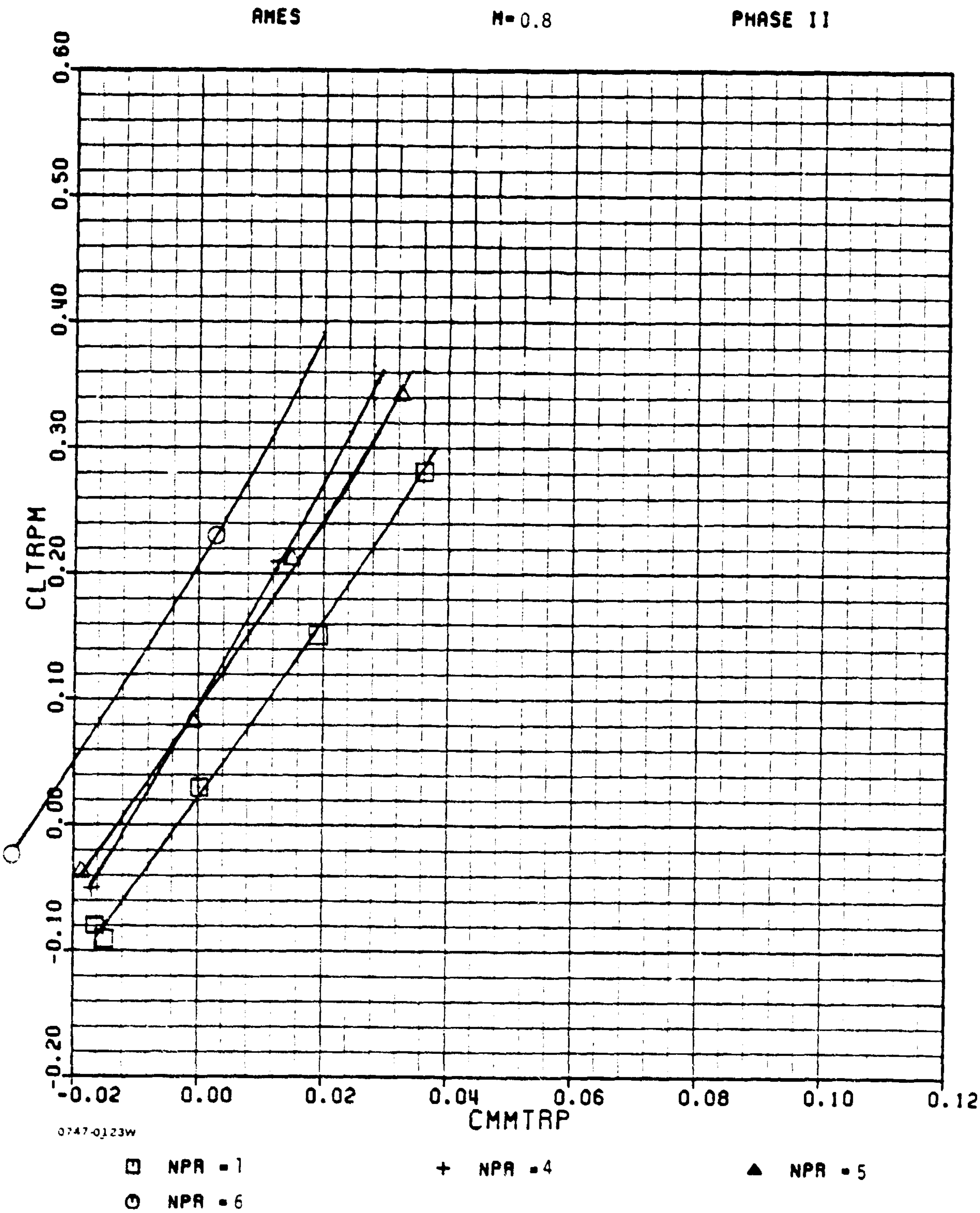
ADEN CRUISE FIVE DEGREE



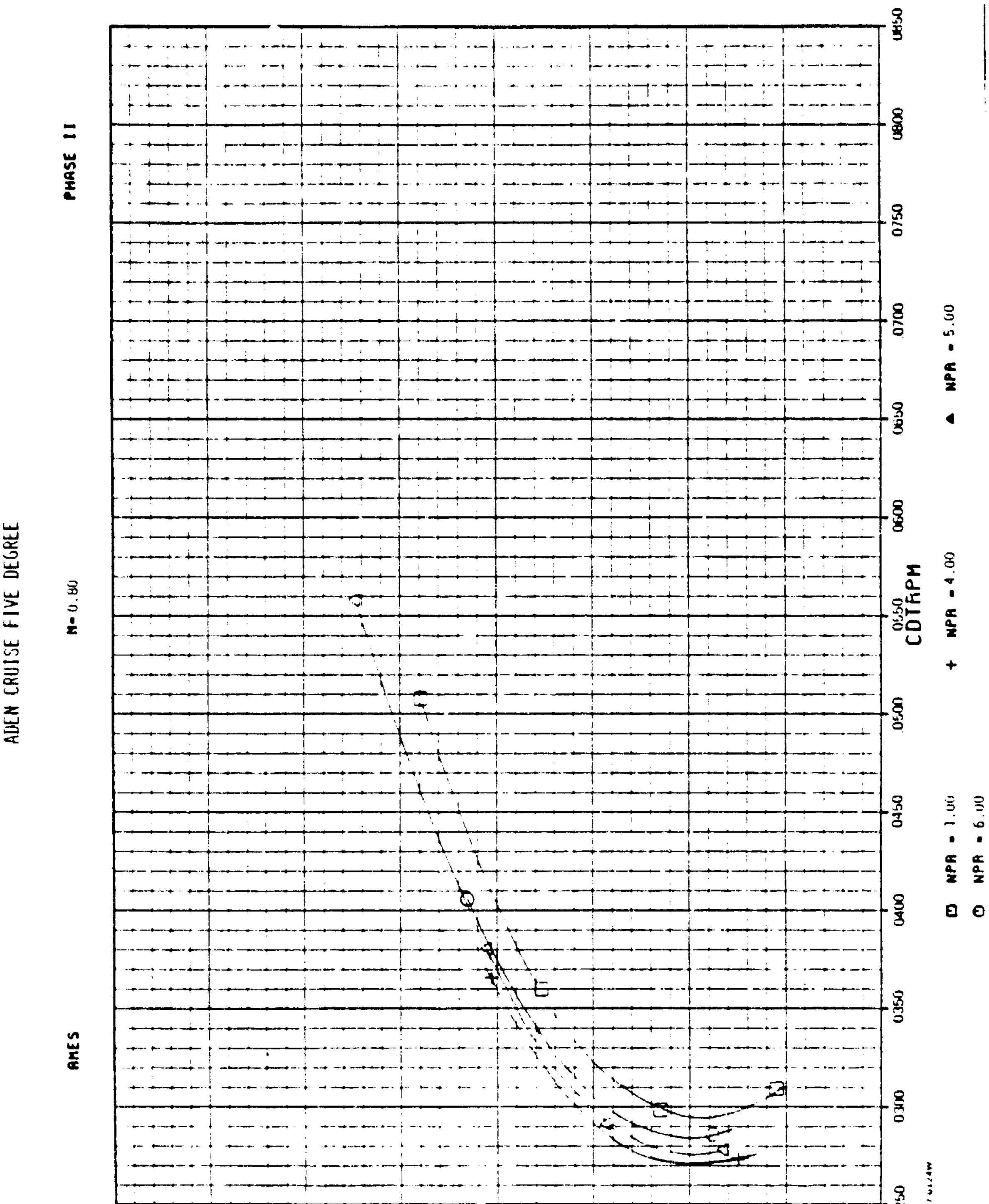
ADEN CRUISE FIVE DEGREE



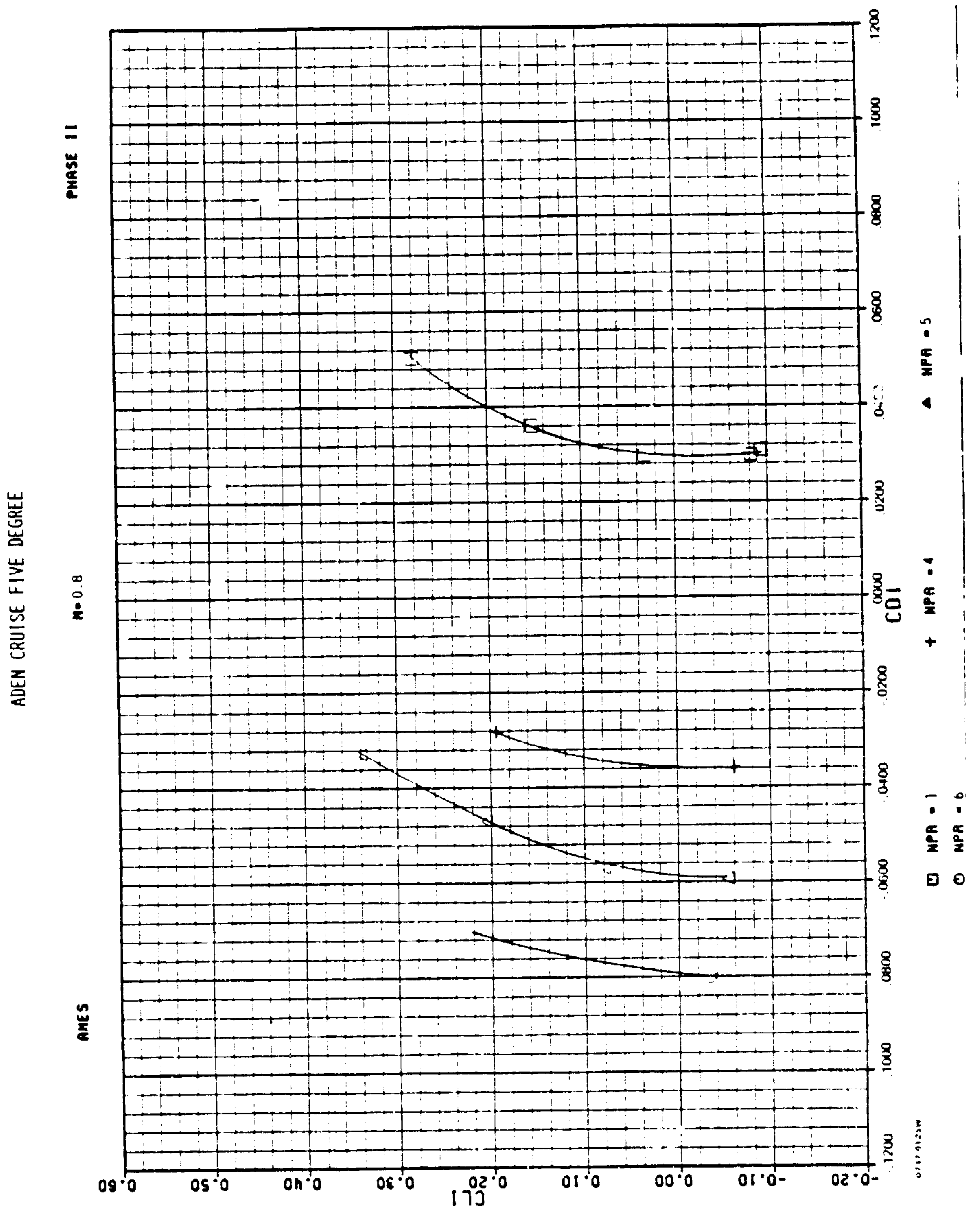
ADEN CRUISE FIVE DEGREE



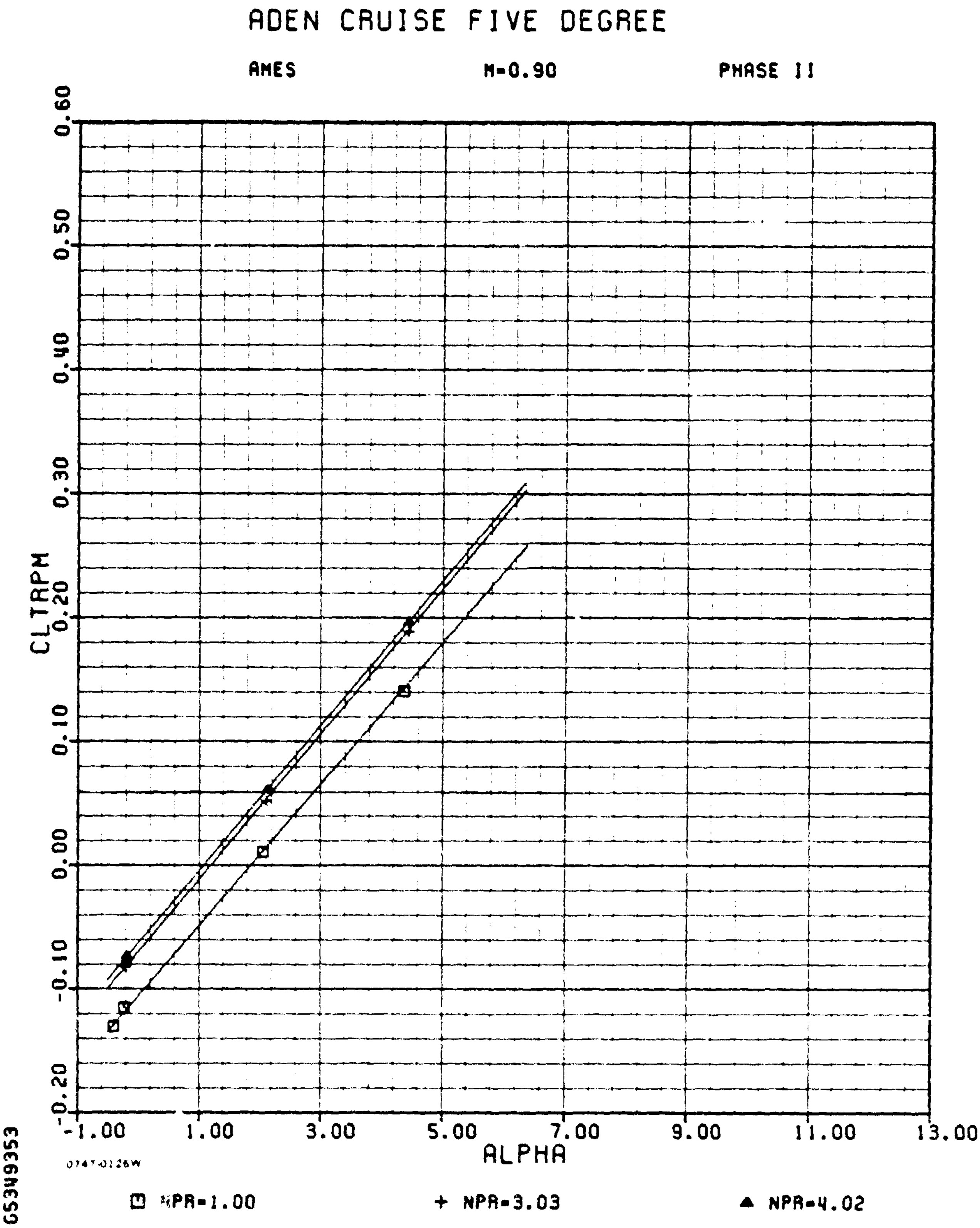
F-1(d)



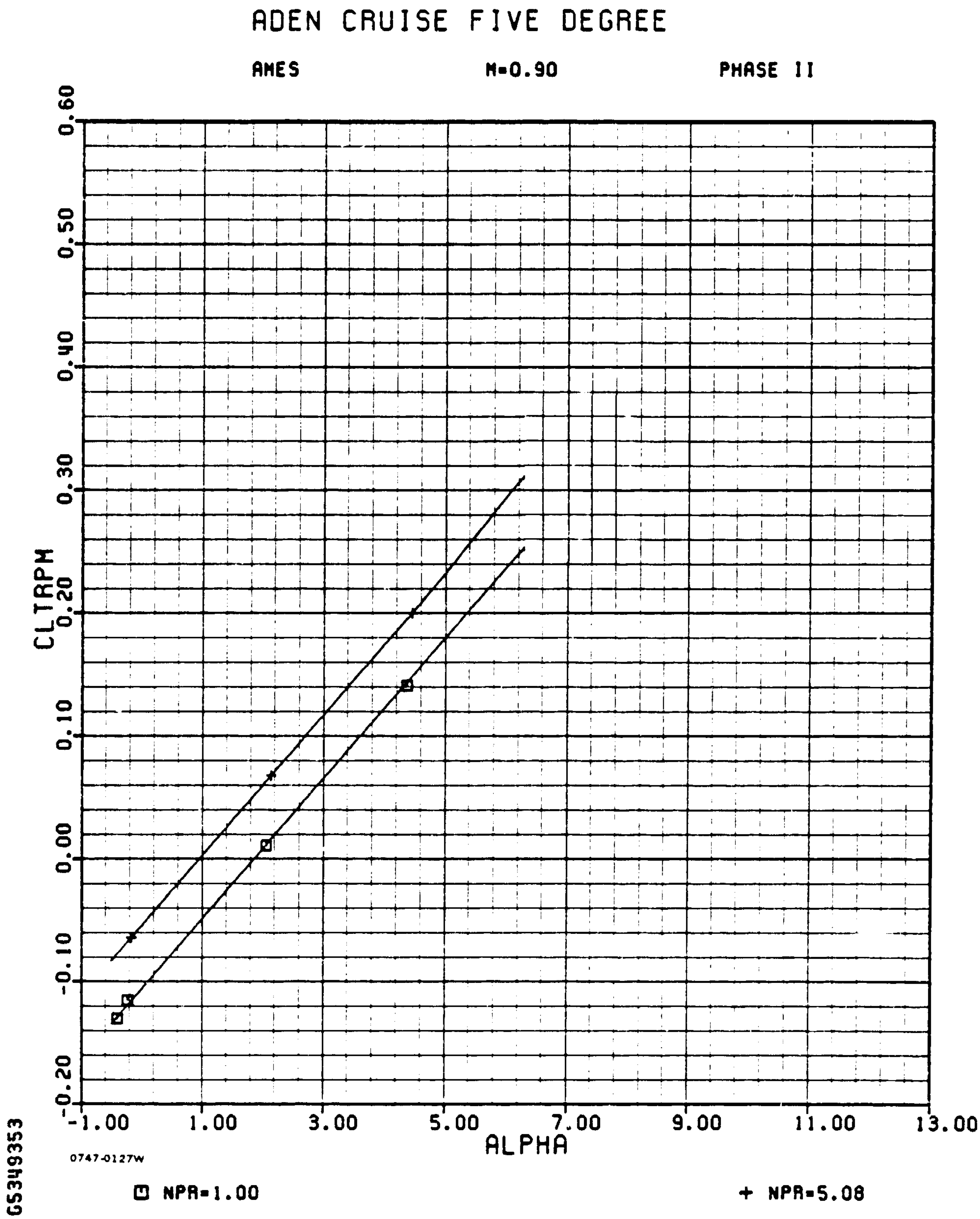
ADEN CRUISE FIVE DEGREE
AMES
M= 0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CDTRPM
0250
0300
0350
0400
0450
0500
0550
0600
0650
0700
0750
0800
0850
NPR = 1.00
NPR = 6.00
NPR = 4.00
NPR = 5.00



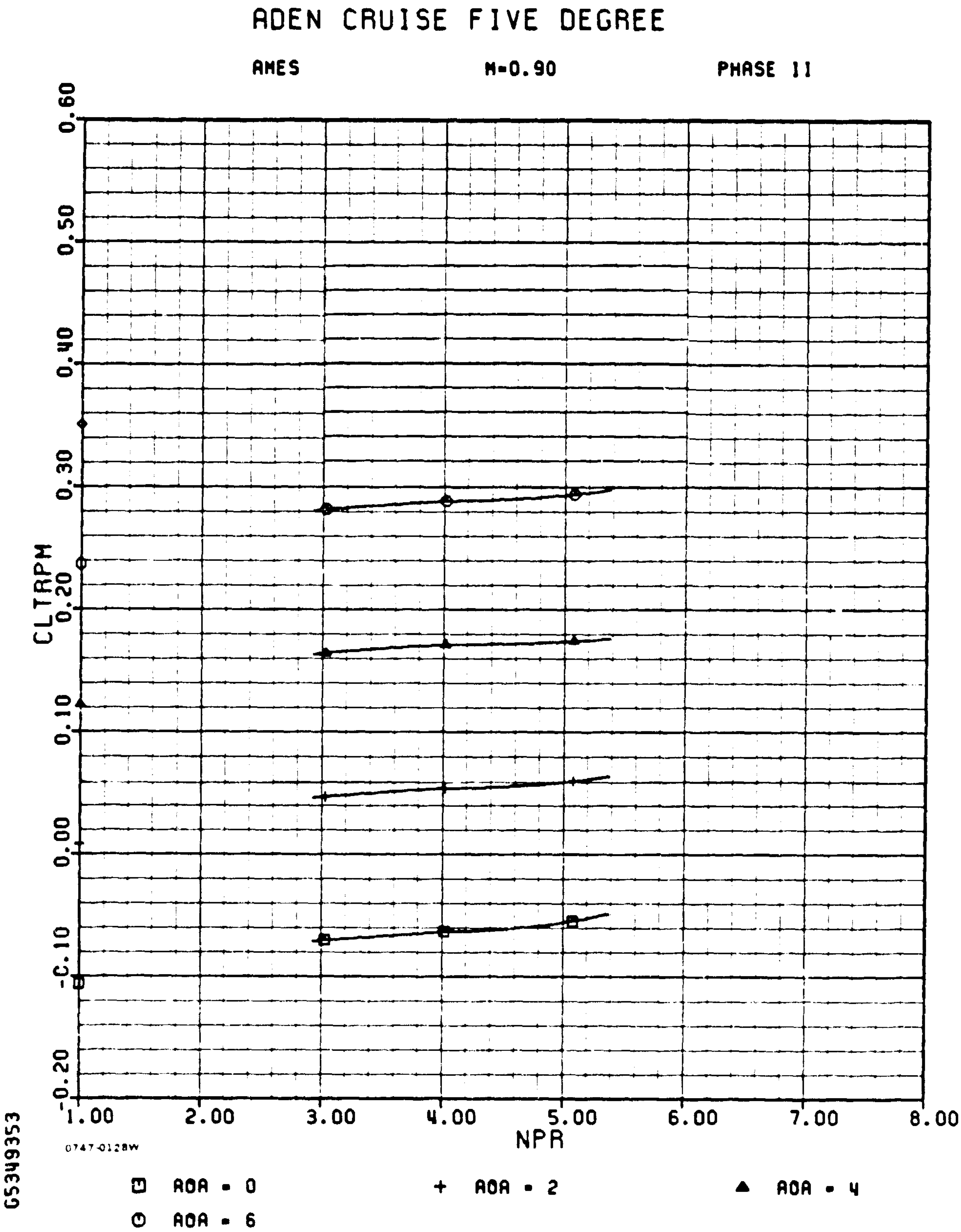
ADEN CRUISE FIVE DEGREE
M=0.8
PHASE II
AMES
CD1
CL1
NPR = 1
NPR = 4
NPR = 5
NPR = 6
-0.20 -0.10 0.00 0.10 0.20 0.30 0.40 0.50 0.60
-.1200 -.1000 -.0800 -.0600 -.0400 -.0200 .0000 .0200 .0400 .0600 .0800 .1000 .1200



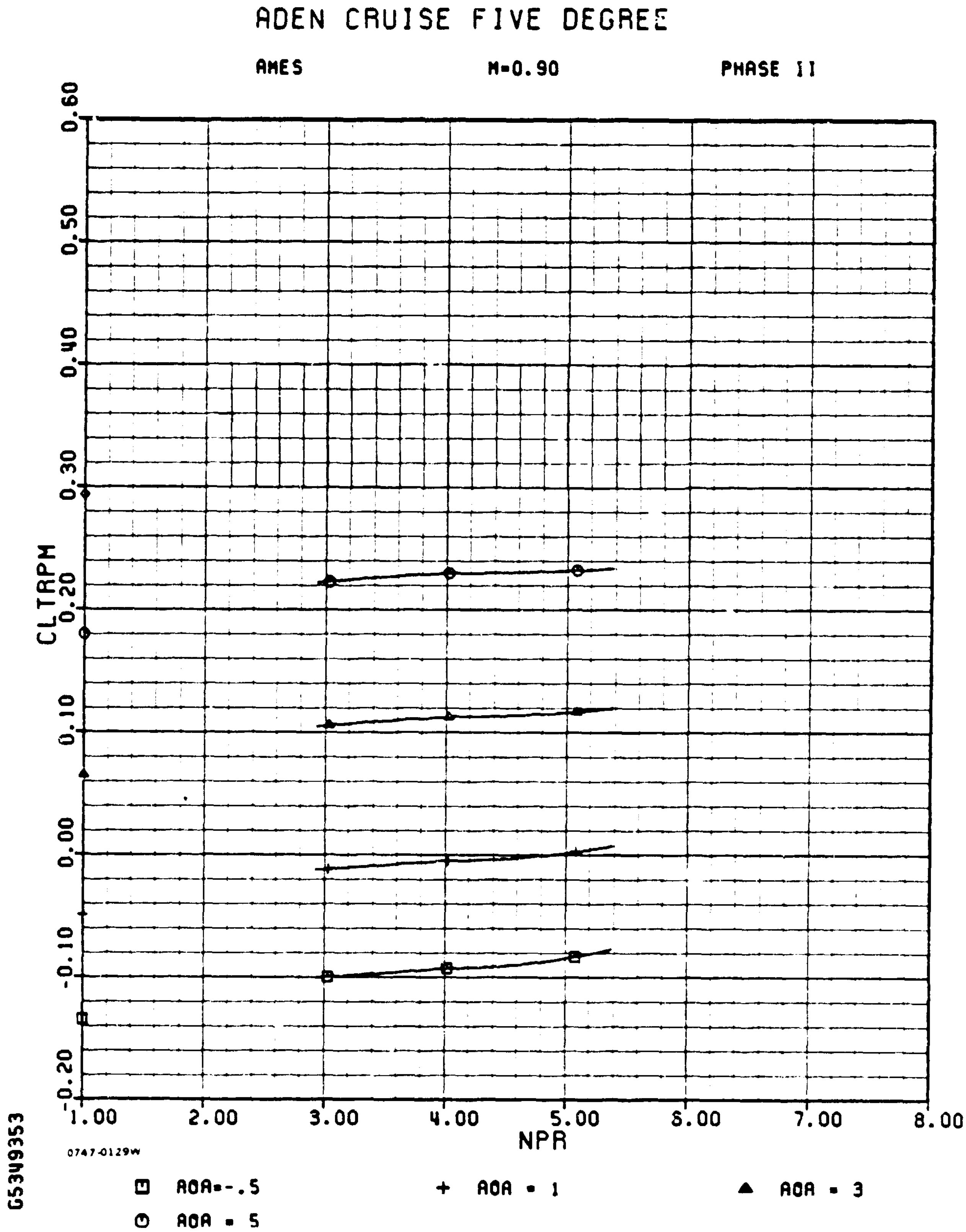
ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0126W
G5349353
NPR=1.00
+ NPR=3.03
NPR=4.02


ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G5349353
0747-0127W
NPR=1.00
+ NPR=5.08

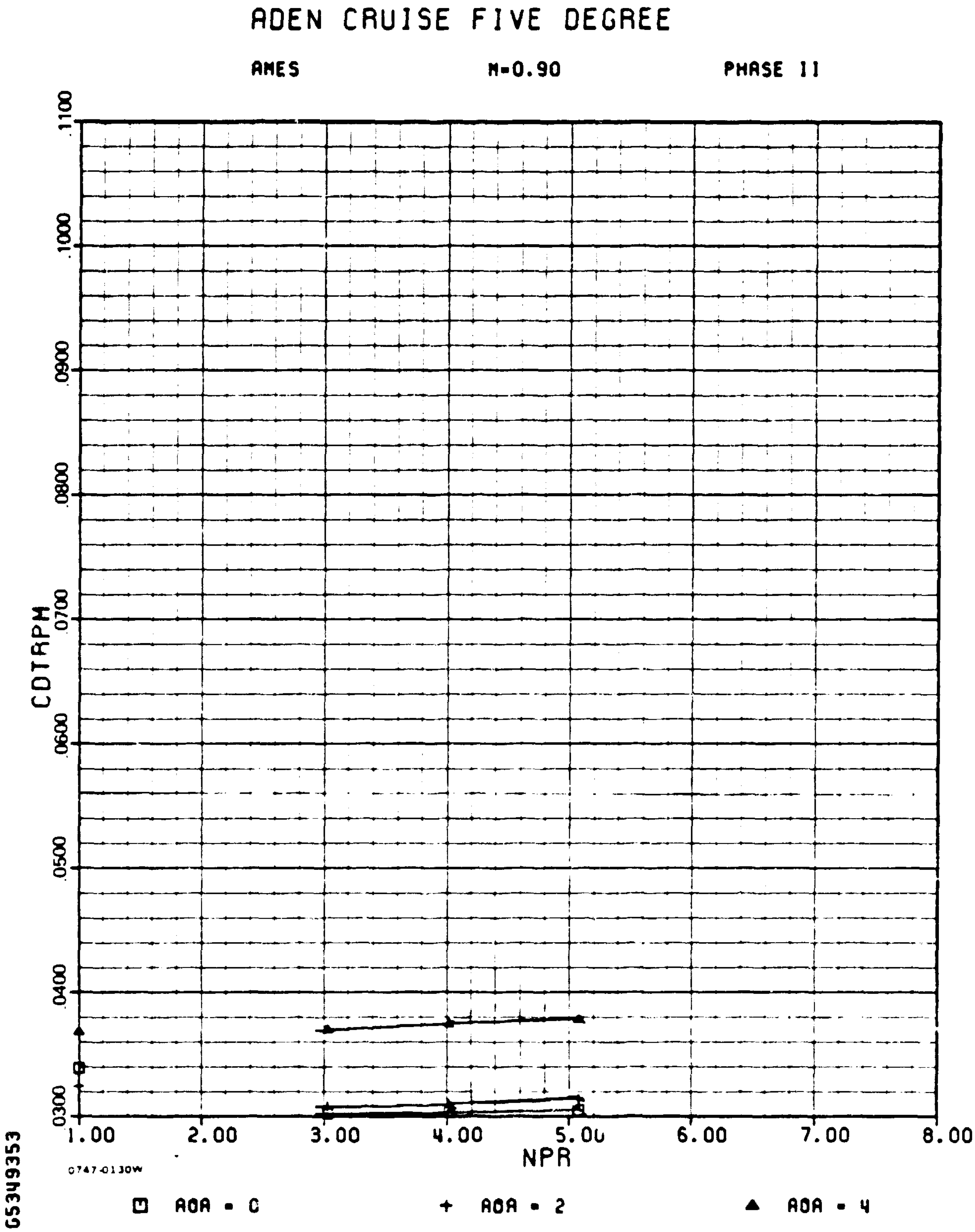
F-2(a) (concl.)

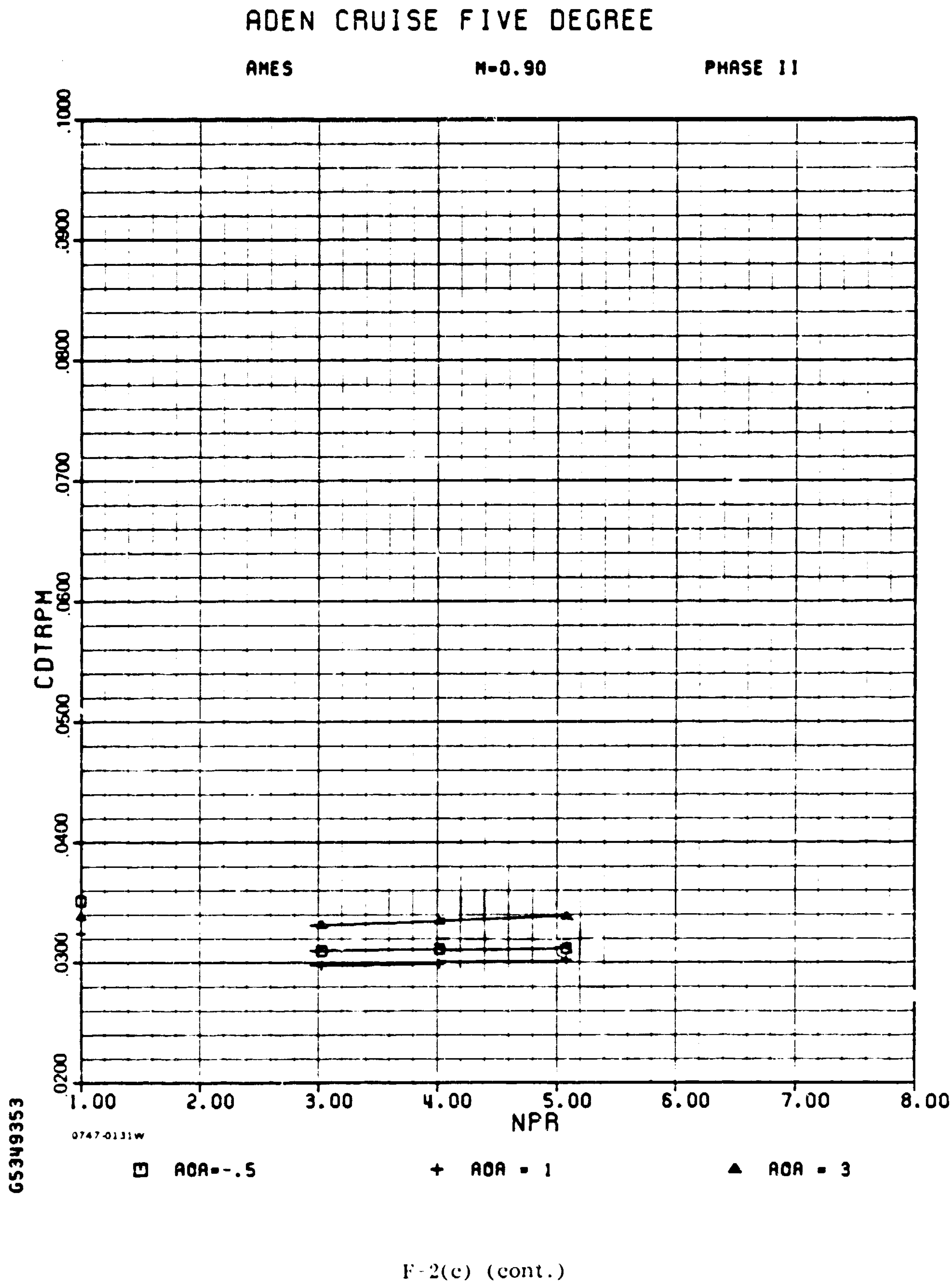


ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CLTRPM
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G5349353
0747-0128W
AOA = 0
AOA = 2
AOA = 4
AOA = 6

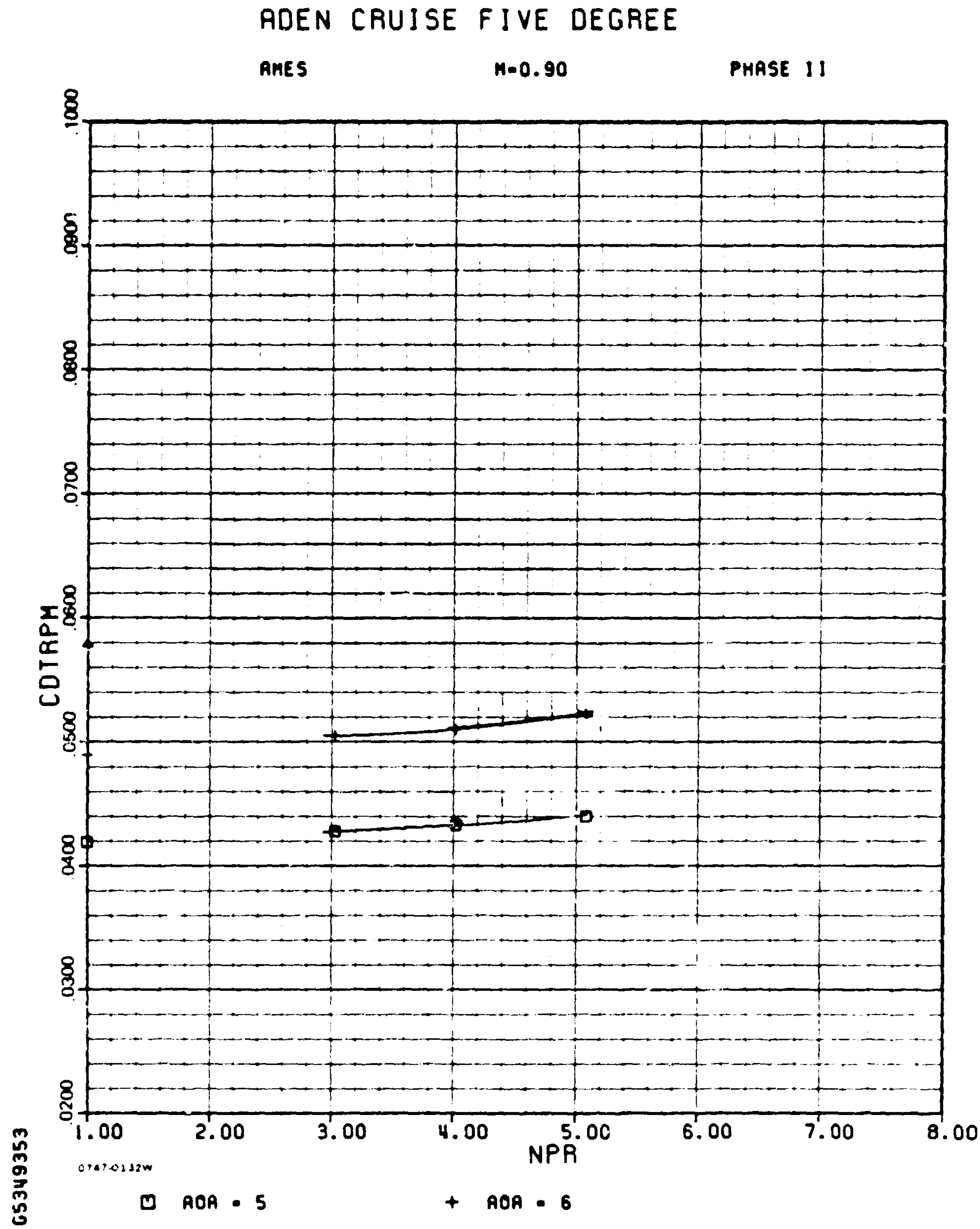

ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0129W
G5349353
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

F-2(b) (concl.)


ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1100
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0130W
AOA = 0
AOA = 2
AOA = 4
G5349353


ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0131W
G5349353
AOA=-.5
AOA = 1
AOA = 3

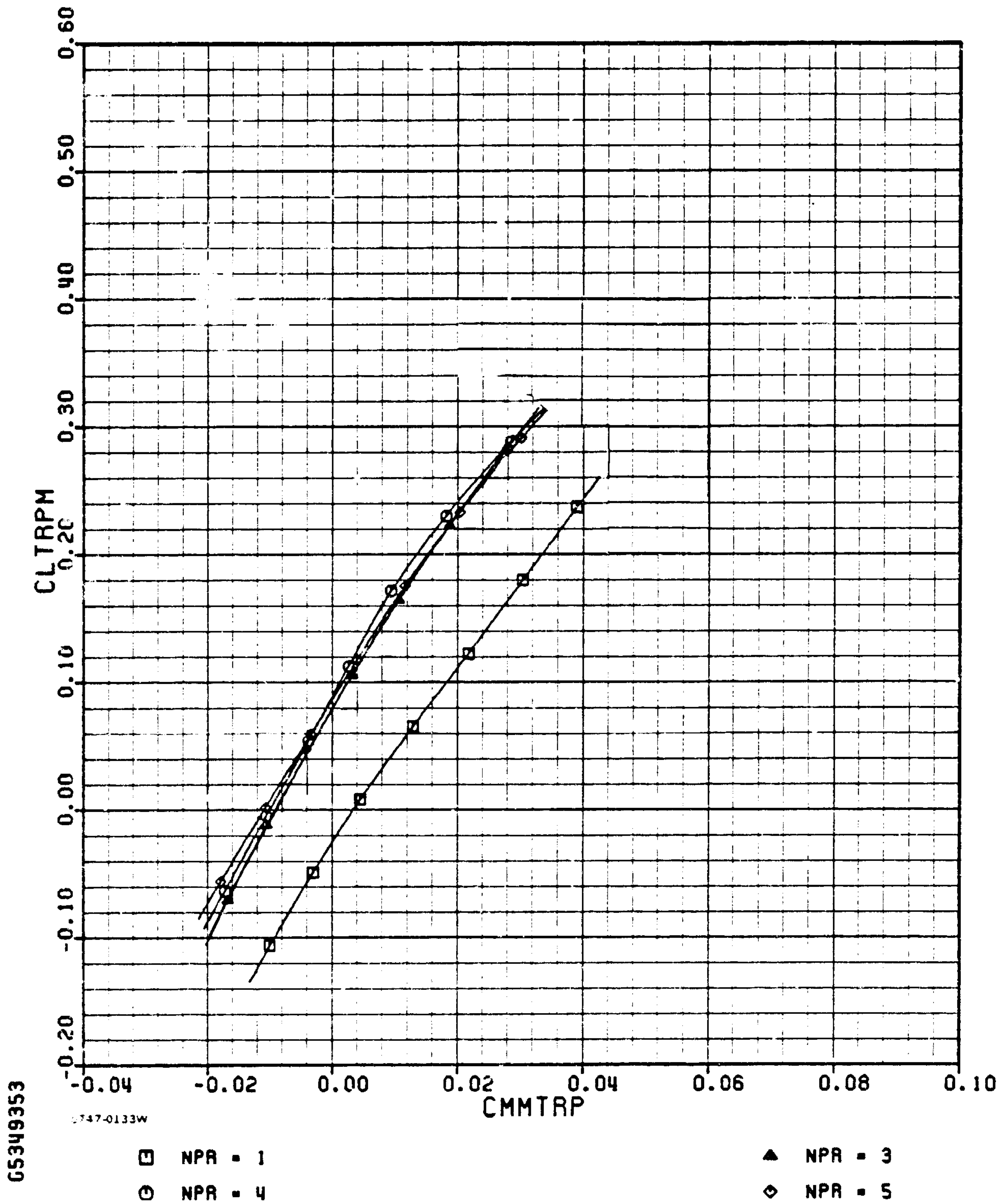
F-2(c) (cont.)


ADEN CRUISE FIVE DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0132W
AOA = 5
AOA = 6
G5349353

F-2(c) (concl.)

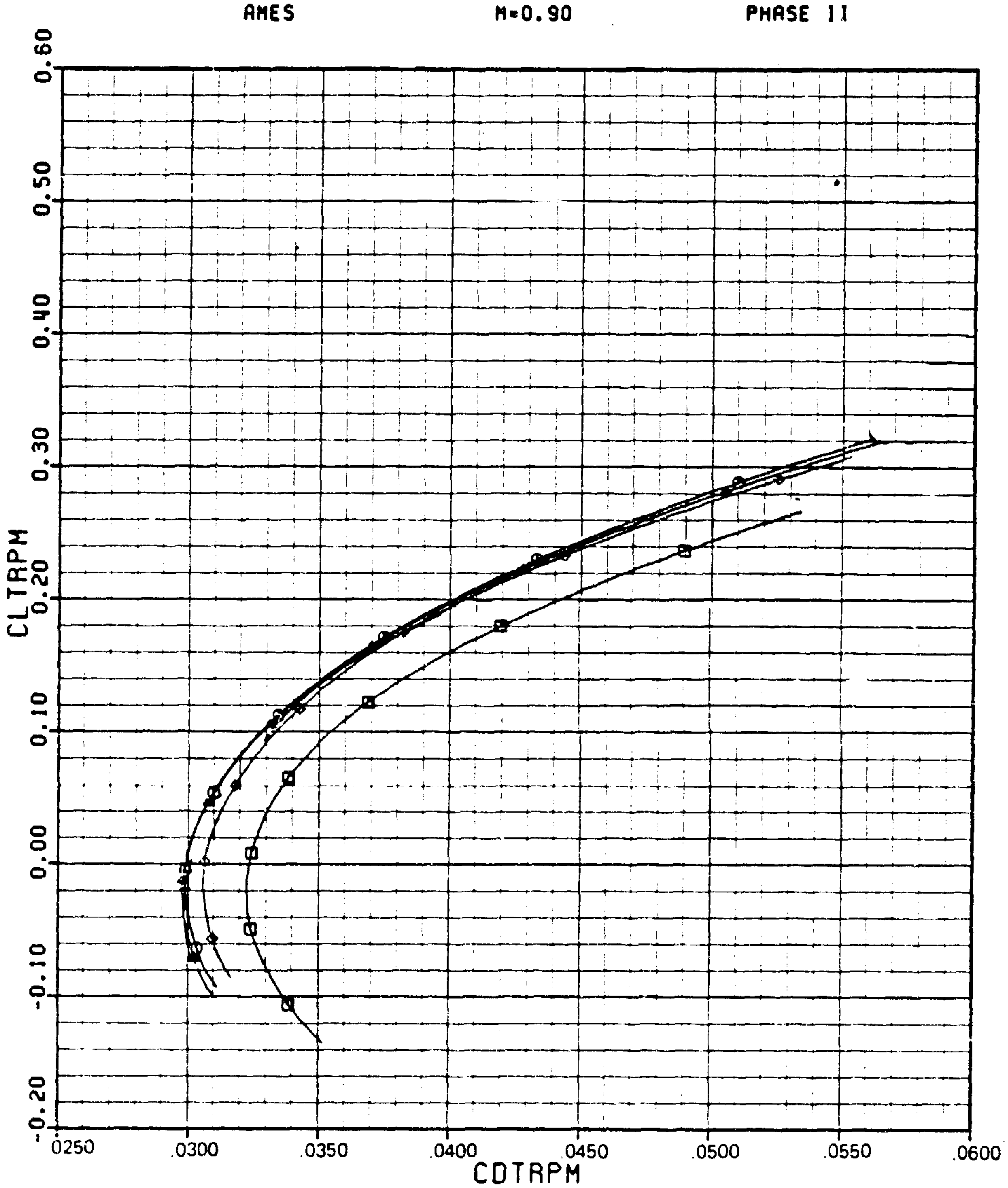
ADEN CRUISE FIVE DEGREE

AMES M=0.90 PHASE II



ADEN CRUISE FIVE DEGREE

AMES M=0.90 PHASE II

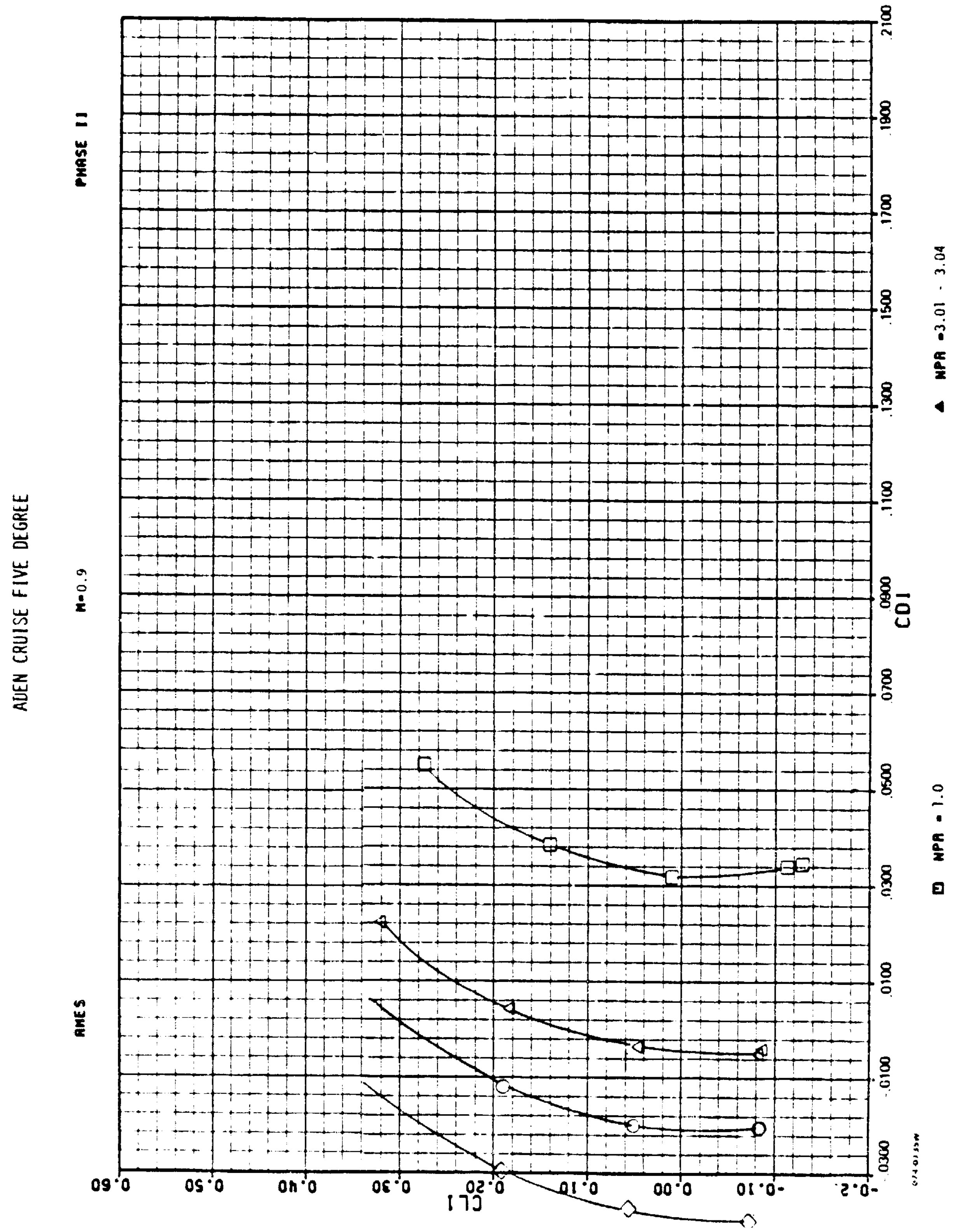


G5349353

0747-0134W

NPR = 1 NPR = 3

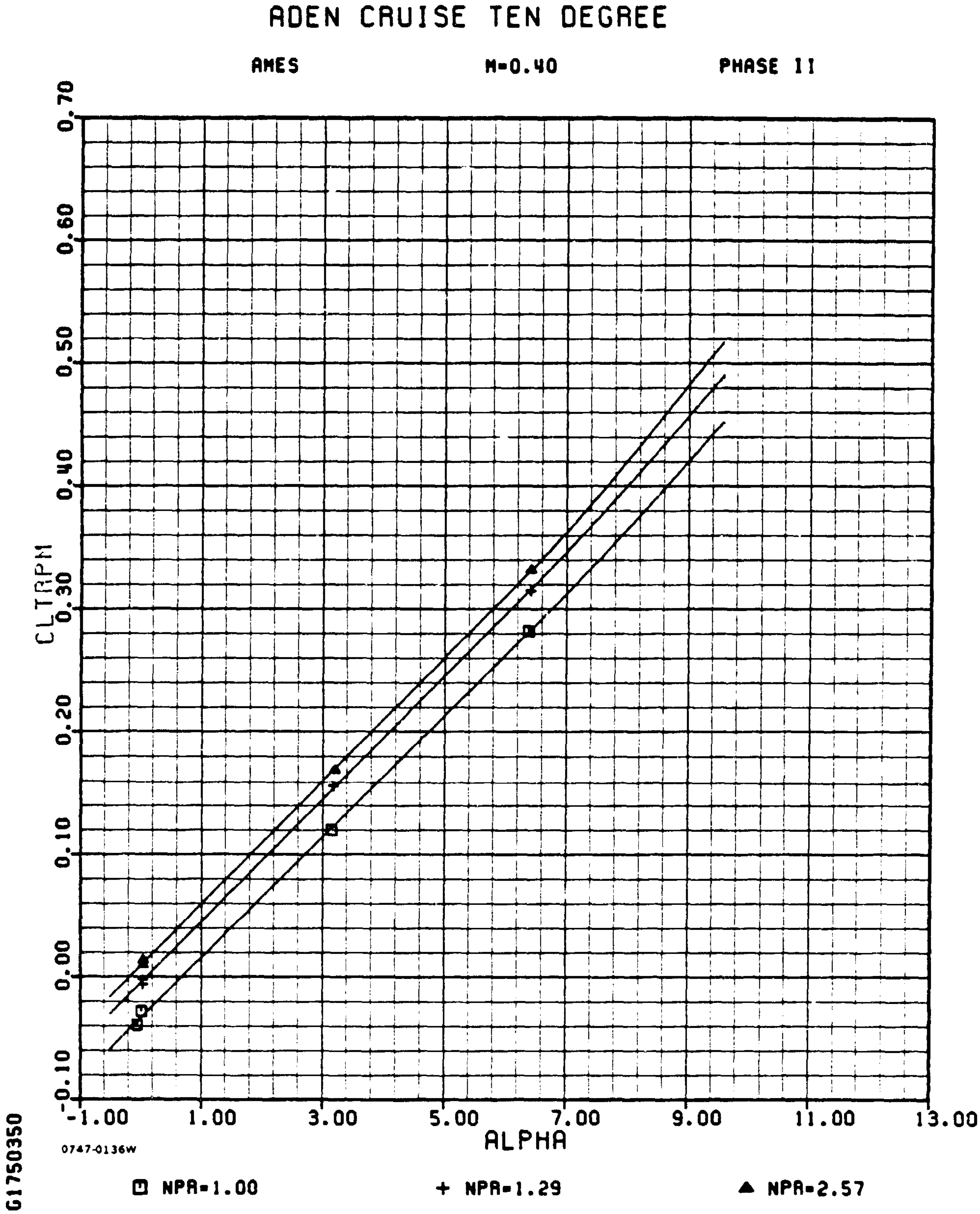
NPR = 4 NPR = 5



ADEN CRUISE FIVE DEGREE
AMES
M=0.9
PHASE II
CDI
CLI
-0.0300
-0.0100
.0100
.0300
.0500
.0700
.0900
.1100
.1300
.1500
.1700
.1900
.2100
-0.2
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
NPR = 1.0
NPR = 3.97 - 4.04
NPR = 5.05 - 5.14
NPR = 3.01 - 3.04

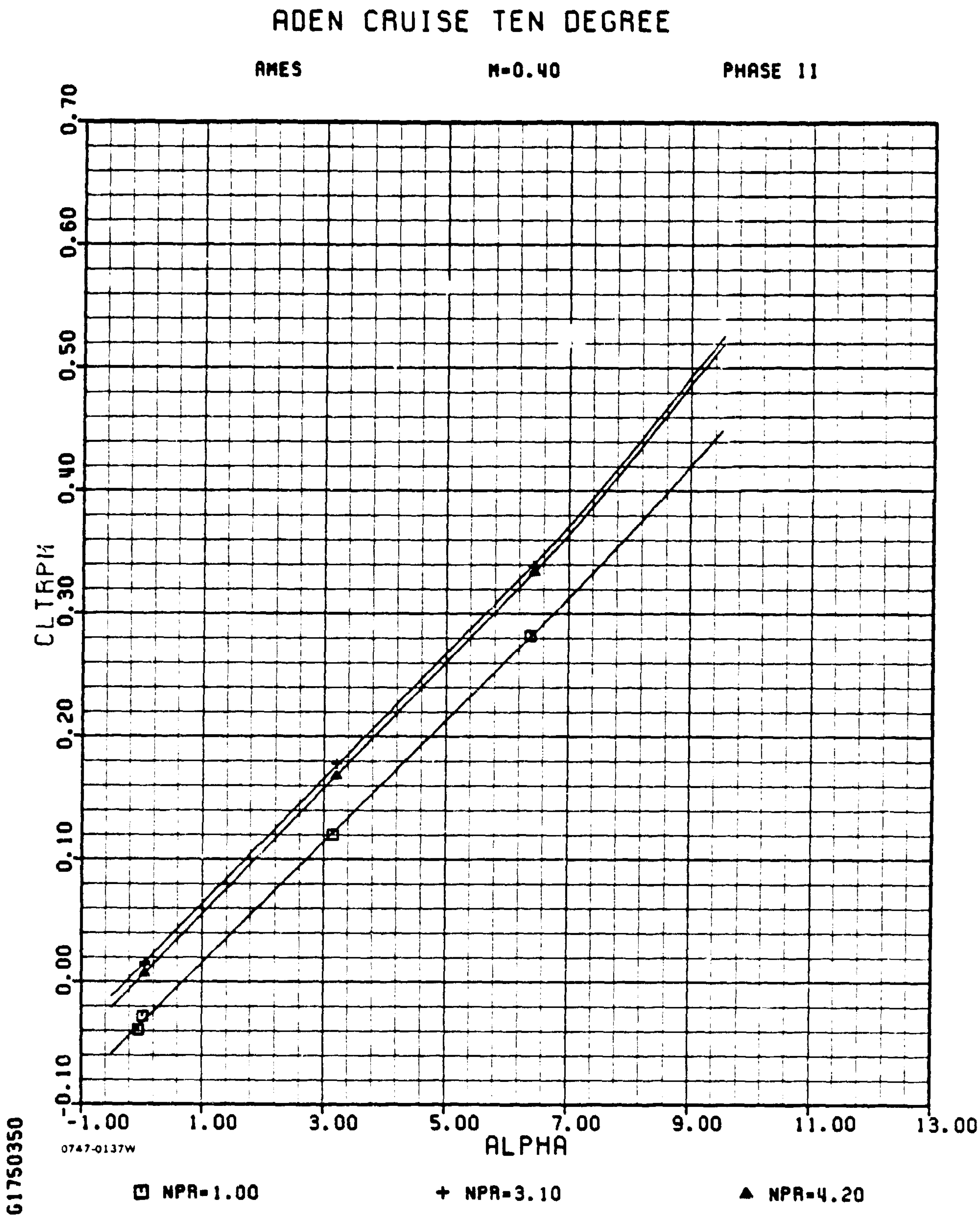
APPENDIX G

ADEN CRUISE 10° WIND-ON DATA

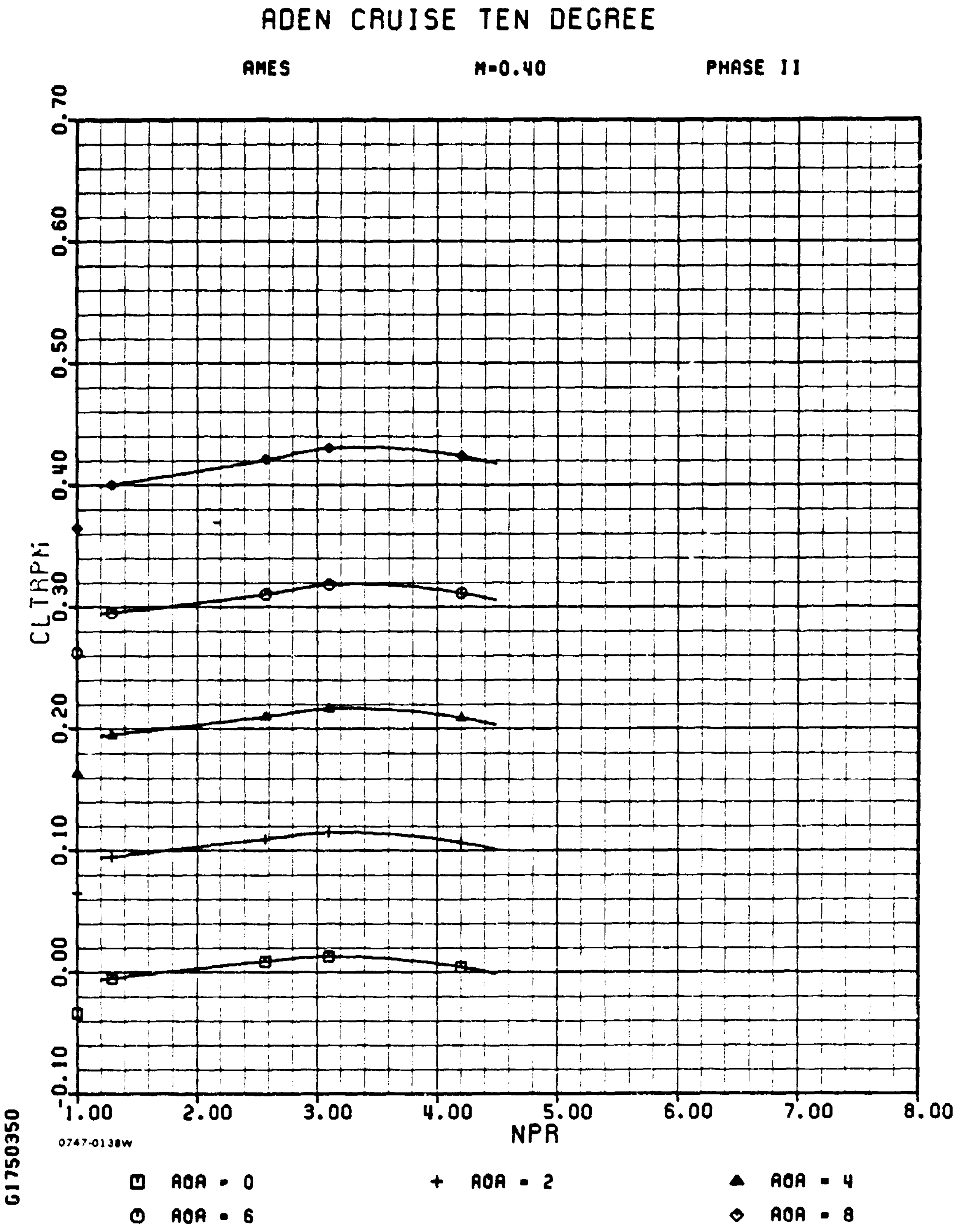


G1750350

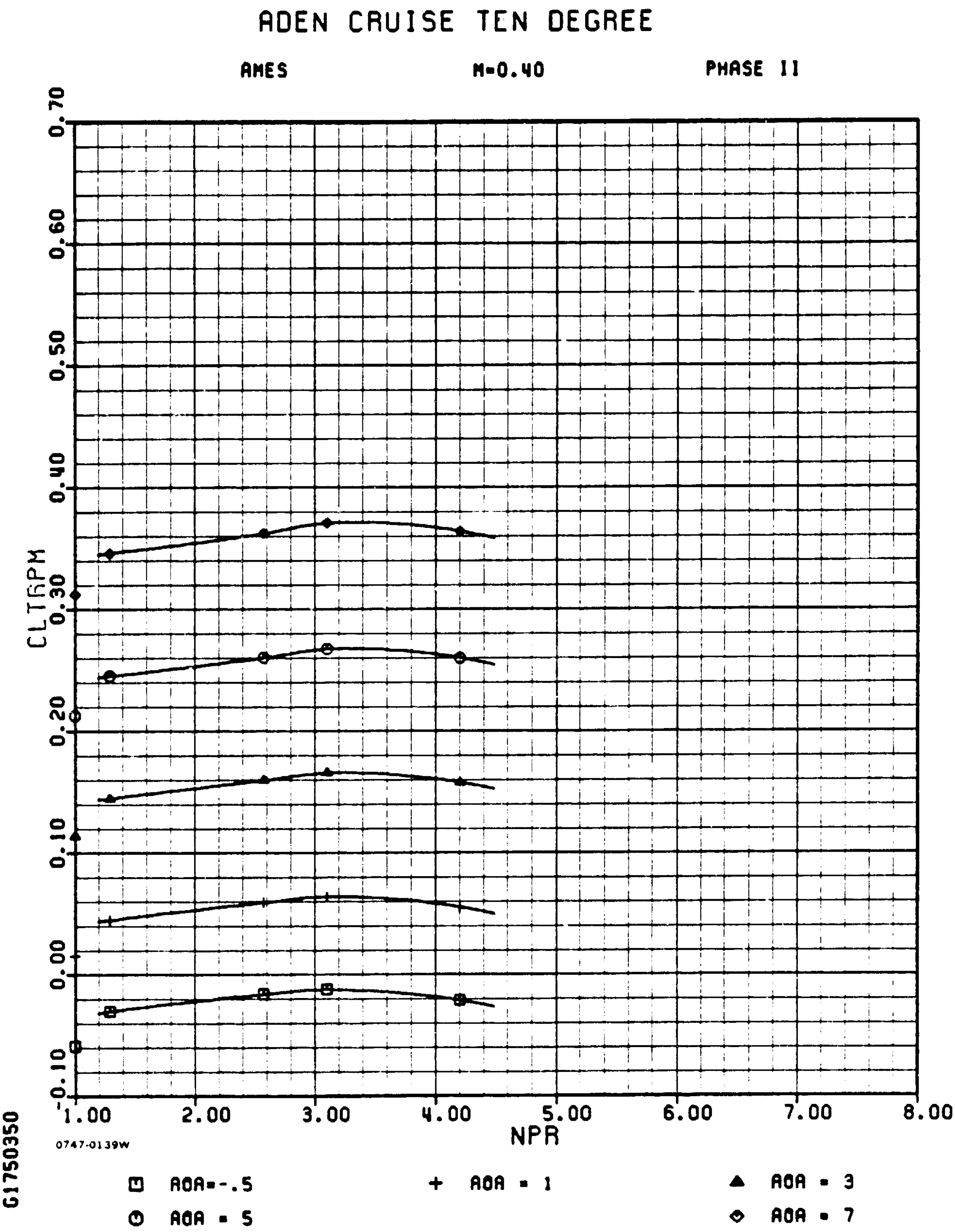
G-1(a)


ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0137W
G1750350
NPR=1.00
NPR=3.10
NPR=4.20

G-1(a) (concl.)


ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G1750350
0747-0138W
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8

G-1(b)

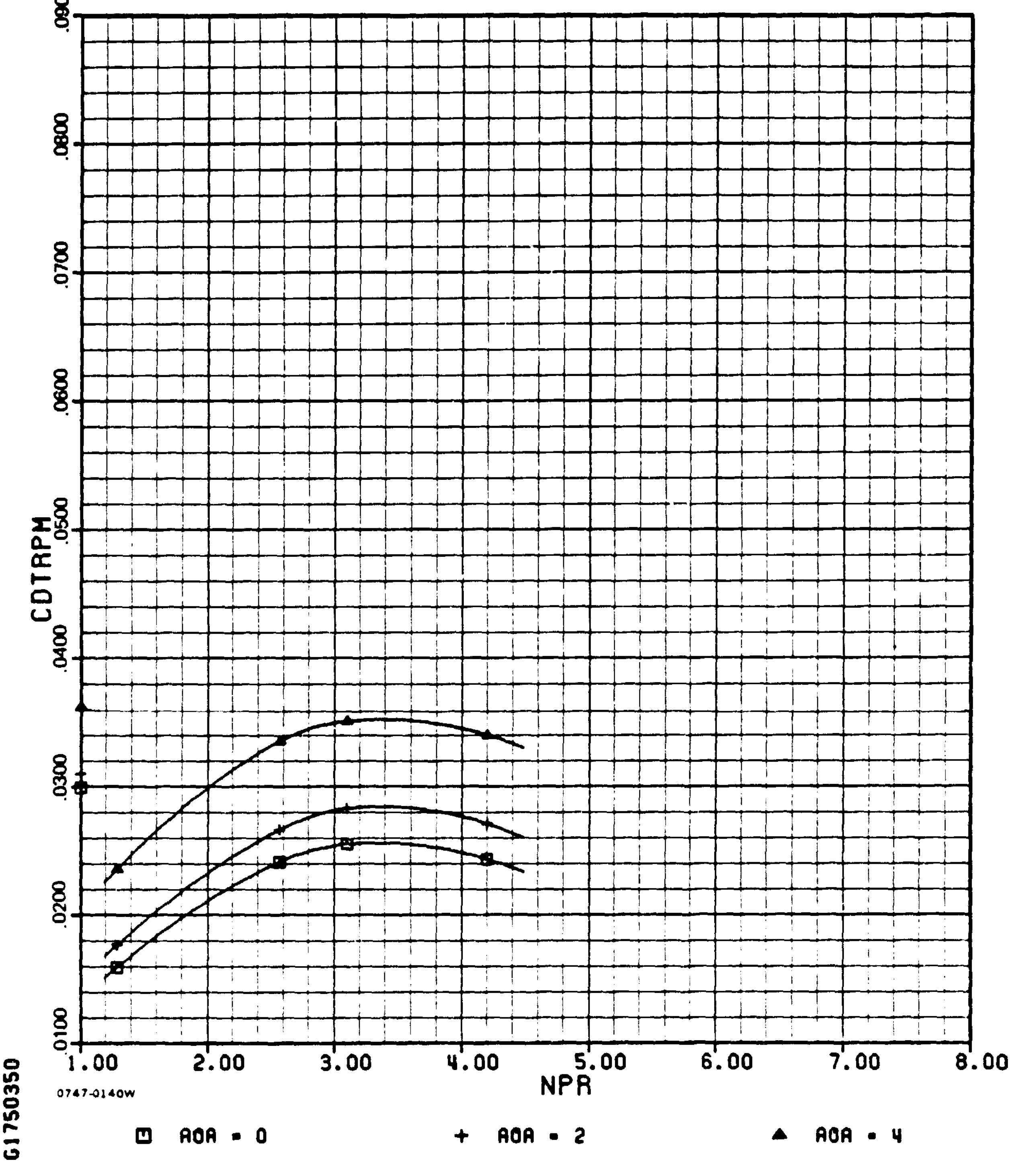


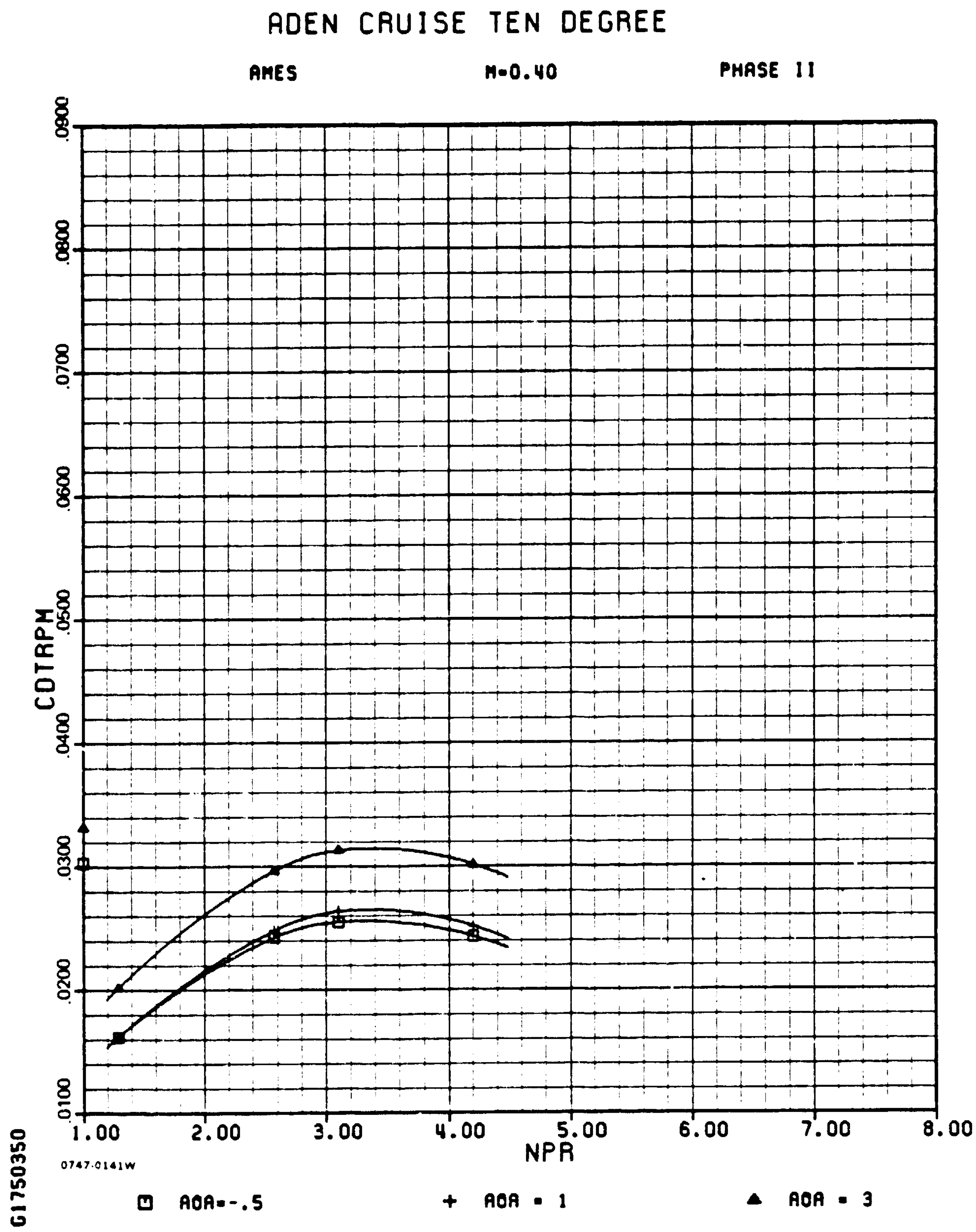
ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0139W
G1750350
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

G-1(b) (concl.)

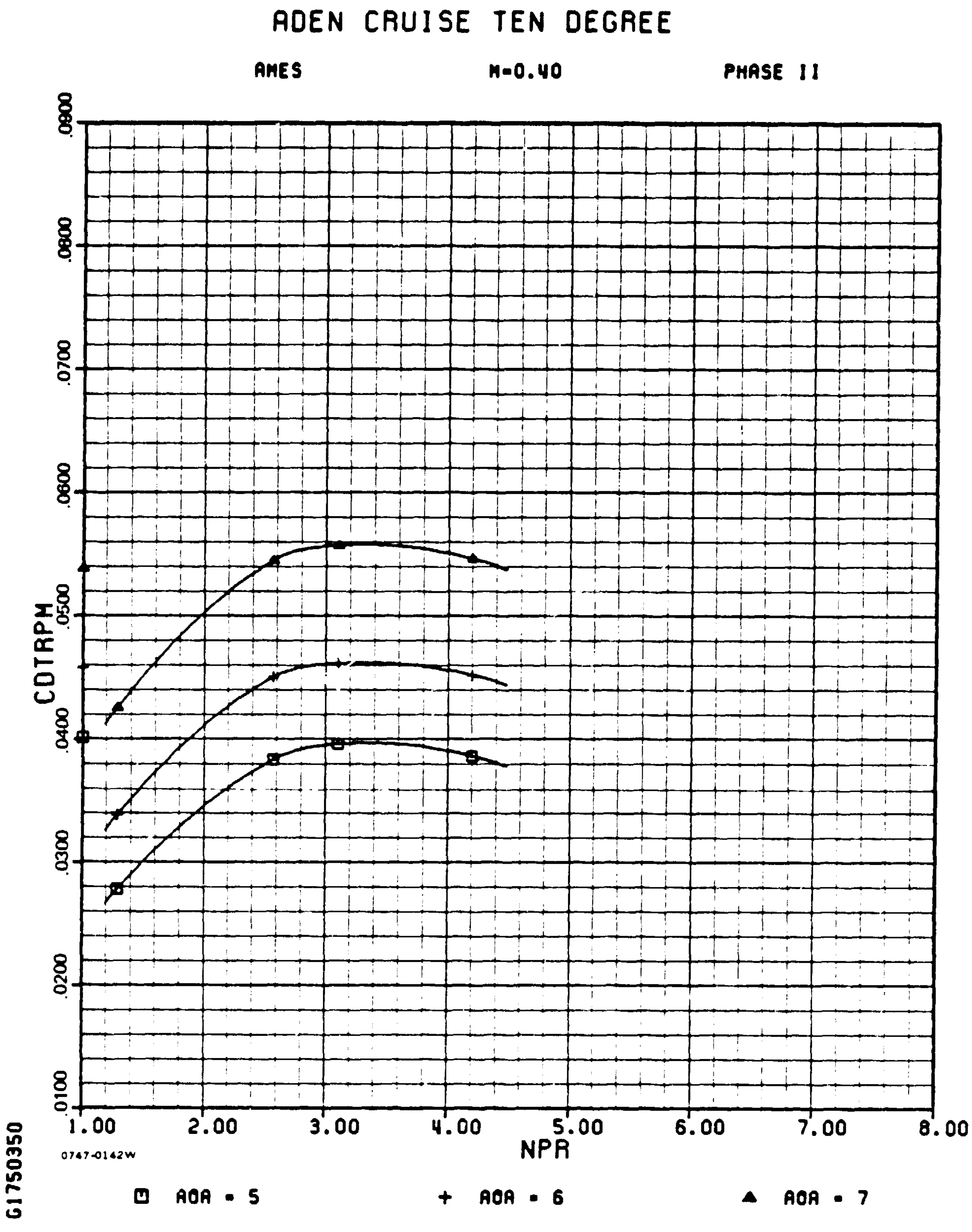
ADEN CRUISE TEN DEGREE

AMES M=0.40 PHASE II



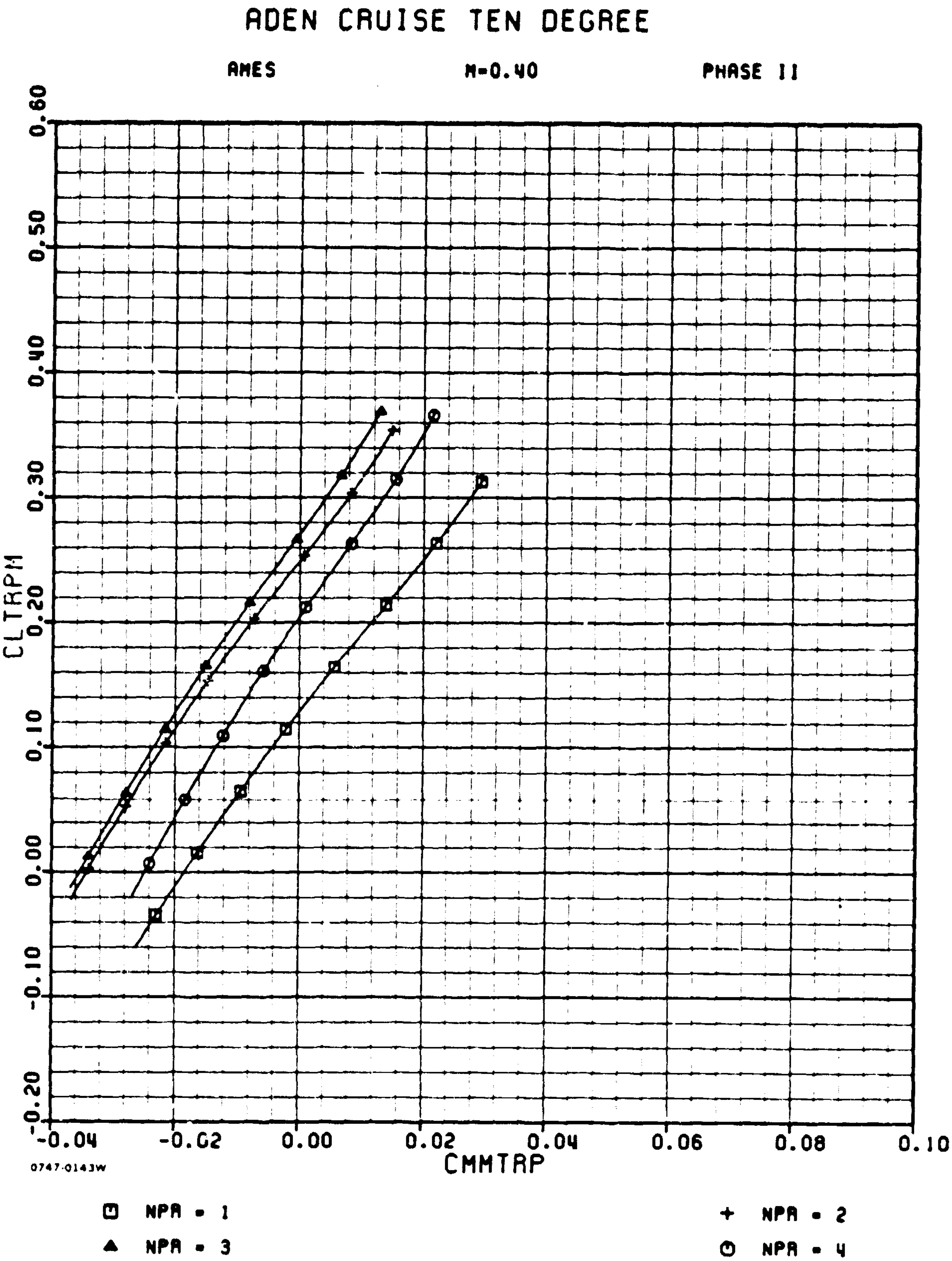

ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0141W
G1750350
AOA=-.5
AOA = 1
AOA = 3

G-1(c) (cont.)



ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0142W
AOA = 5
AOA = 6
AOA = 7
GI750350

G-1(c) (concl.)

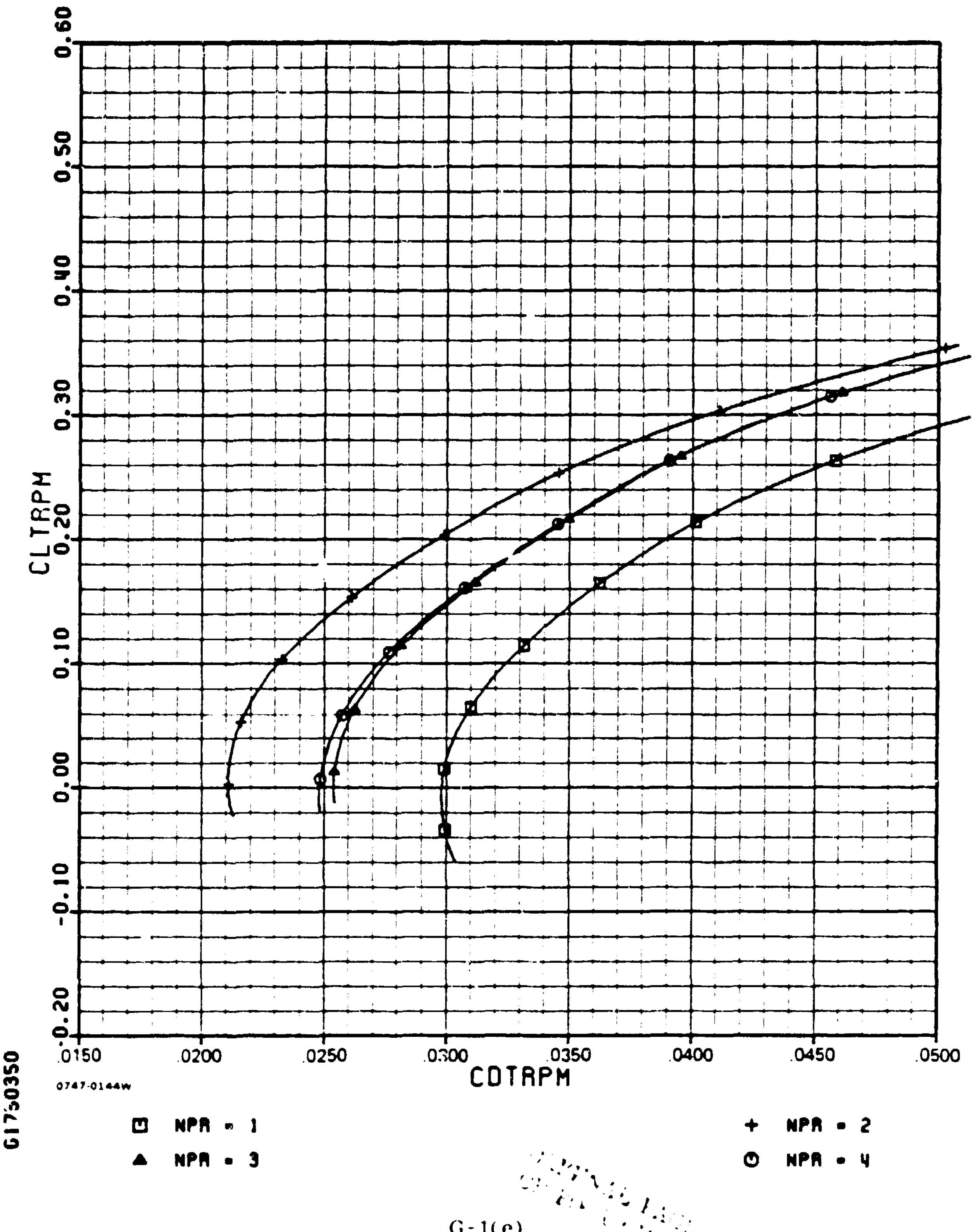


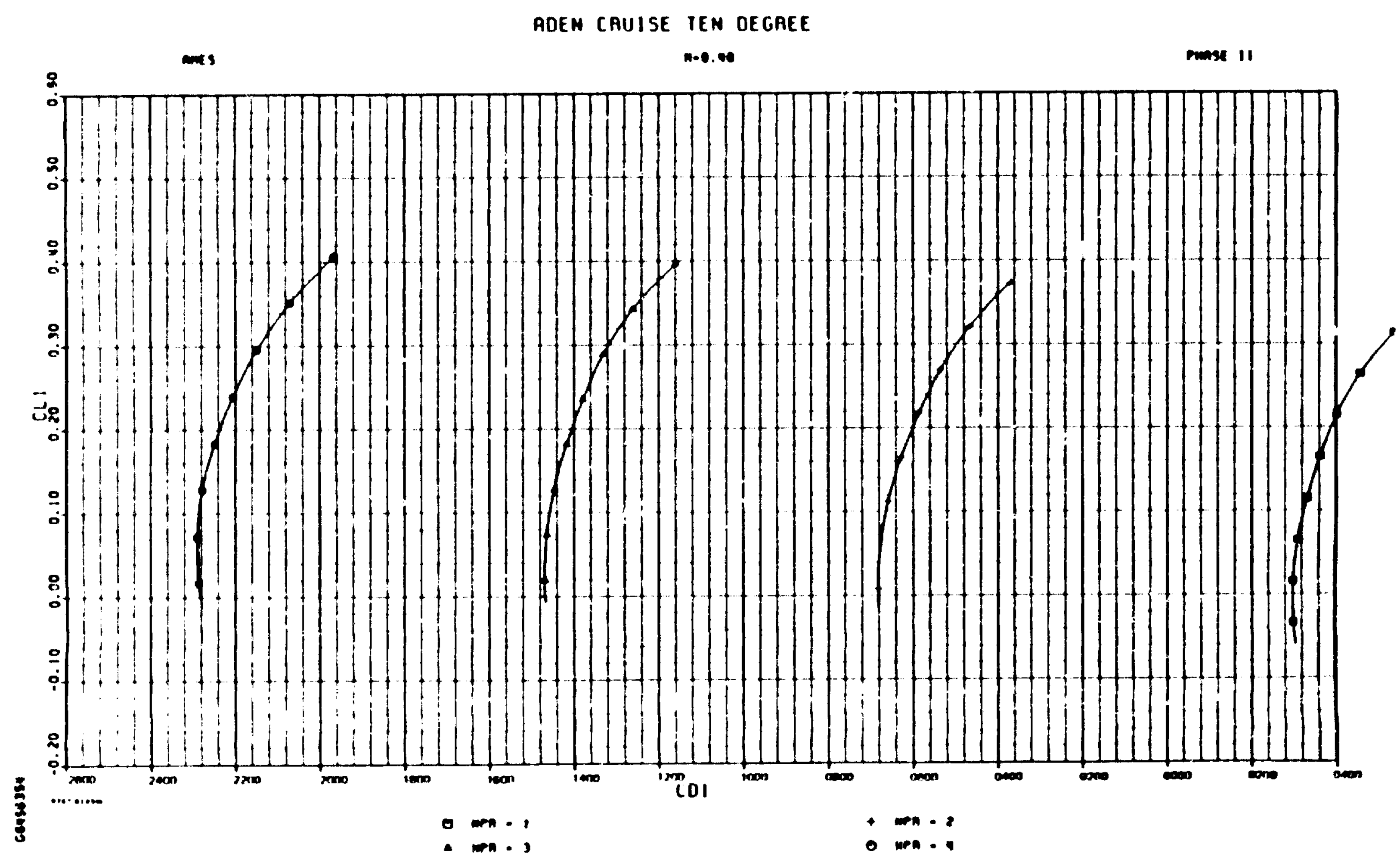
ADEN CRUISE TEN DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
CMMTRP
0747-0143W
NPR = 1
NPR = 2
NPR = 3
NPR = 4

G1750350

ADEN CRUISE TEN DEGREE

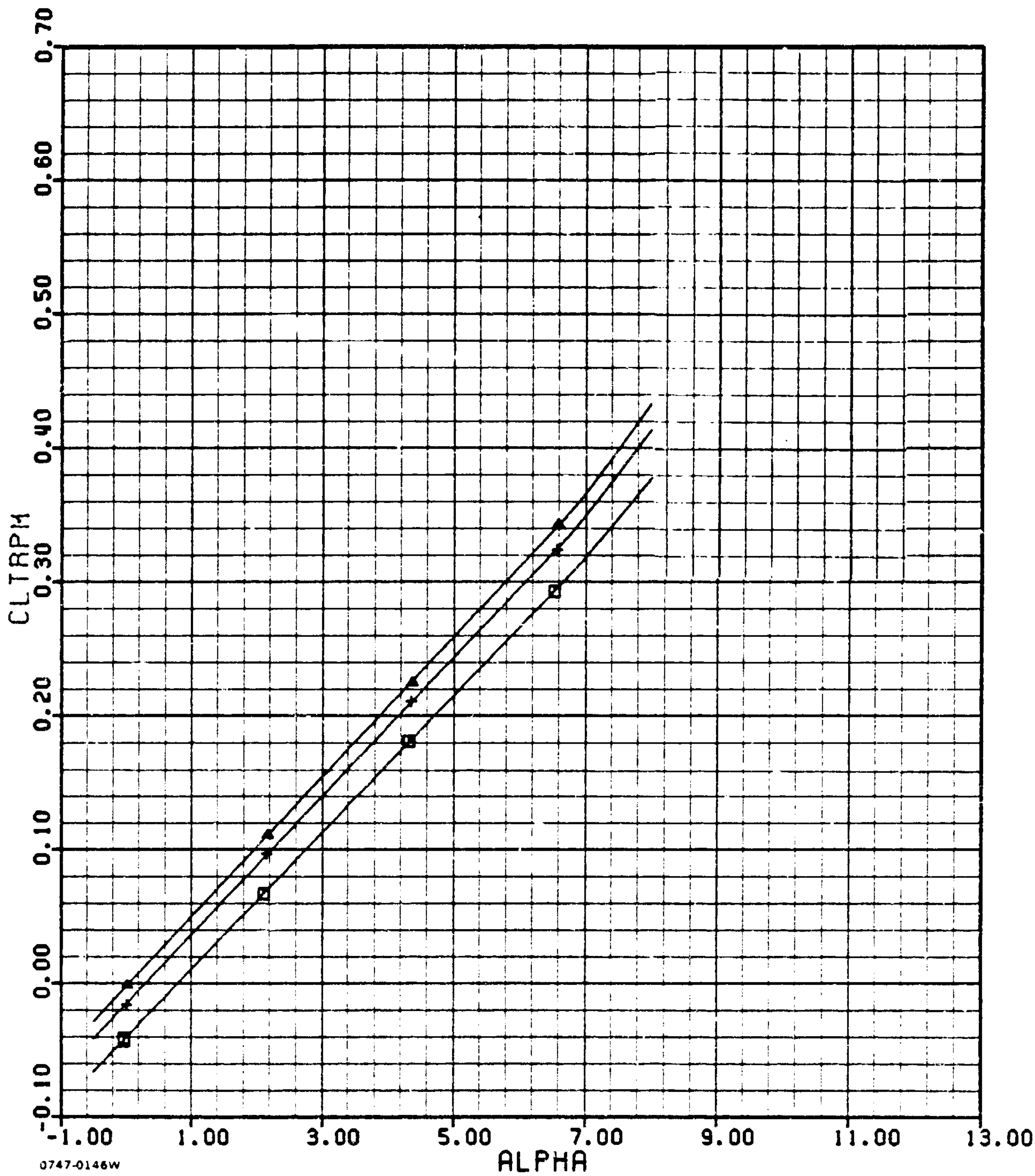
AMES M=0.40 PHASE II




ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLI
CDI
NPR = 1
NPR = 2
NPR = 3
NPR = 4

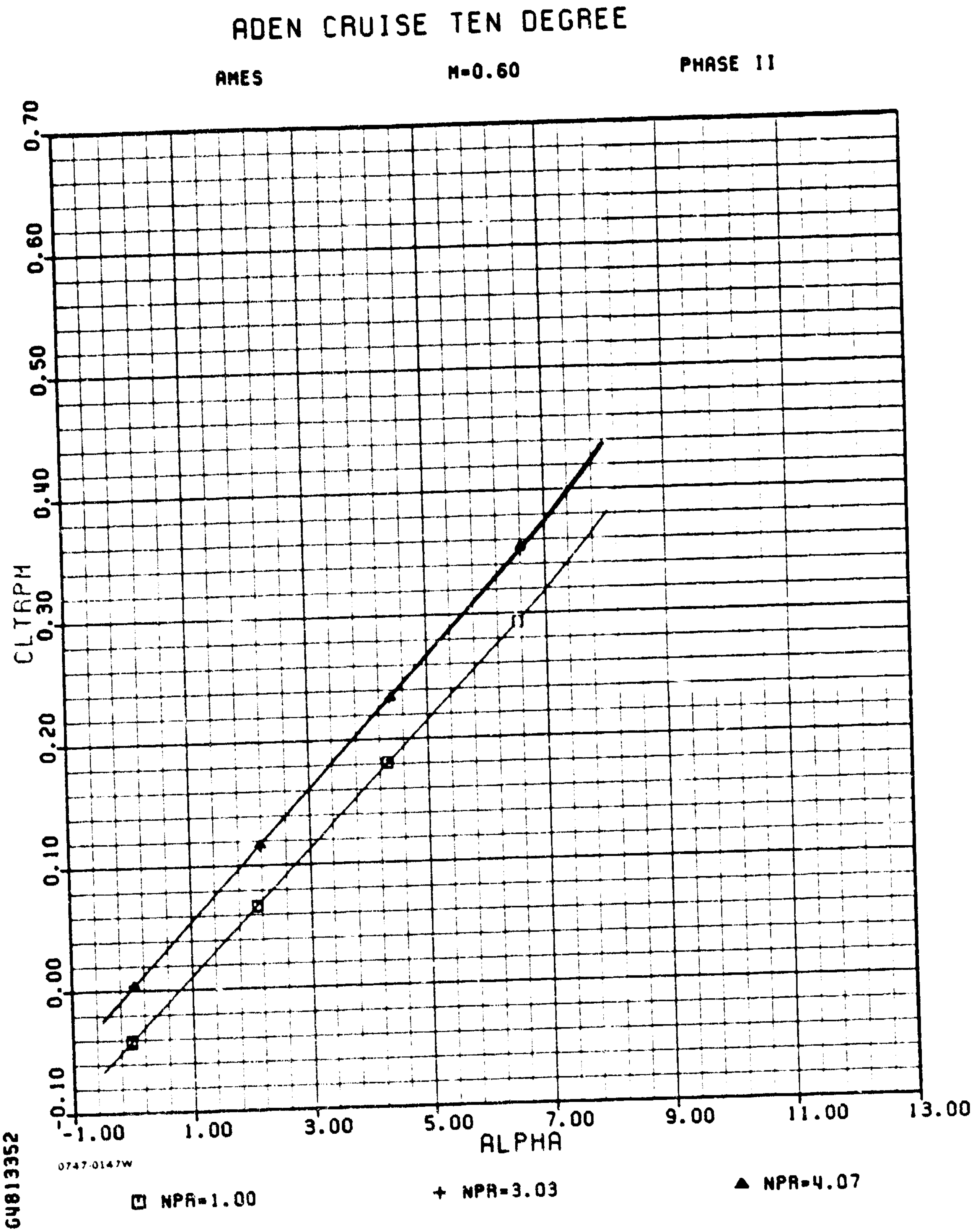
ADEN CRUISE TEN DEGREE

AMES M=0.60 PHASE II



□ NPR=1.00 + NPR=1.28 ▲ NPR=2.55

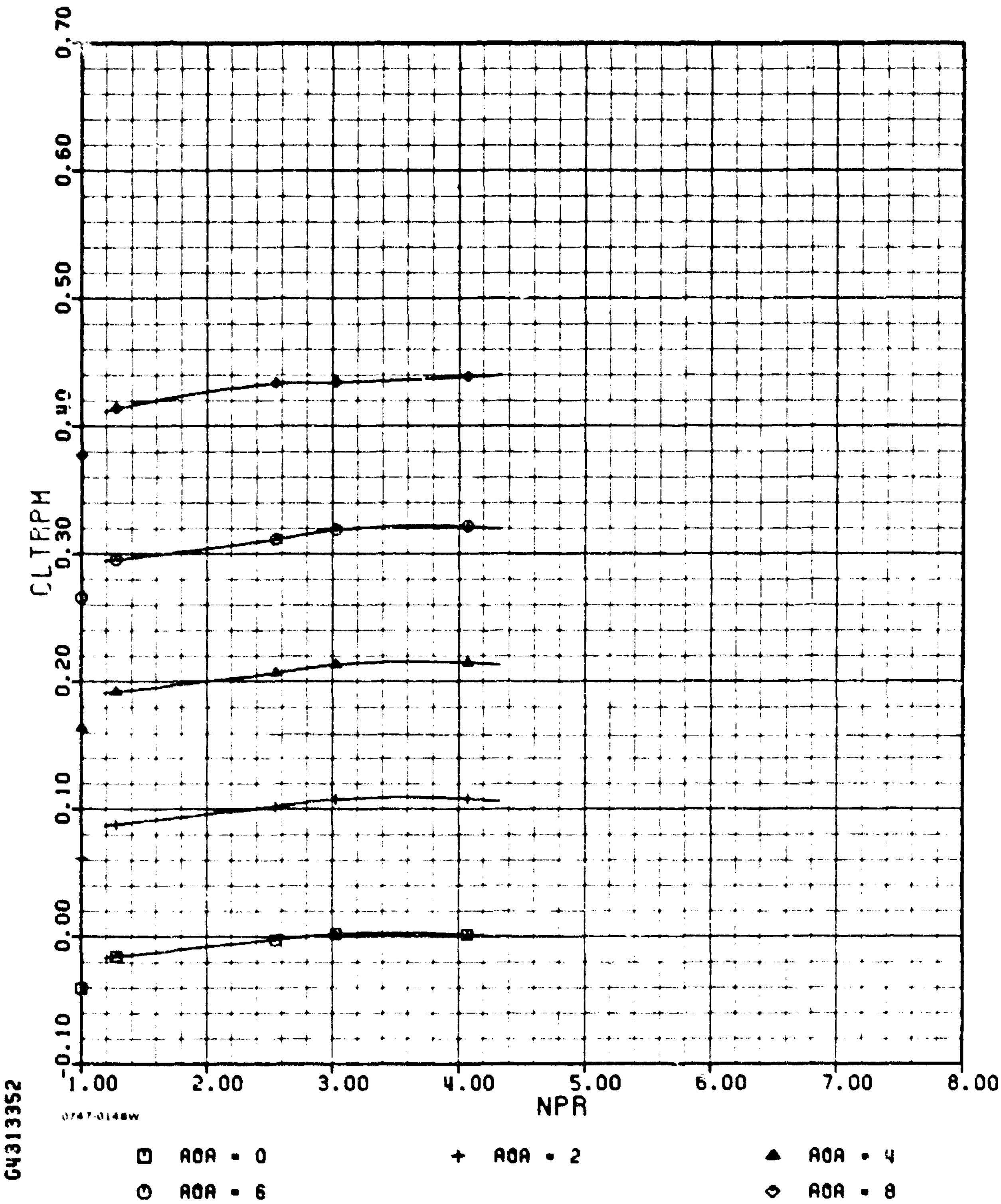
G4813352

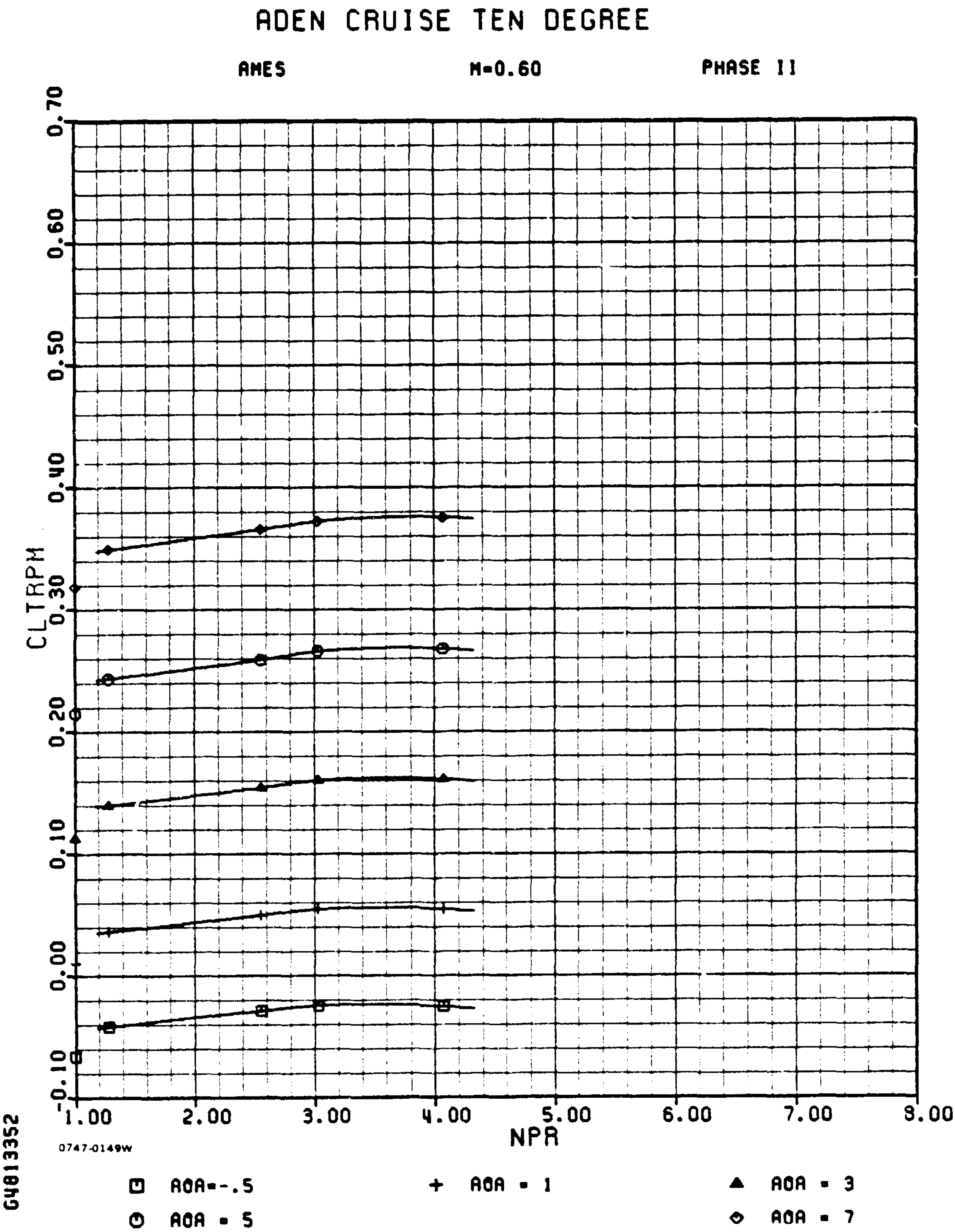

ADEN CRUISE TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G4813352
0747-0147W
NPR=1.00
+ NPR=3.03
NPR=4.07

G-2(a) (concl.)

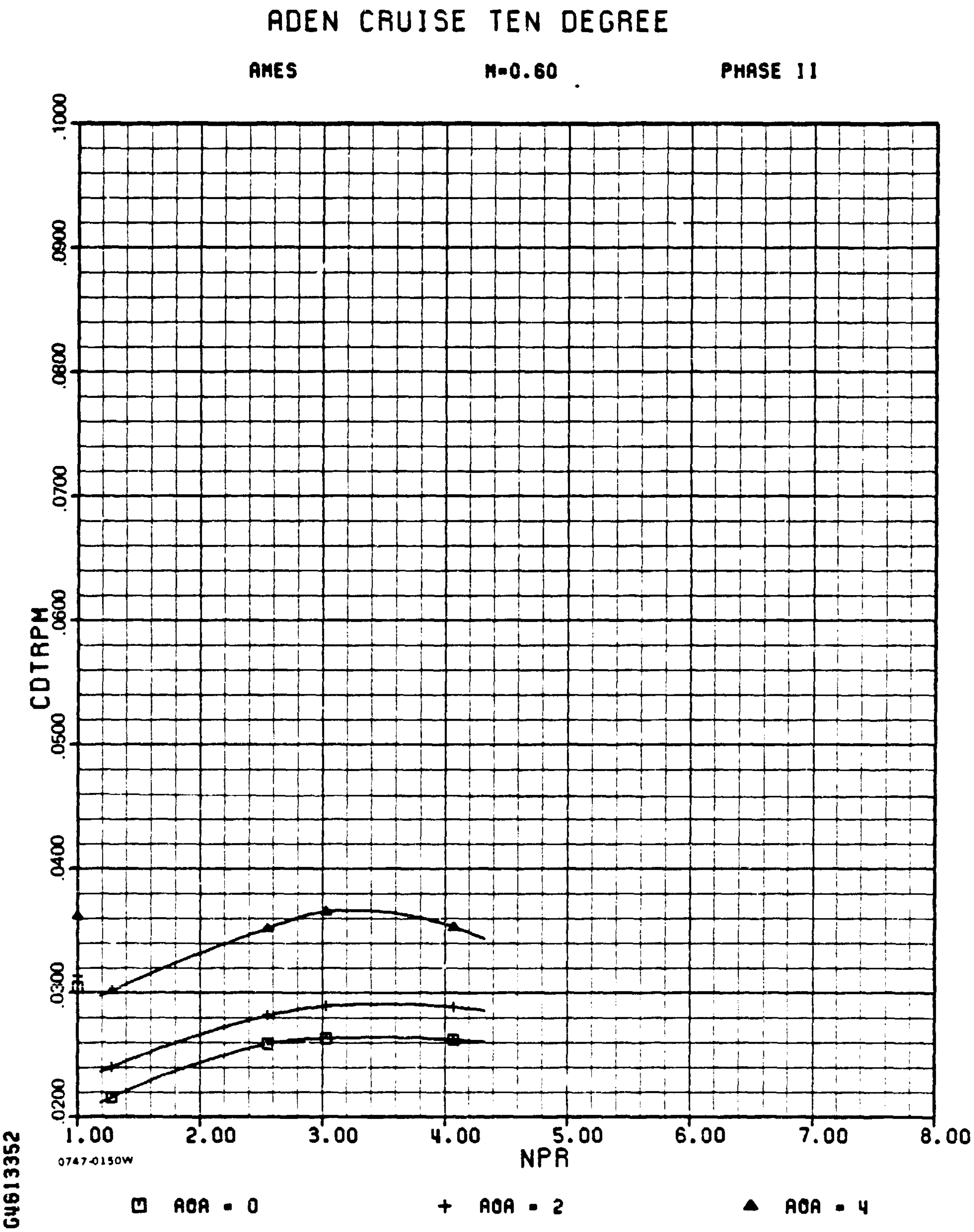
ADEN CRUISE TEN DEGREE

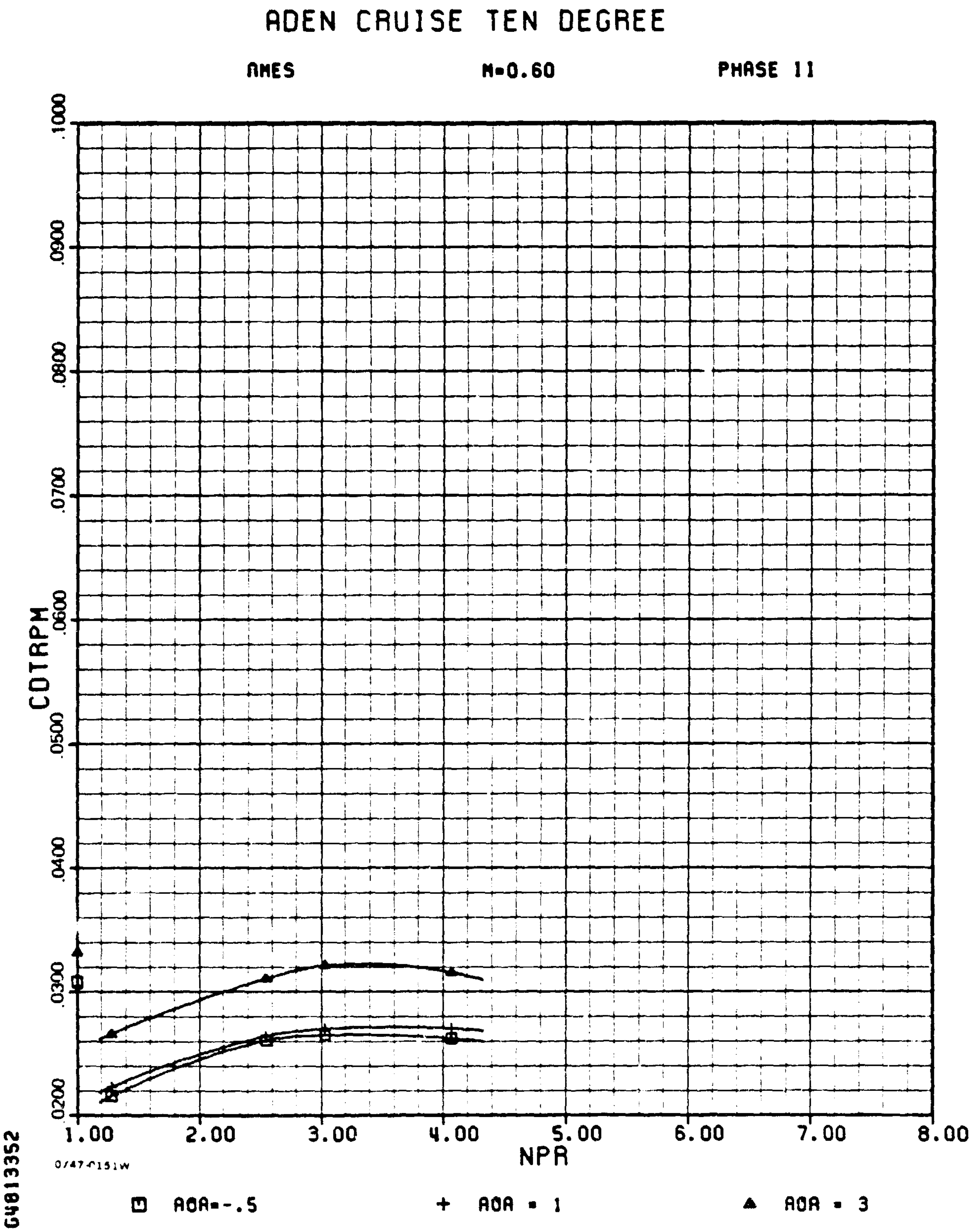
AMES M=0.60 PHASE II



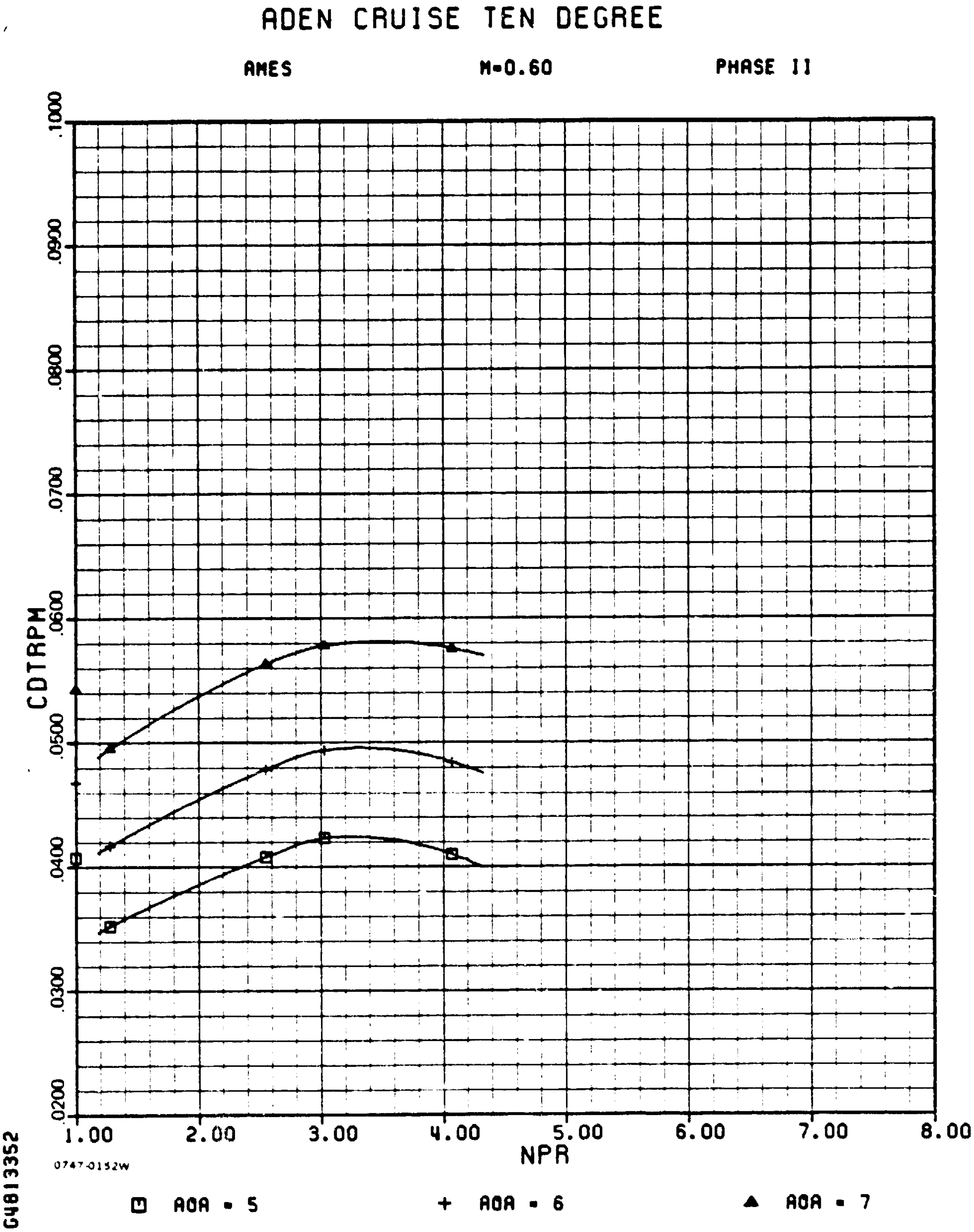

ADEN CRUISE TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0149W
G4813352
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

G-2(b) (concl.)


ADEN CRUISE TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0150W
G4613352
AOA = 0
AOA = 2
AOA = 4


ADEN CRUISE TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G4813352
AOA=-.5
+ AOA = 1
AOA = 3

G-2(c) (cont.)

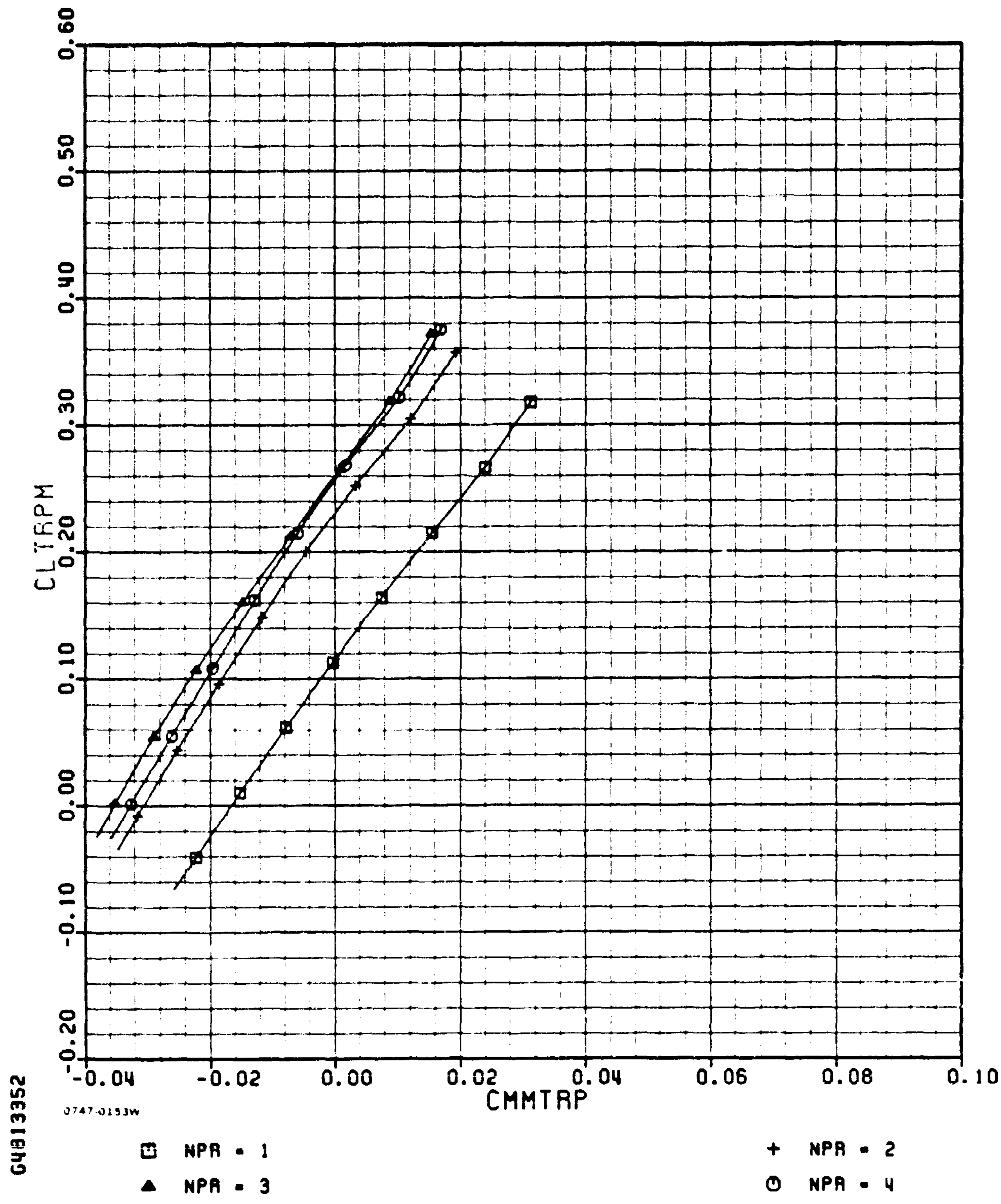


ADEN CRUISE TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0152W
G4813352
AOA = 5
AOA = 6
AOA = 7

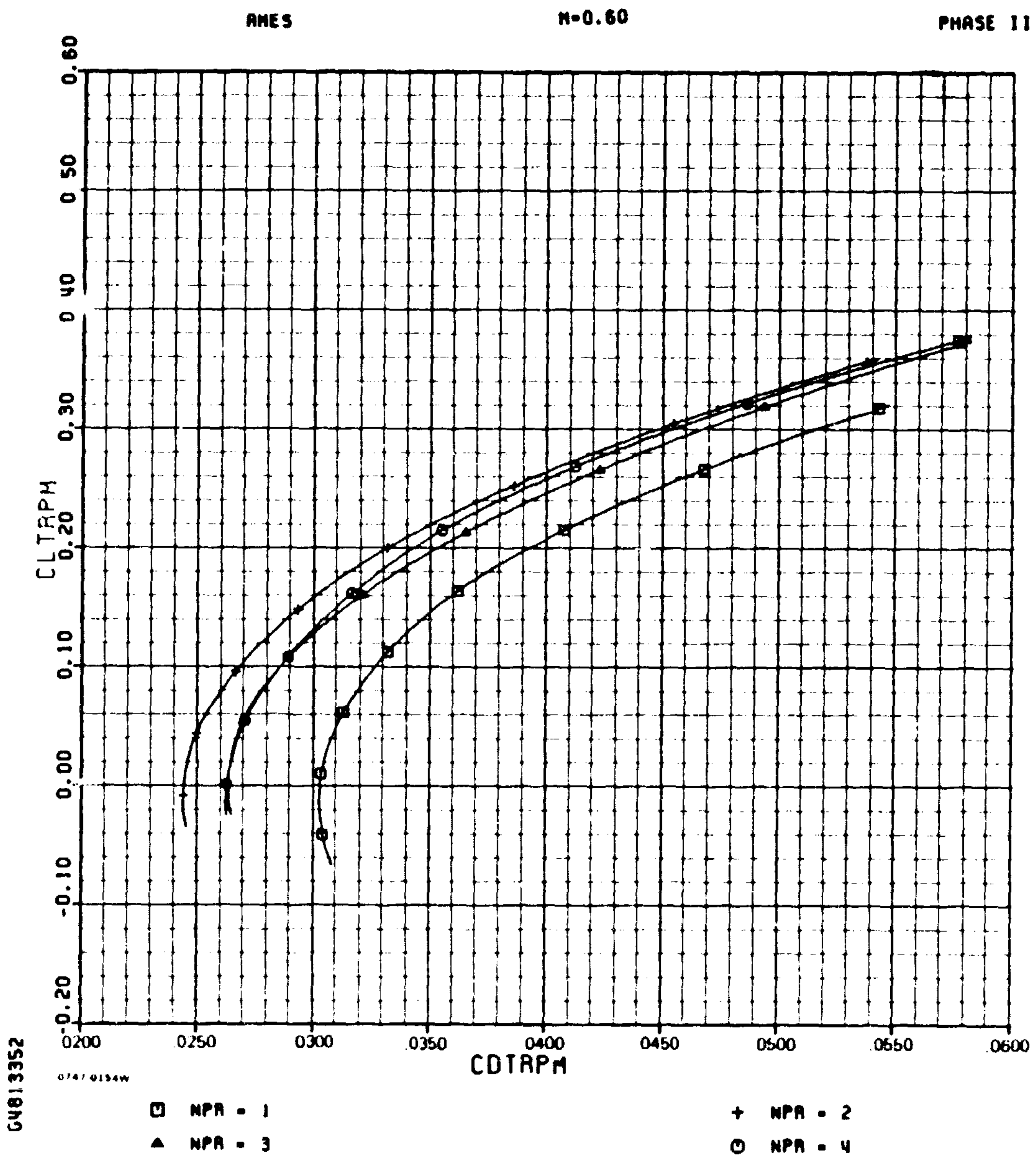
G-2(c) (concl.)

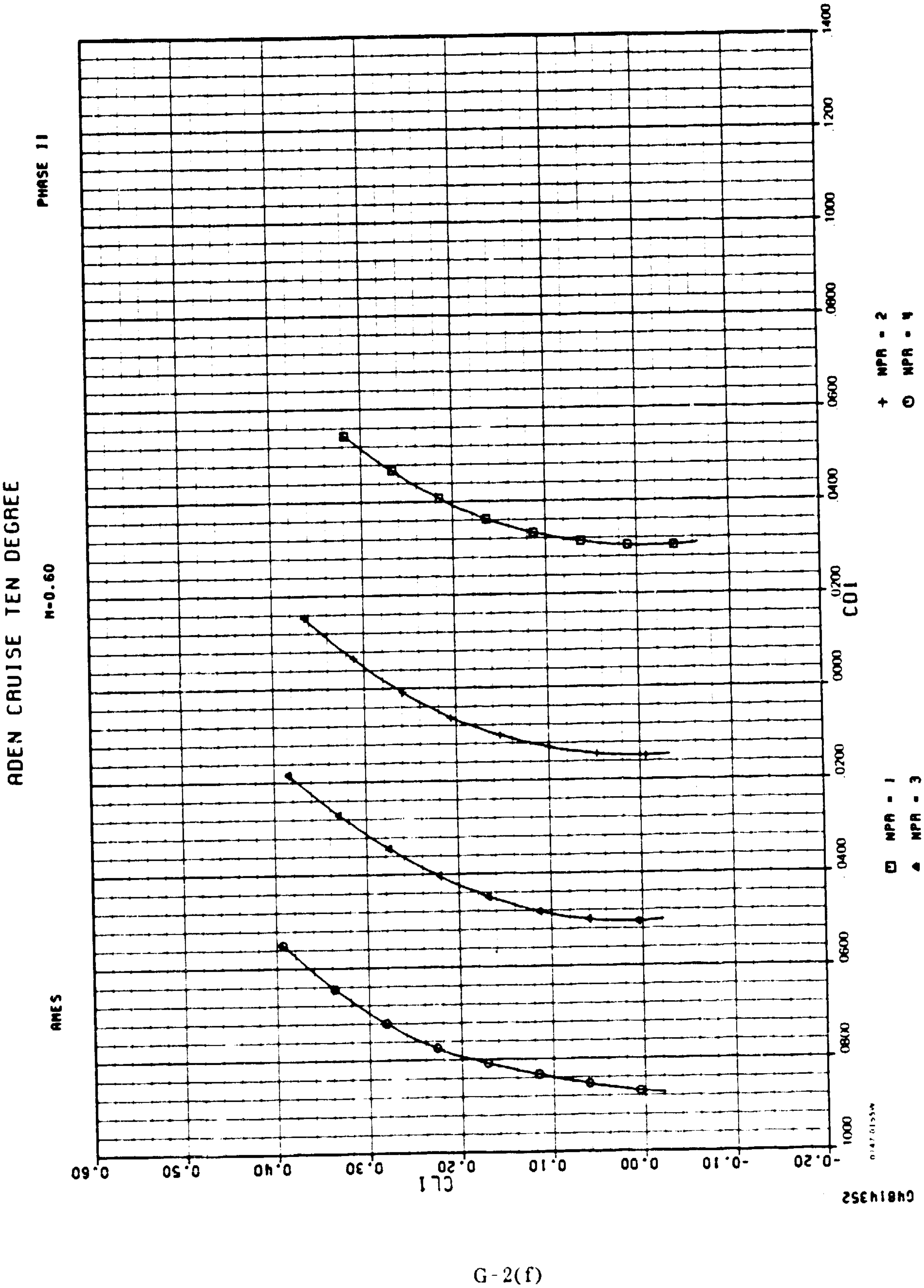
ADEN CRUISE TEN DEGREE

AMES M=0.60 PHASE II

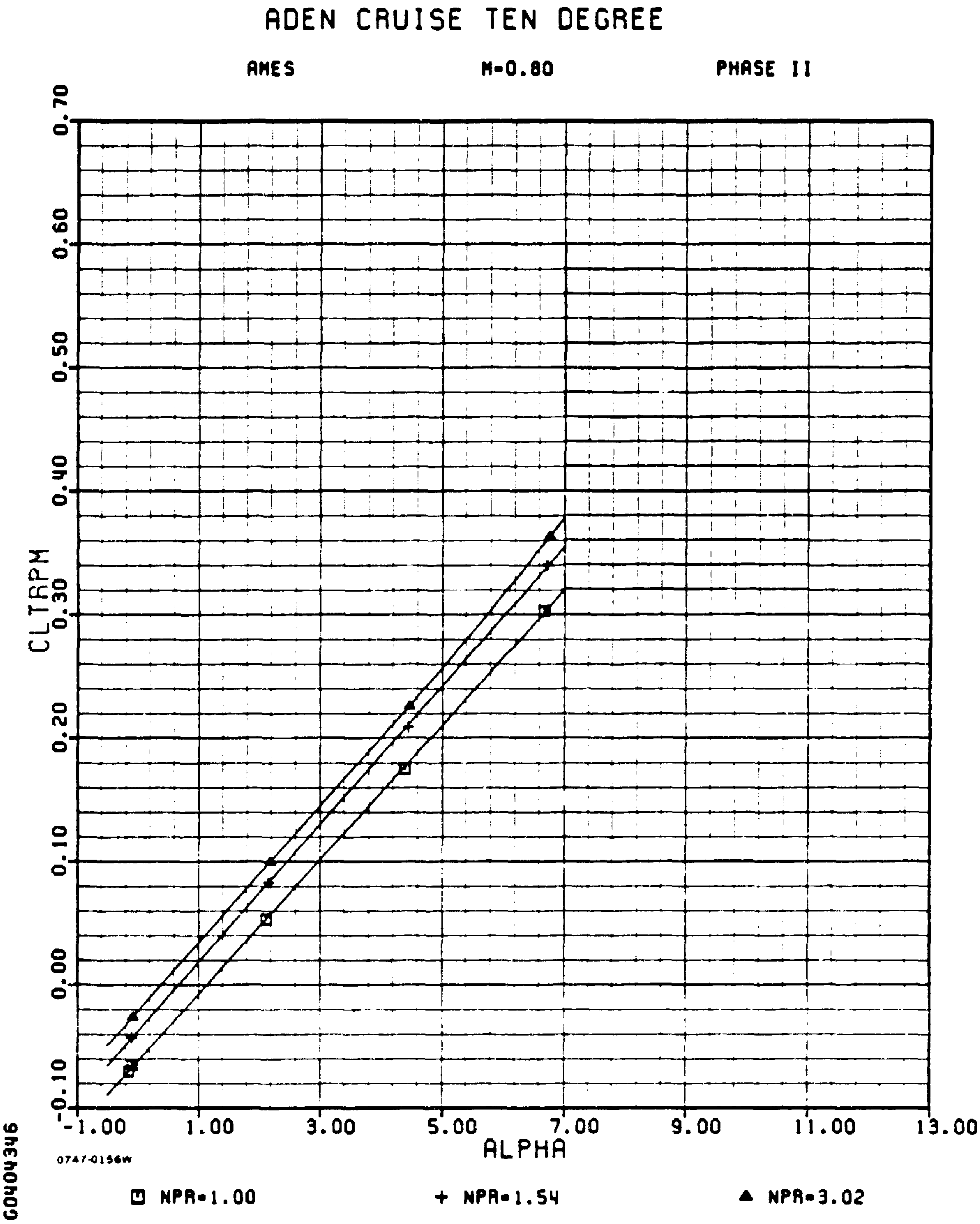


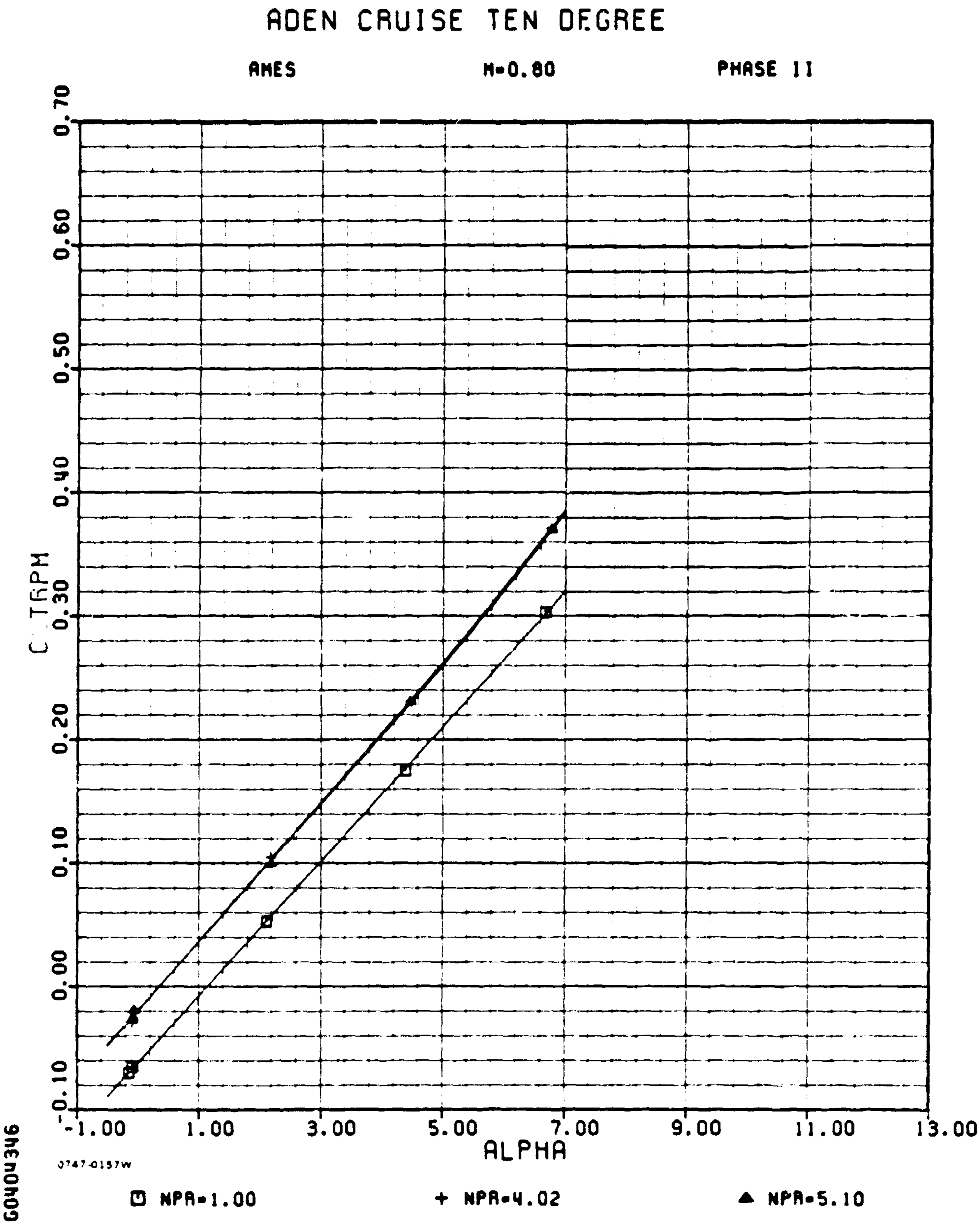
ADEN CRUISE TEN DEGREE




ADEN CRUISE TEN DEGREE
M-0.60
AMES
PHASE II
CDI
CLI
NPR = 1
NPR = 2
NPR = 3
NPR = 4
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
1000
0800
0600
0400
0200
0000
0200
0400
0600
0800
1000
1200
1400

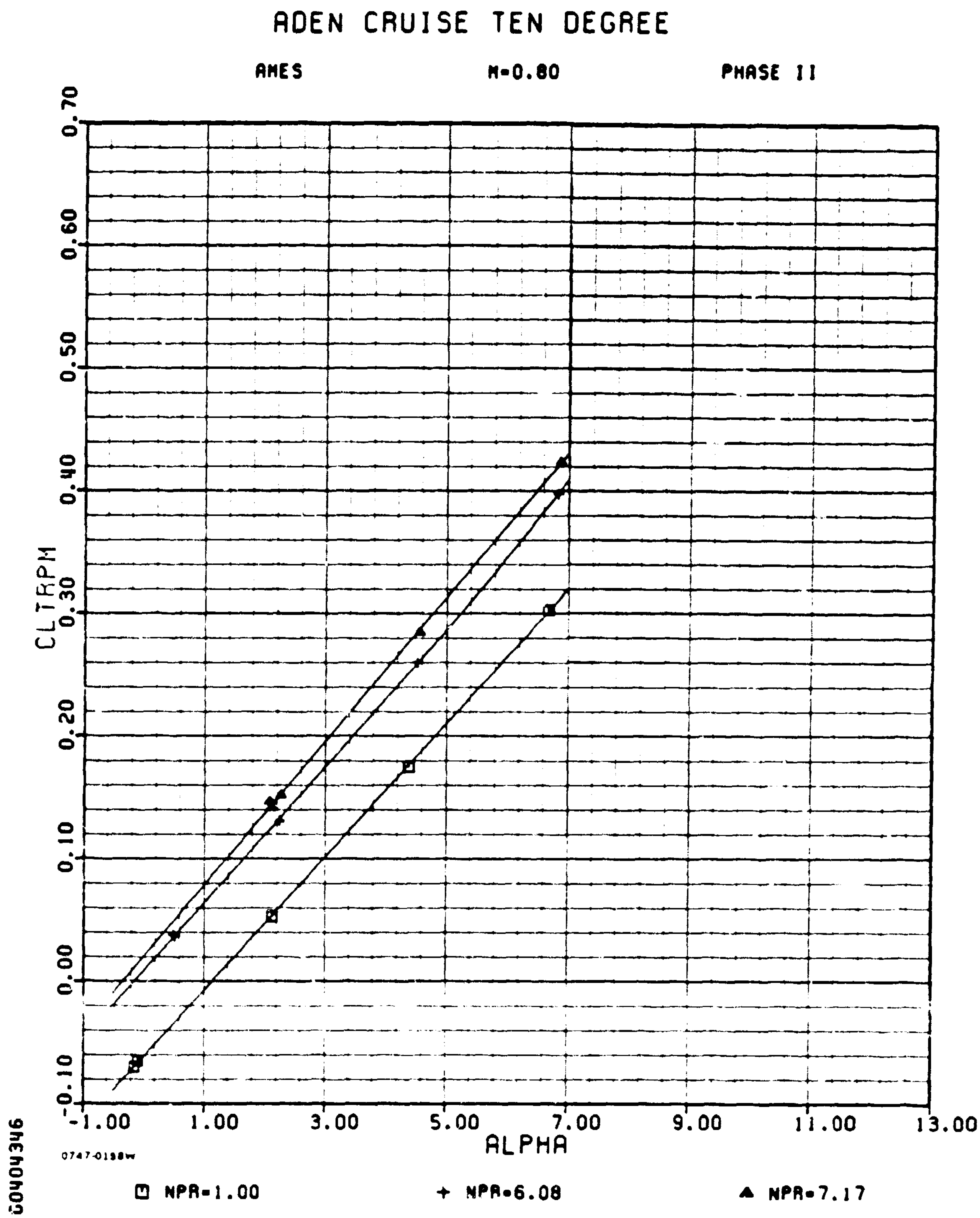
G-2(f)


ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0156W
G0404346
NPR=1.00
NPR=1.54
NPR=3.02

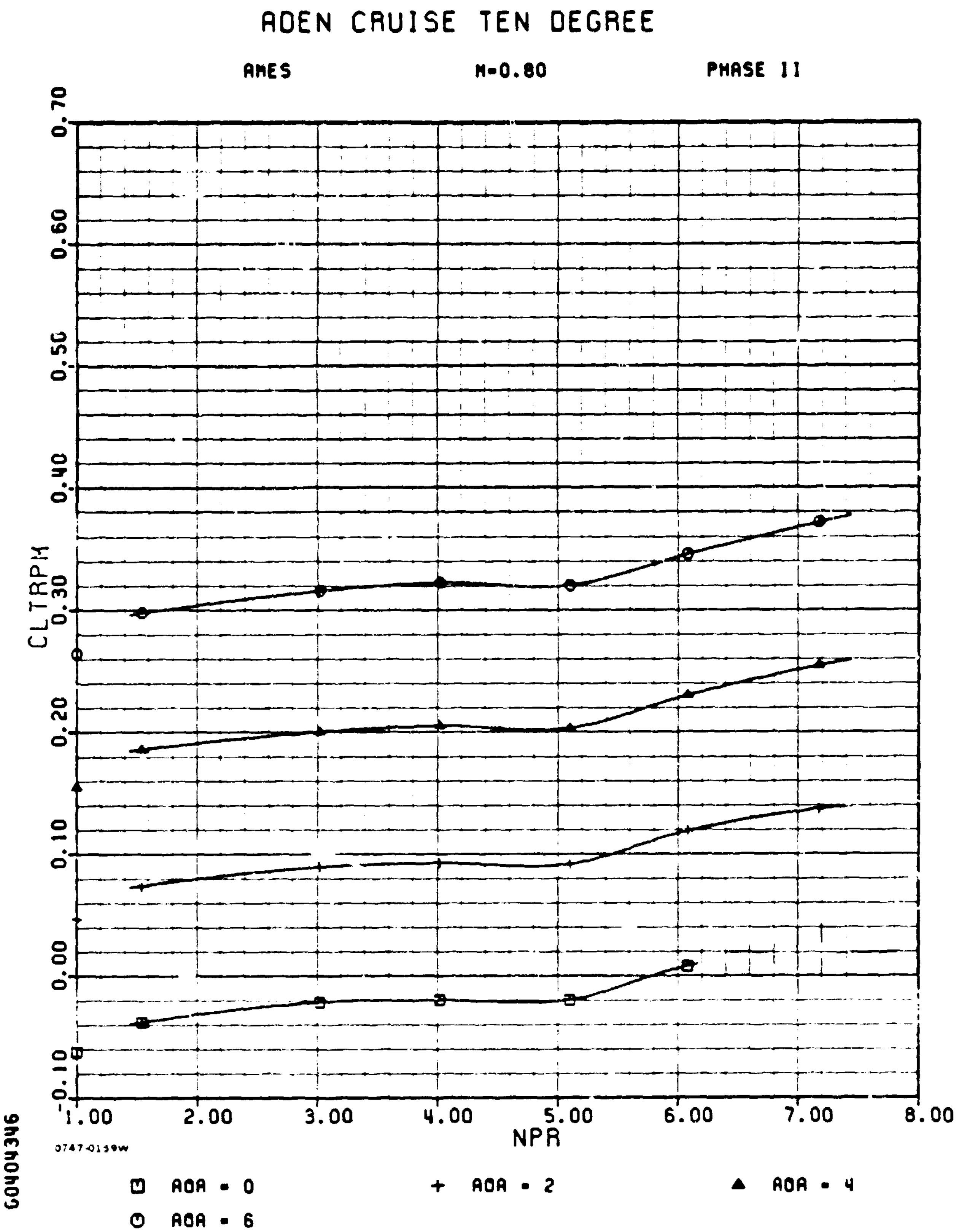


ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
C TRPM
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
G0404346
0747-0157W
NPR=1.00
NPR=4.02
NPR=5.10

G-3(a) (cont.)


ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0198W
NPR=1.00
NPR=6.08
NPR=7.17
G0404346

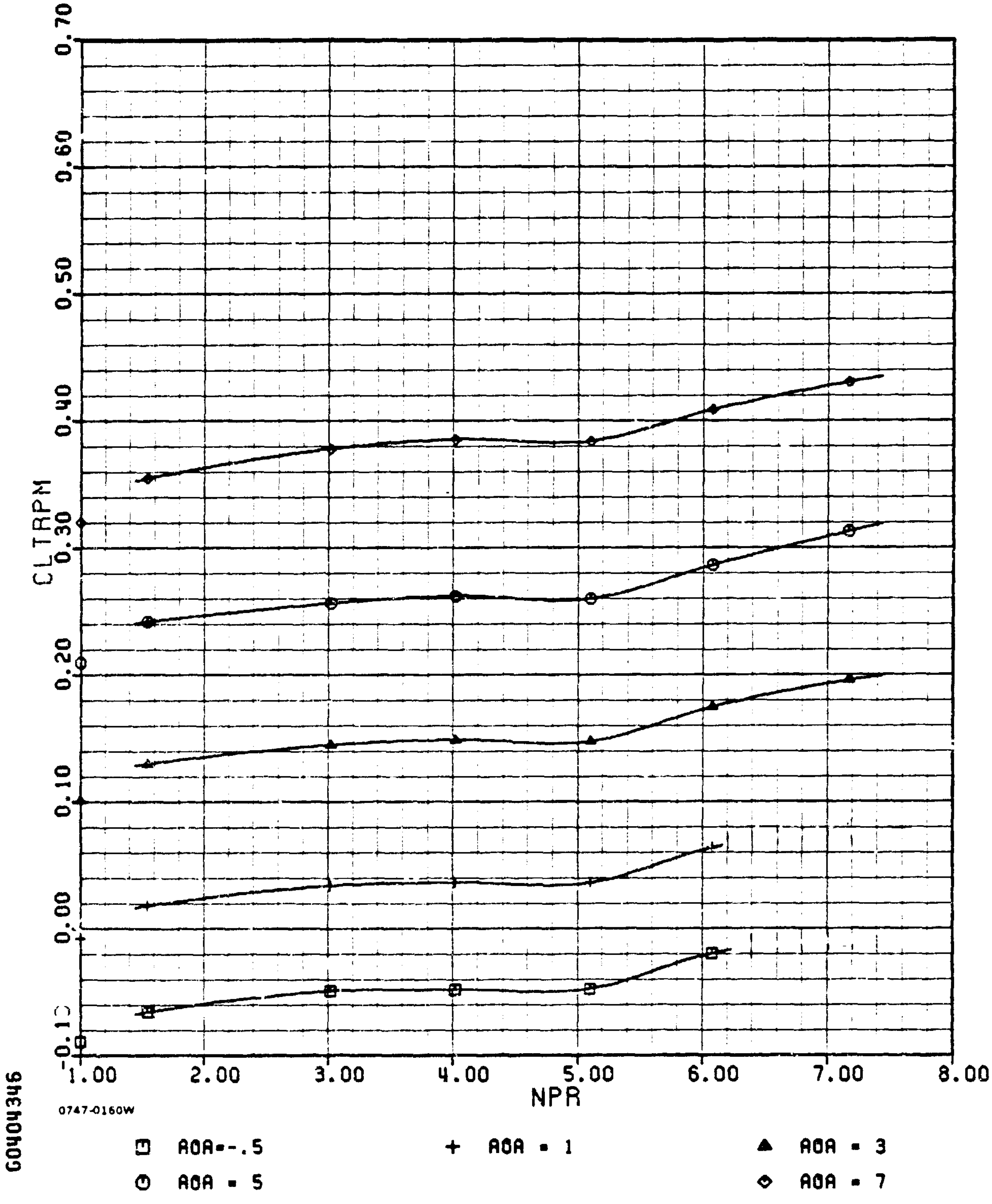
G-3(a) (concl.)



ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA = 0
AOA = 2
AOA = 4
AOA = 6
0747-0159W
G0404346

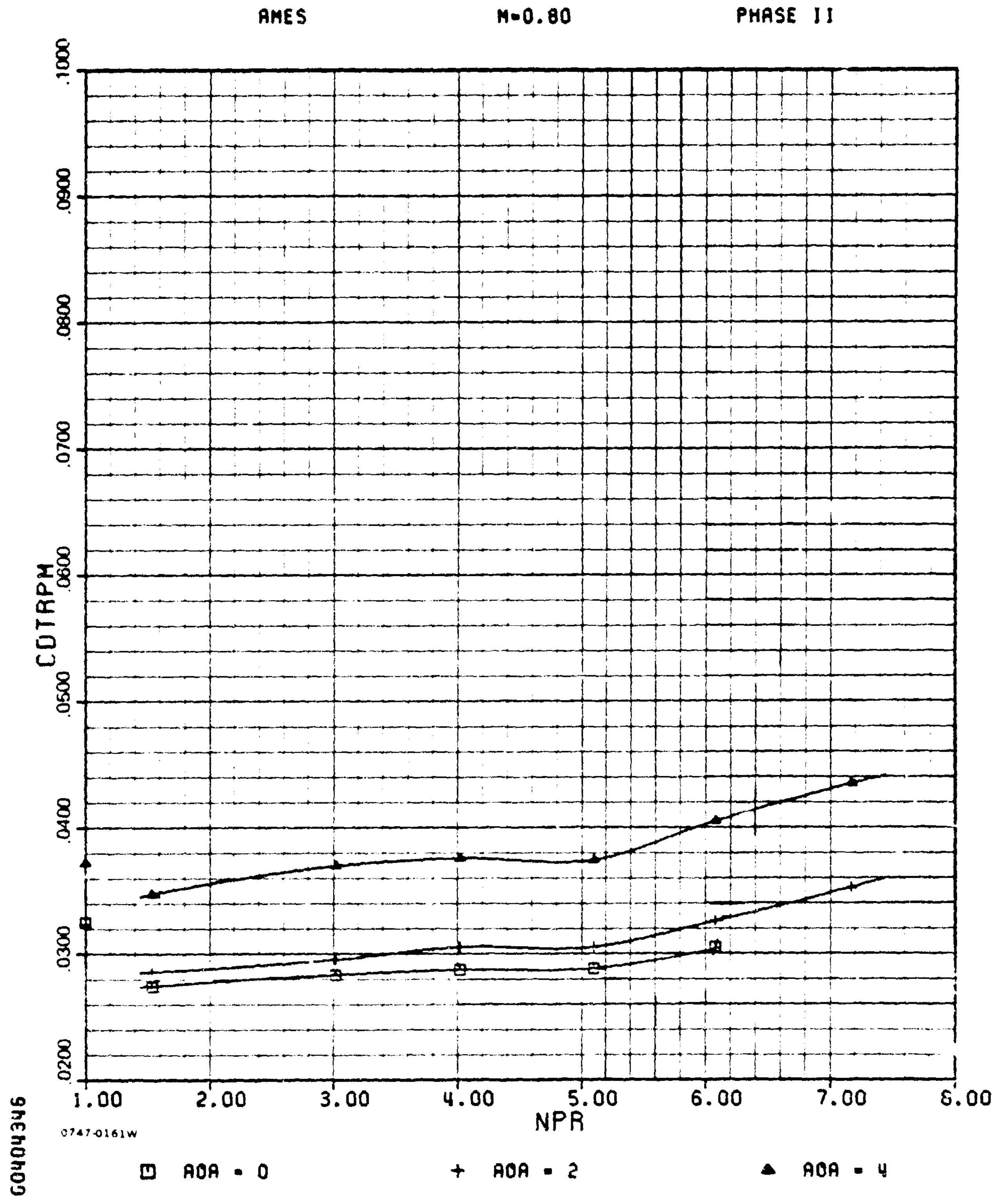
ADEN CRUISE TEN DEGREE

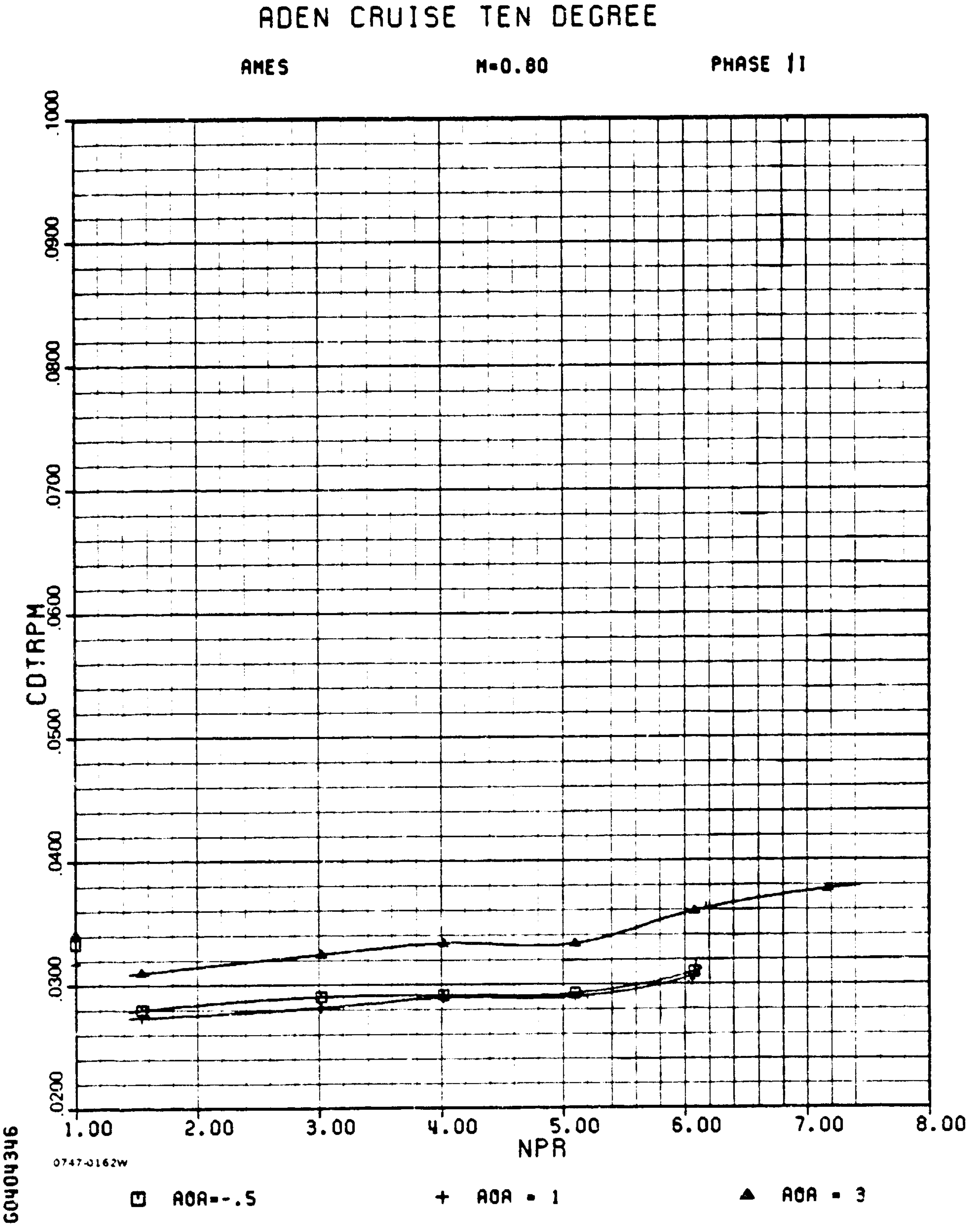
AMES M=0.80 PHASE II



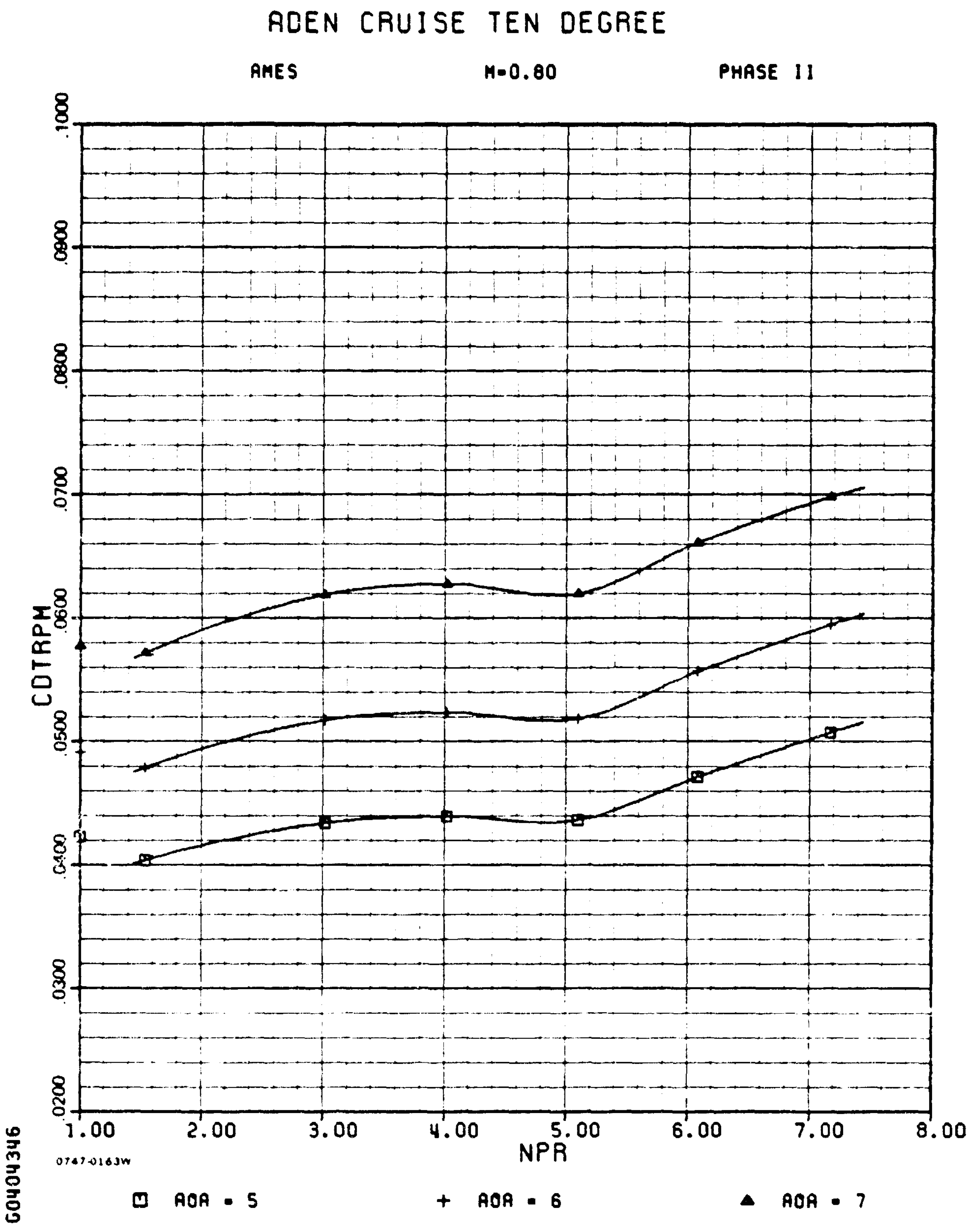
G-3(b) (concl.)

ADEN CRUISE TEN DEGREE

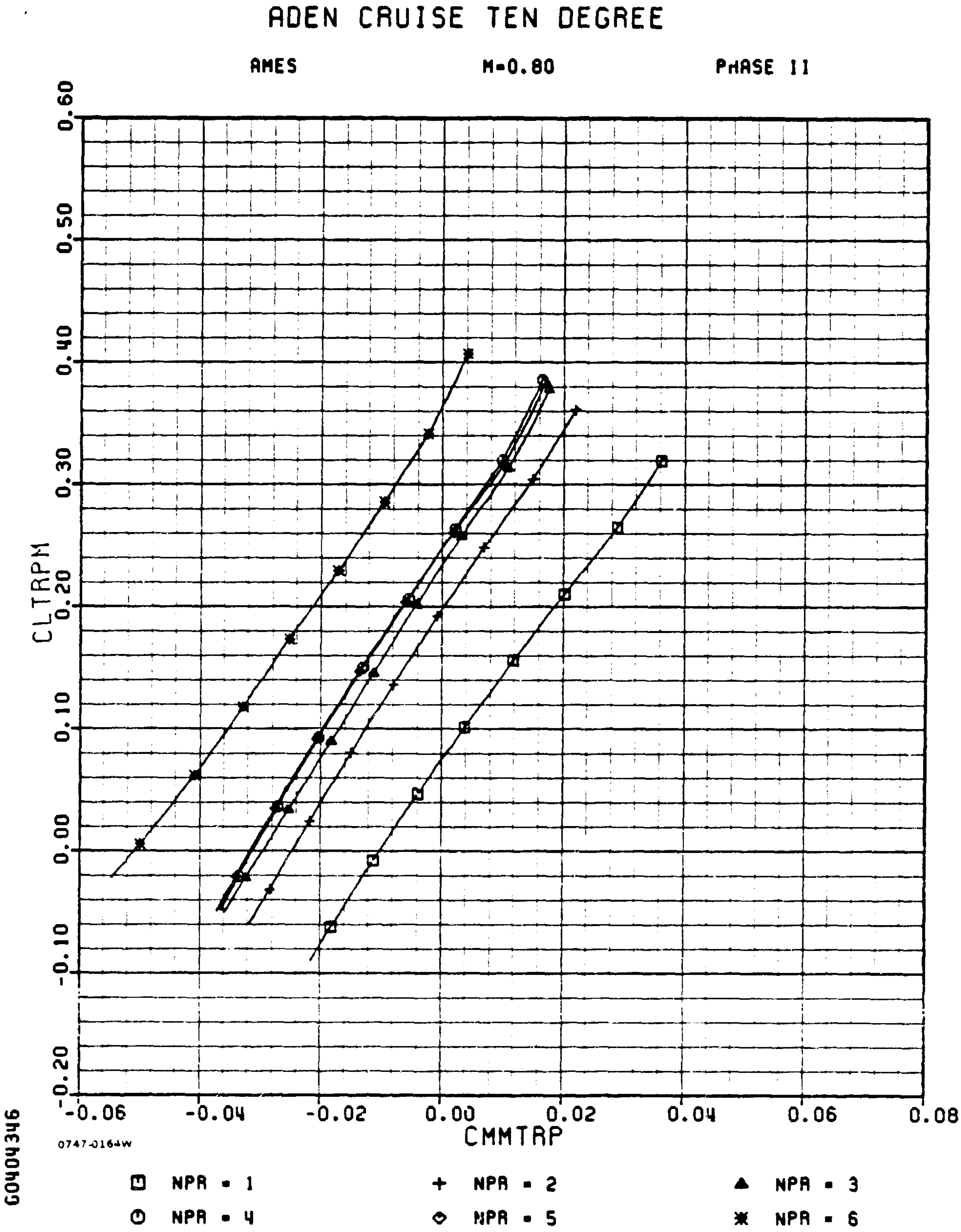



ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0162W
G0404346
AOA=-.5
AOA = 1
AOA = 3

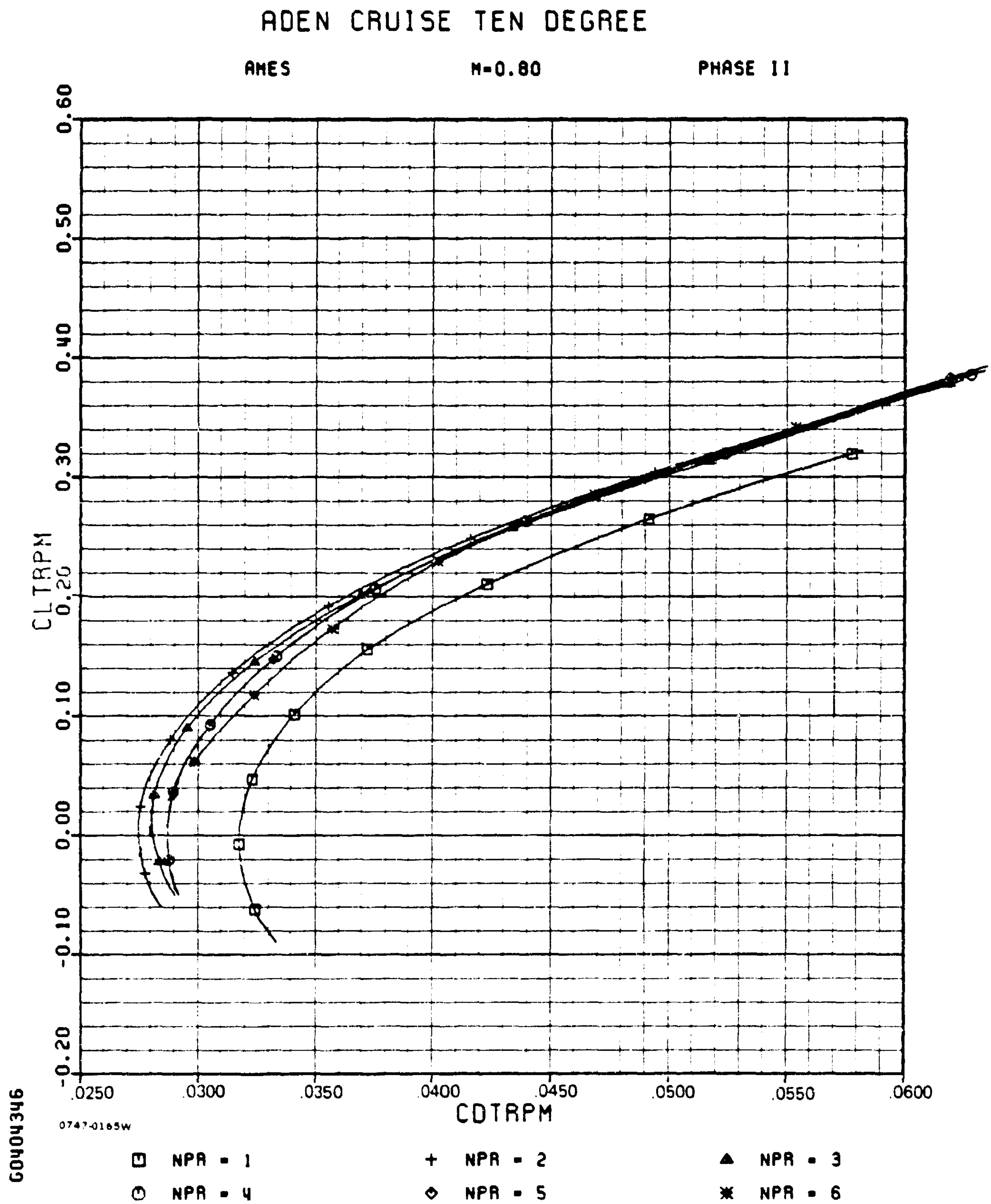
G-3(c) (cont.)


ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0163W
AOA = 5
AOA = 6
AOA = 7
G0404346

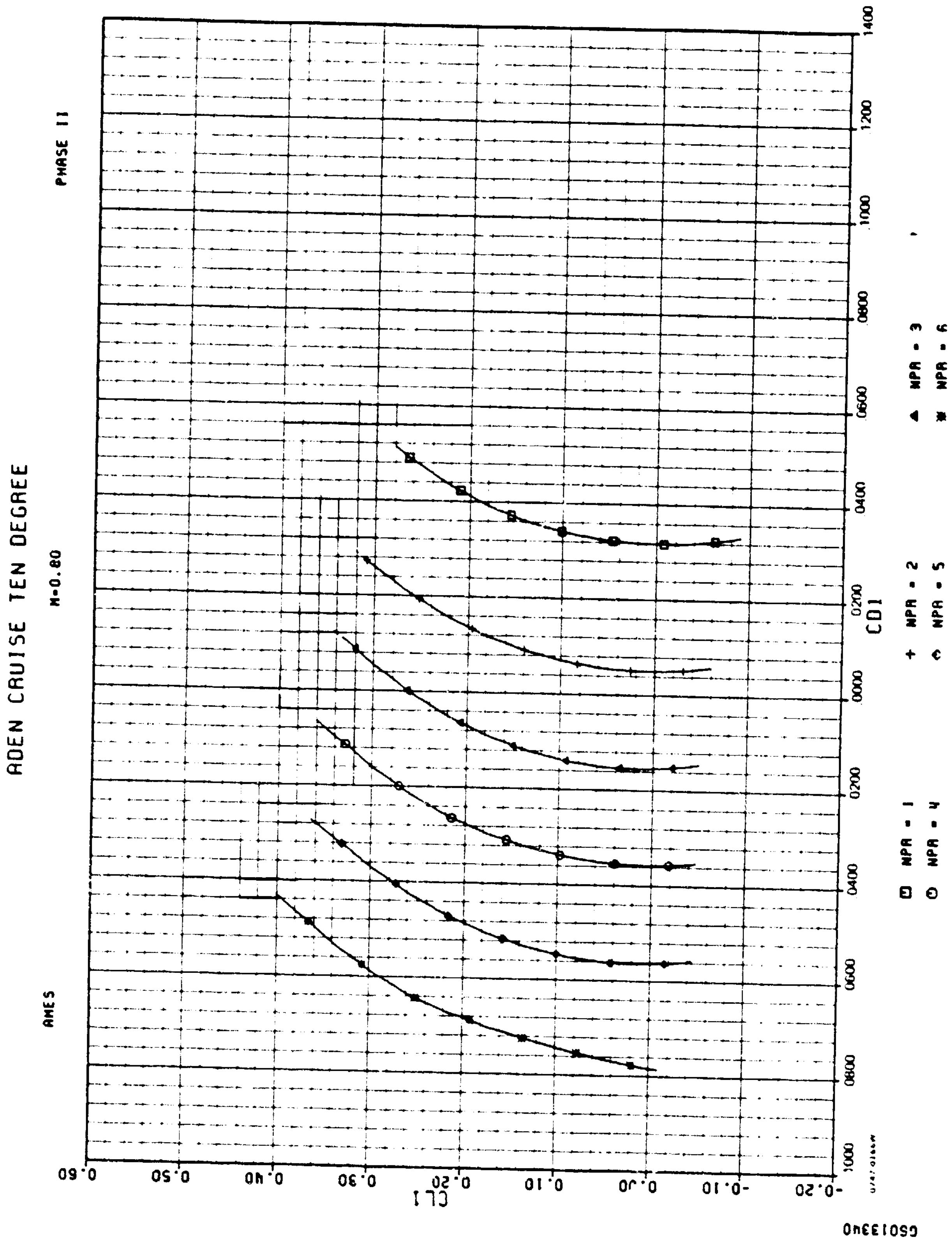
G-3(c) (concl.)


ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.06
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
G0404346
0747-0164W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

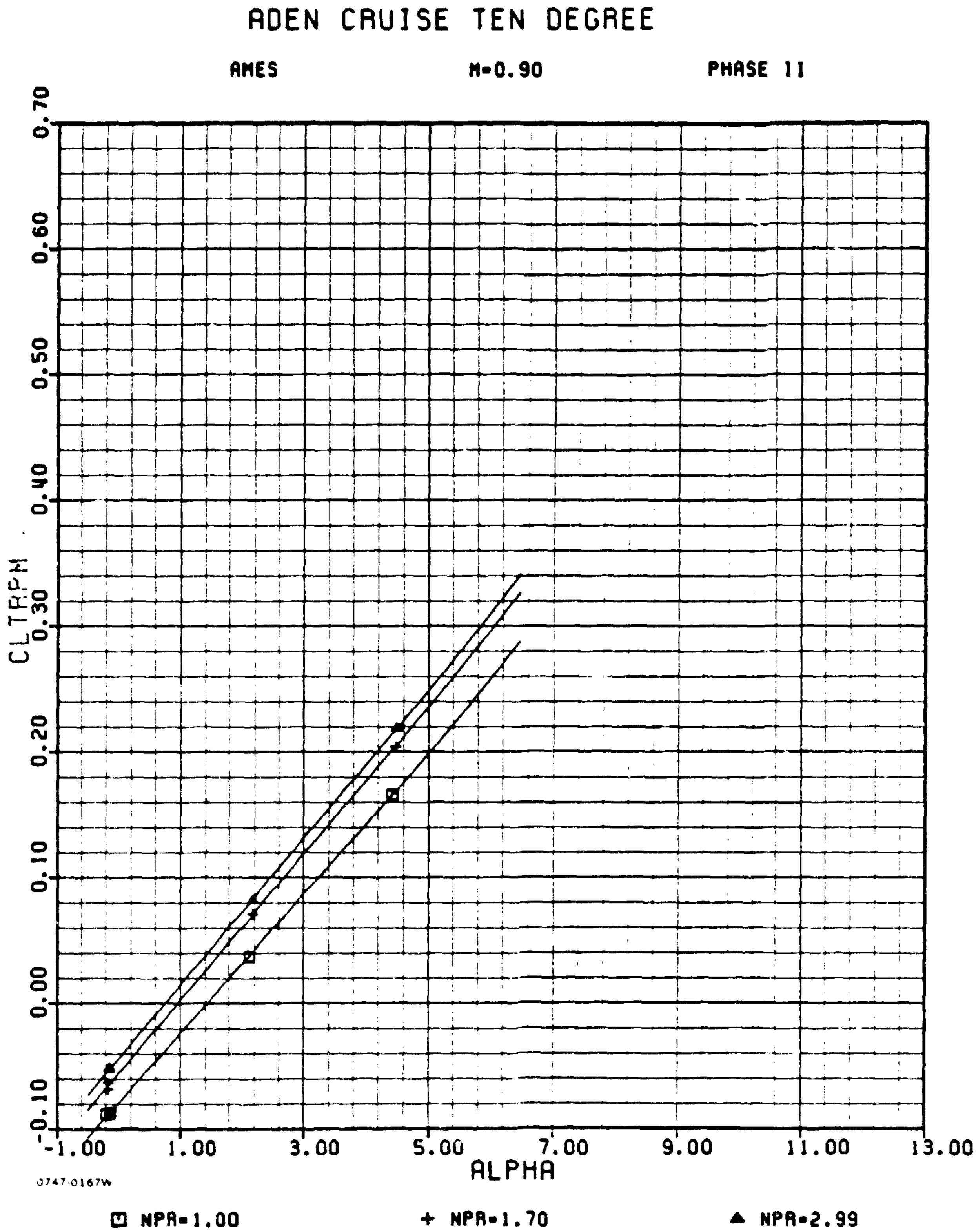
G-3(d)



ADEN CRUISE TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
CDTRPM
G0404346
0747-0165W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN CRUISE TEN DEGREE
M=0.80
AMES
PHASE II
CDI
CLI
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

G-3(f)

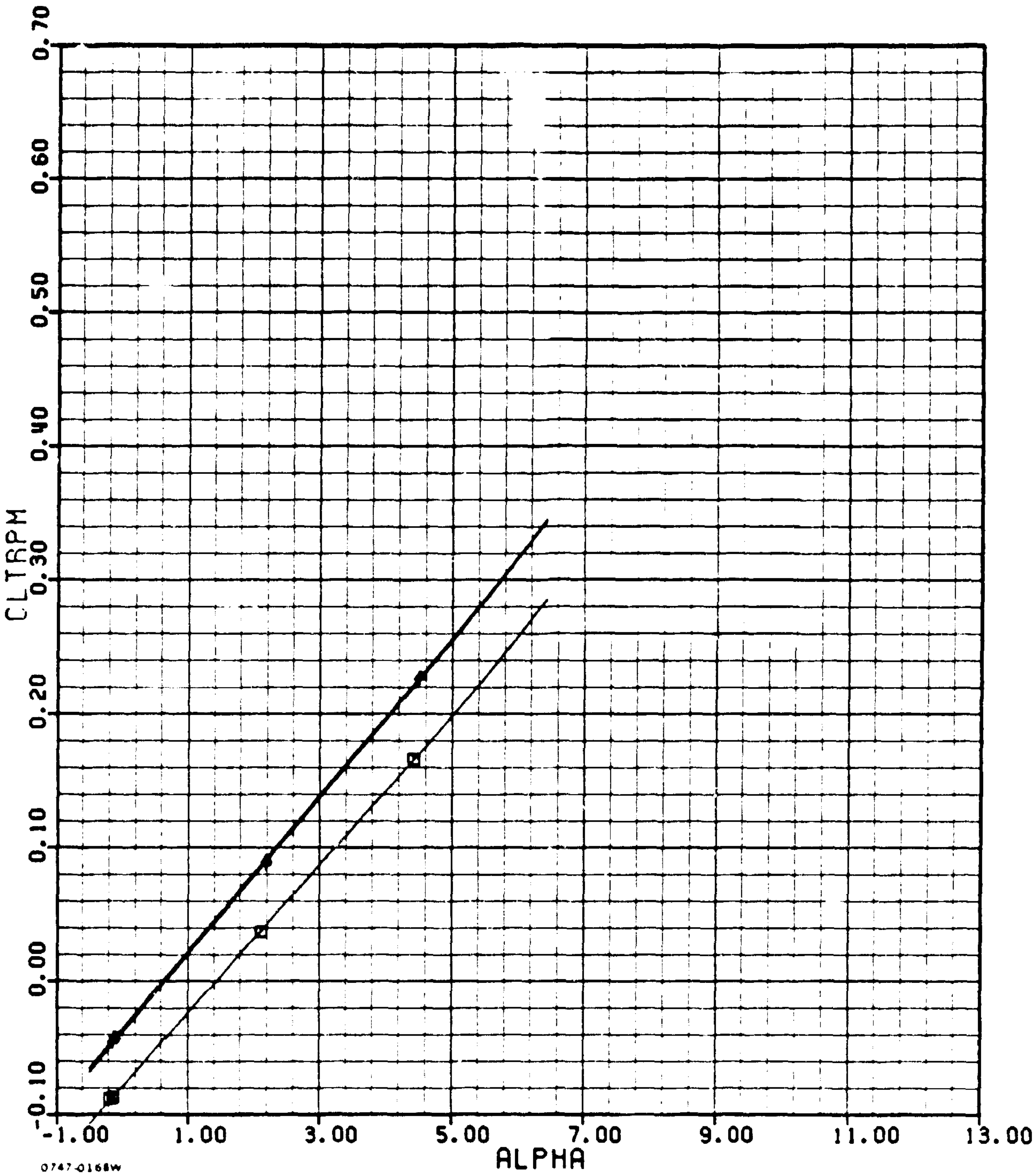


ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0167W
NPR=1.00
NPR=1.70
NPR=2.99

900339

ADEN CRUISE TEN DEGREE

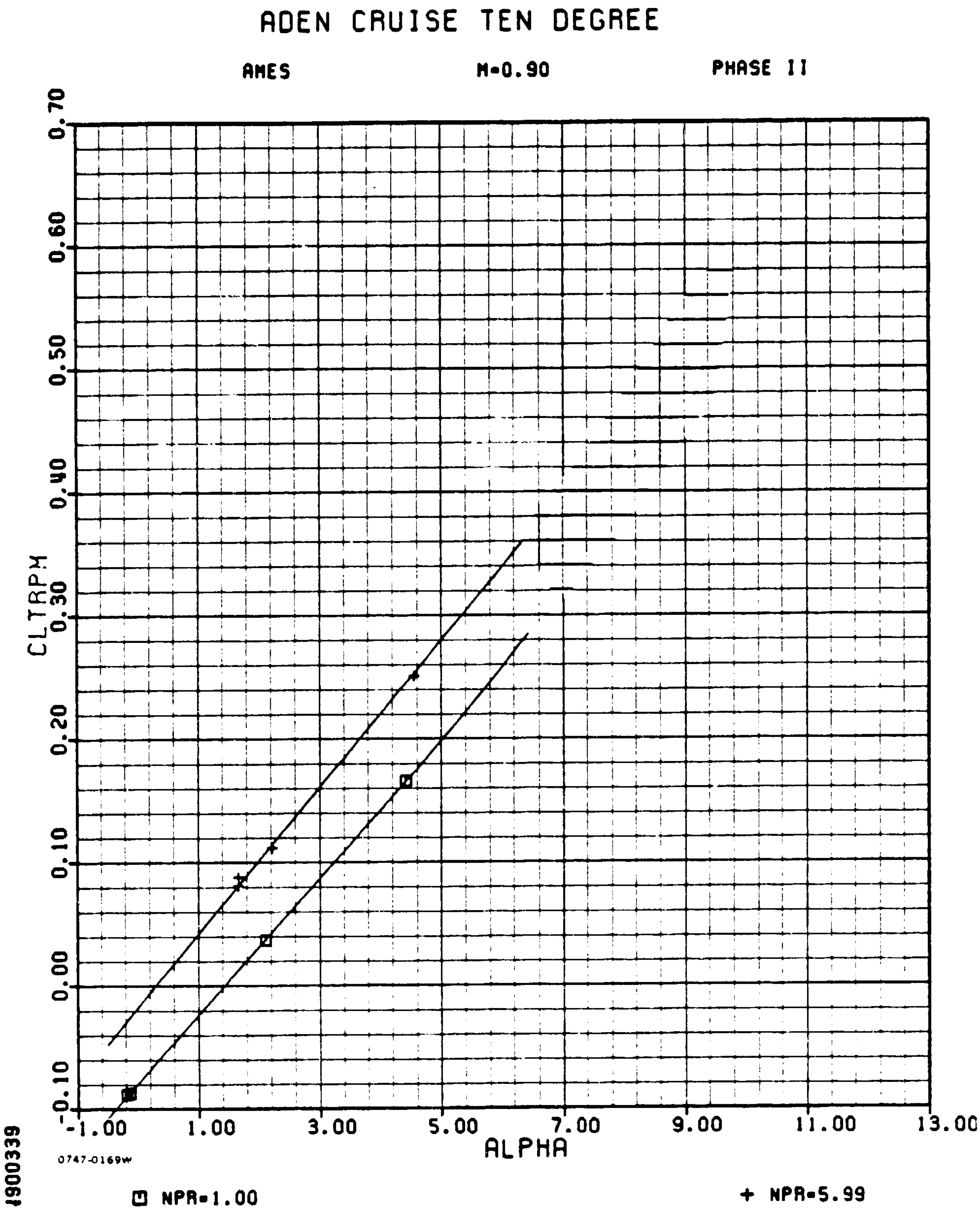
AMES M=0.90 PHASE II



G4900339

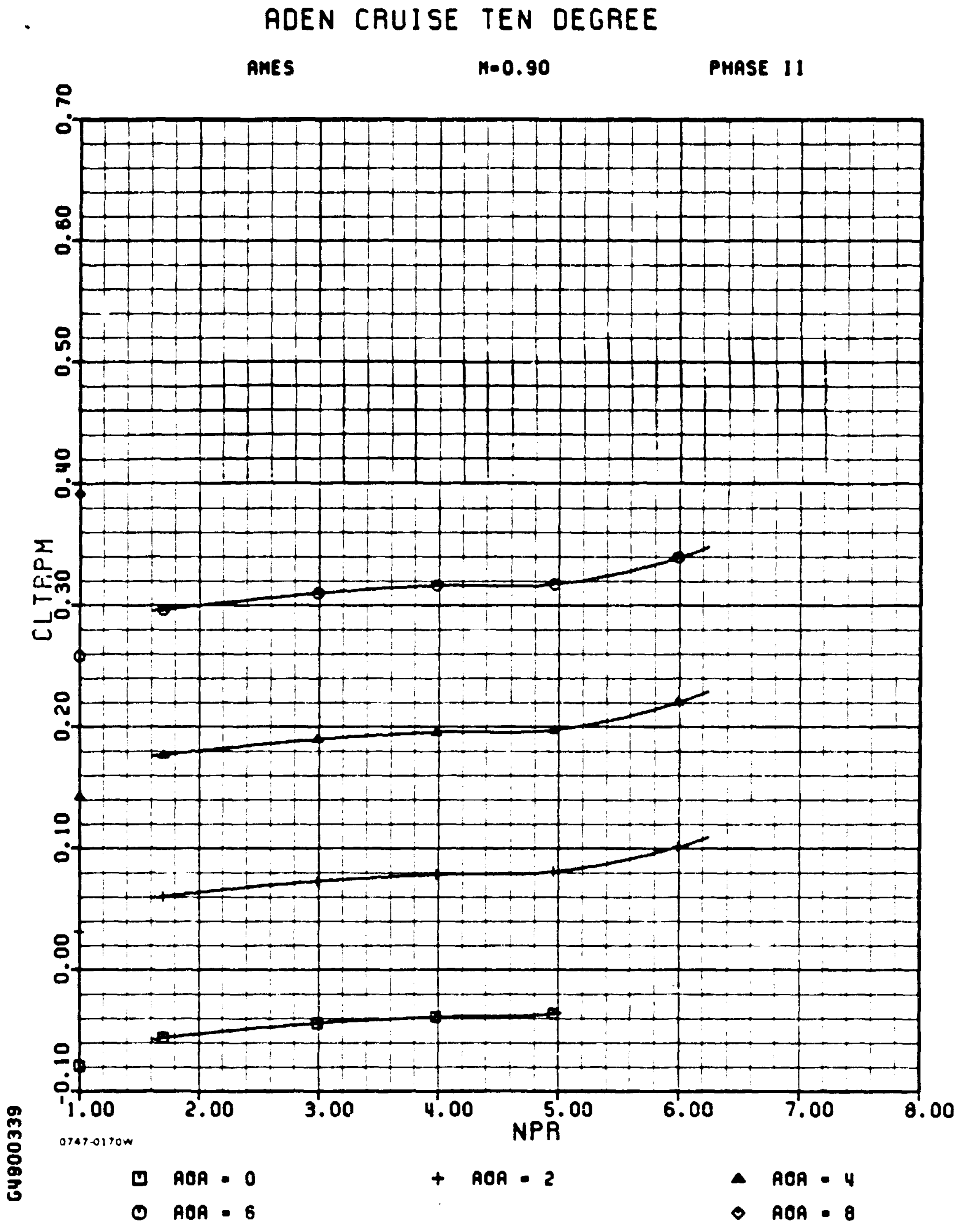
□ NPR=1.00 + NPR=3.98 ▲ NPR=4.96

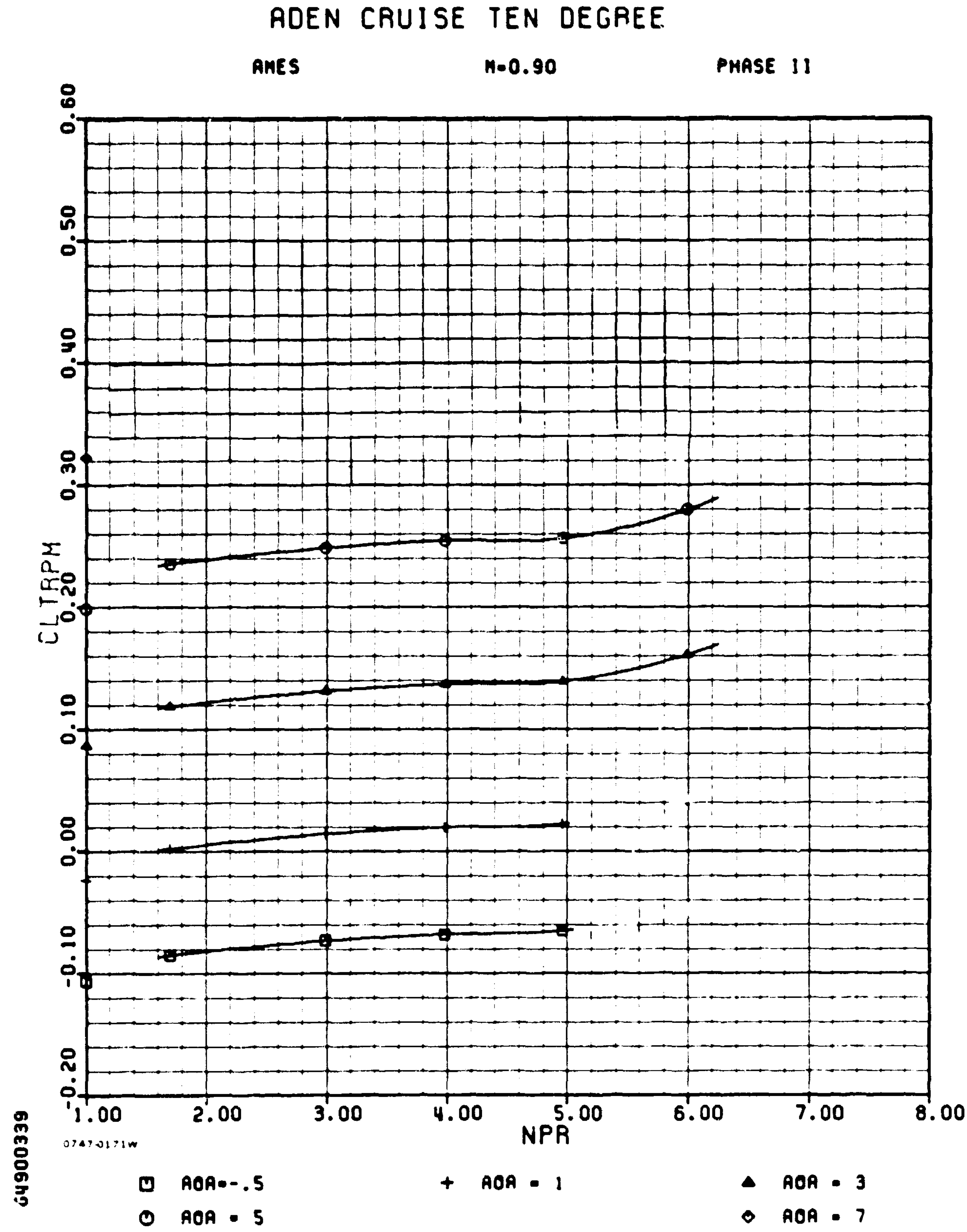
G-4(a) (cont.)



ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
4900339
0747-0169W
NPR=1.00
+ NPR=5.99

G-4(a) (concl.)


ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0170W
GV900339
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8

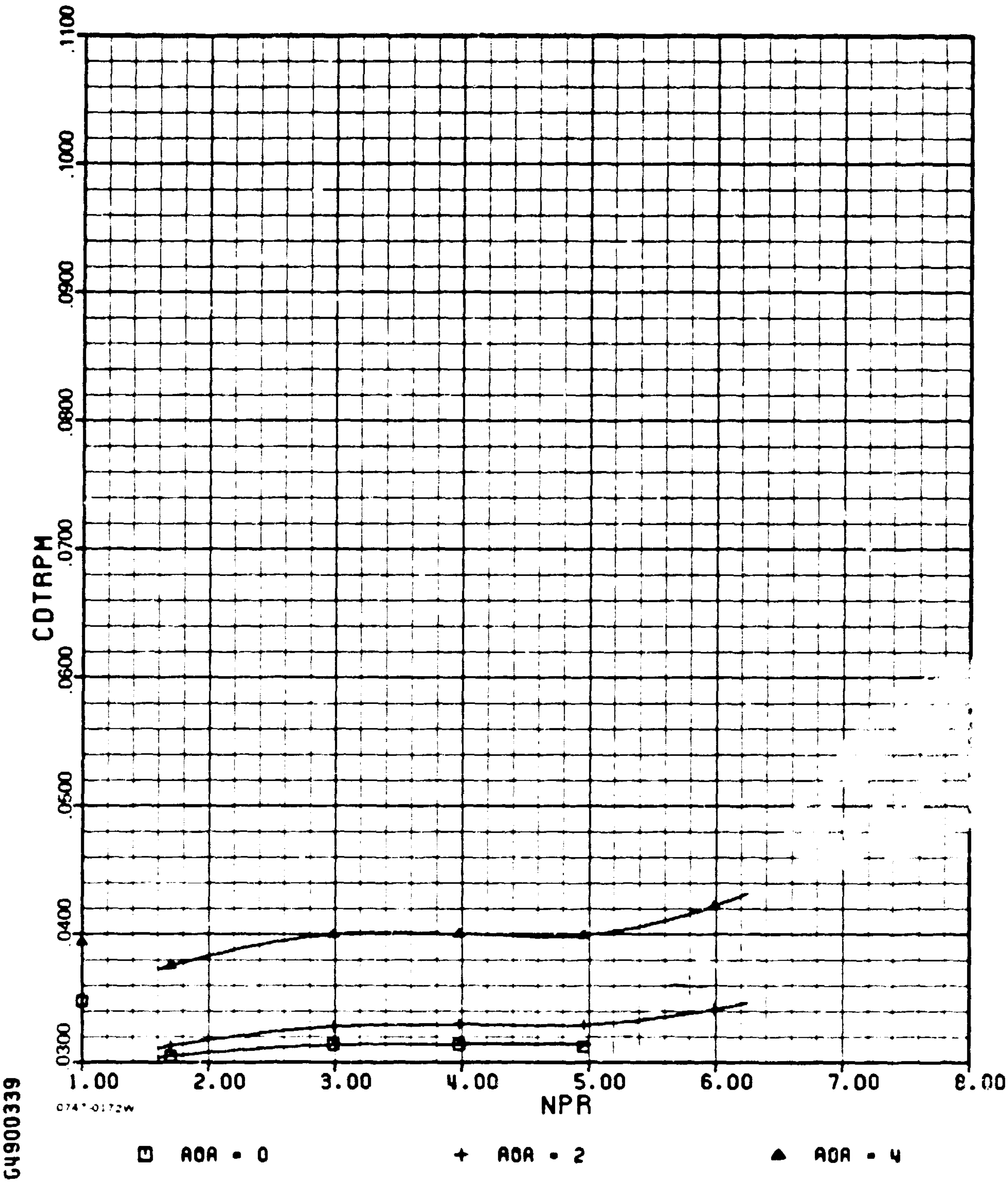


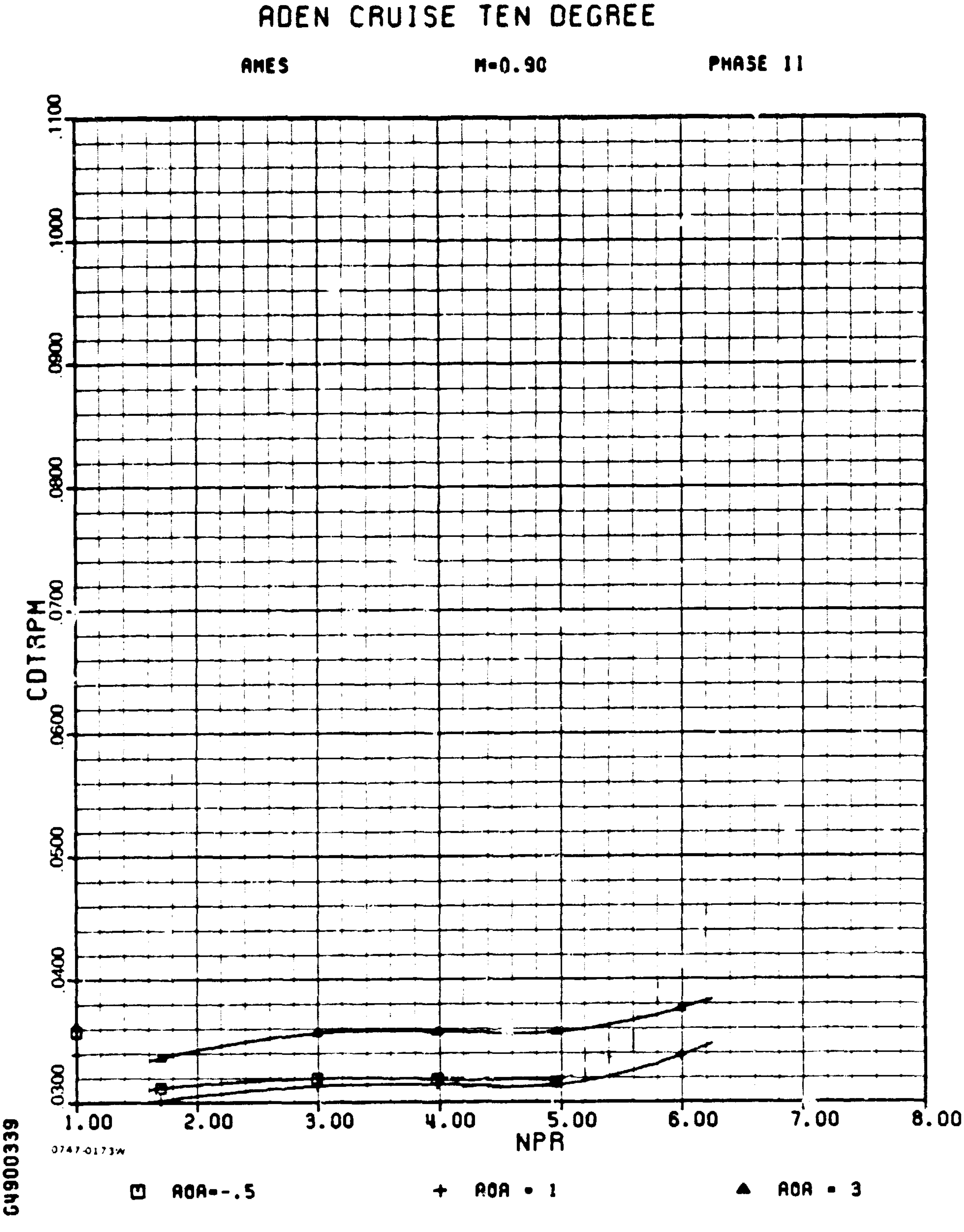
ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0171W
G4900339
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

G-4(b) (concl.)

ADEN CRUISE TEN DEGREE

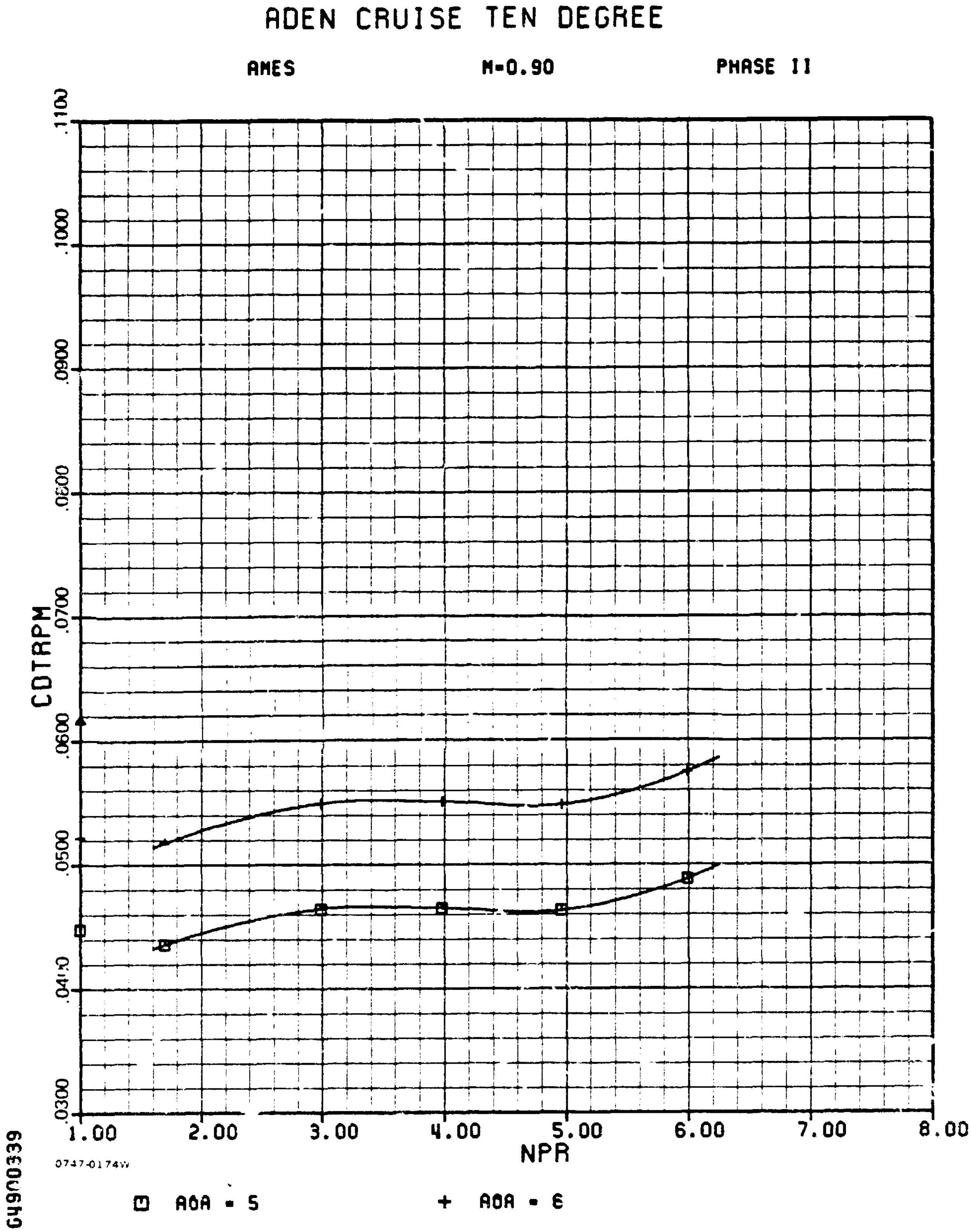
AMES M=0.90 PHASE II





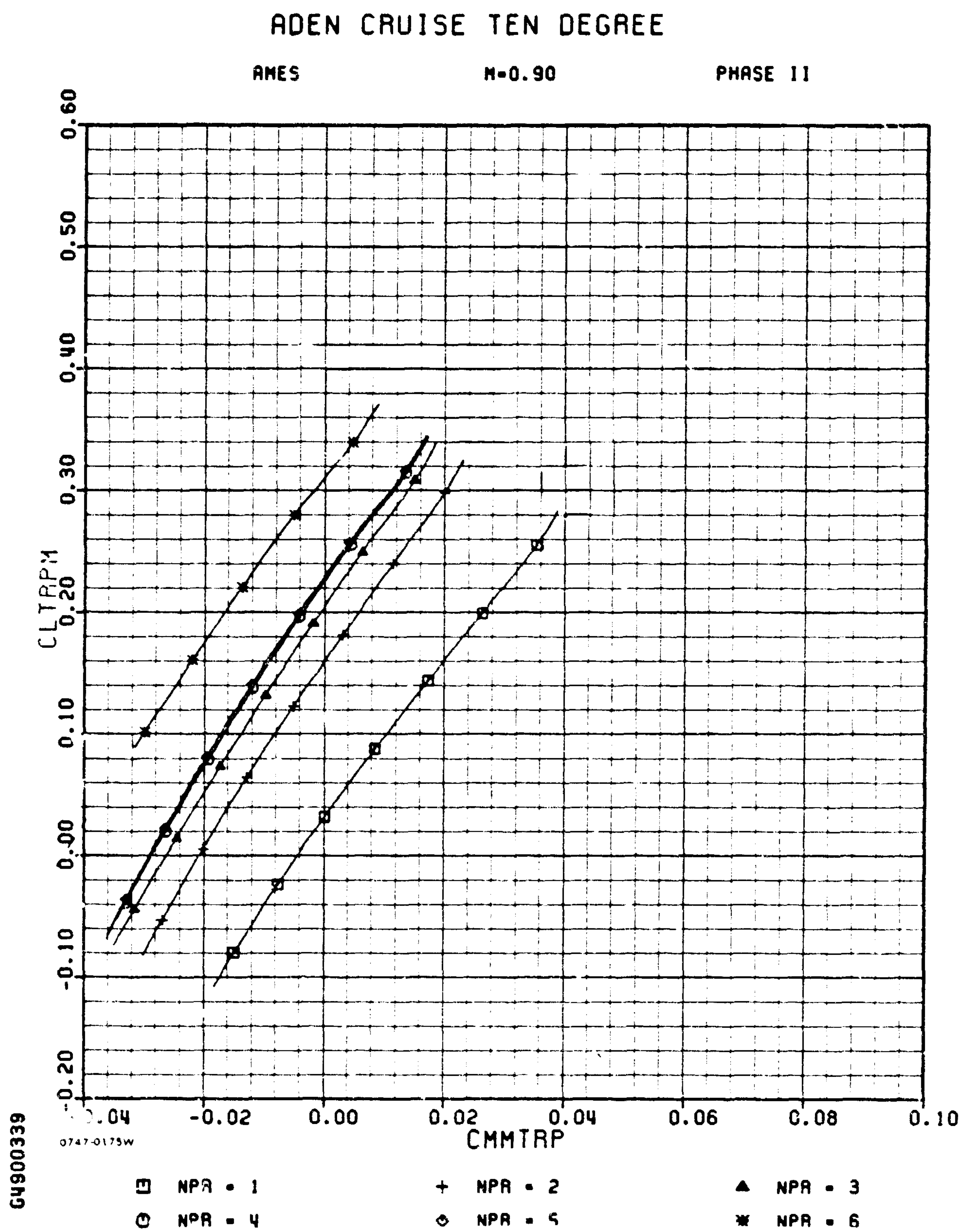
ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.0300
.0400
.0500
.0600
.0700
.0800
.0900
.1000
.1100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0173W
G4900339
AOA=-.5
AOA = 1
AOA = 3

G-4(c) (cont.)



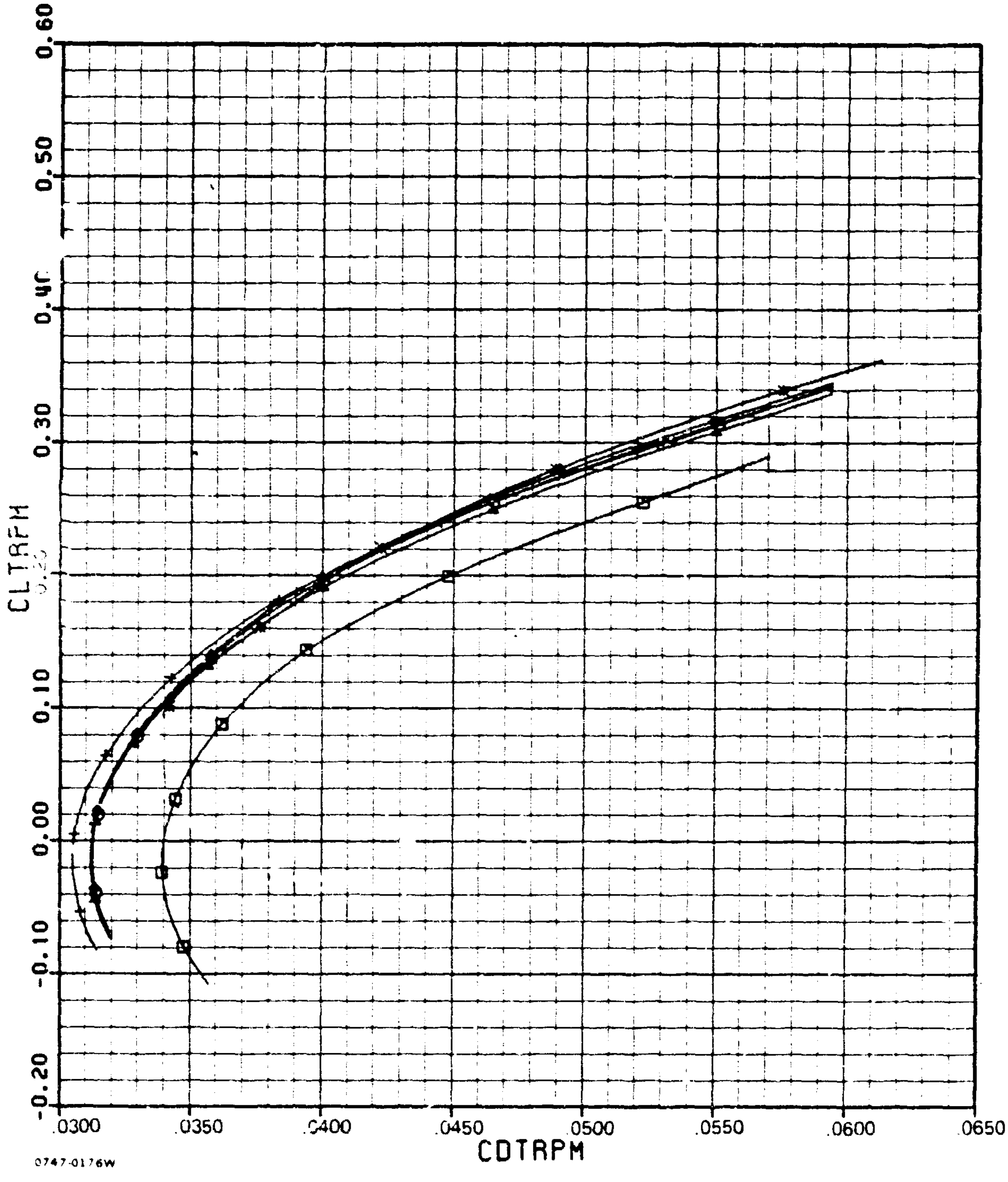
ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1100
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0174W
□ AOA = 5
+ AOA = 6
G4900339

G-4(c) (concl.)


ADEN CRUISE TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
CMMTRP
G4900339
0747-0175W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN CRUISE TEN DEGREE

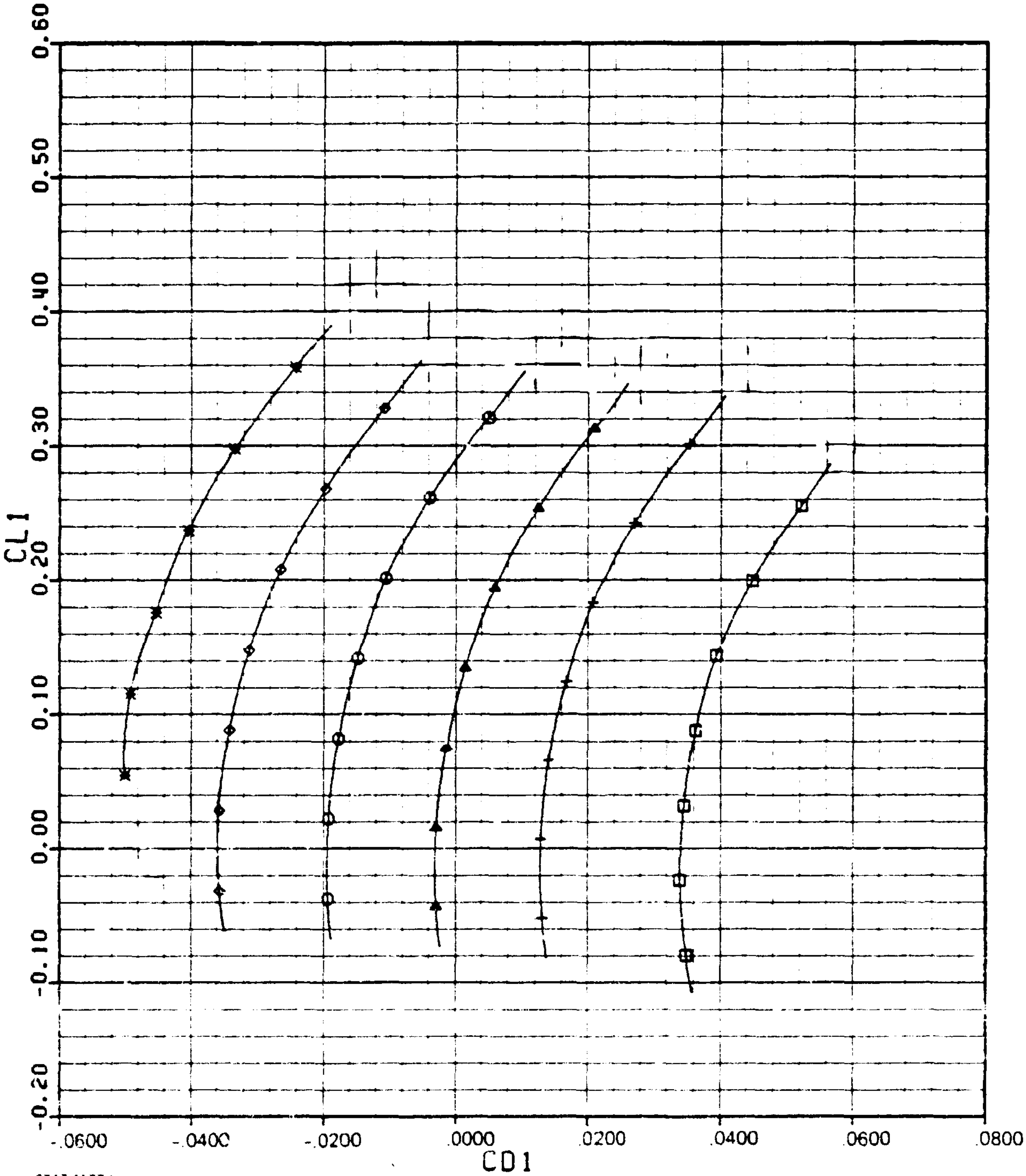
AMES M=0.90 PHASE II



□ NPR = 1 + NPR = 2 ▲ NPR = 3
⊕ NPR = 4 ◇ NPR = 5 ✱ NPR = 6

ADEN CRUISE TEN DEGREE

AMES M=0.90 PHASE II



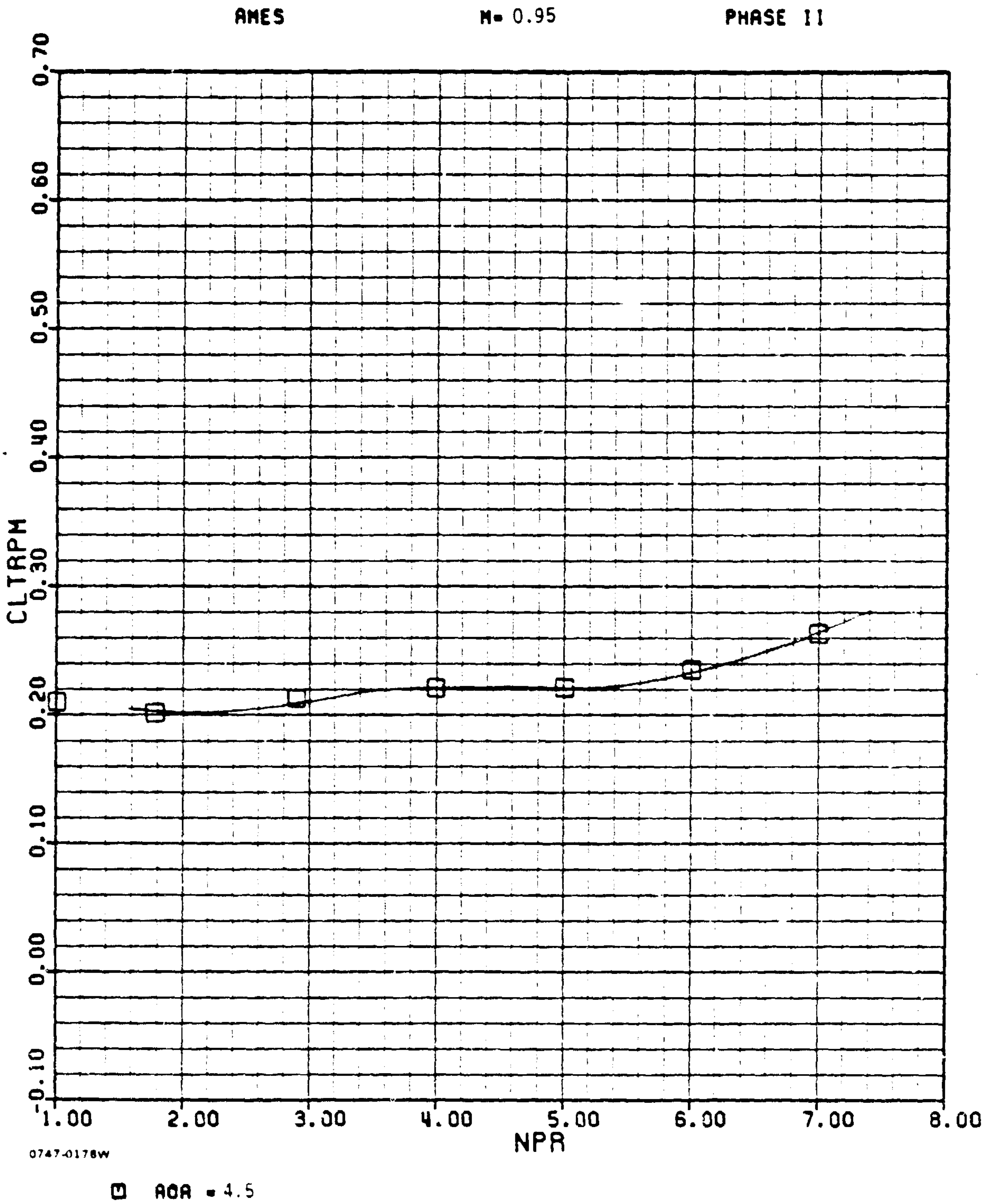
G0405346

0747-0177W

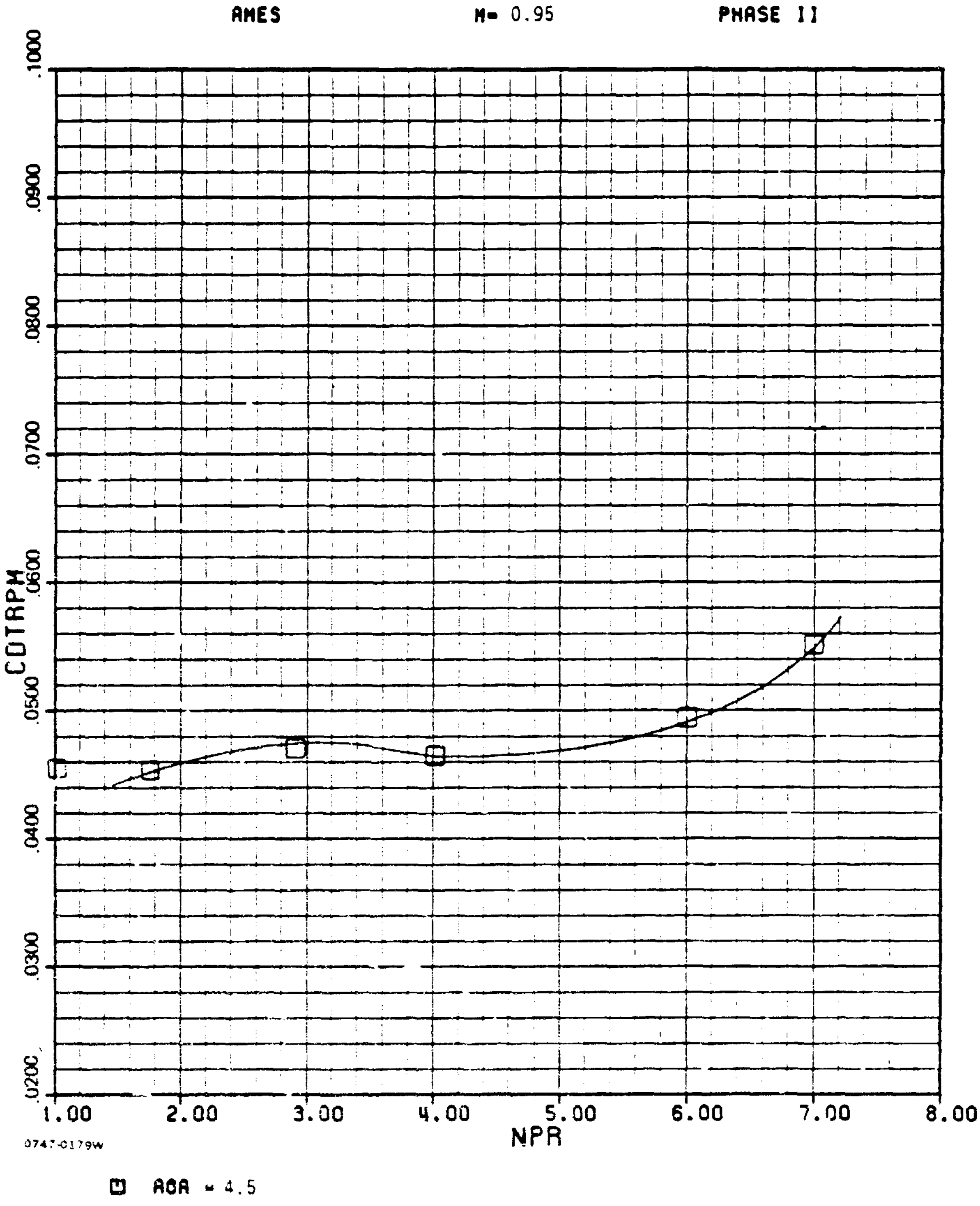
NPR = 1 | NPR = 2 | NPR = 3

NPR = 4 | NPR = 5 | NPR = 6

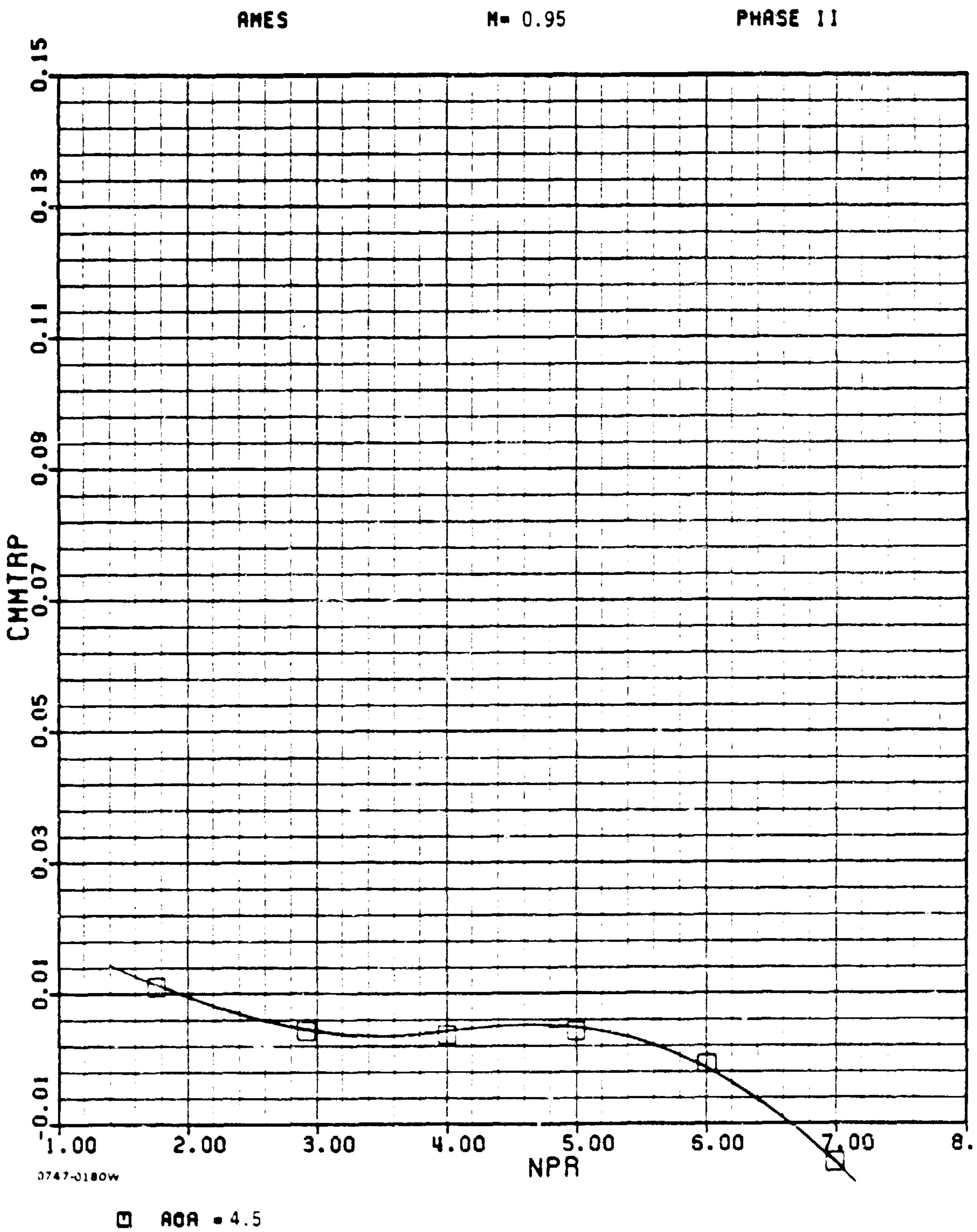
ADEN CRUISE TEN DEGREE



ADEN CRUISE TEN DEGREE

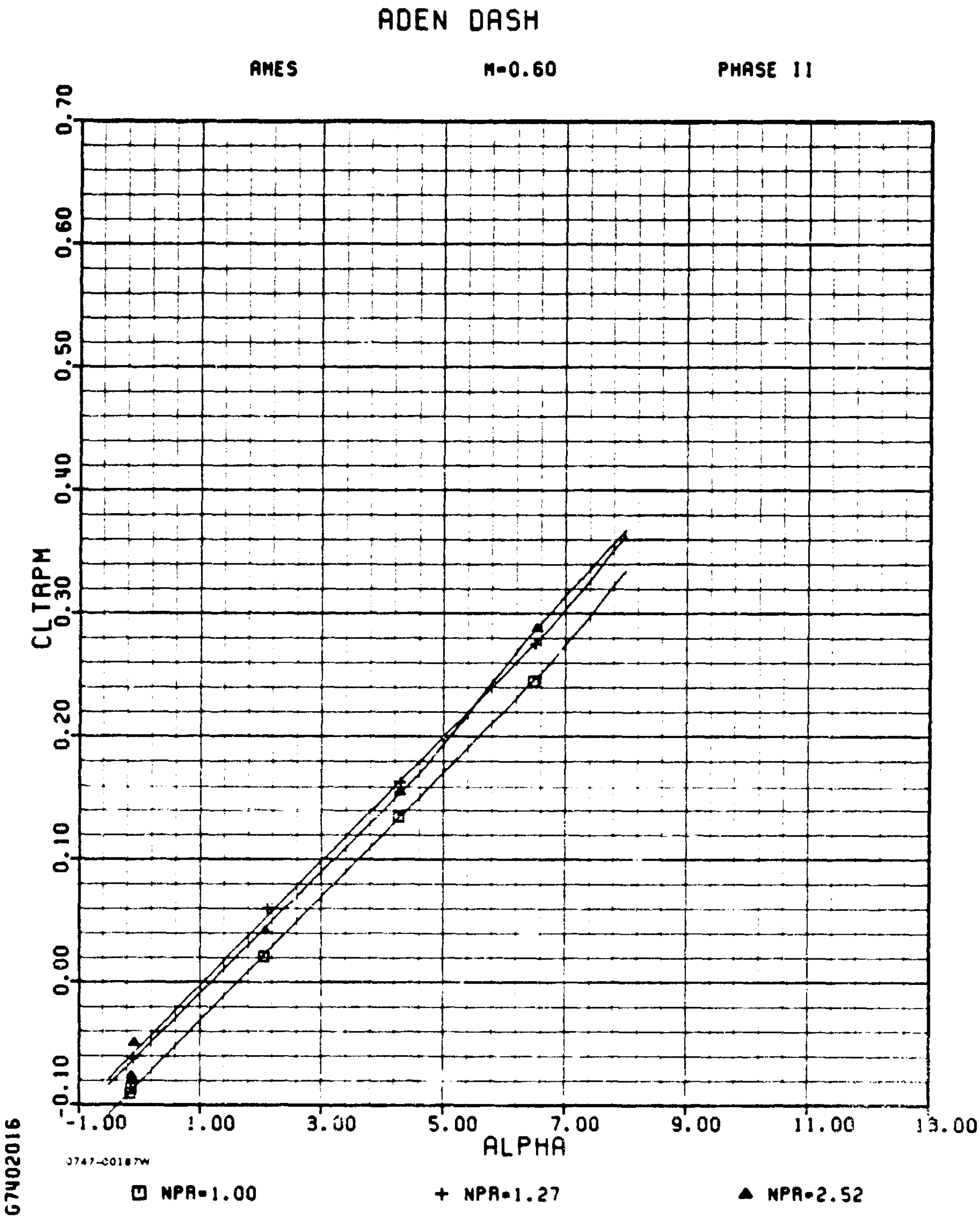


ADEN CRUISE TEN DEGREE

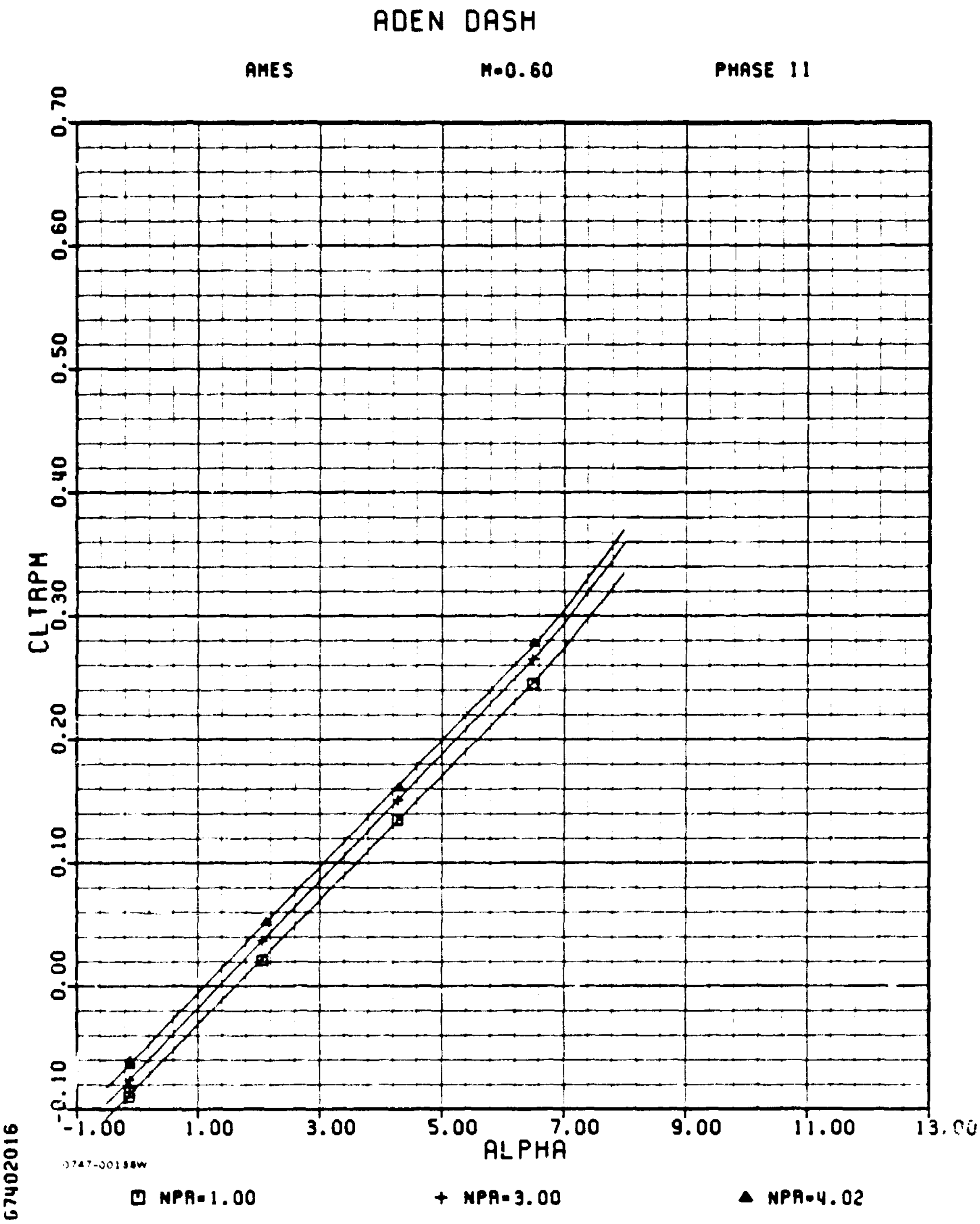


APPENDIX H

ADEN DASH WIND-ON DATA

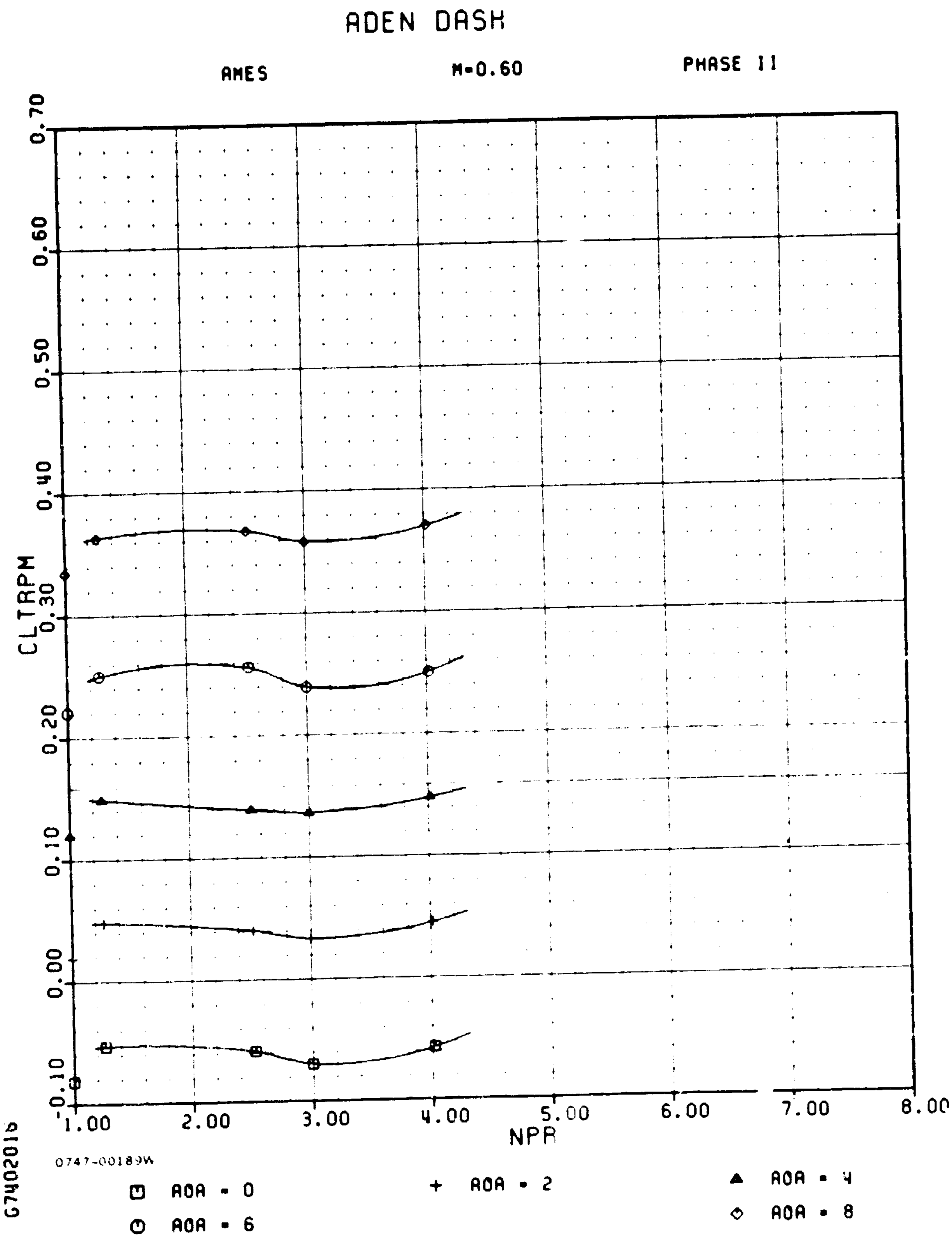


ADEN DASH
AMES
M=0.60
PHASE II
CLTRPM
ALPHA
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-00187W
G7402016
NPR=1.00
NPR=1.27
NPR=2.52



ADEN DASH
AMES
M=0.60
PHASE II
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
CLTRPM
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G7402016
NPR=1.00
+ NPR=3.00
NPR=4.02

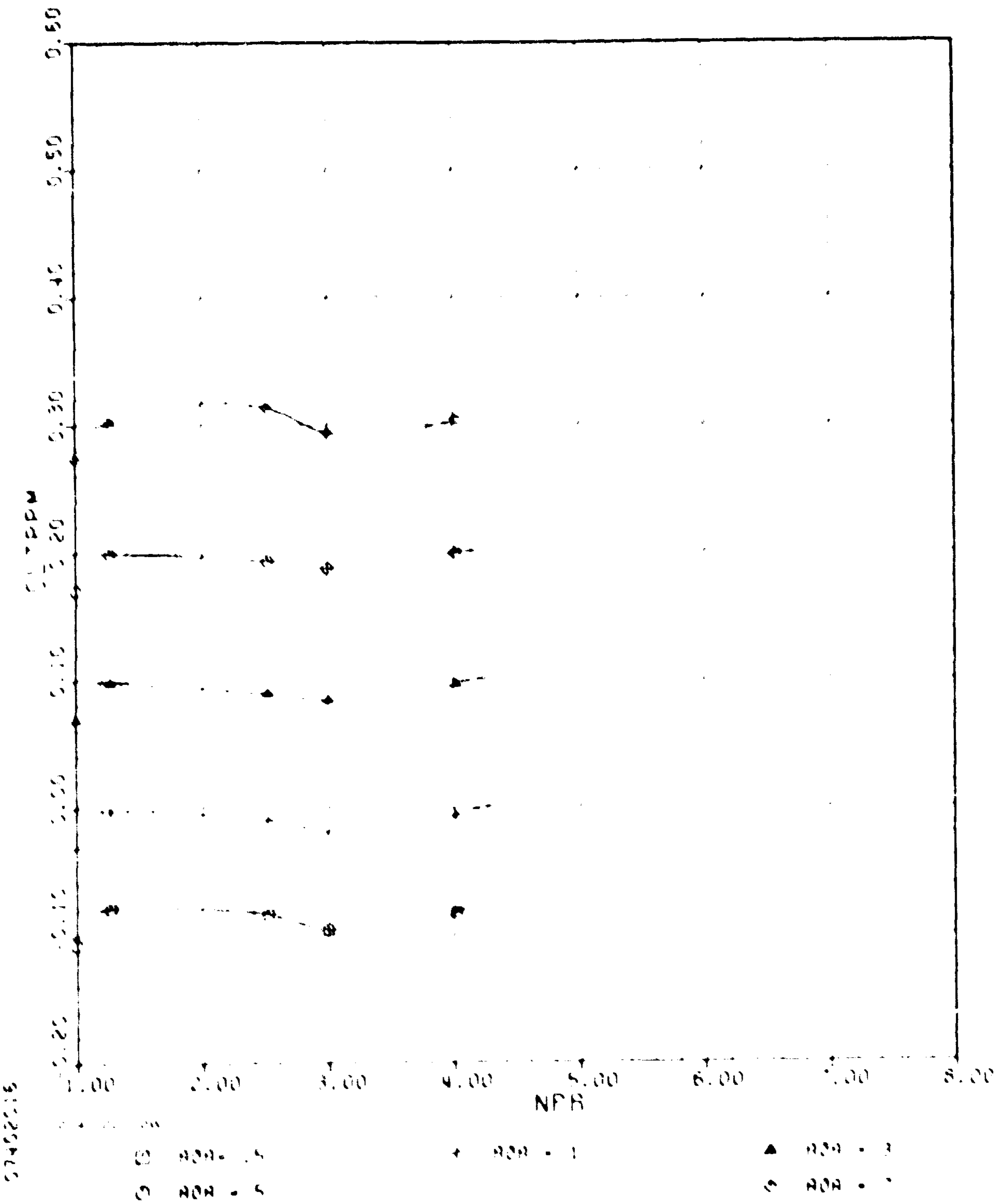
H-1(a) (concl.)

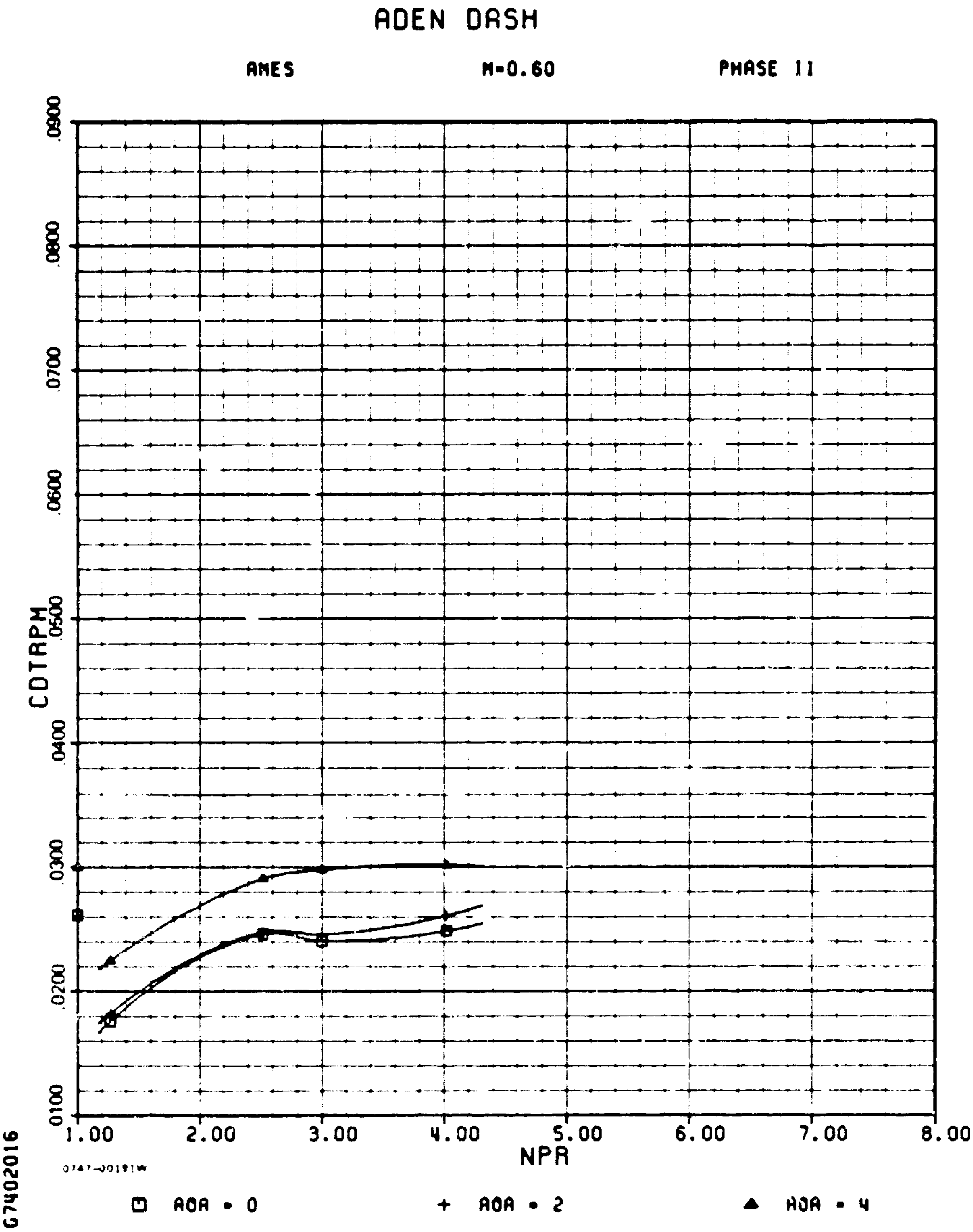


ADEN DASH
AMES
M=0.60
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G7402016
0747-00189W
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8

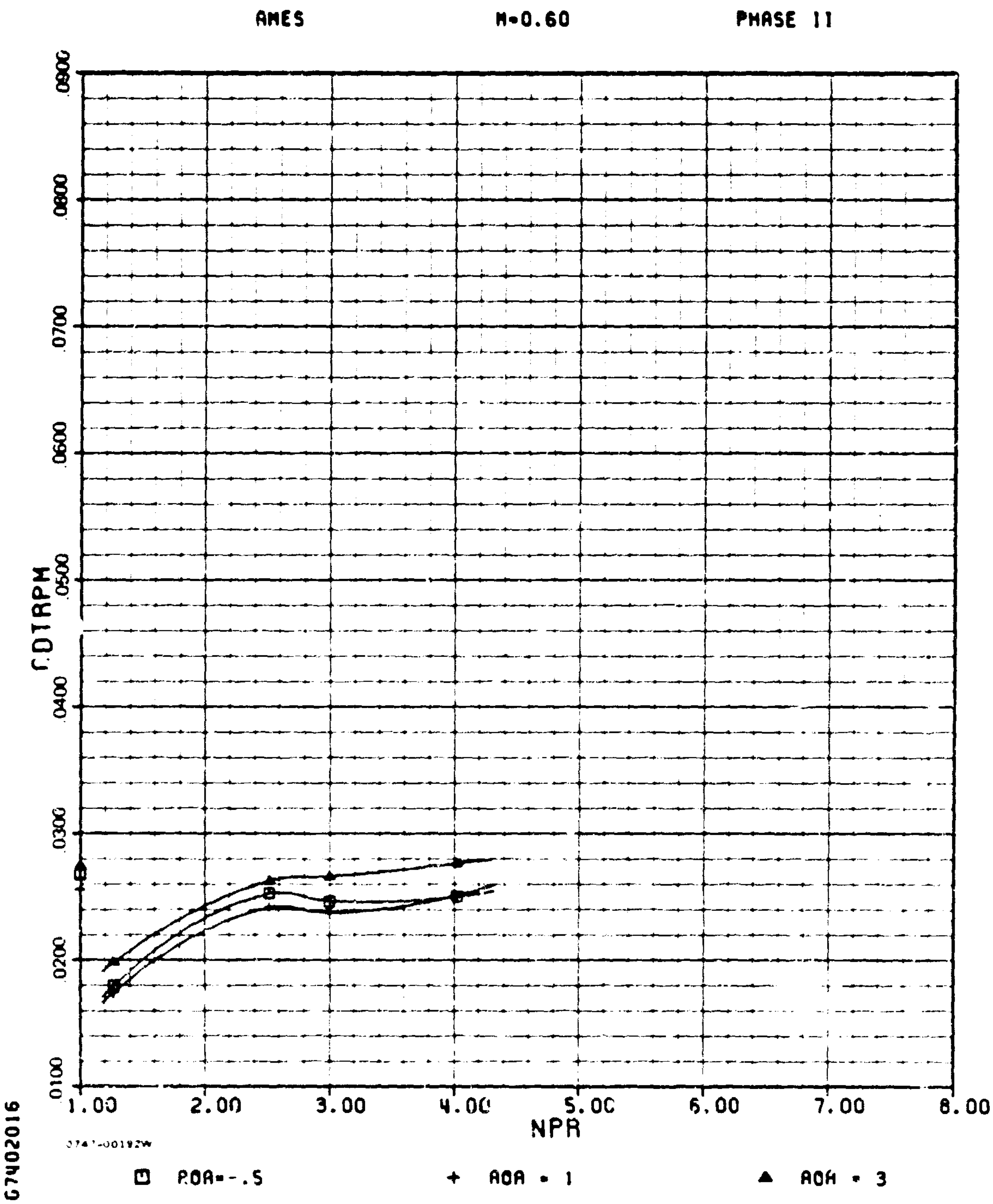
ADEN DASH

AMES M=0.60 PHASE II

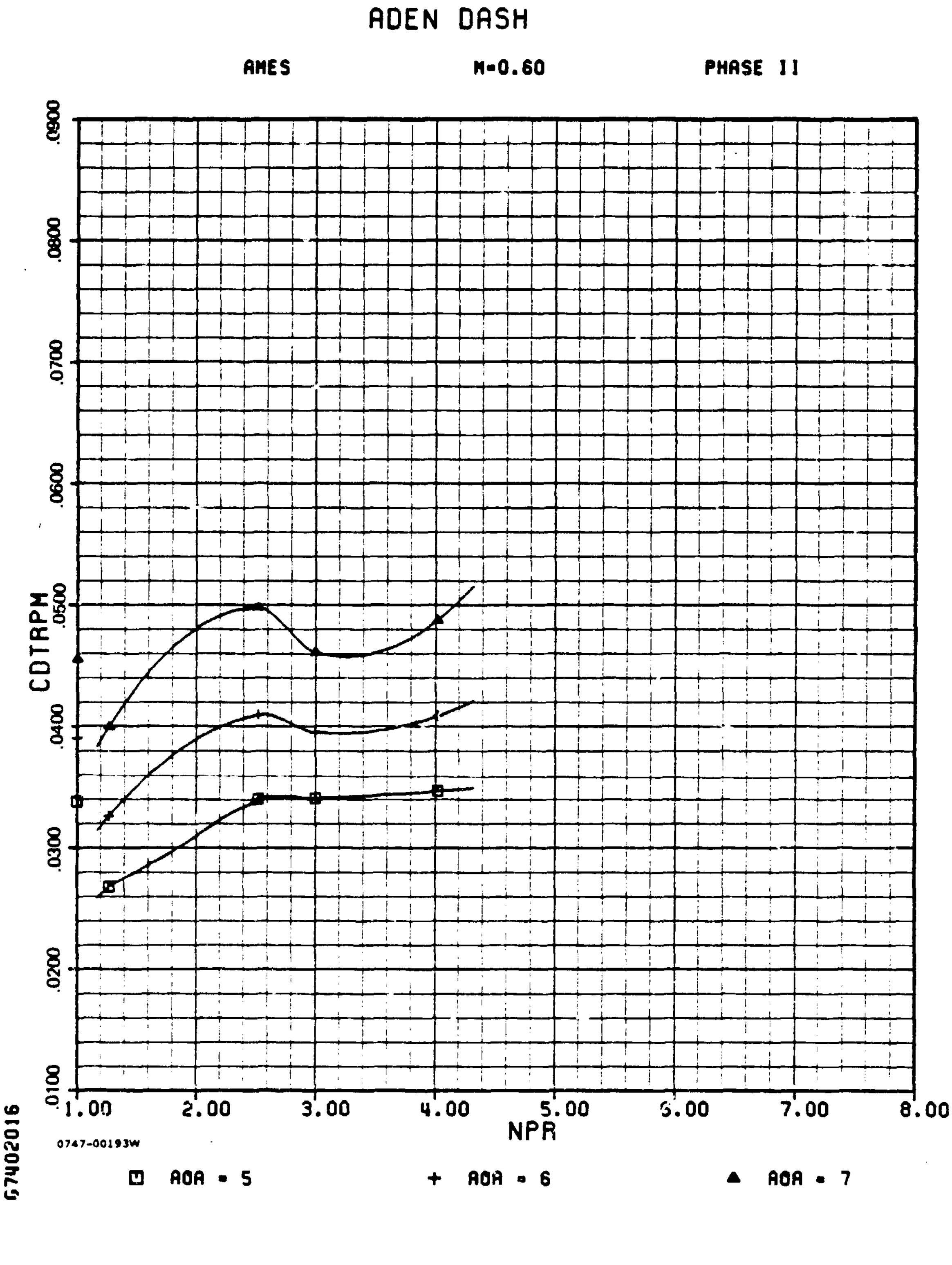



ADEN DASH
AMES
M=0.60
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G7402016
AOA = 0
AOA = 2
AOA = 4

ADEN DASH

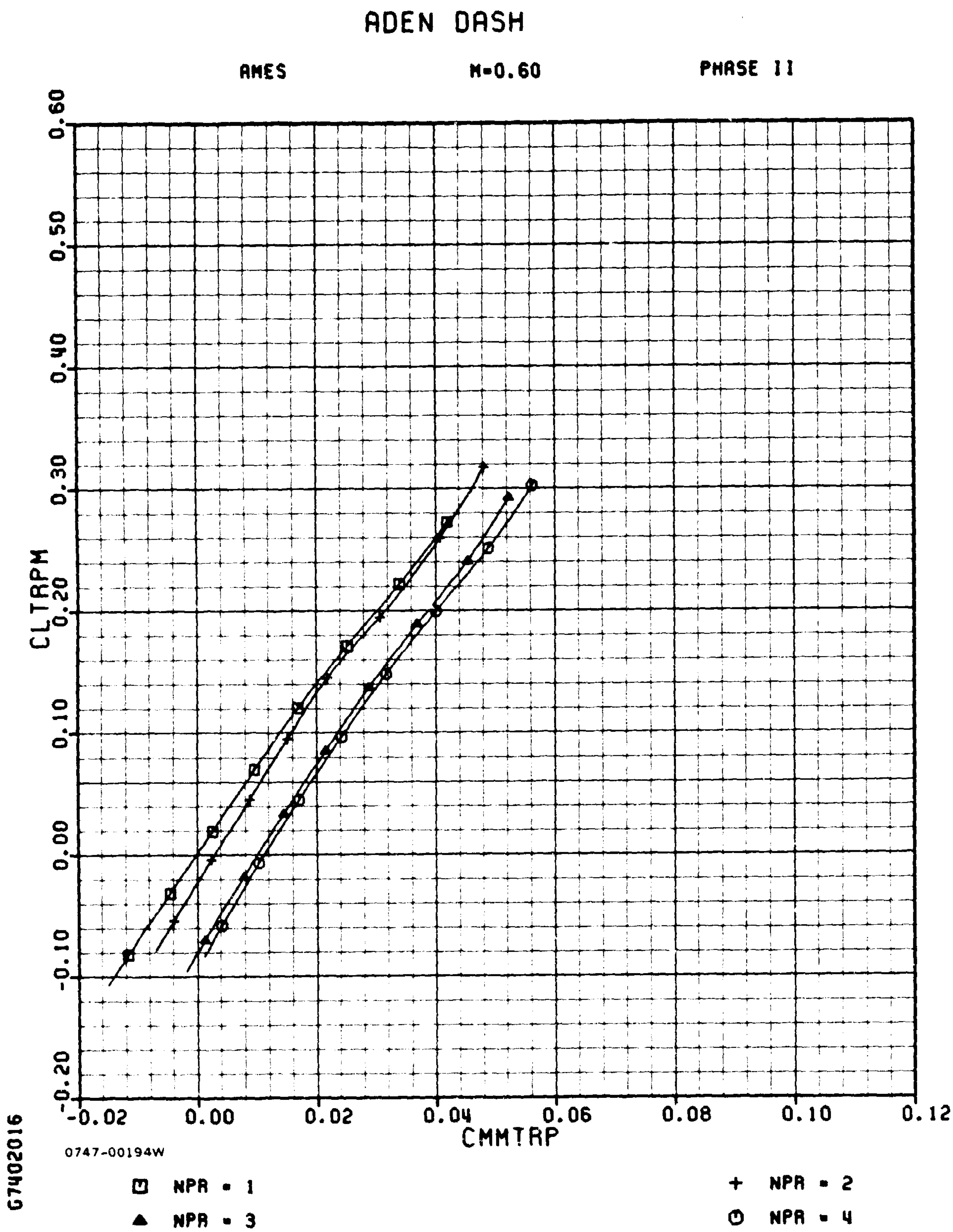


AMES
M=0.60
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA=-.5
AOA = 1
AOA = 3
G7402016

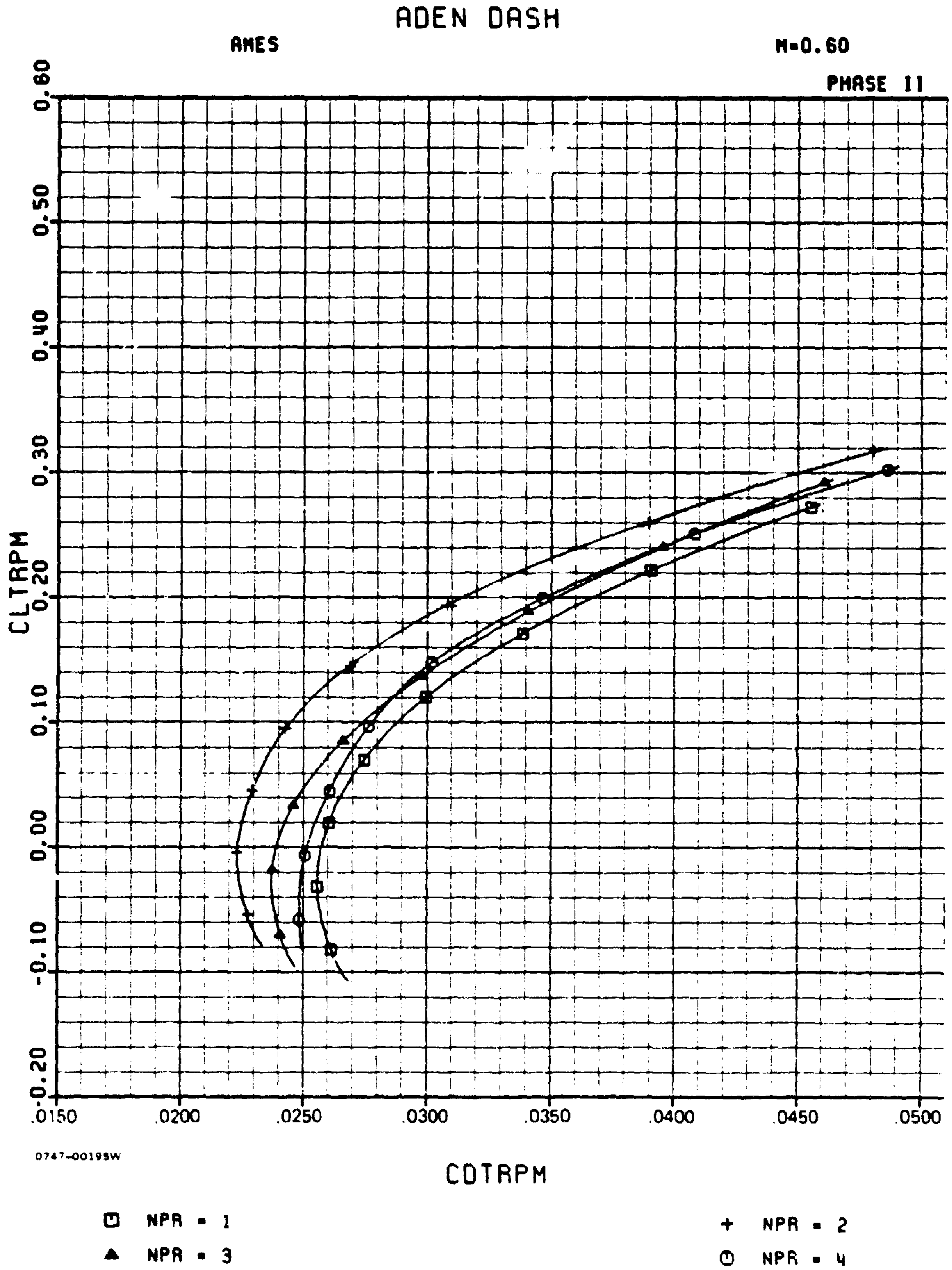

ADEN DASH
AMES
M=0.60
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G7402016
0747-00193W
AOA = 5
AOA = 6
AOA = 7

C-4

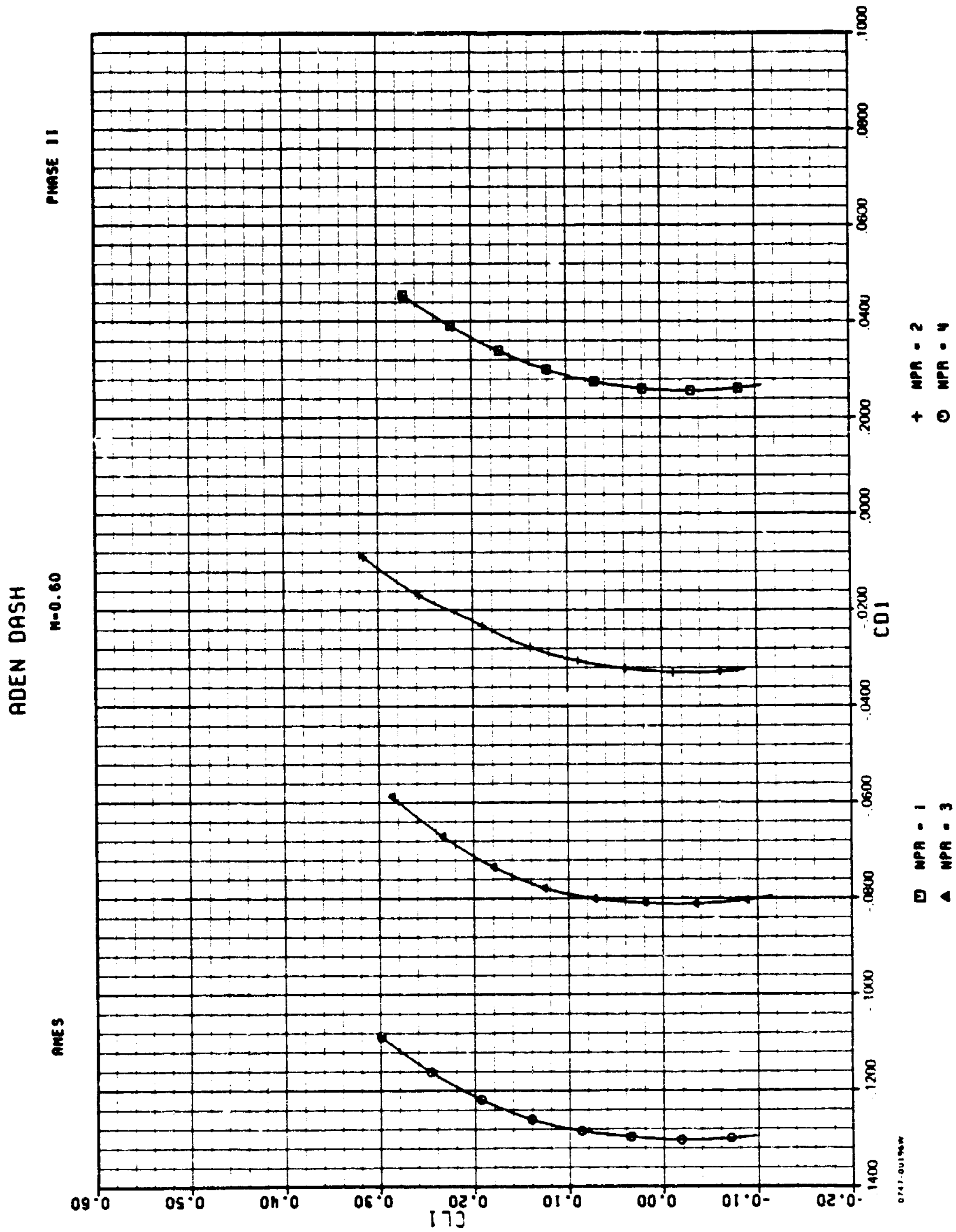
H-1(c)(concl.)

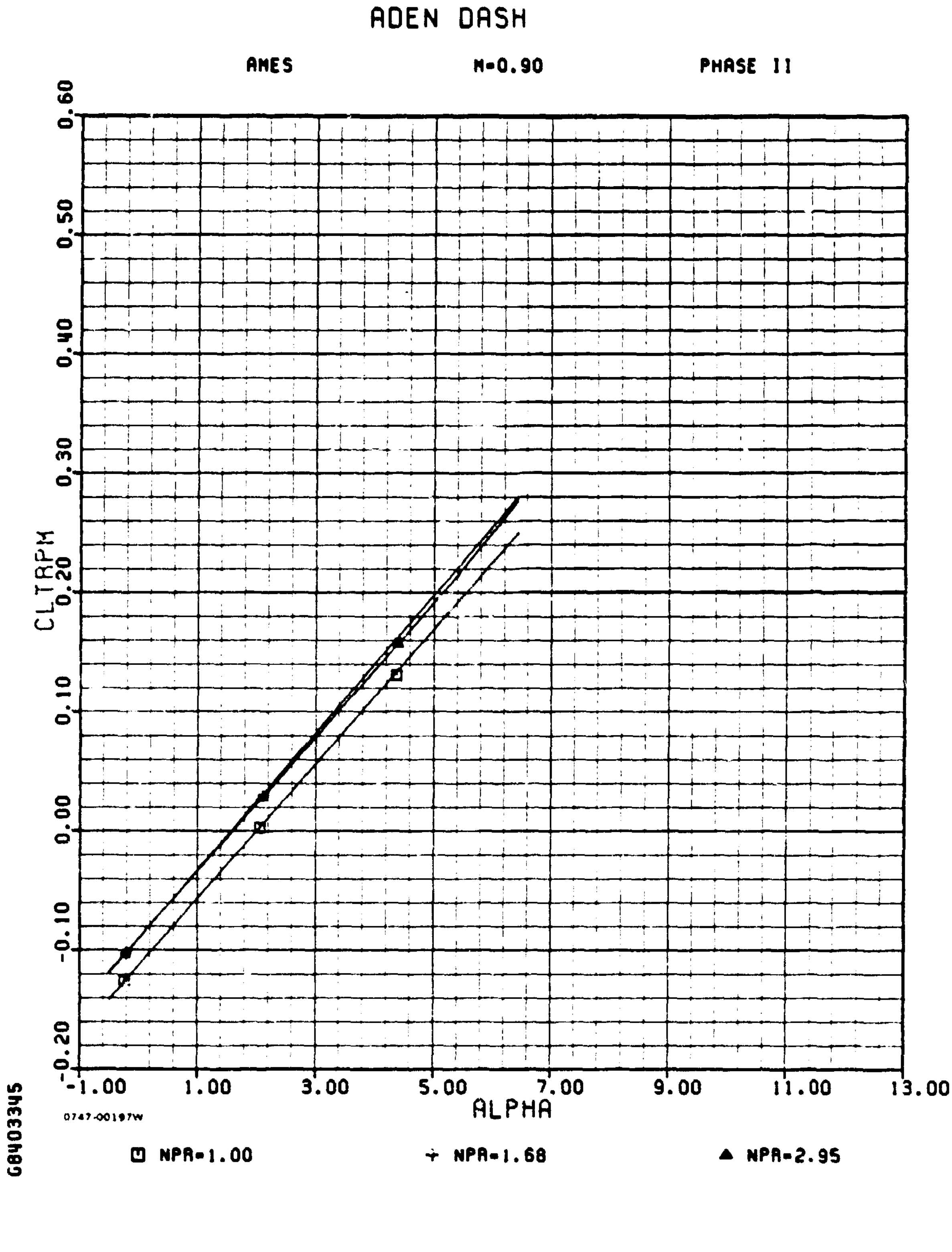


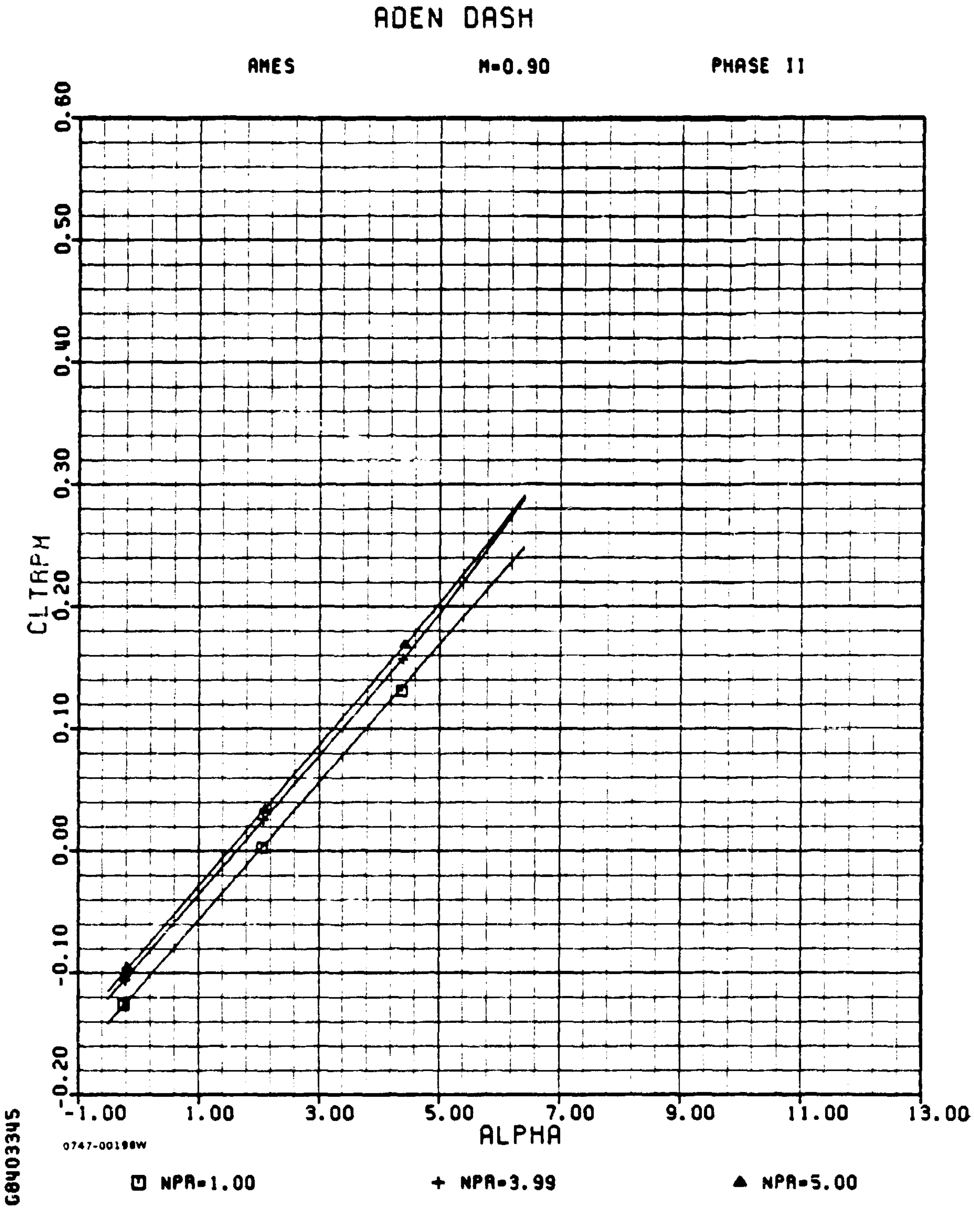
ADEN DASH
AMES
M=0.60
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
CMMTRP
G7402016
0747-00194W
NPR = 1
NPR = 3
NPR = 2
NPR = 4



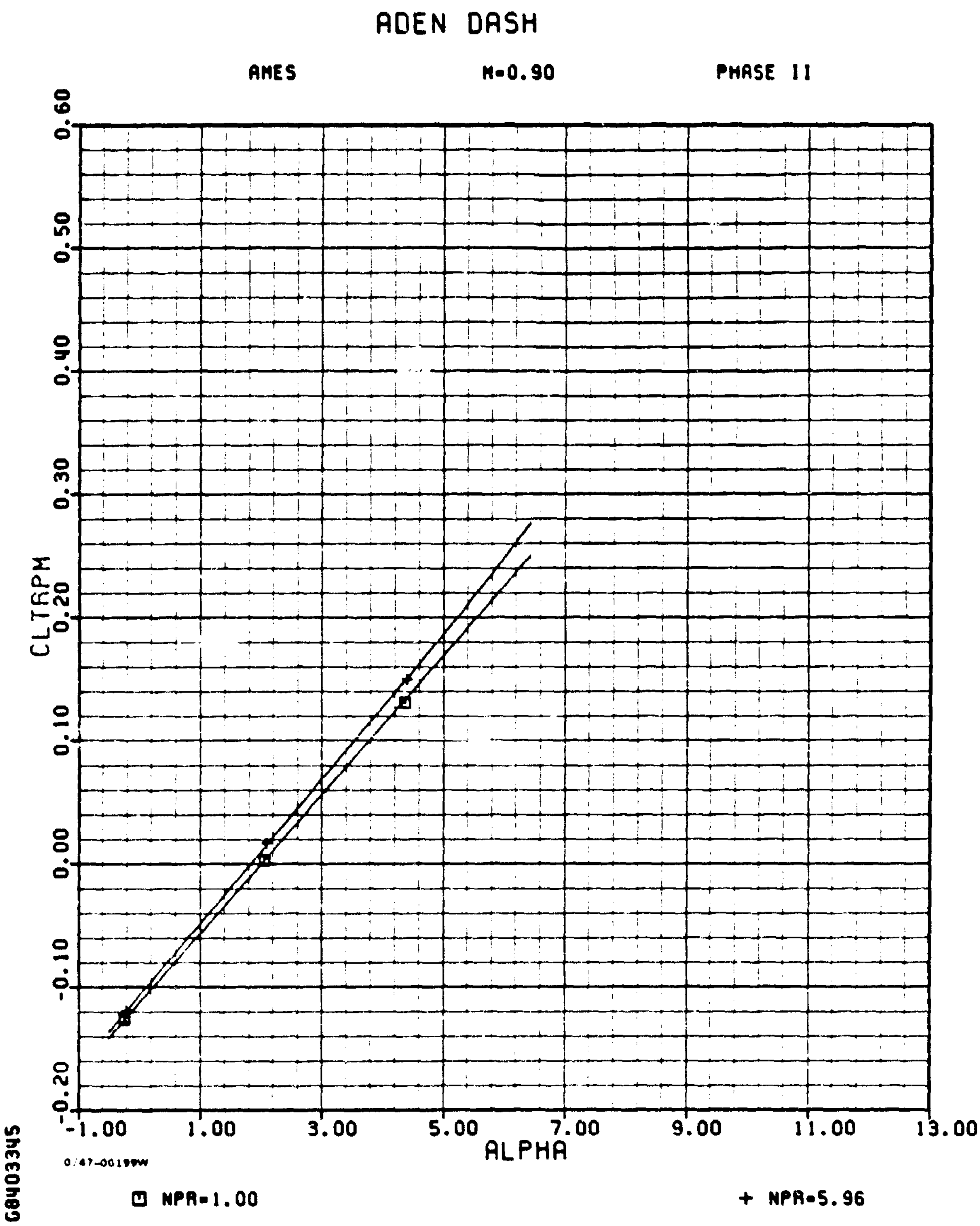
ADEN DASH
AMES
M=0.60
PHASE II
CLTRPM
CDTRPM
0747-00195W
□ NPR = 1
▲ NPR = 3
+ NPR = 2
⊙ NPR = 4


ADEN DASH
AMES
M=0.60
PHASE II
CD1
CL
NPR = 1
NPR = 2
NPR = 3
NPR = 4

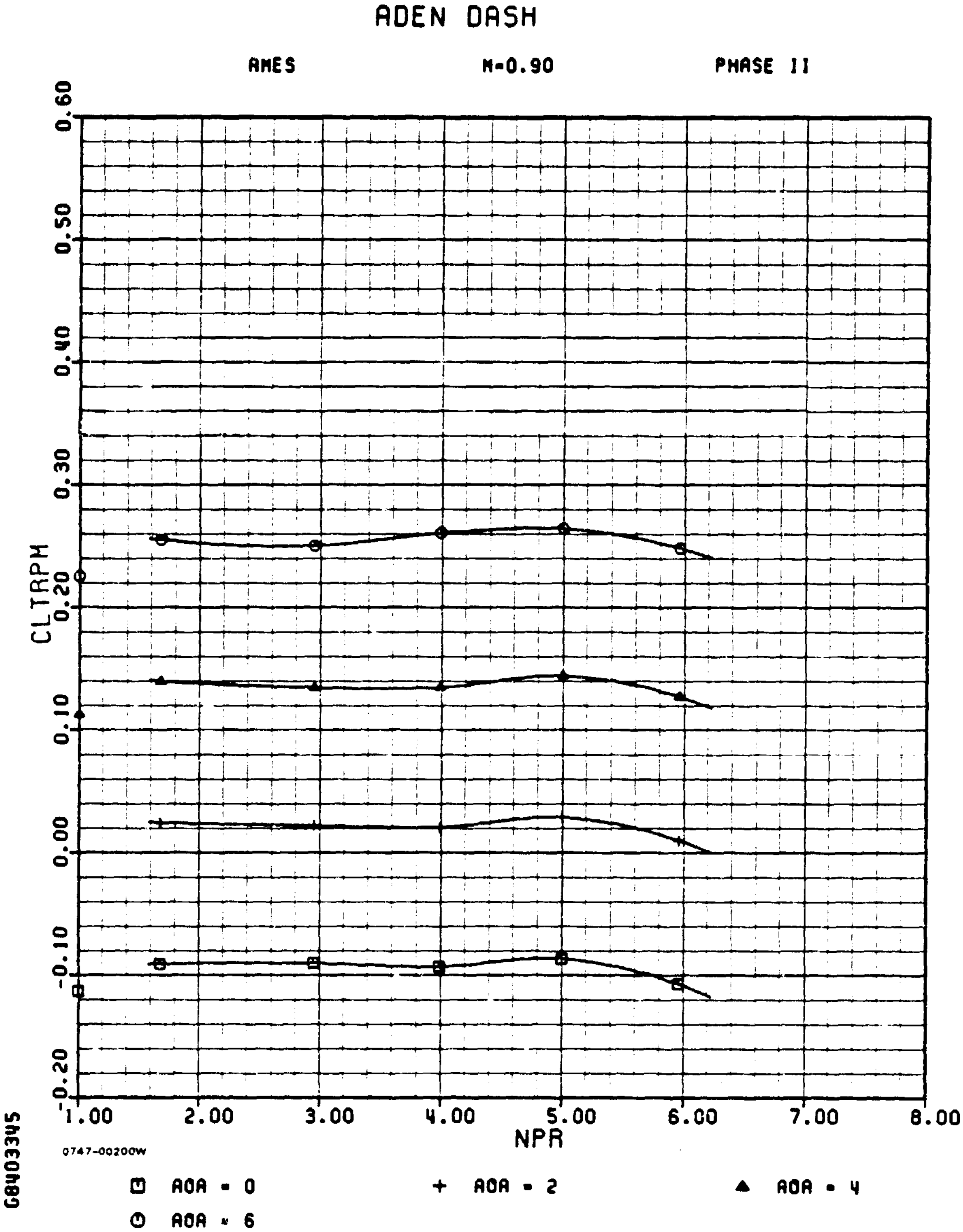

ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
ALPHA
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-00197W
G8403345
NPR=1.00
NPR=1.68
NPR=2.95

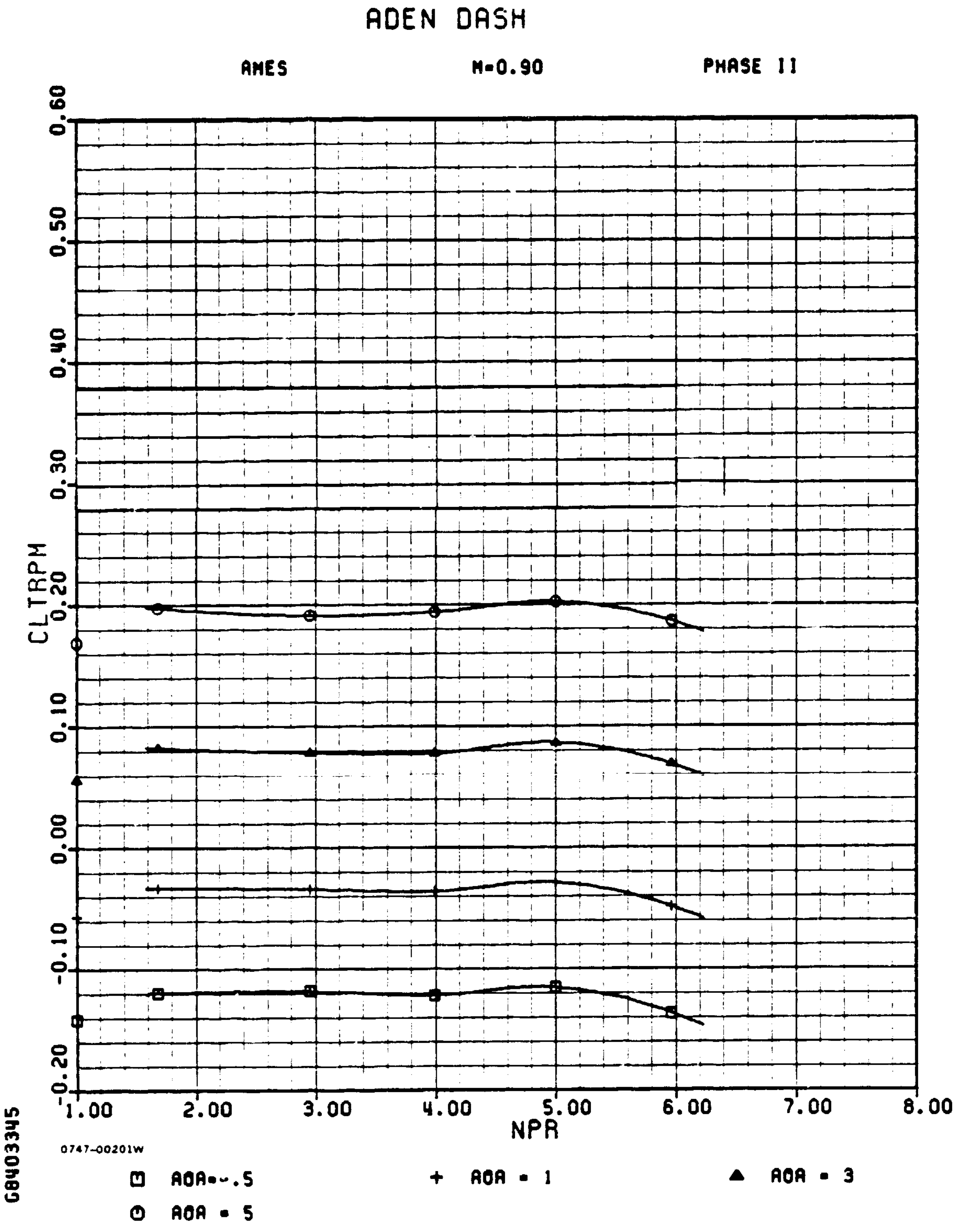


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-00198W
G8403345
NPR=1.00
NPR=3.99
NPR=5.00


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
ALPHA
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
G8403345
NPR=1.00
+ NPR=5.96

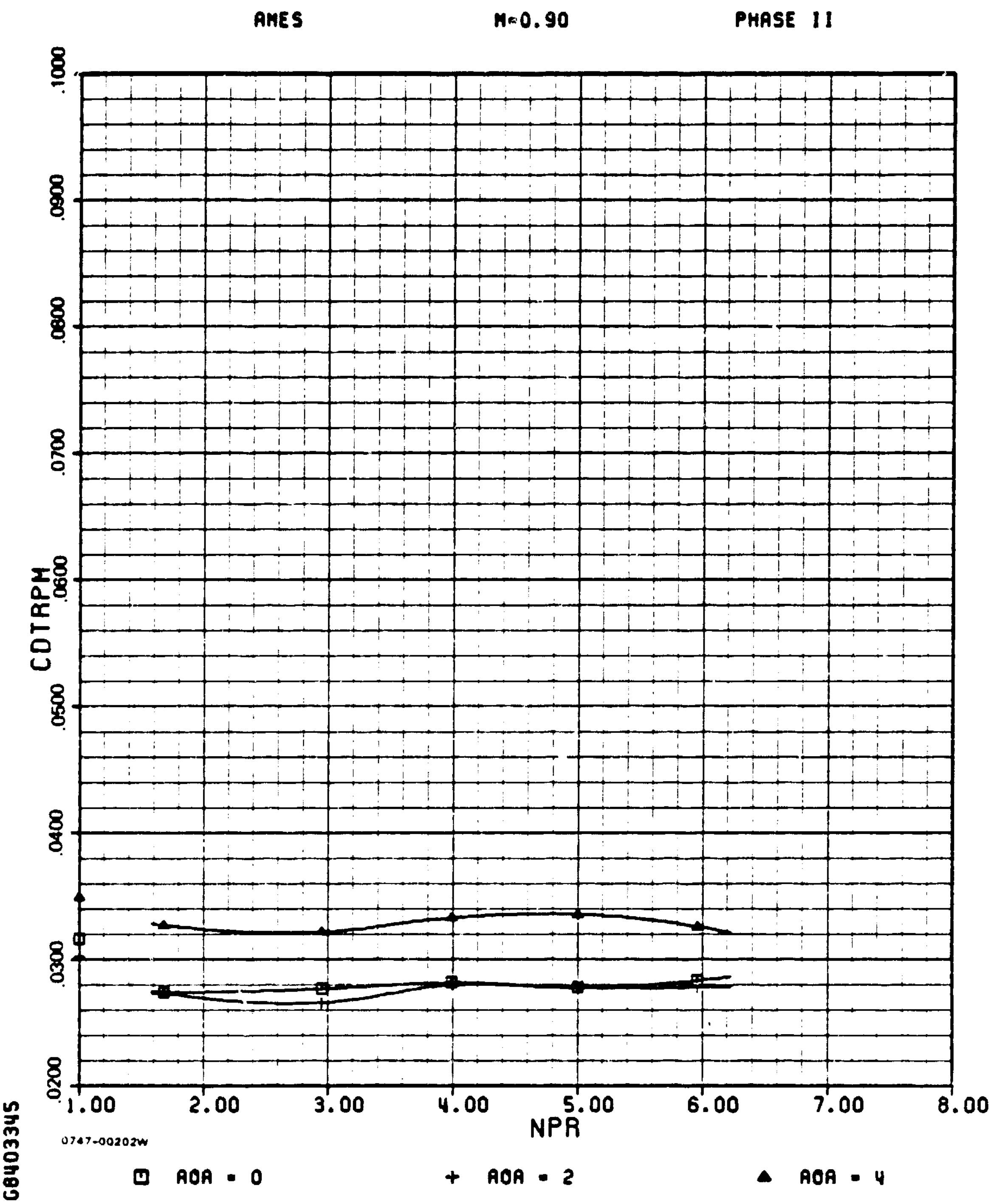
H-2(a)(concl.)


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
NPR
0747-00200W
G8403345
AOA = 0
AOA = 2
AOA = 4
AOA = 6

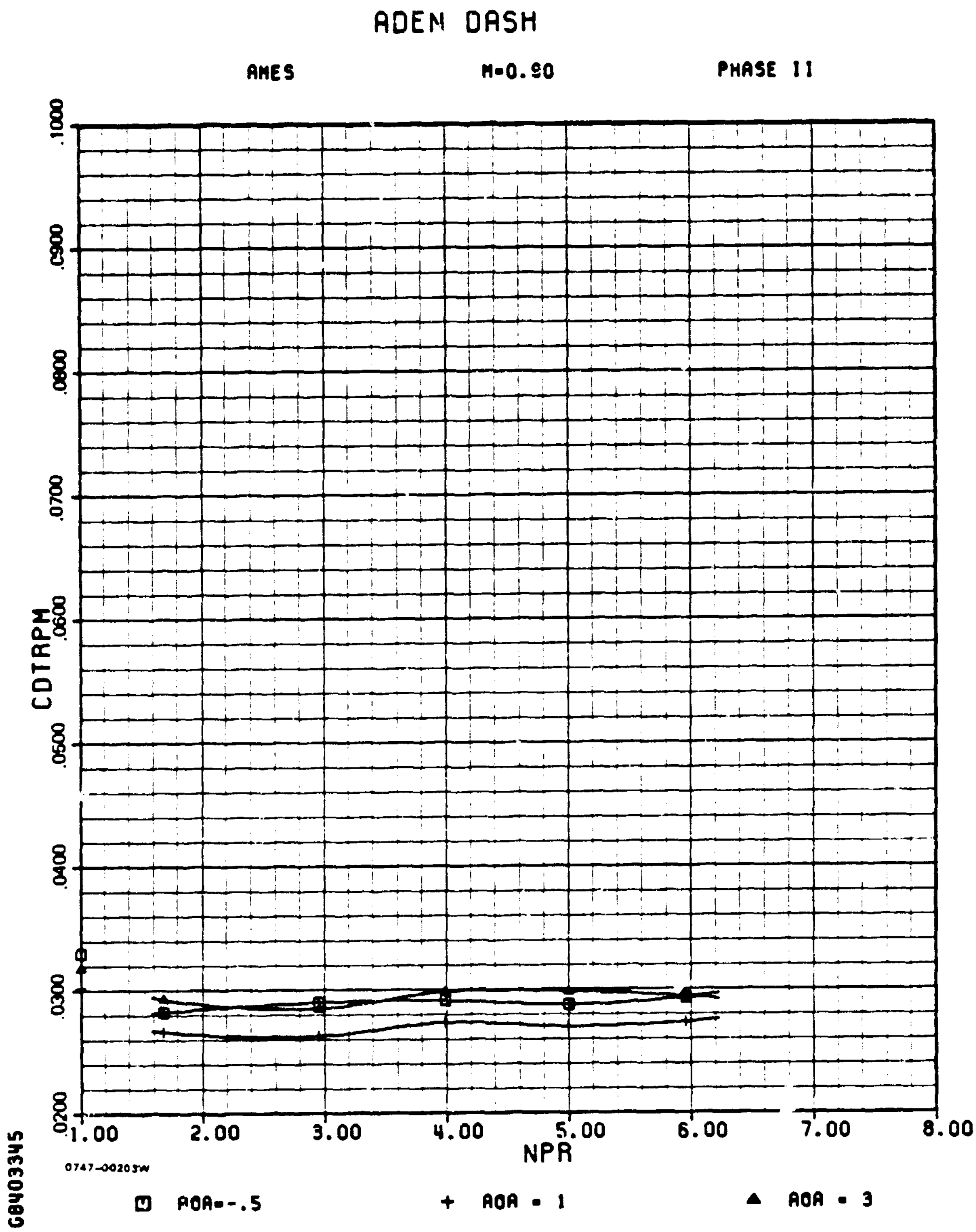


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G8403345
0747-00201W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

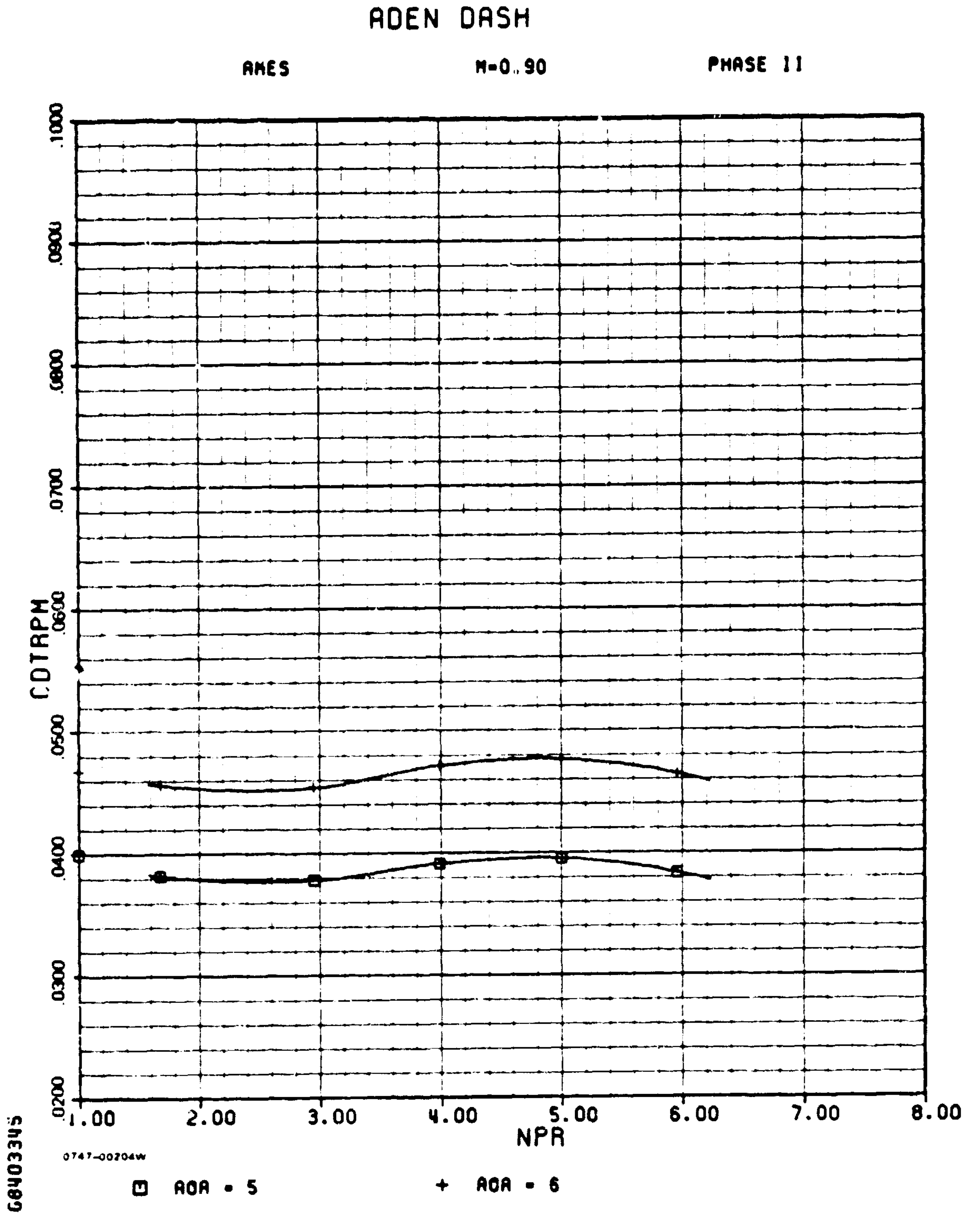
ADEN DASH

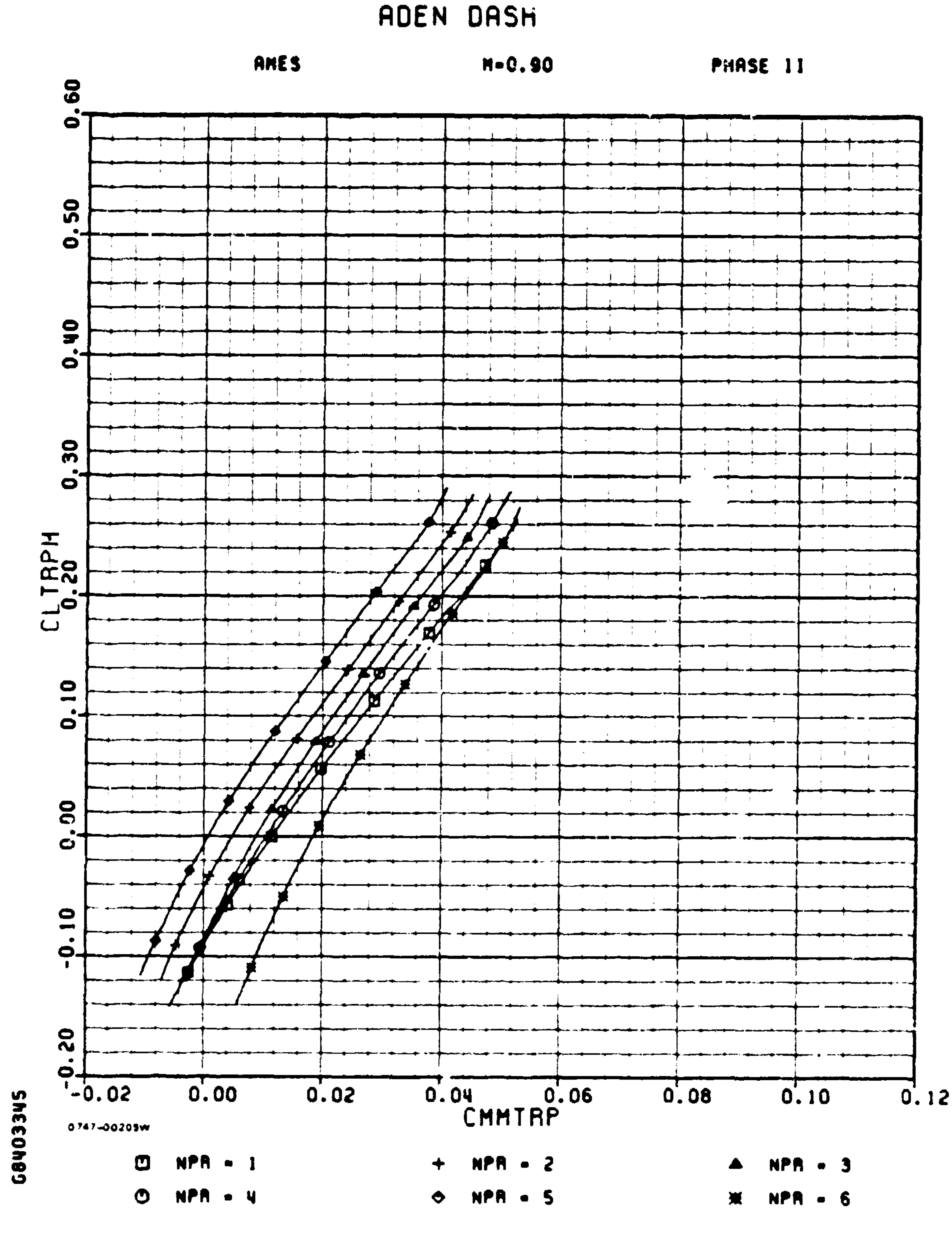


AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-00202W
G8403345
AOA = 0
AOA = 2
AOA = 4

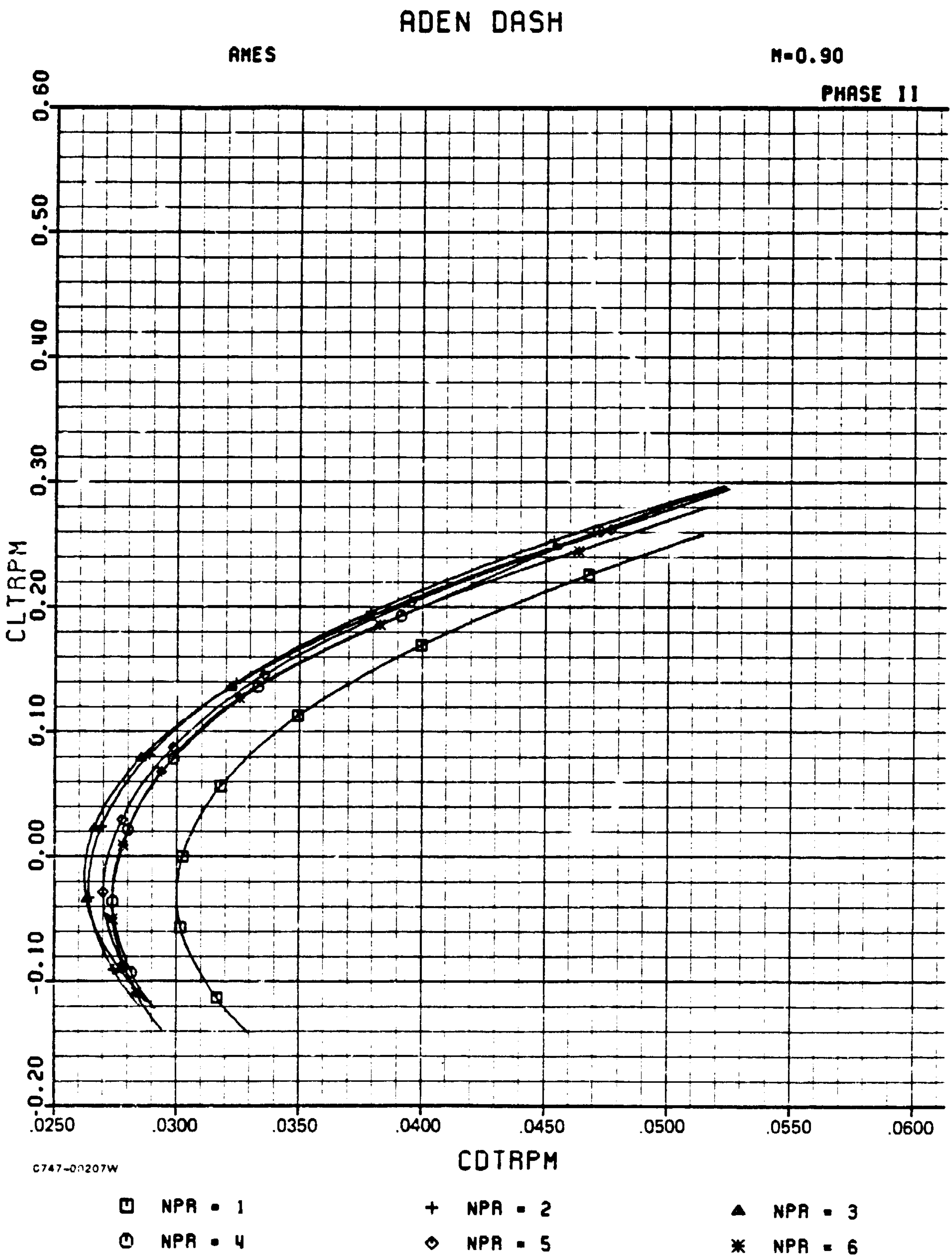

ADEN DASH
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-00203W
G84033N5
AOA=-.5
AOA = 1
AOA = 3

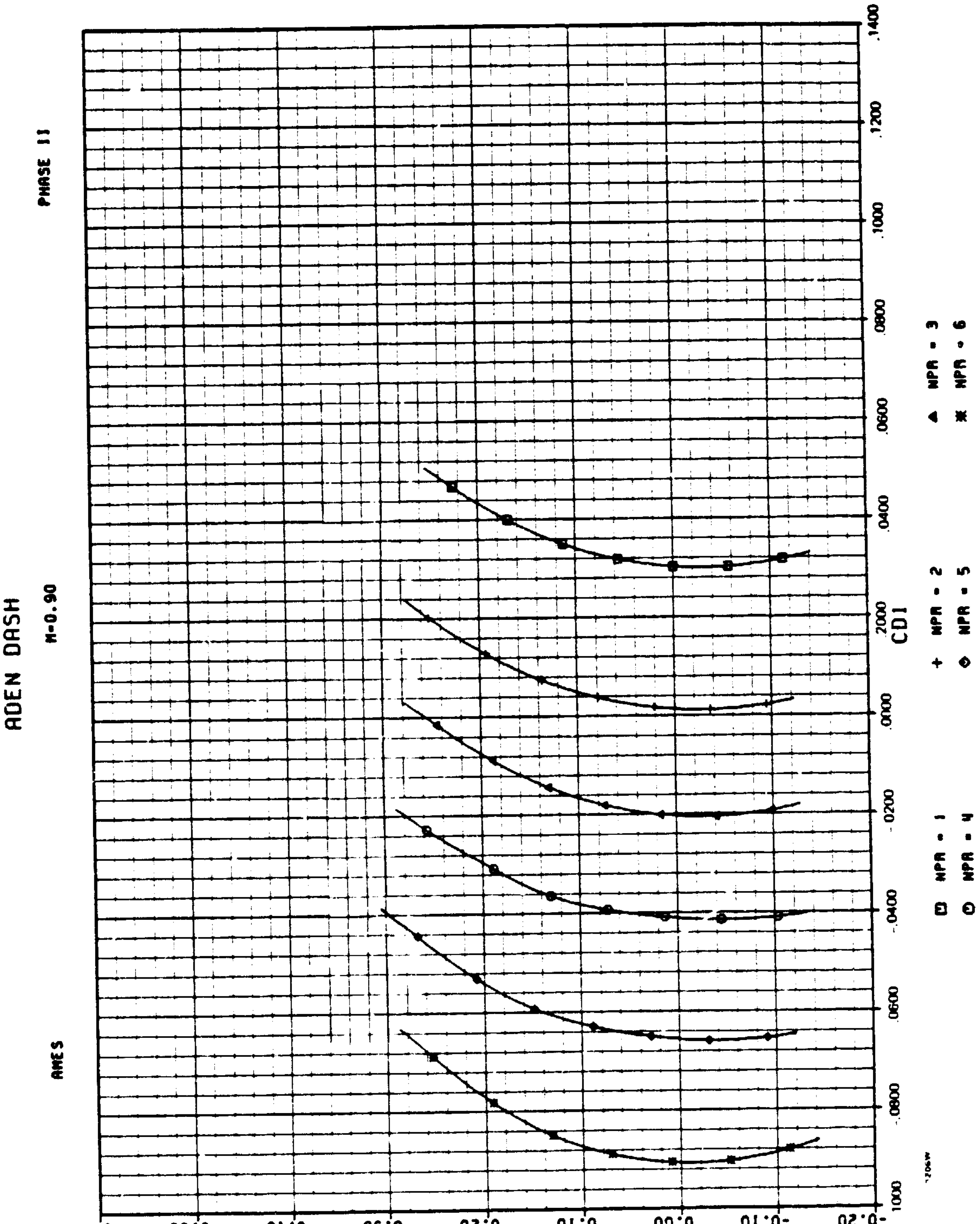
H-2(c)(cont.)

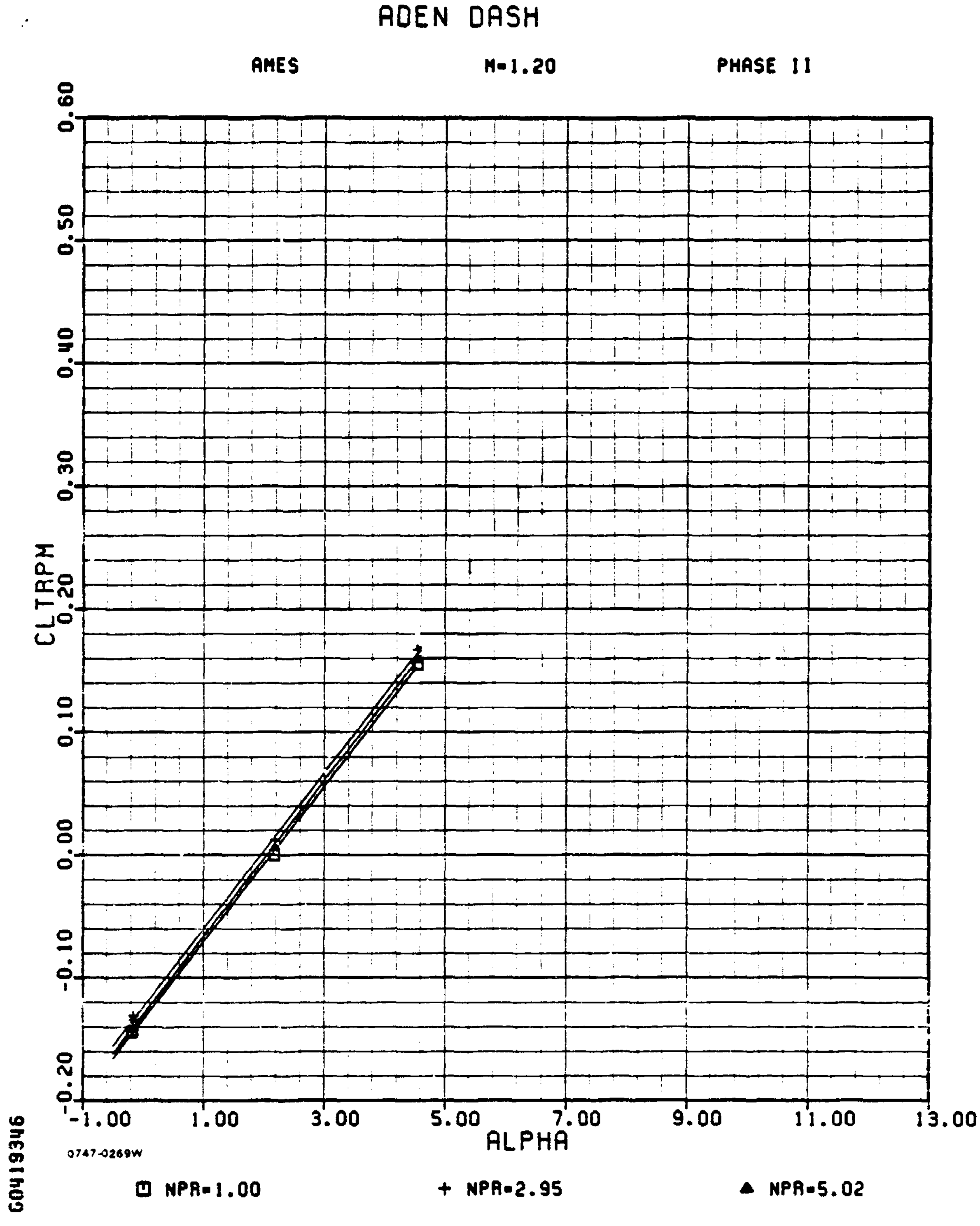

ADEN DASH
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-00204W
AOA = 5
AOA = 6
G8403345

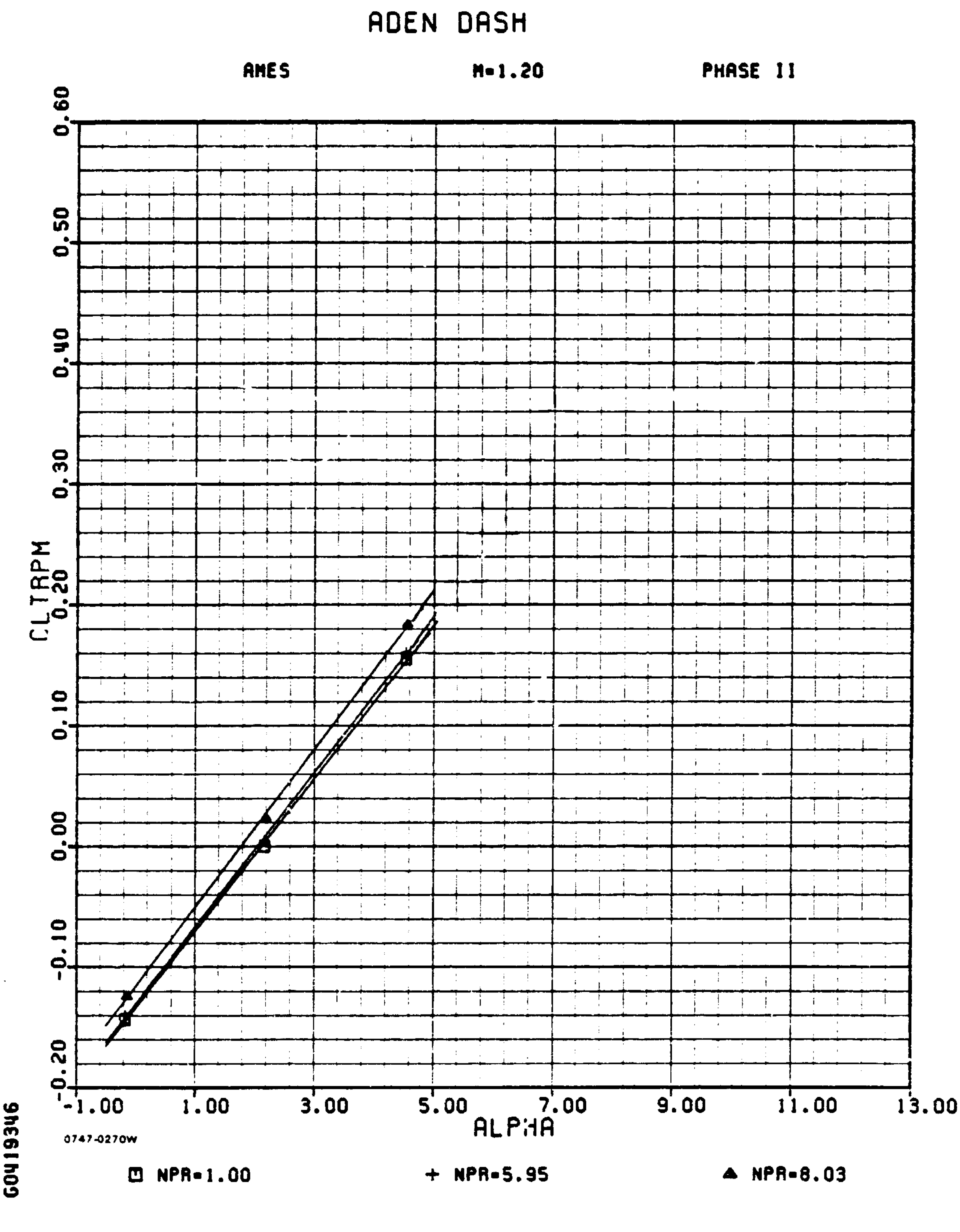


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPH
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0747-00205W
G840334S
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN DASH
AMES
M=0.90
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
C747-00207W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

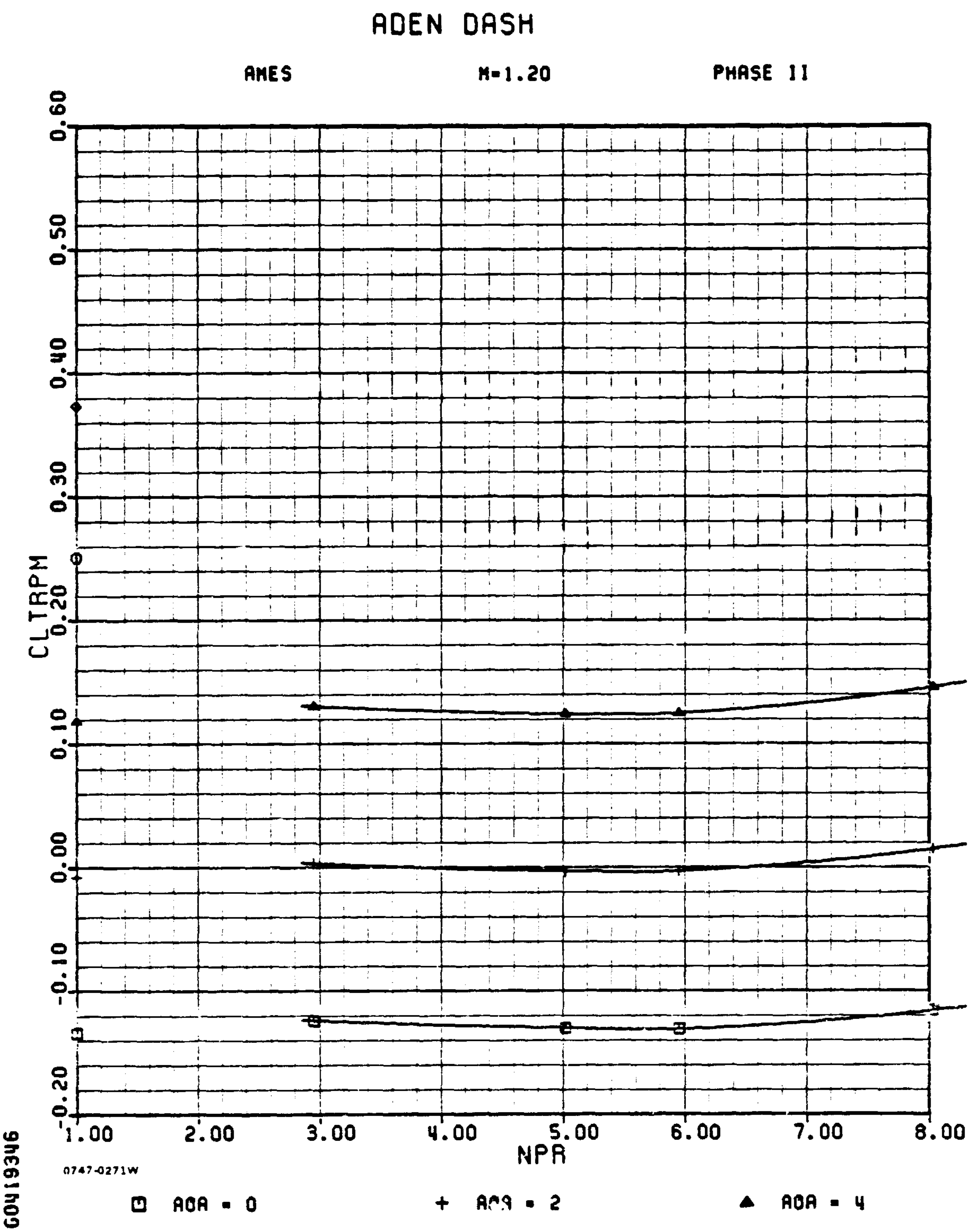

ADEN DASH
M=0.90
AMES
PHASE II
CDI
CLI
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
-.1000
-.0800
-.0600
-.0400
-.0200
.0000
.0200
.0400
.0600
.0800
.1000
.1200
.1400
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60


ADEN DASH
AMES
M=1.20
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G0419346
0747-0269W
NPR=1.00
+ NPR=2.95
▲ NPR=5.02

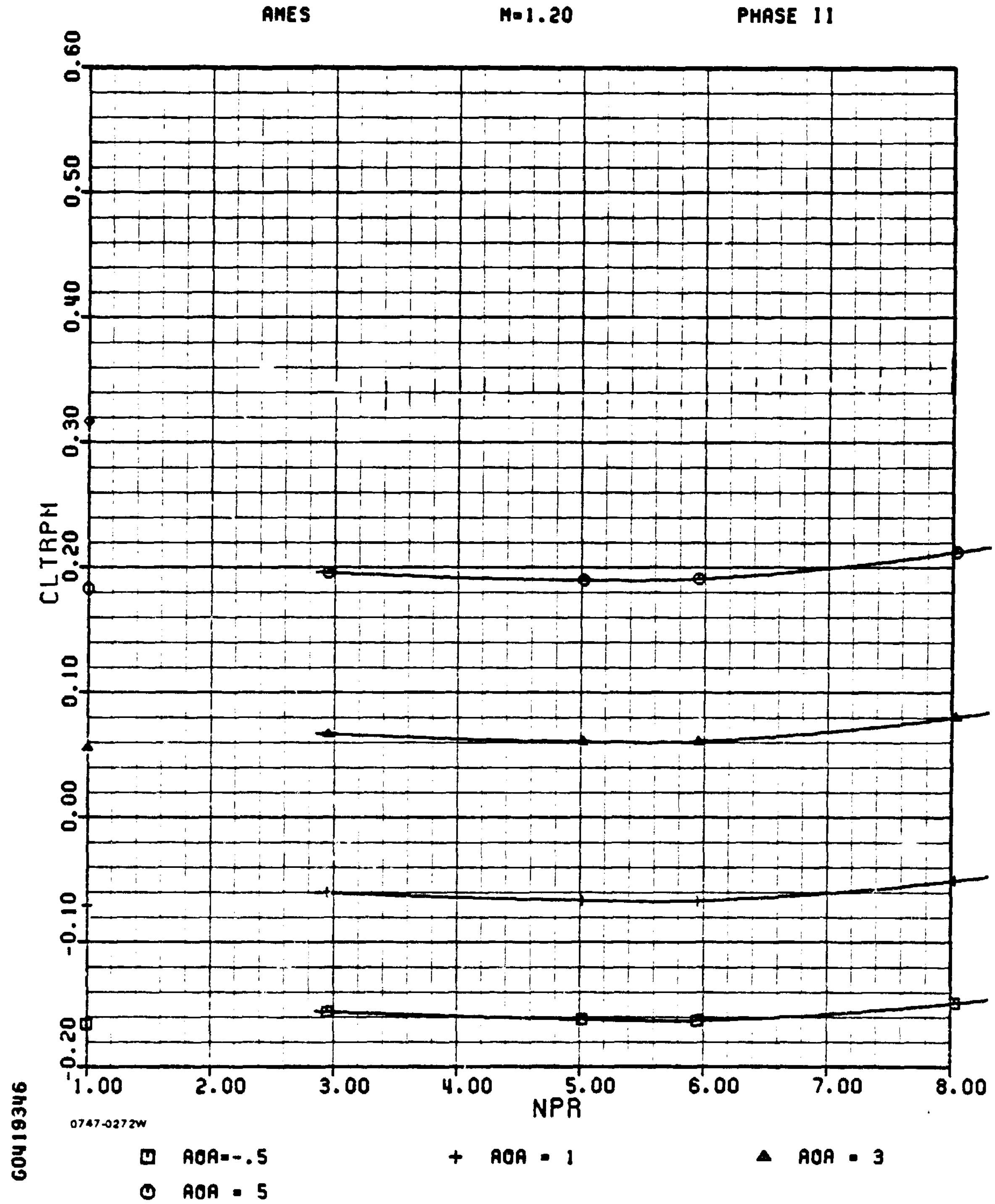


ADEN DASH
AMES
M=1.20
PHASE II
CLTRPM
ALPHA
0747-0270W
G0419346
NPR=1.00
NPR=5.95
NPR=8.03

H-3(a)(concl.)


ADEN DASH
AMES
M=1.20
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0271W
G0419346
AOA = 0
AOA = 2
AOA = 4

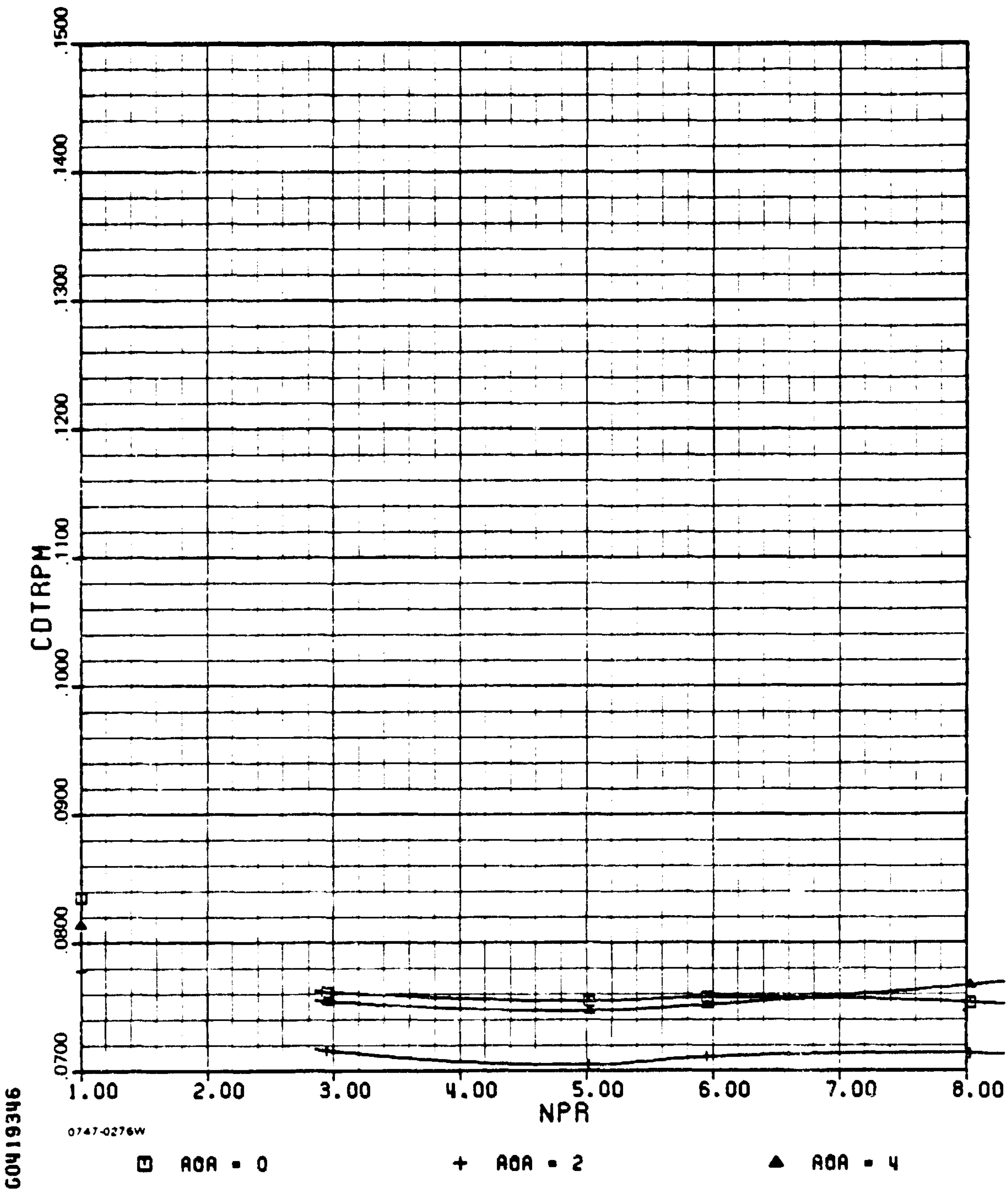
ADEN DASH

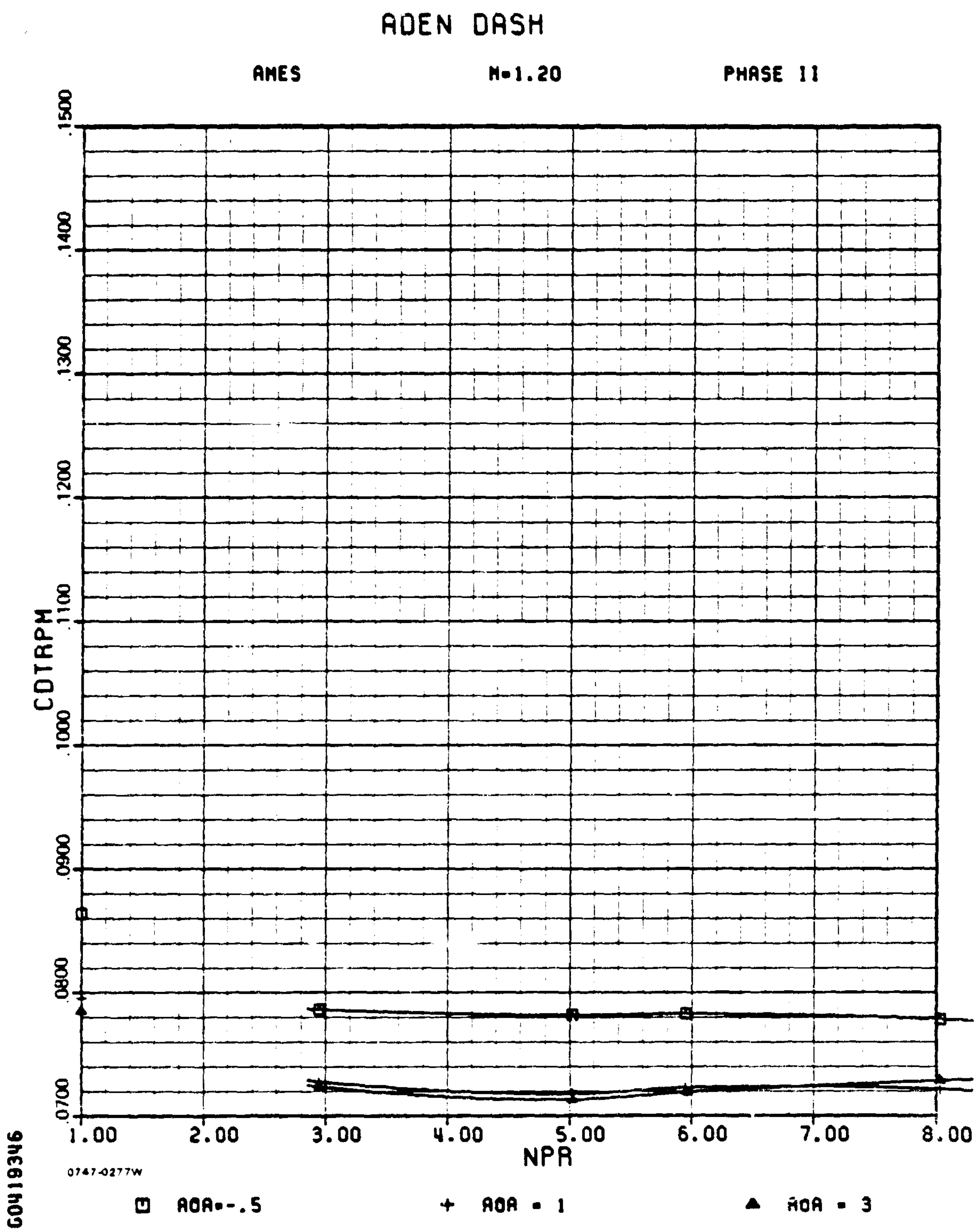


H-3(b)(concl.)

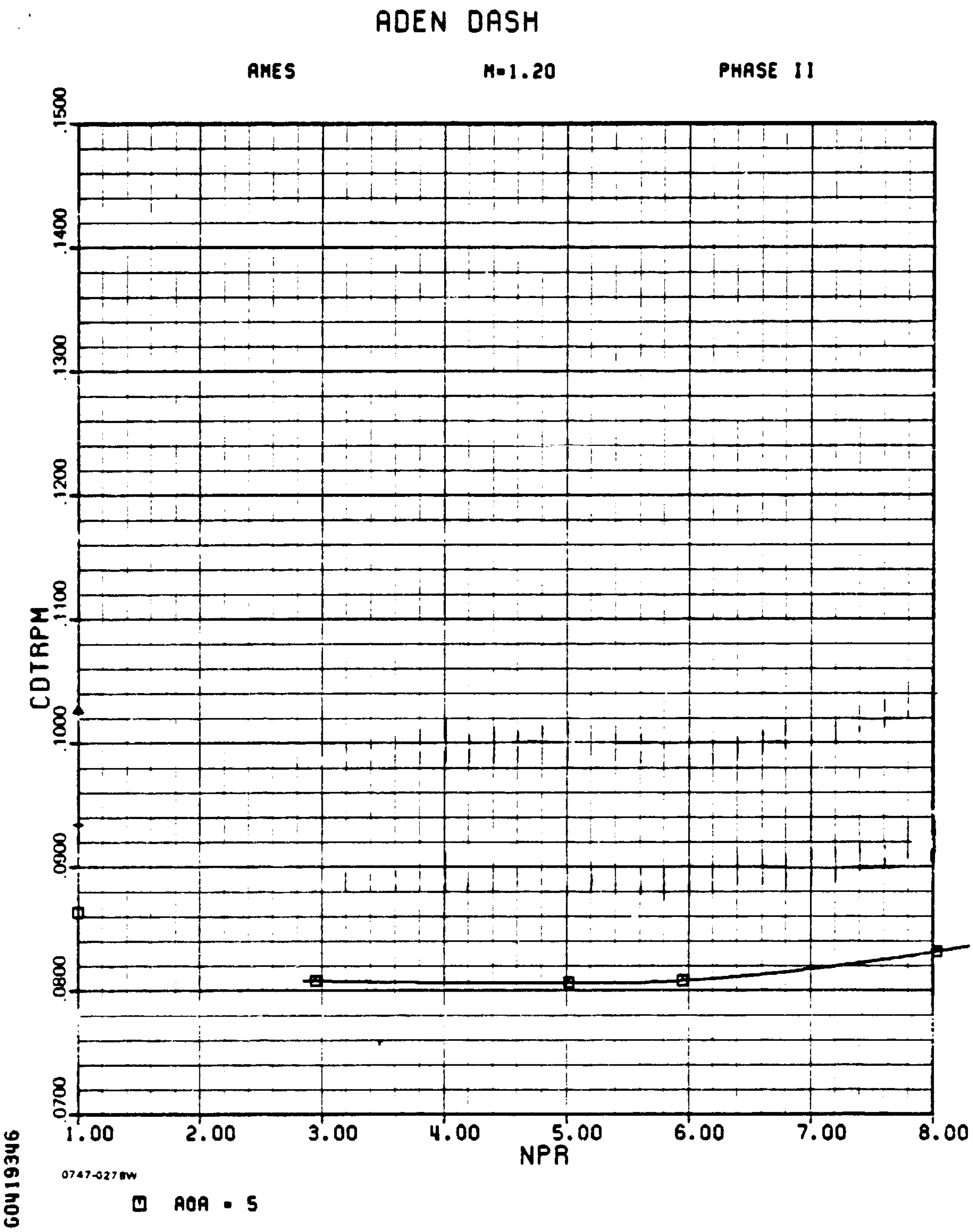
ADEN DASH

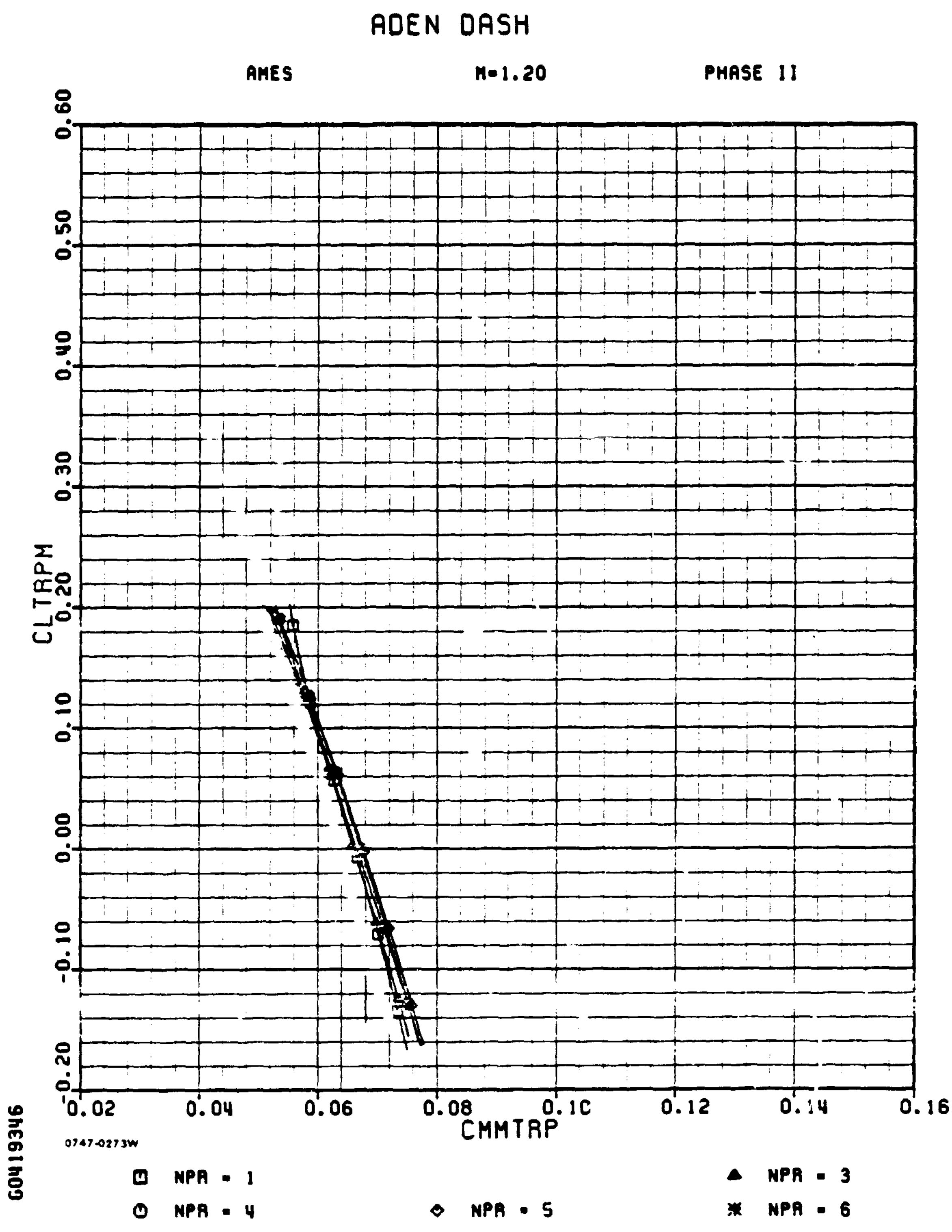
AMES M=1.20 PHASE II



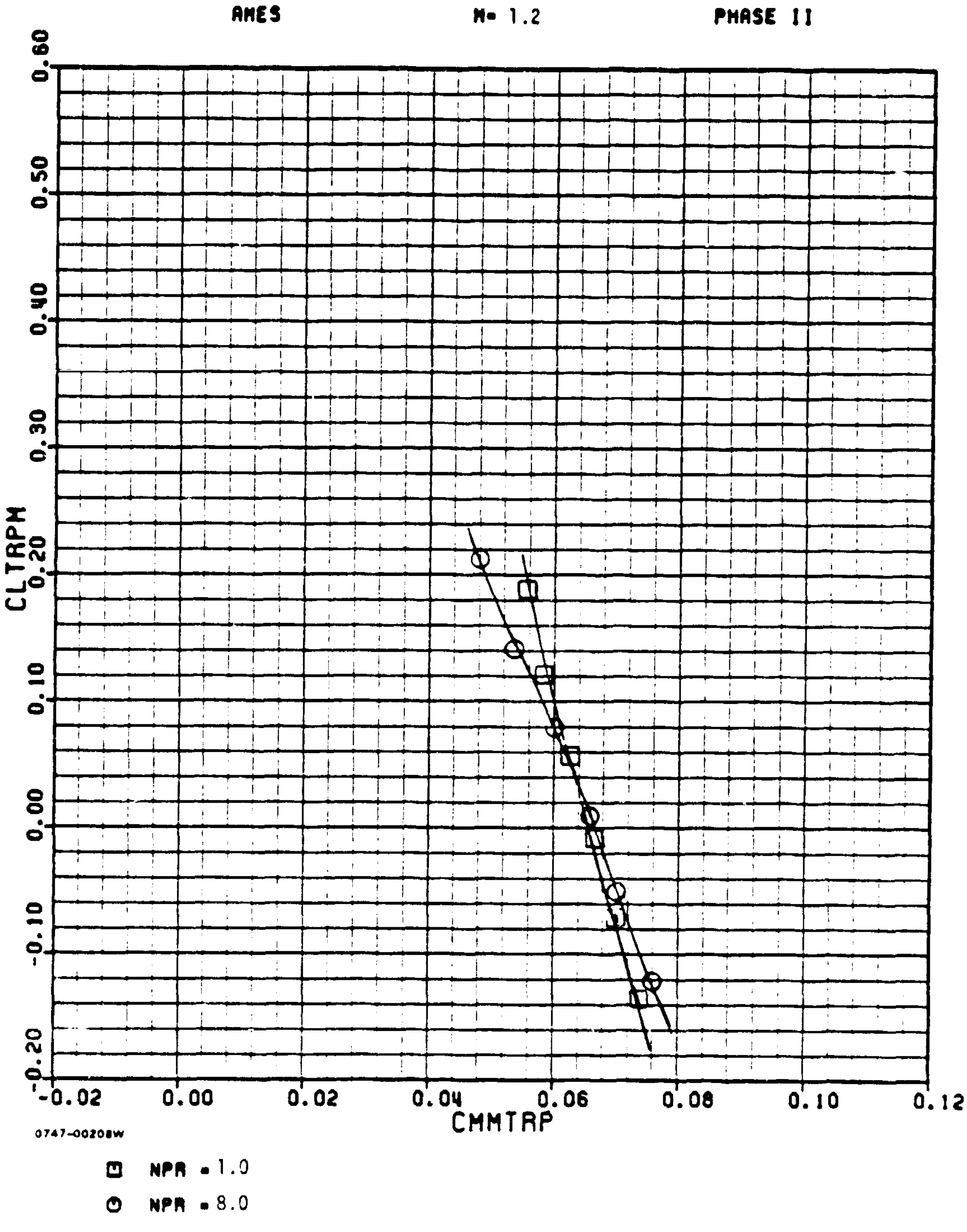

ADEN DASH
AMES
M=1.20
PHASE II
CDTRPM
.0700
.0800
.0900
.1000
.1100
.1200
.1300
.1400
.1500
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G0419346
0747-0277W
AOA=-.5
AOA = 1
AOA = 3

H-3(c) (cont.)

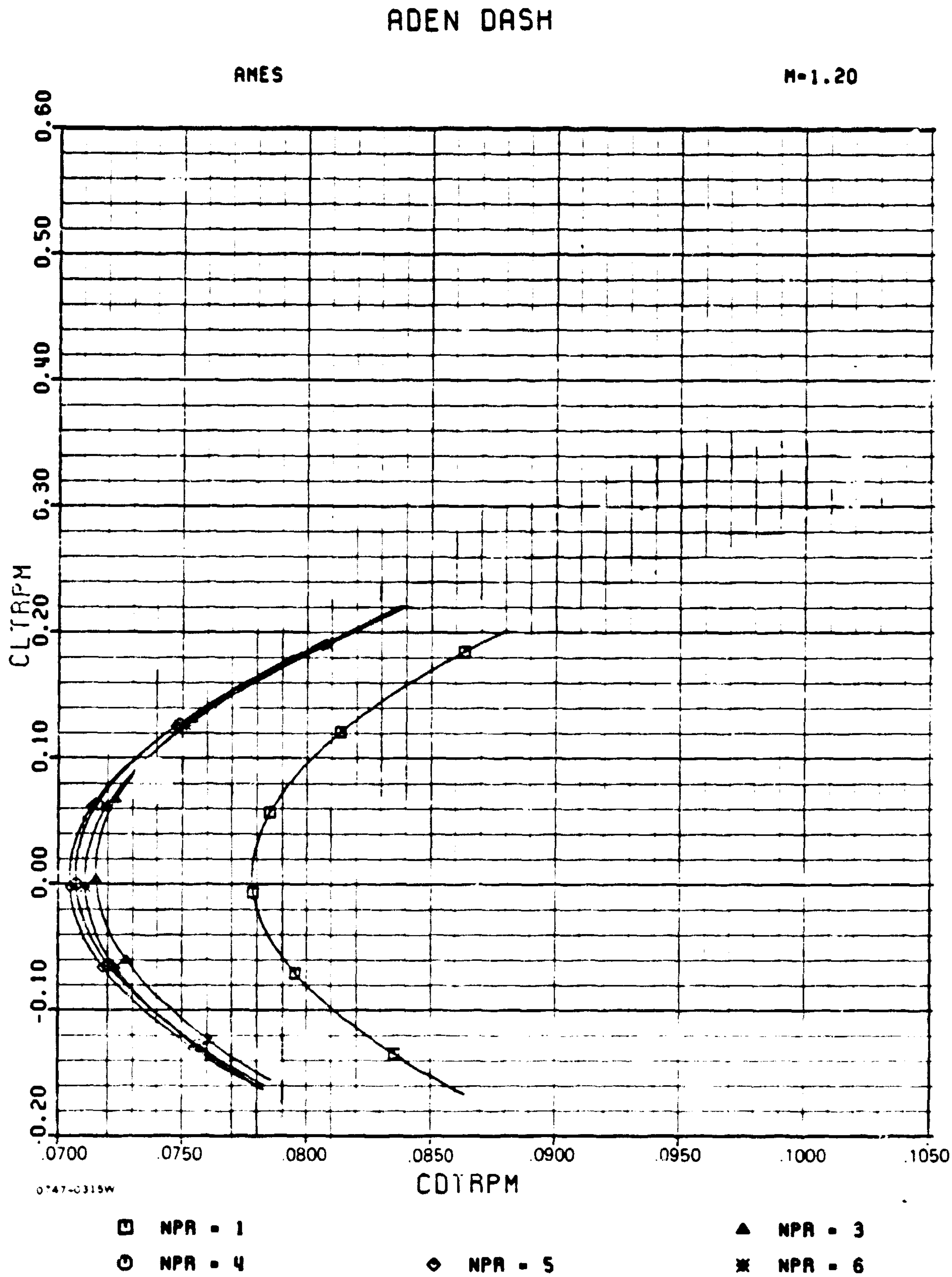

ADEN DASH
AMES
M=1.20
PHASE II
CDTRPM
.1500
.1400
.1300
.1200
.1100
.1000
.0900
.0800
.0700
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0278W
G0419346
AOA = 5


ADEN DASH
AMES
M=1.20
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
CMMTRP
G0419346
0747-0273W
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN DASH

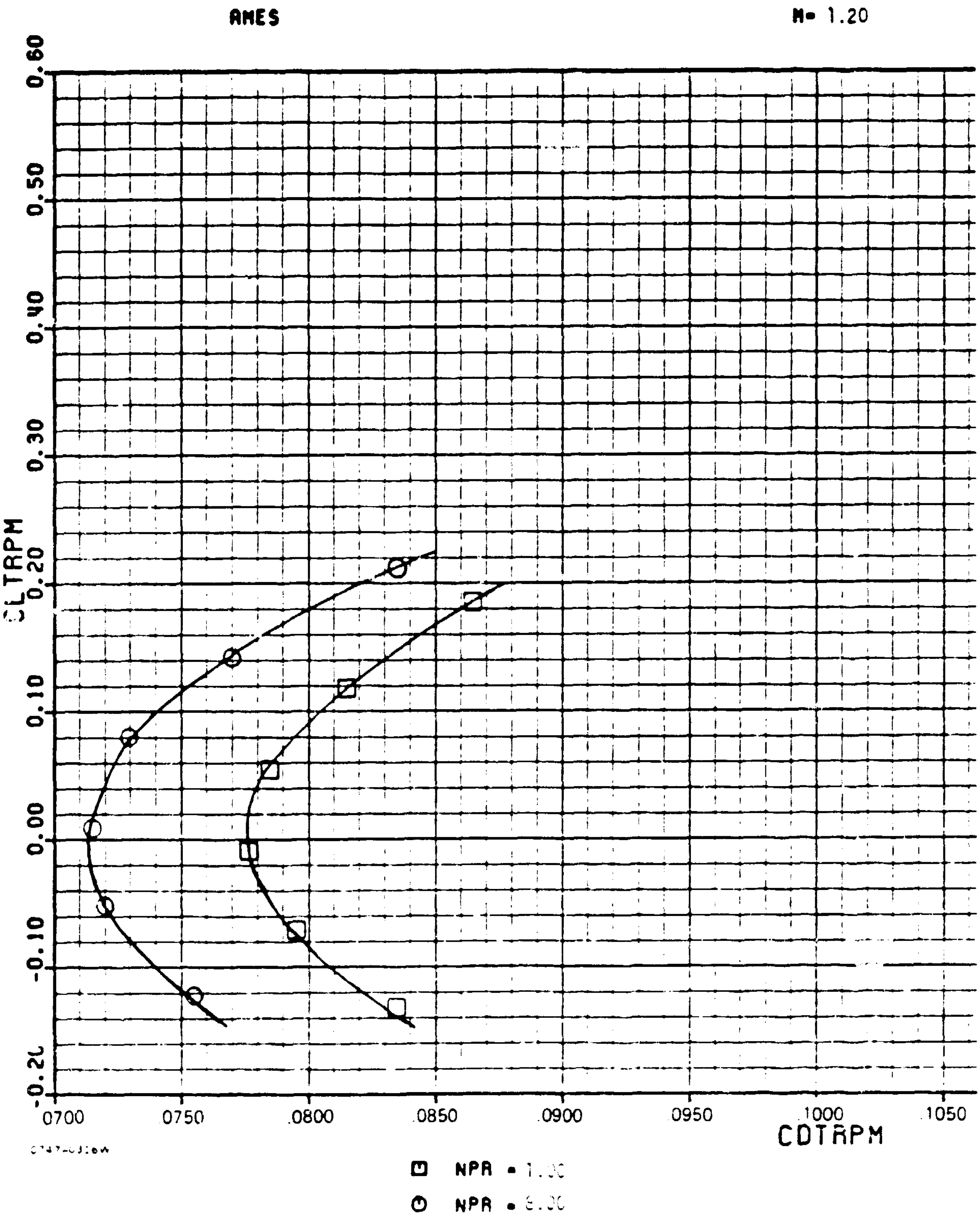


H-3(d)(concl.)

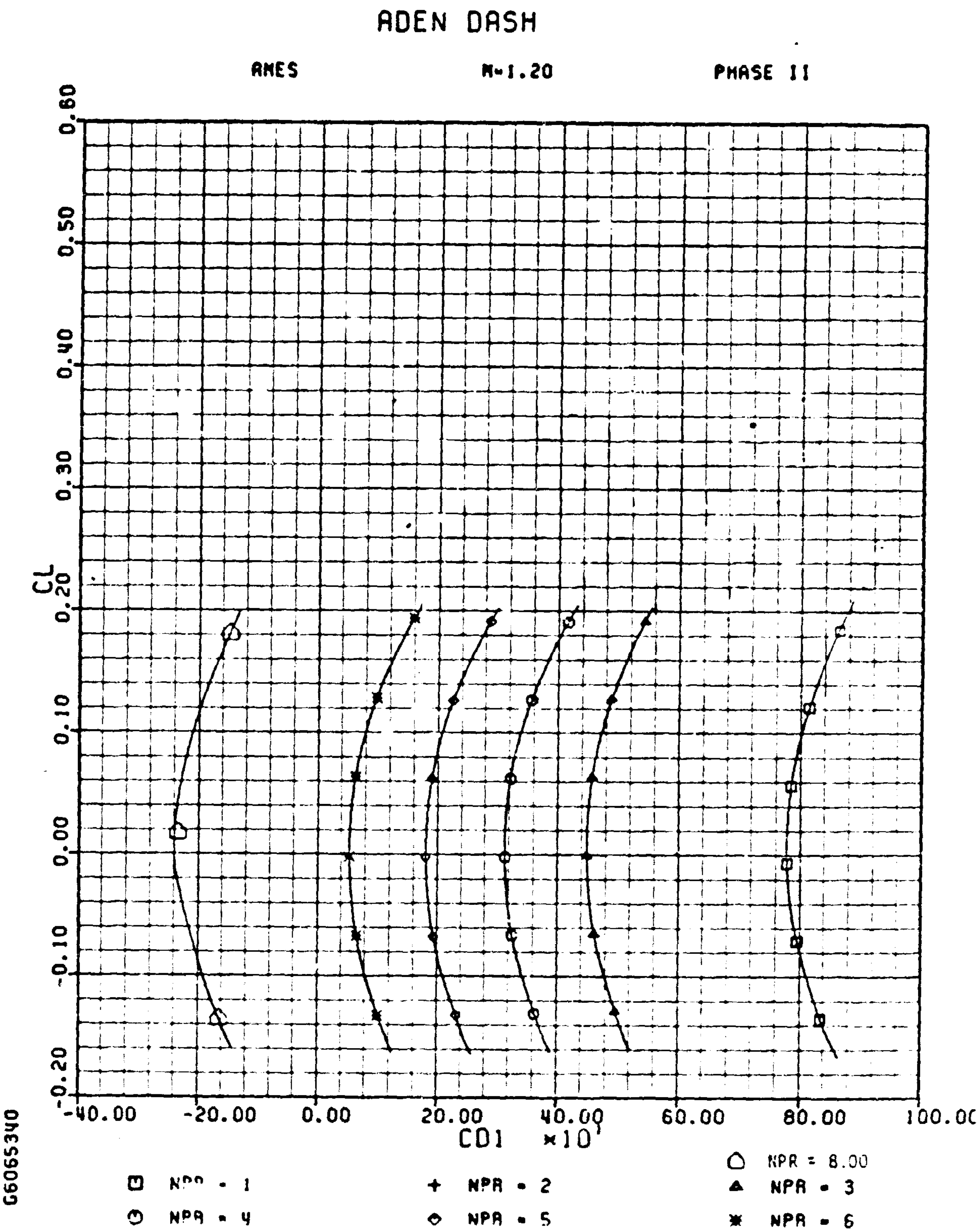

ADEN DASH
AMES
M=1.20
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0700
.0750
.0800
.0850
.0900
.0950
.1000
.1050
CDTRPM
0747-0315W
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

G0419346

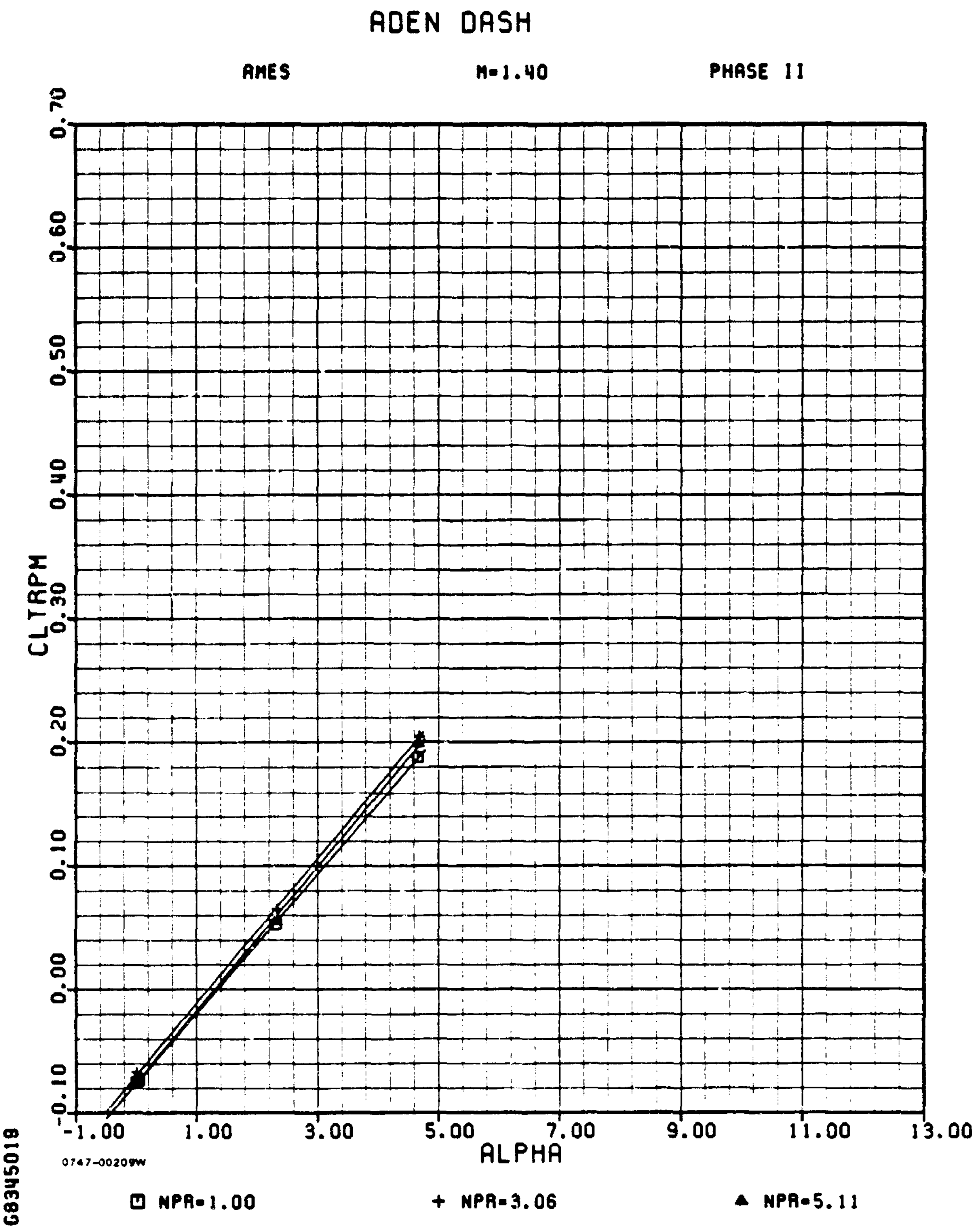
ADEN DASH



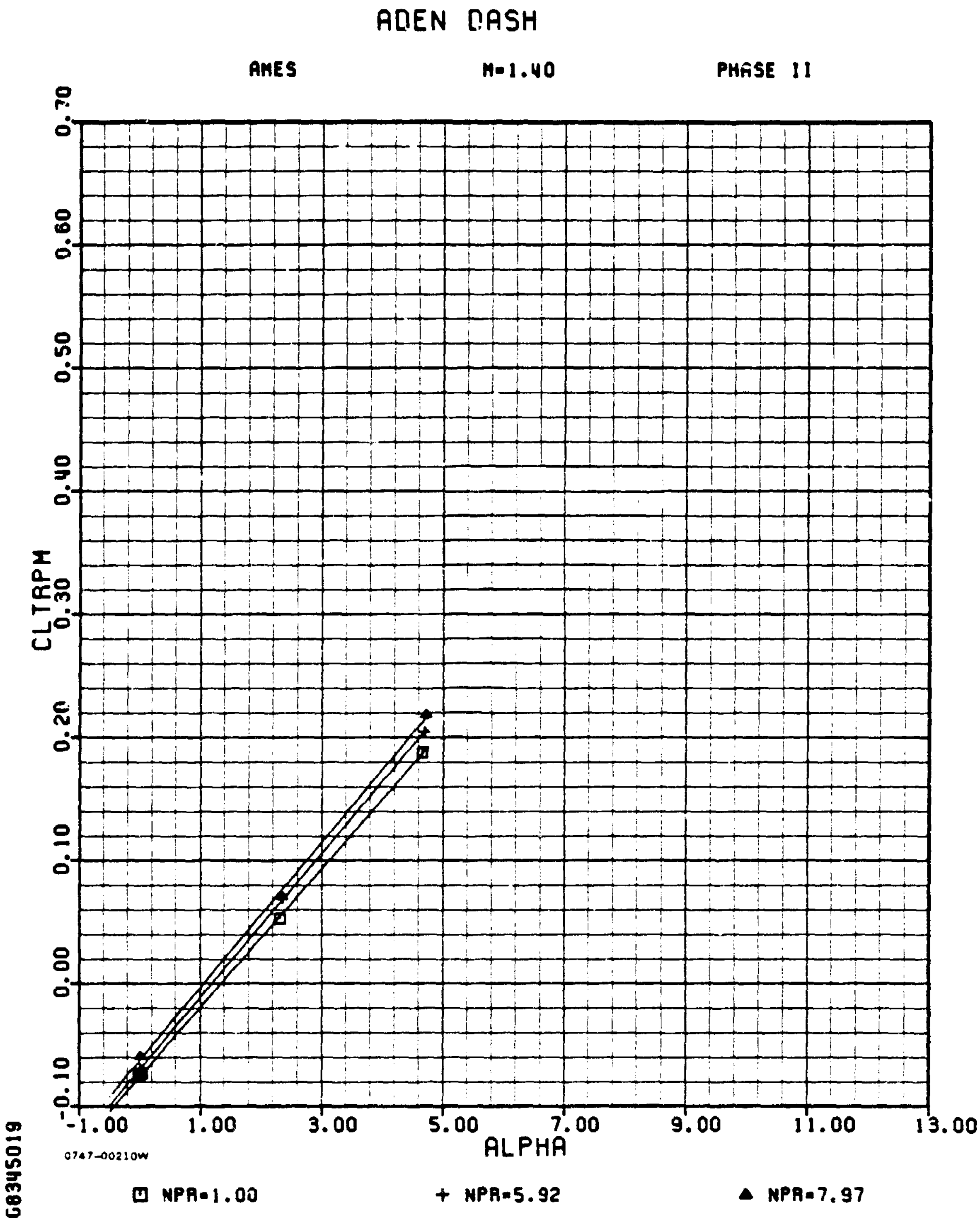
H-3(e)(concl.)



ADEN DASH
AMES
M=1.20
PHASE II
CL
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
CDI ×10
NPR = 8.00
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
G6065340

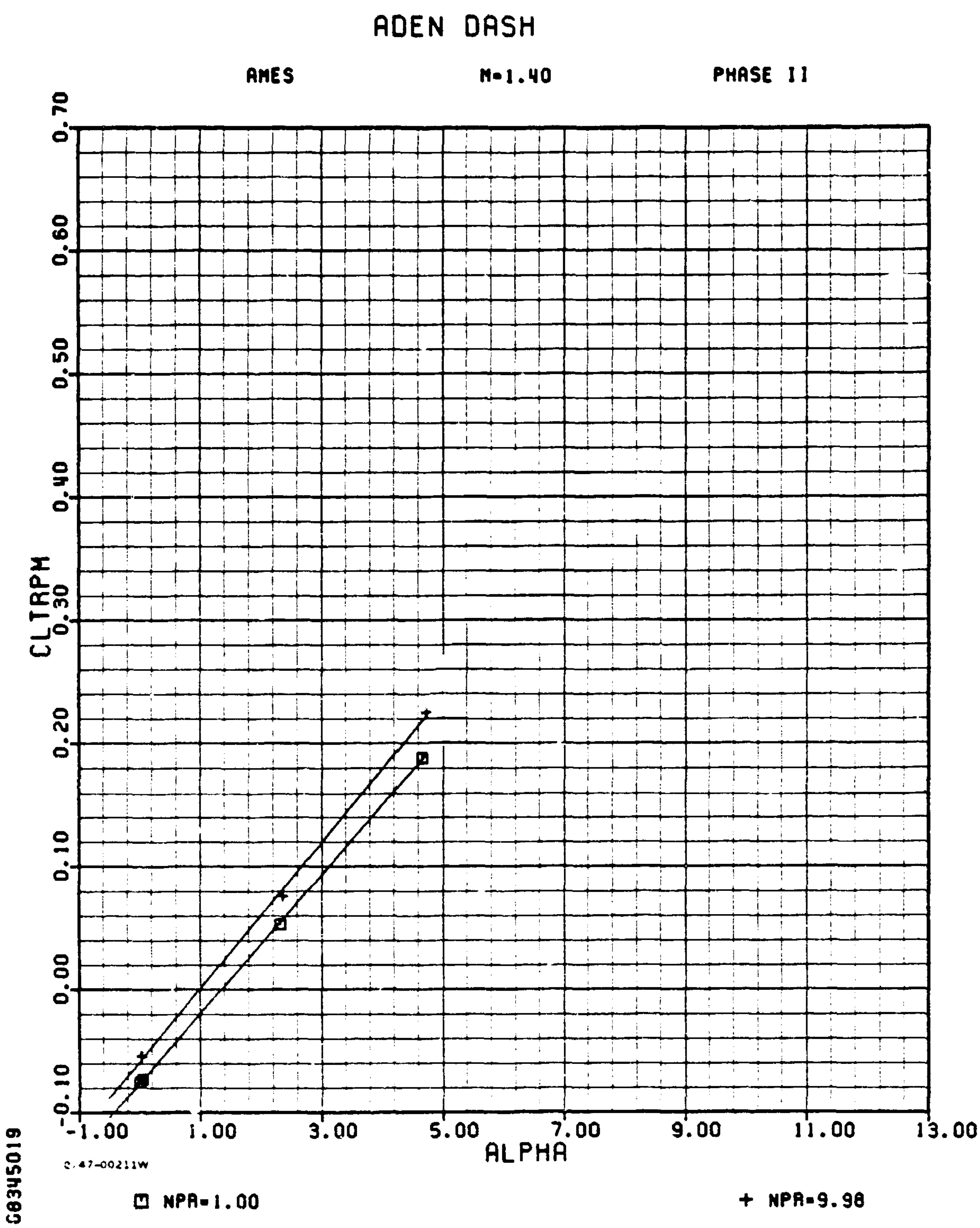


ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-00209W
G8345018
NPR=1.00
+ NPR=3.06
NPR=5.11



ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-00210W
G8345019
NPR=1.00
NPR=5.92
NPR=7.97

H-4(a)(cont.)



ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
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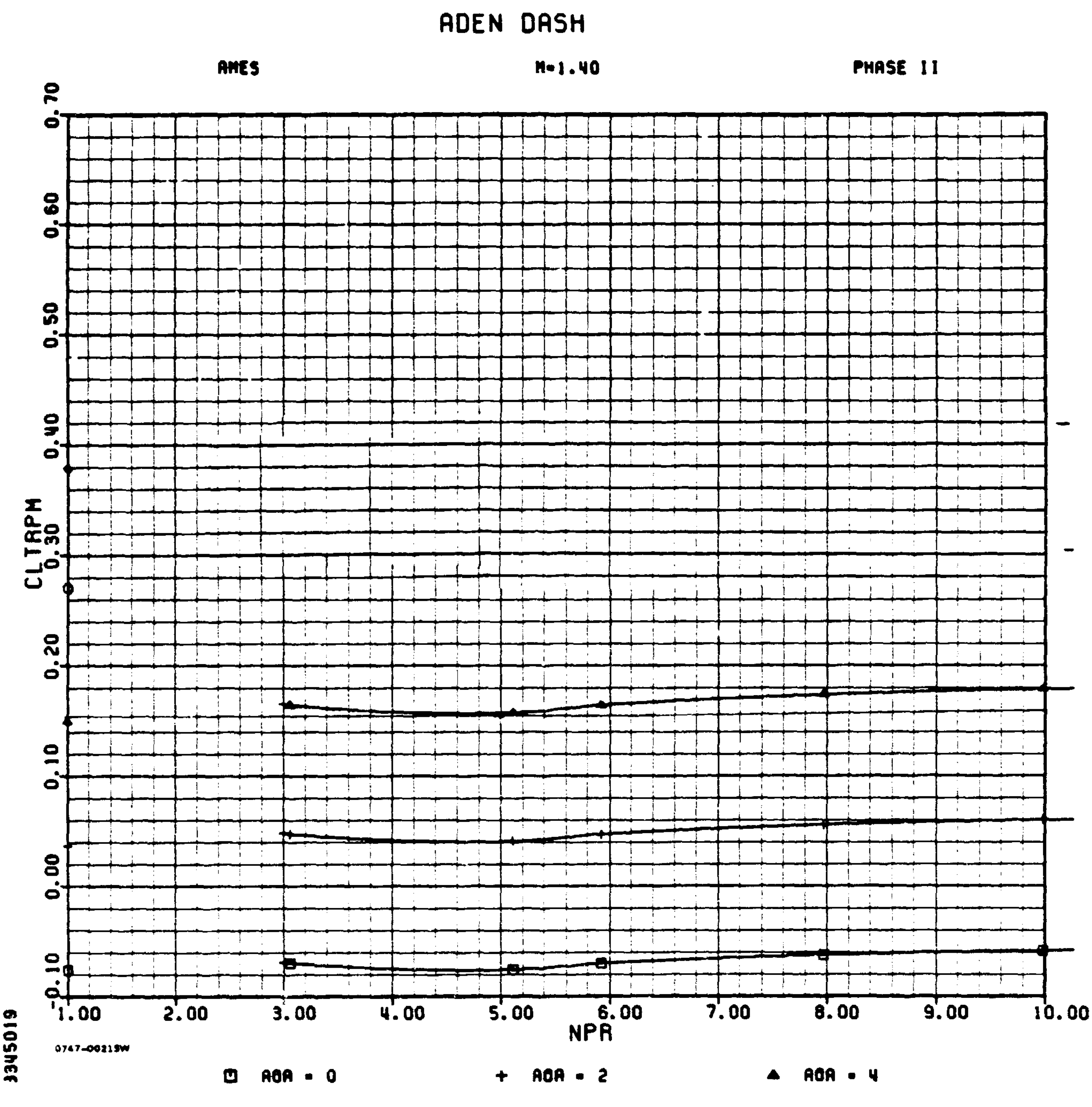
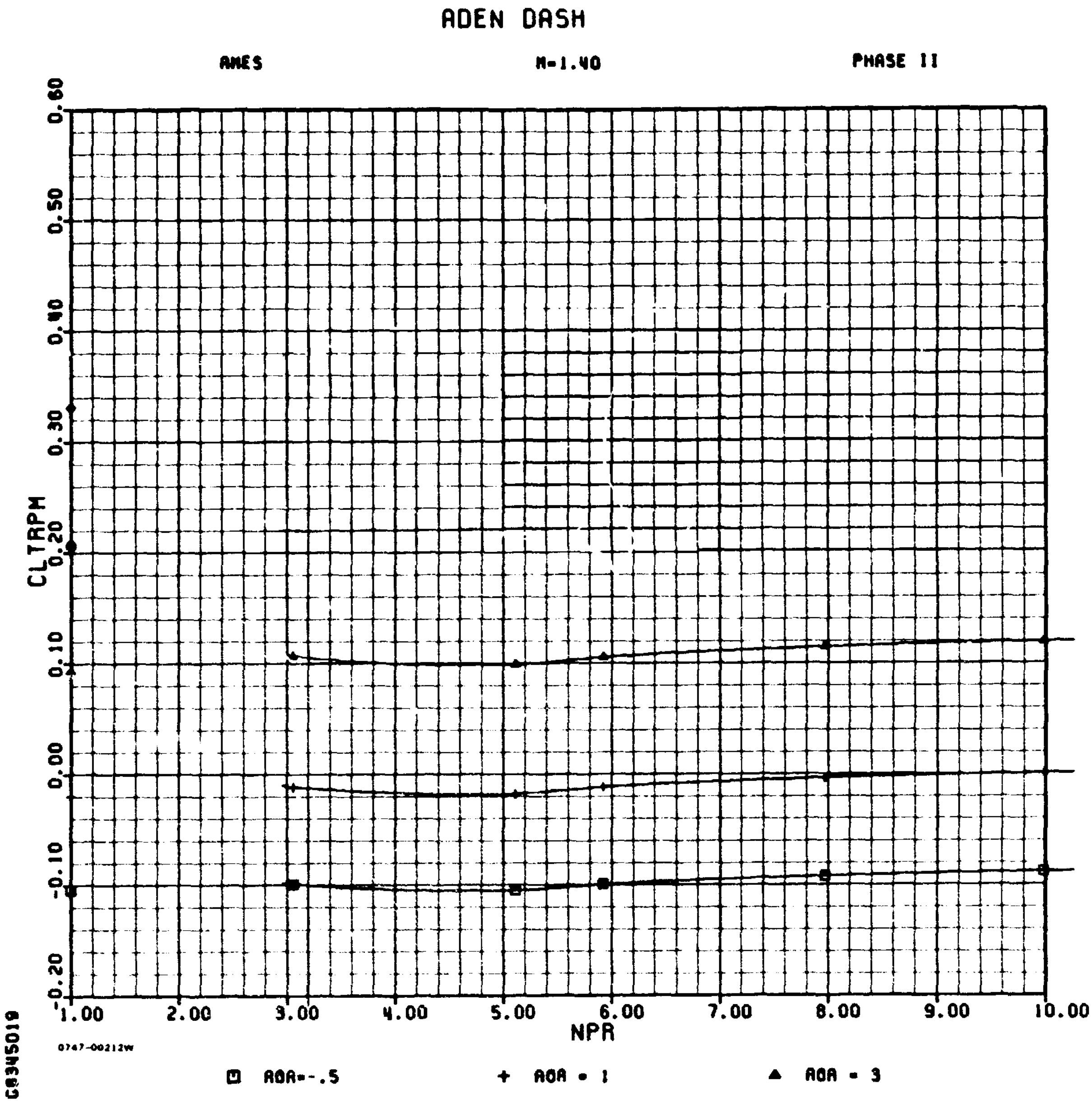
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G8345019
NPA=1.00
+ NPA=9.98


ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
0747-00215W
AOA = 0
AOA = 2
AOA = 4
3345019


ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
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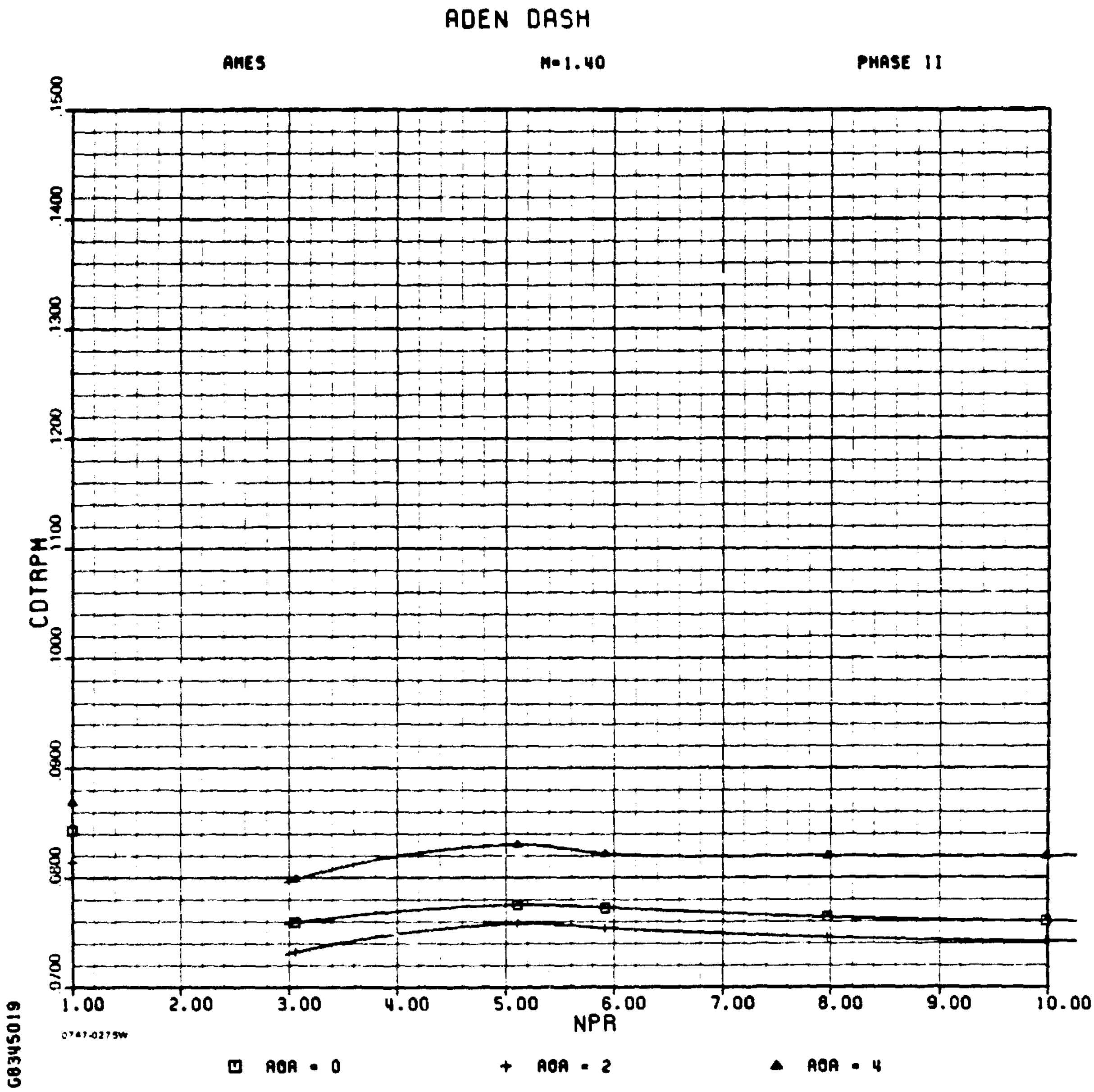
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
NPR
0747-00212W
GA345019
AOA=-.5
AOA = 1
AOA = 3


ADEN DASH
AMES
M=1.40
PHASE II
CDTRPM
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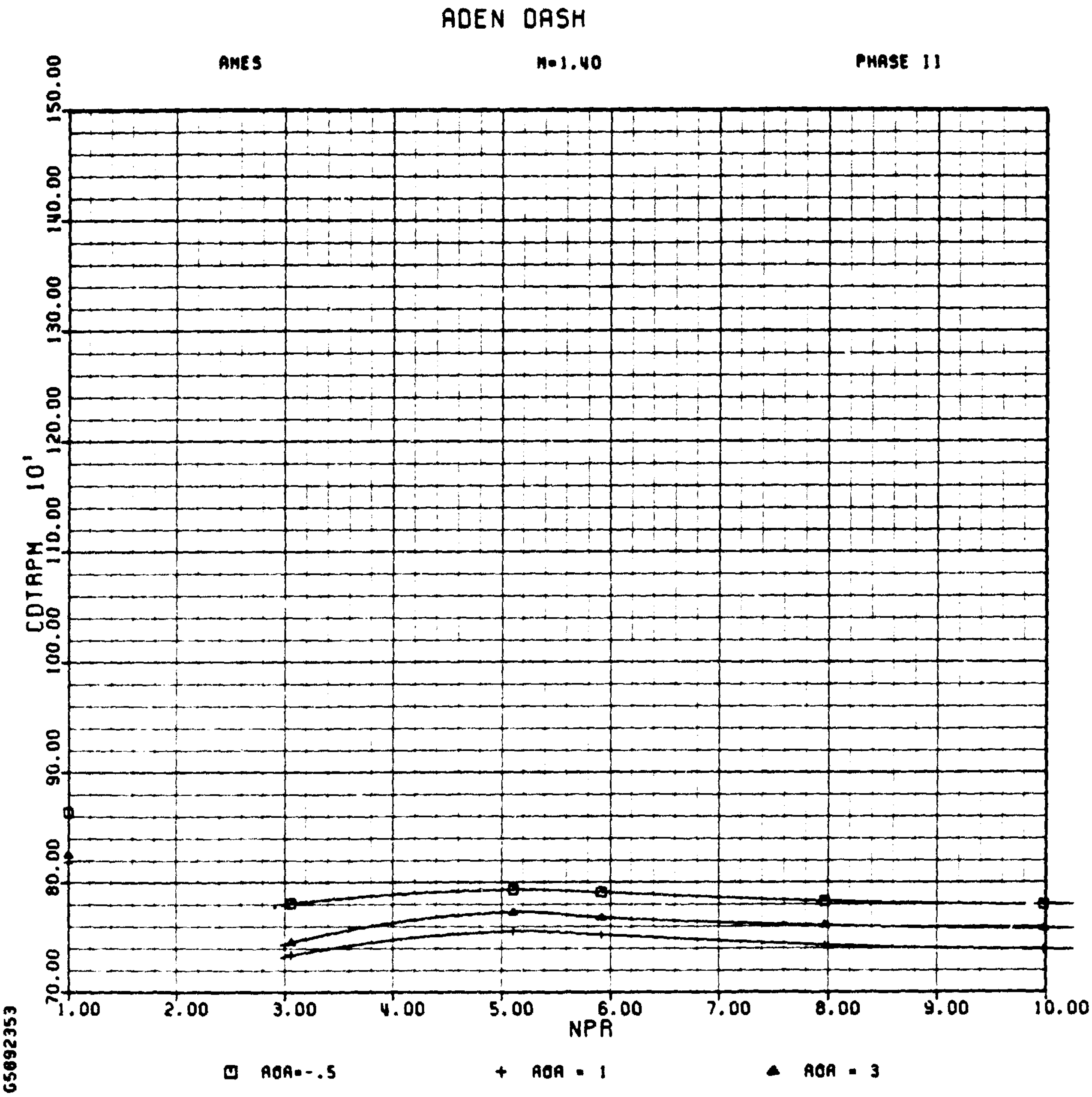
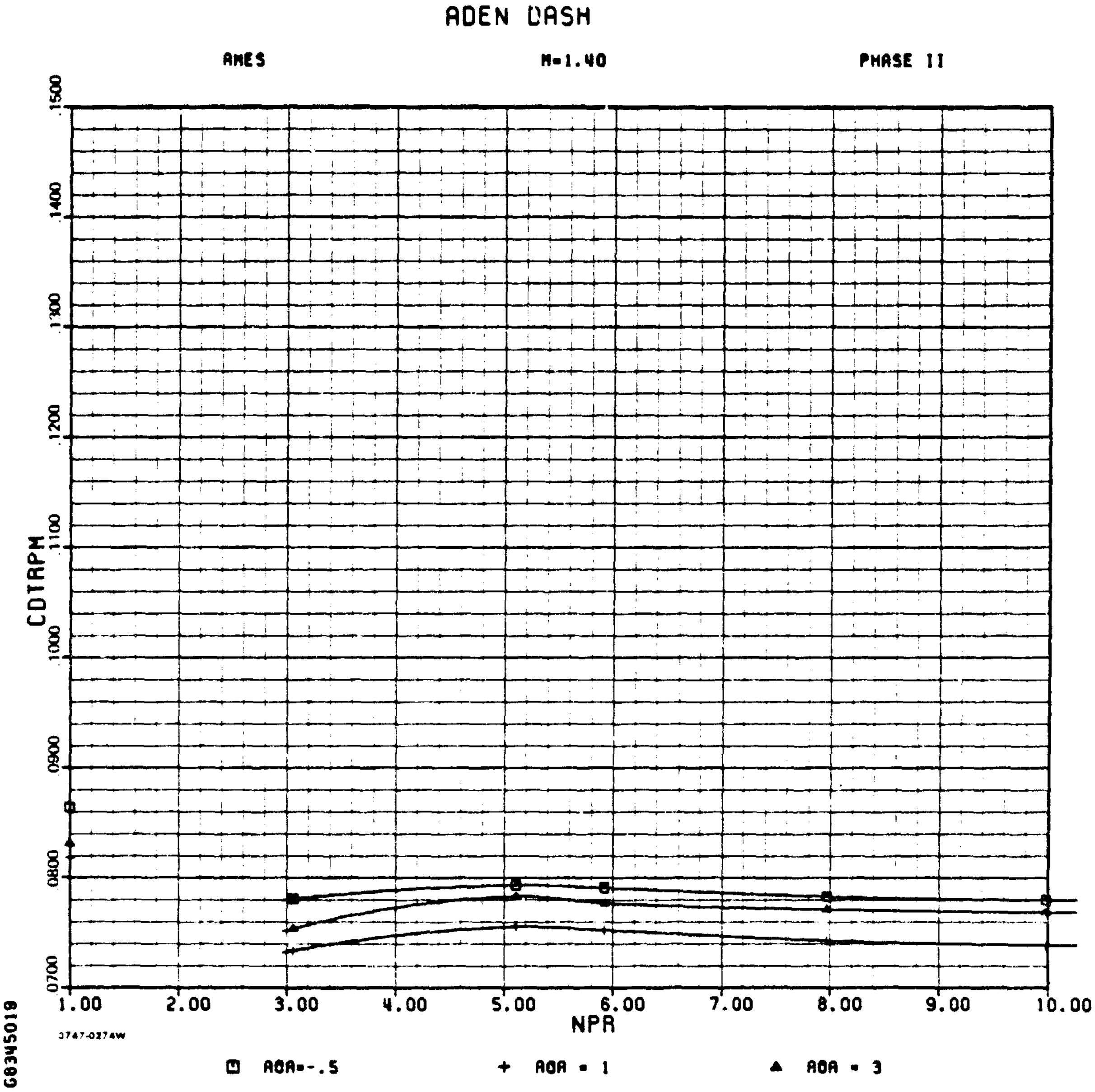
.1400
.1300
.1200
.1100
.1000
.0900
.0800
.0700
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
NPR
G8345019
AOA = 0
AOA = 2
AOA = 4

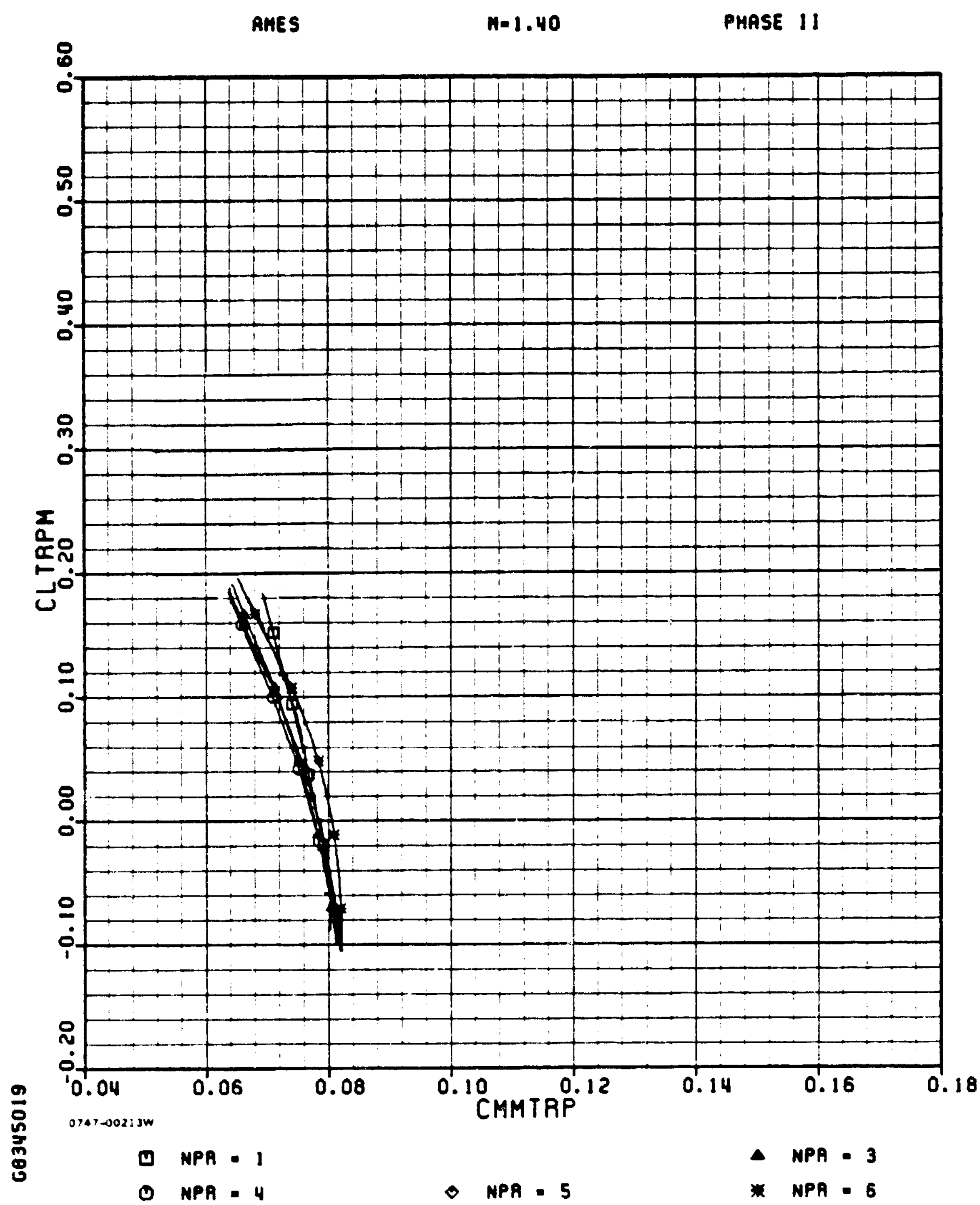

ADEN DASH
AMES
M=1.40
PHASE II
CDTRPM 10'
NPR
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
AOA=-.5
AOA = 1
AOA = 3
G5892353

H-4(c) Cont.


ADEN DASH
AMES
M=1.40
PHASE II
CDTRPM
NPR
AOA=-.5
+ AOA = 1
AOA = 3
G8345019

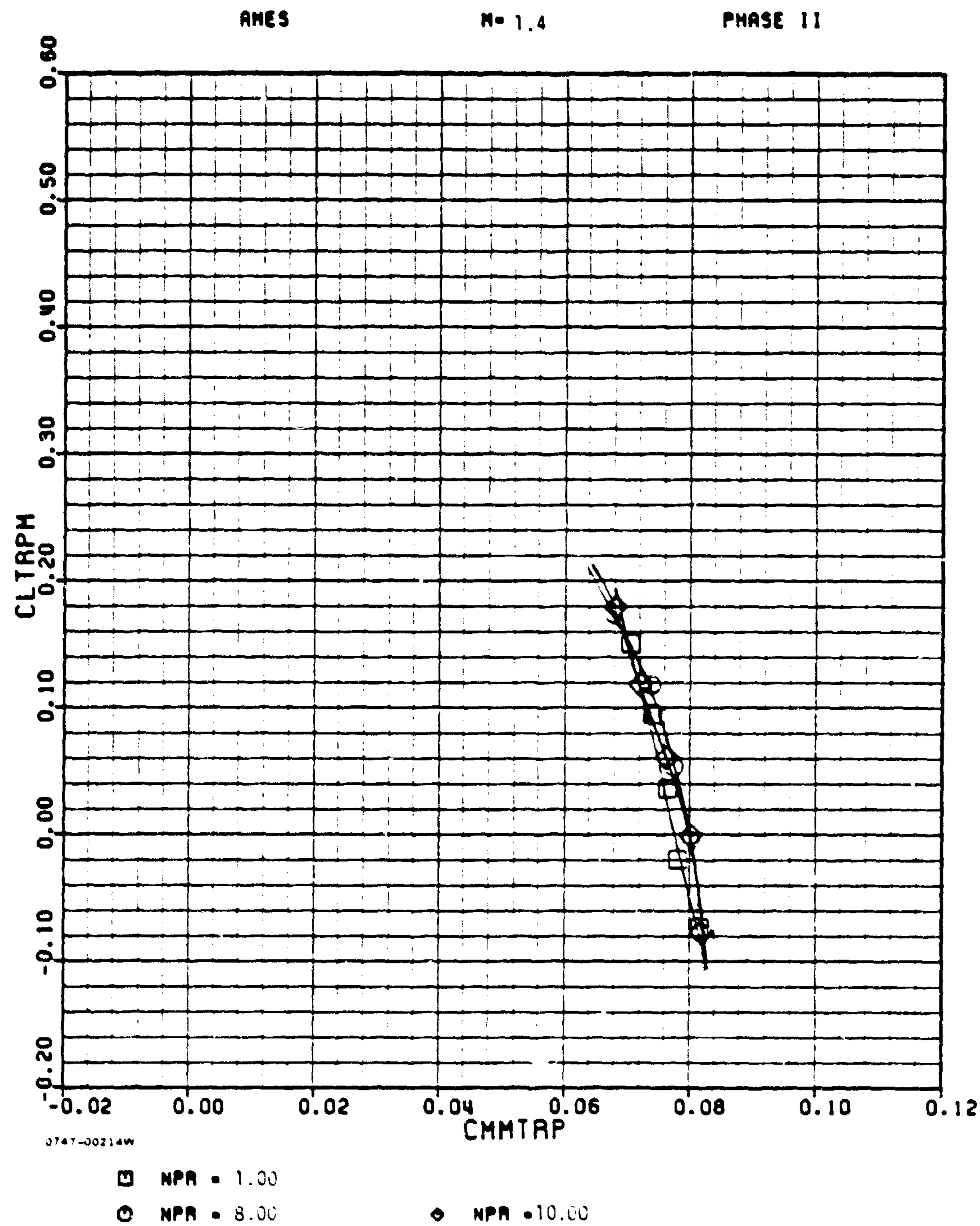
H- 4(c) (concl.)

ADEN DASH

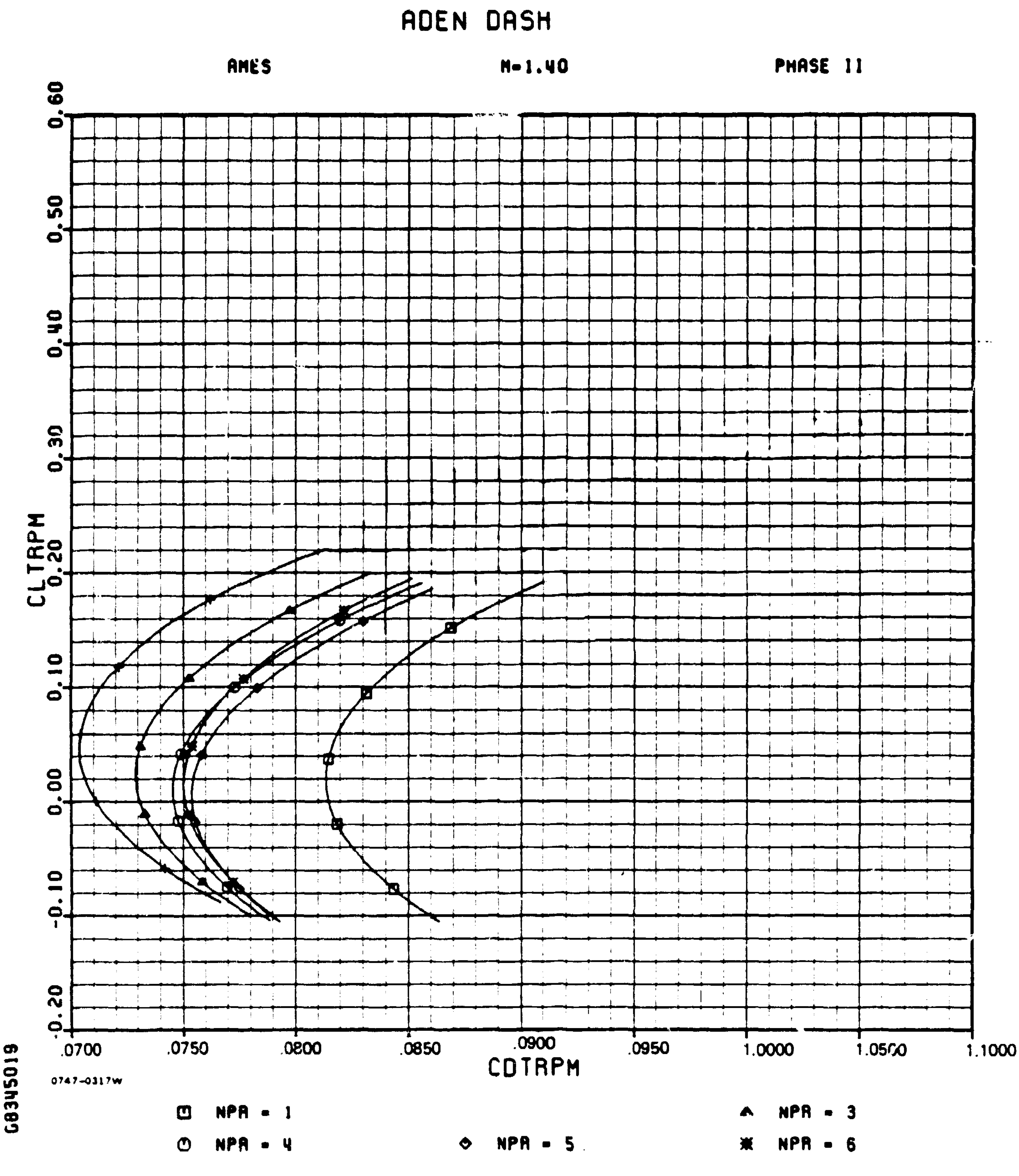


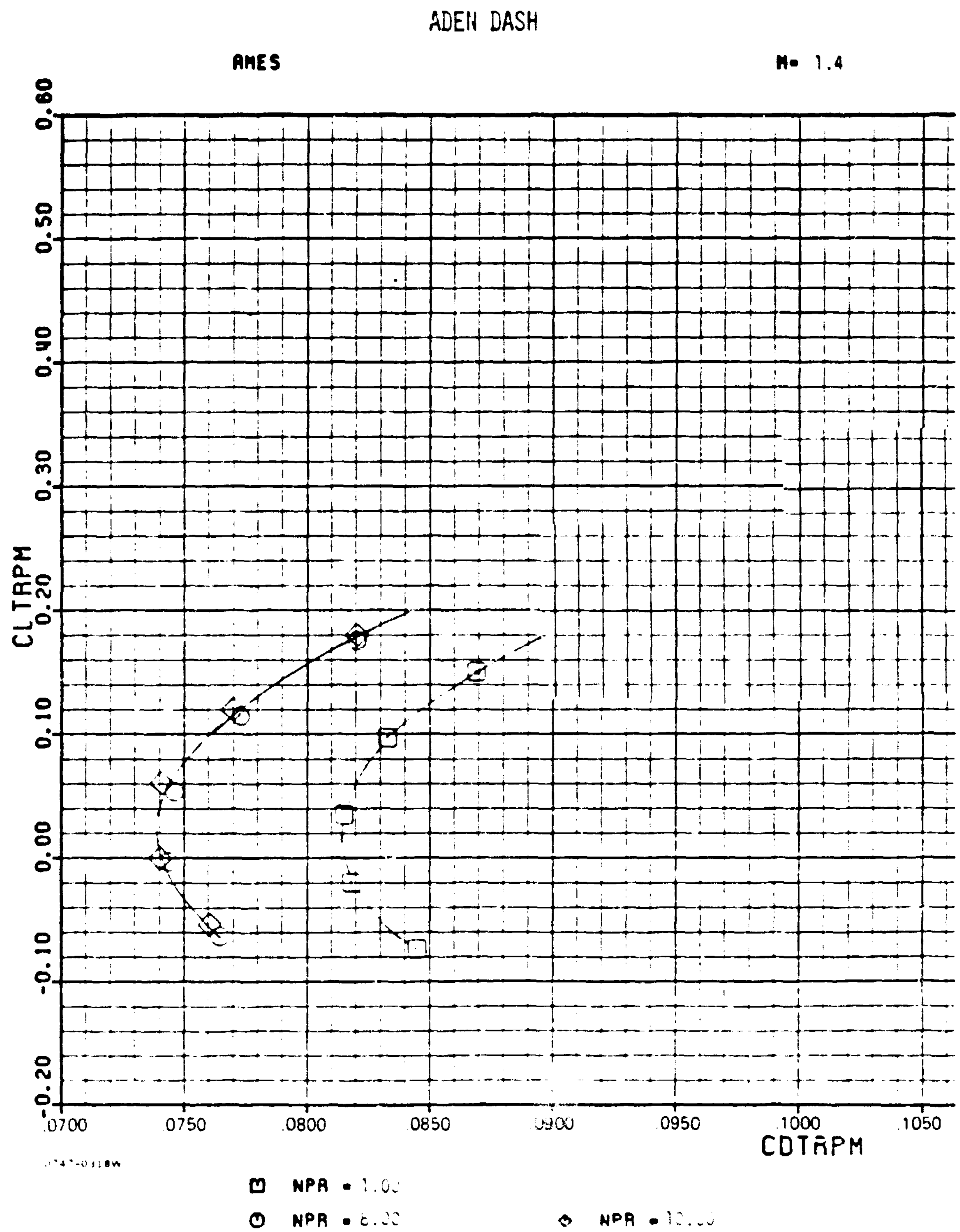
AMES
M=1.40
PHASE II
CLTRPM
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
CMMTRP
0747-00213W
GB345019
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN DASH

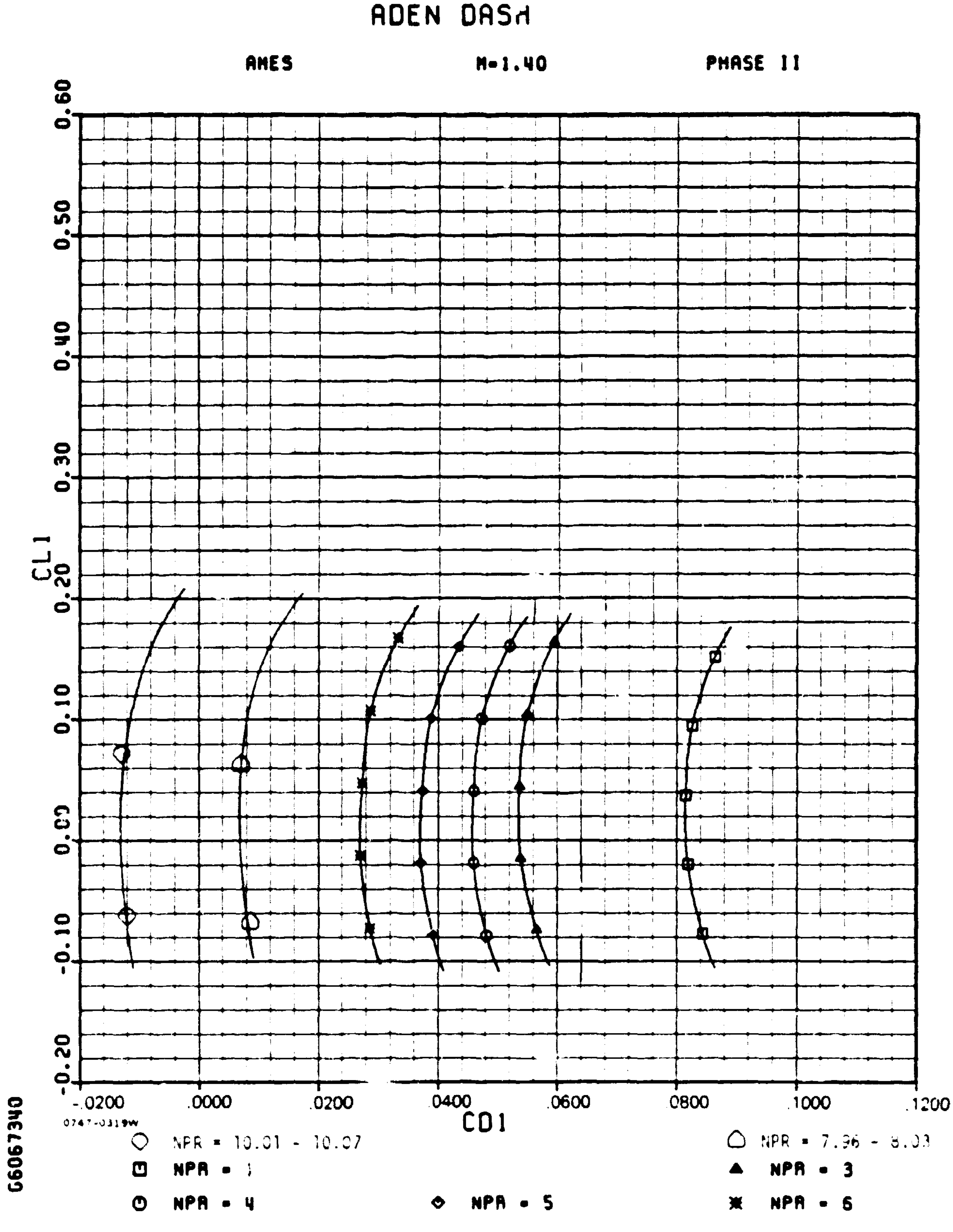


H-4(d) (concl.)


ADEN DASH
AMES
M=1.40
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0700
.0750
.0800
.0850
.0900
.0950
1.0000
1.0500
1.1000
CDTRPM
G8345019
0747-0317W
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

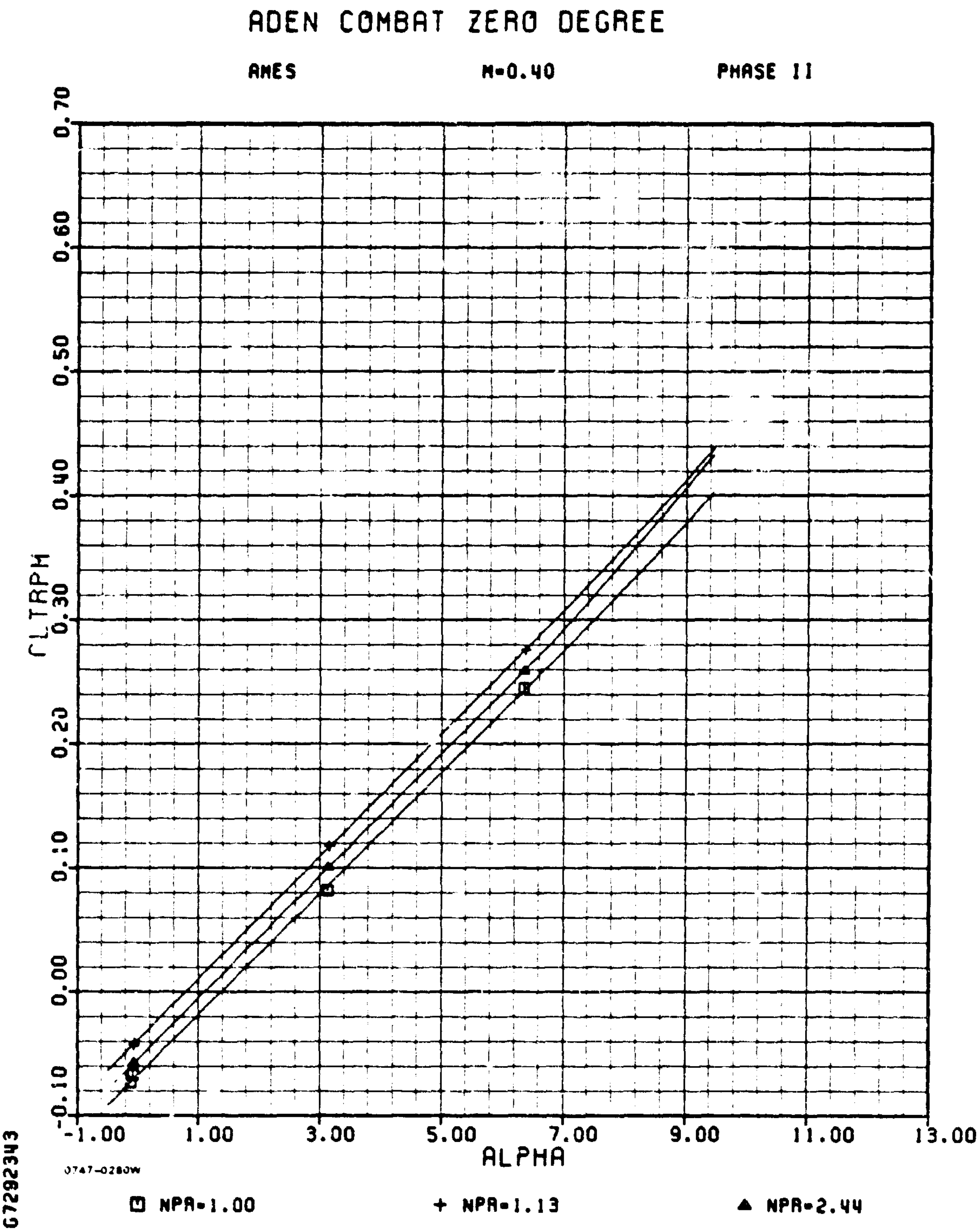

ADEN DASH
AMES
M= 1.4
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0700
.0750
.0800
.0850
.0900
.0950
.1000
.1050
CDTRPM
NPR = 1.00
NPR = 6.00
NPR = 10.00

H-4(e)(concl.)

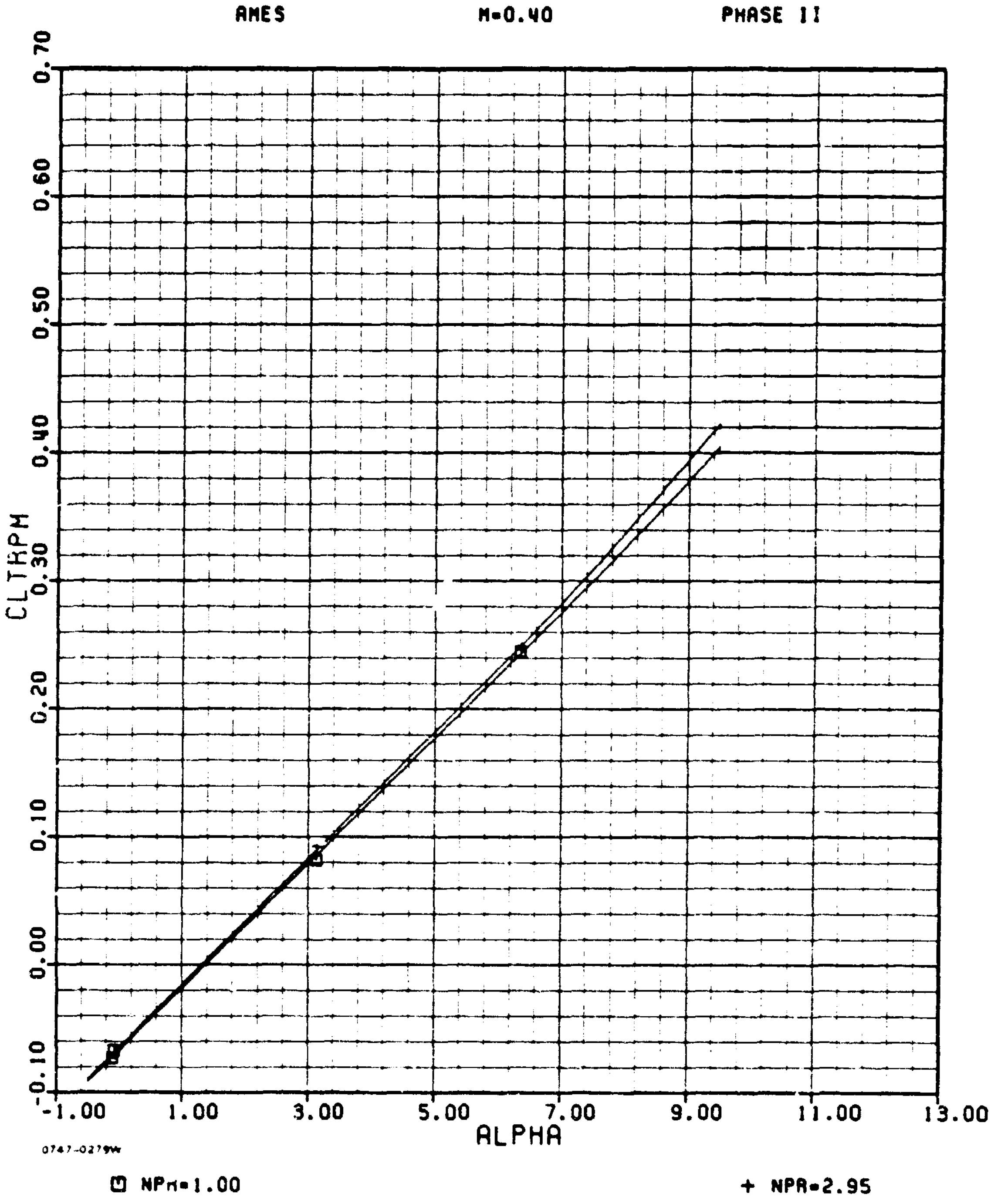

ADEN DASH
AMES
M=1.40
PHASE II
CL1
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CD1
-.0200
.0000
.0200
.0400
.0600
.0800
.1000
.1200
0747-0319W
G6067340
NPR = 10.01 - 10.07
NPR = 7.96 - 8.03
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

APPENDIX I

ADEN COMBAT 0^{o} WIND-ON DATA


ADEN COMBAT ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPH
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0280W
G7292343
NPR=1.00
+ NPR=1.13
▲ NPR=2.44

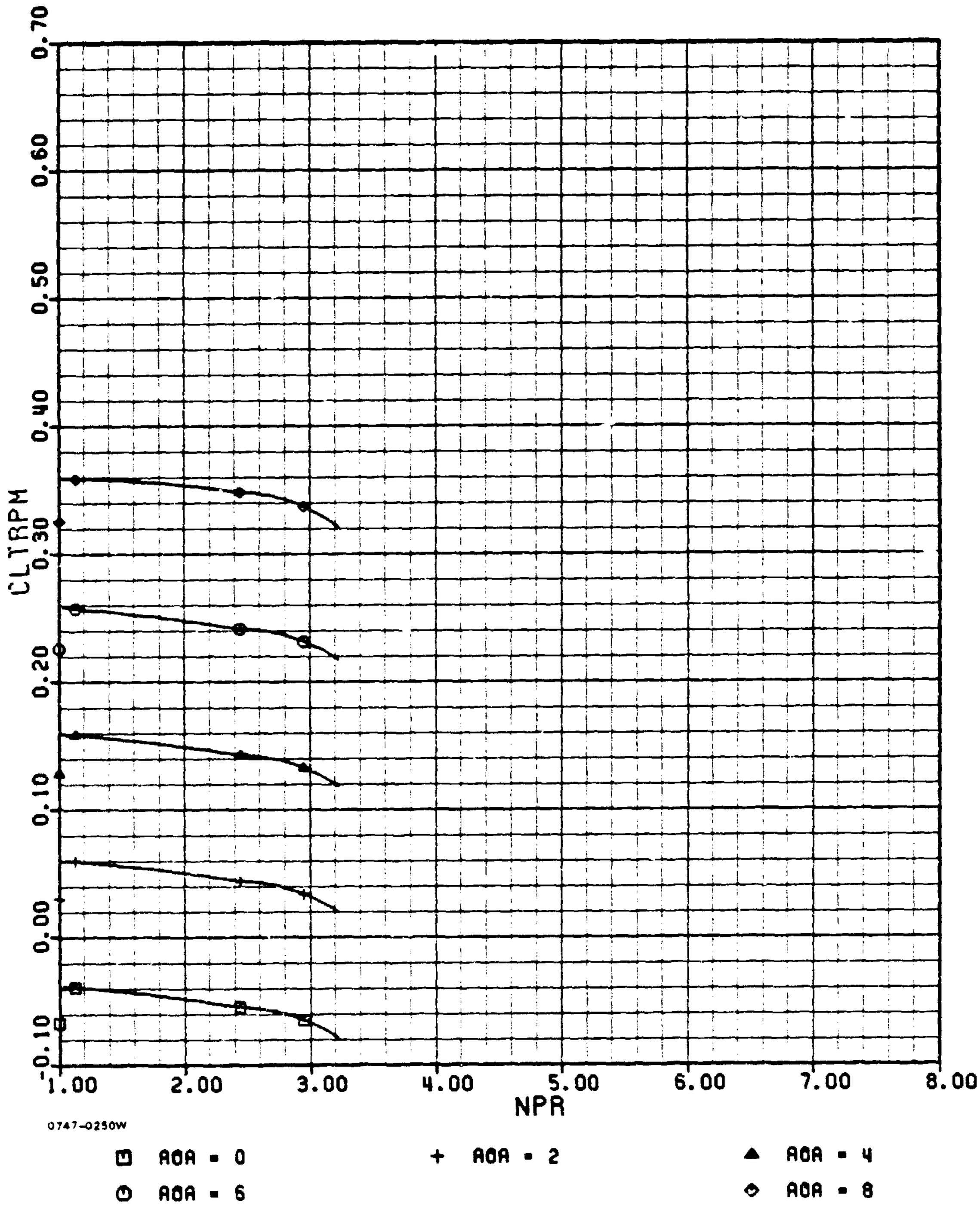
ADEN COMBAT ZERO DEGREE



G7292343

ADEN COMBAT ZERO DEGREE

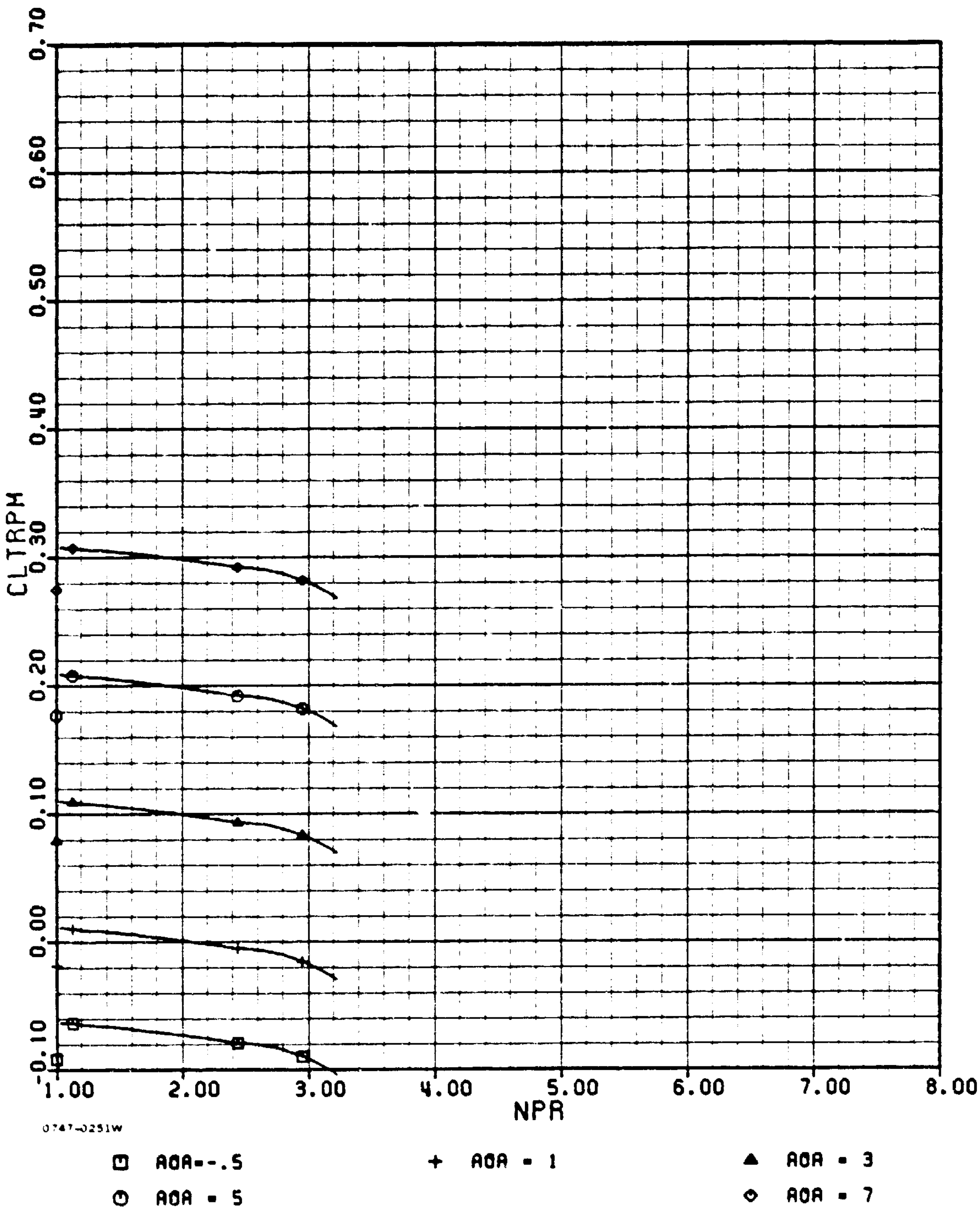
AMES M=0.40 PHASE II



G7292343

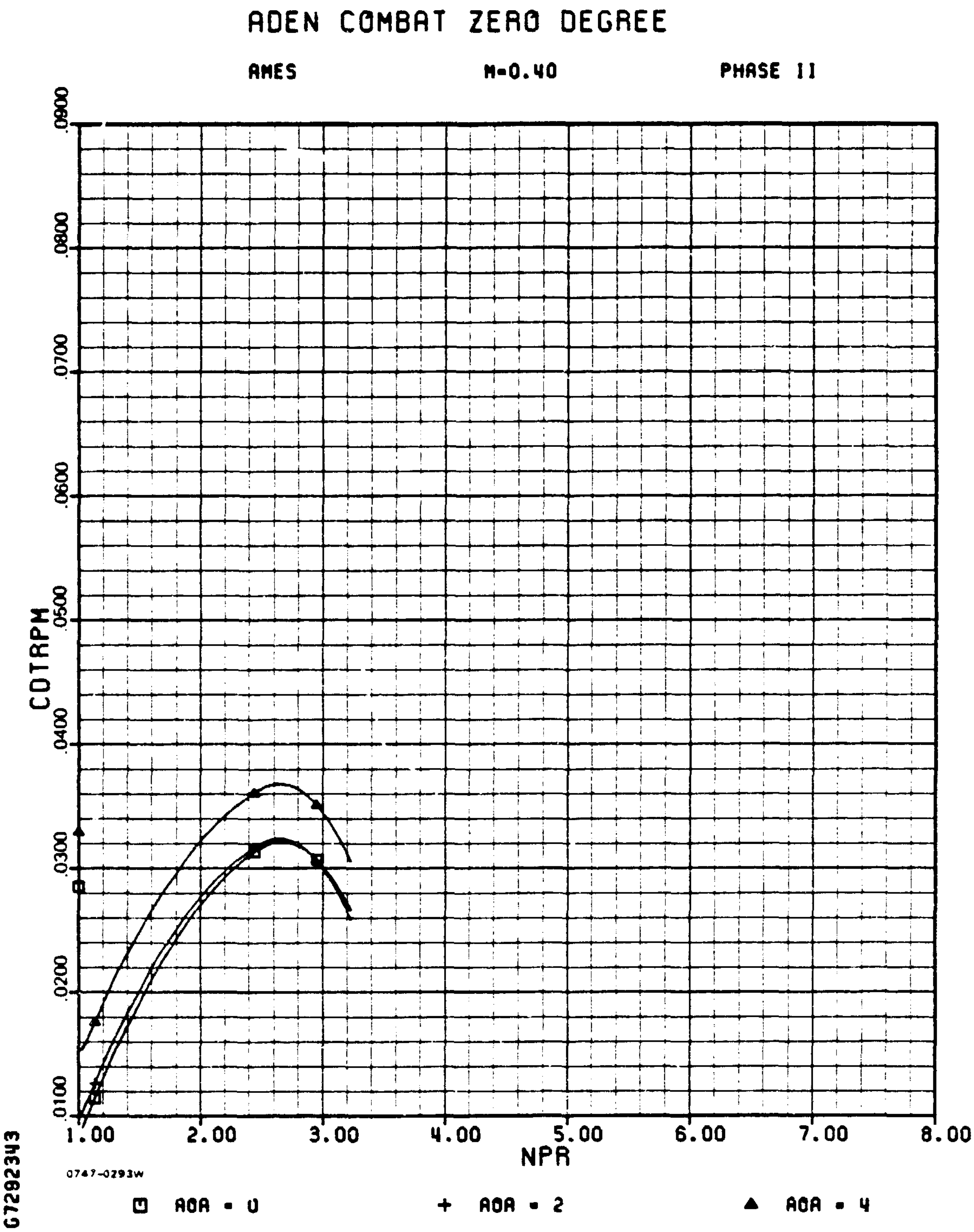
ADEN COMBAT ZERO DEGREE

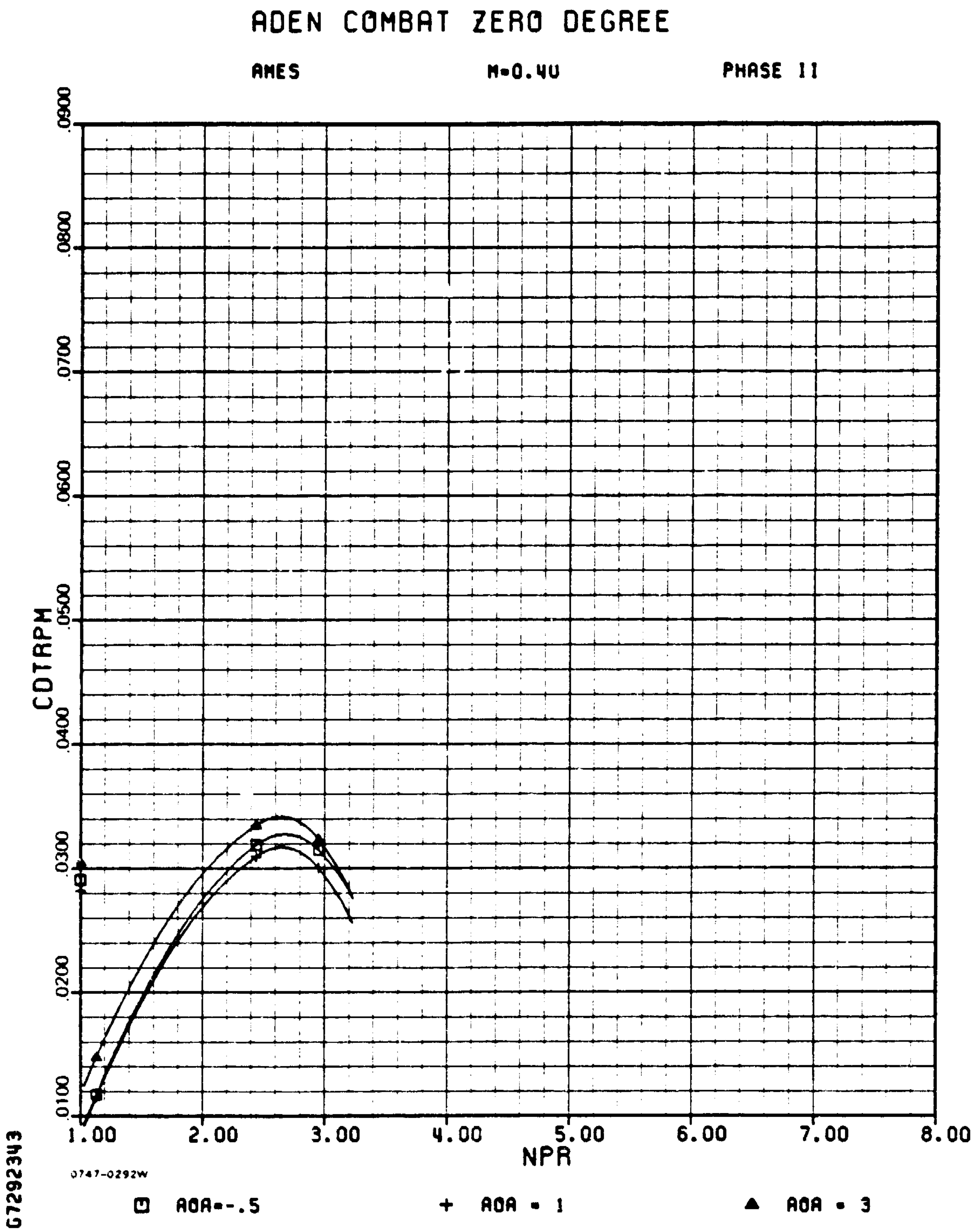
AMES M=0.40 PHASE II

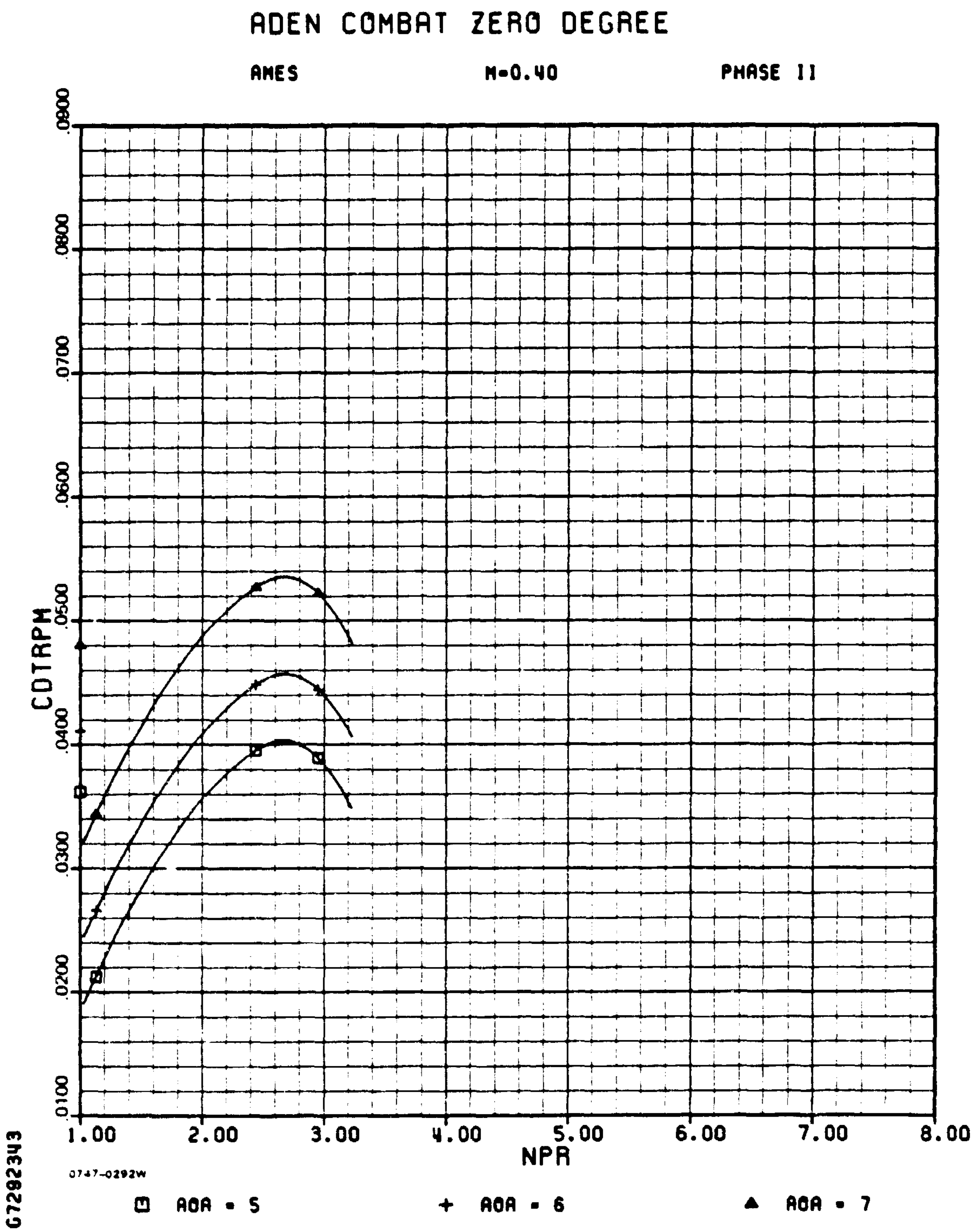


0747-0251W

G7292343


ADEN COMBAT ZERO DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G7292343
0747-0293W
AOA = 0
AOA = 2
AOA = 4

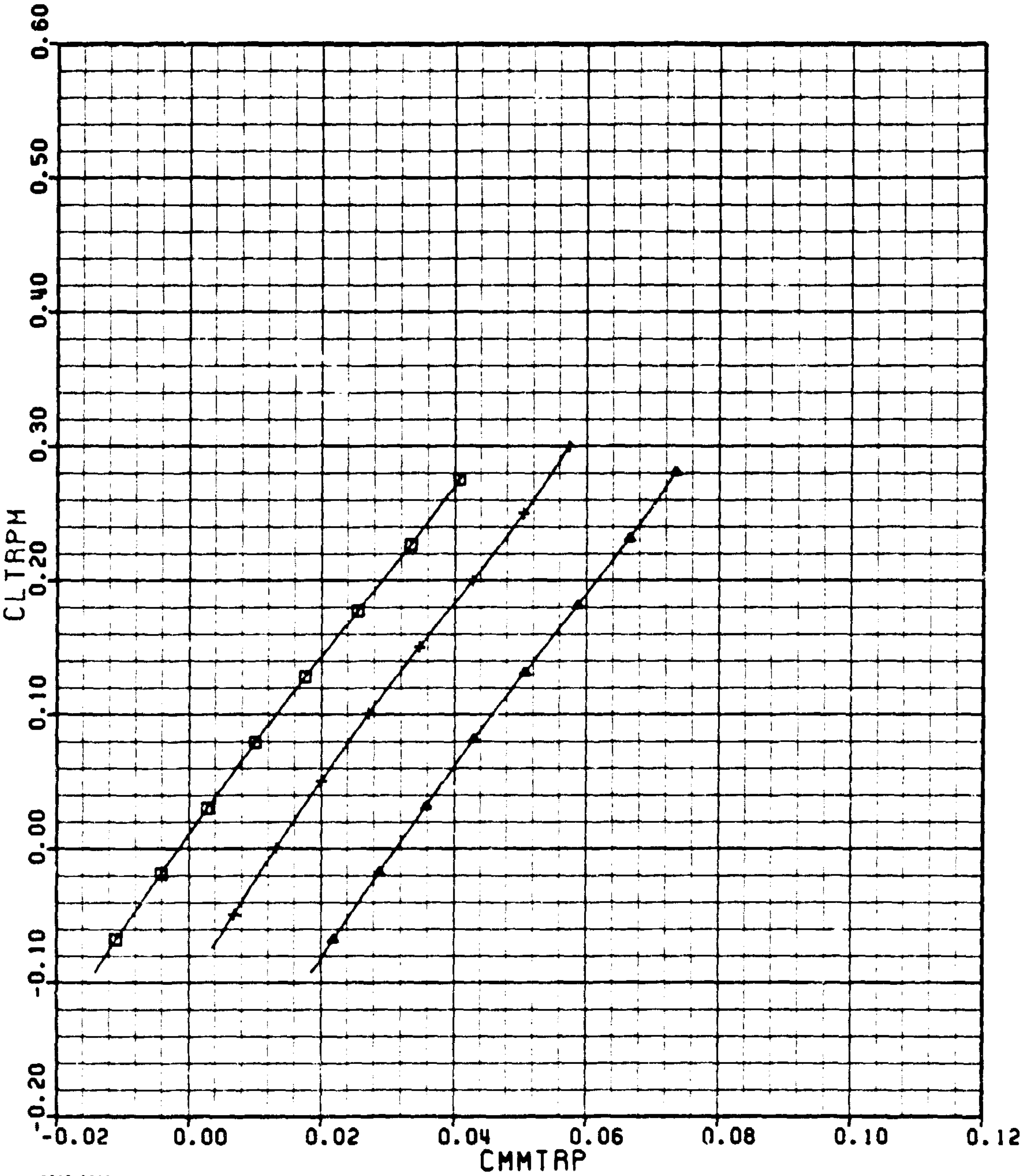

ADEN COMBAT ZERO DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0292W
AOA=-.5
AOA = 1
AOA = 3
G7292343



ADEN COMBAT ZERO DEGREE
AMES
M=0.40
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0292W
AOA = 5
AOA = 6
AOA = 7
G7282343

ADEN COMBAT ZERO DEGREE

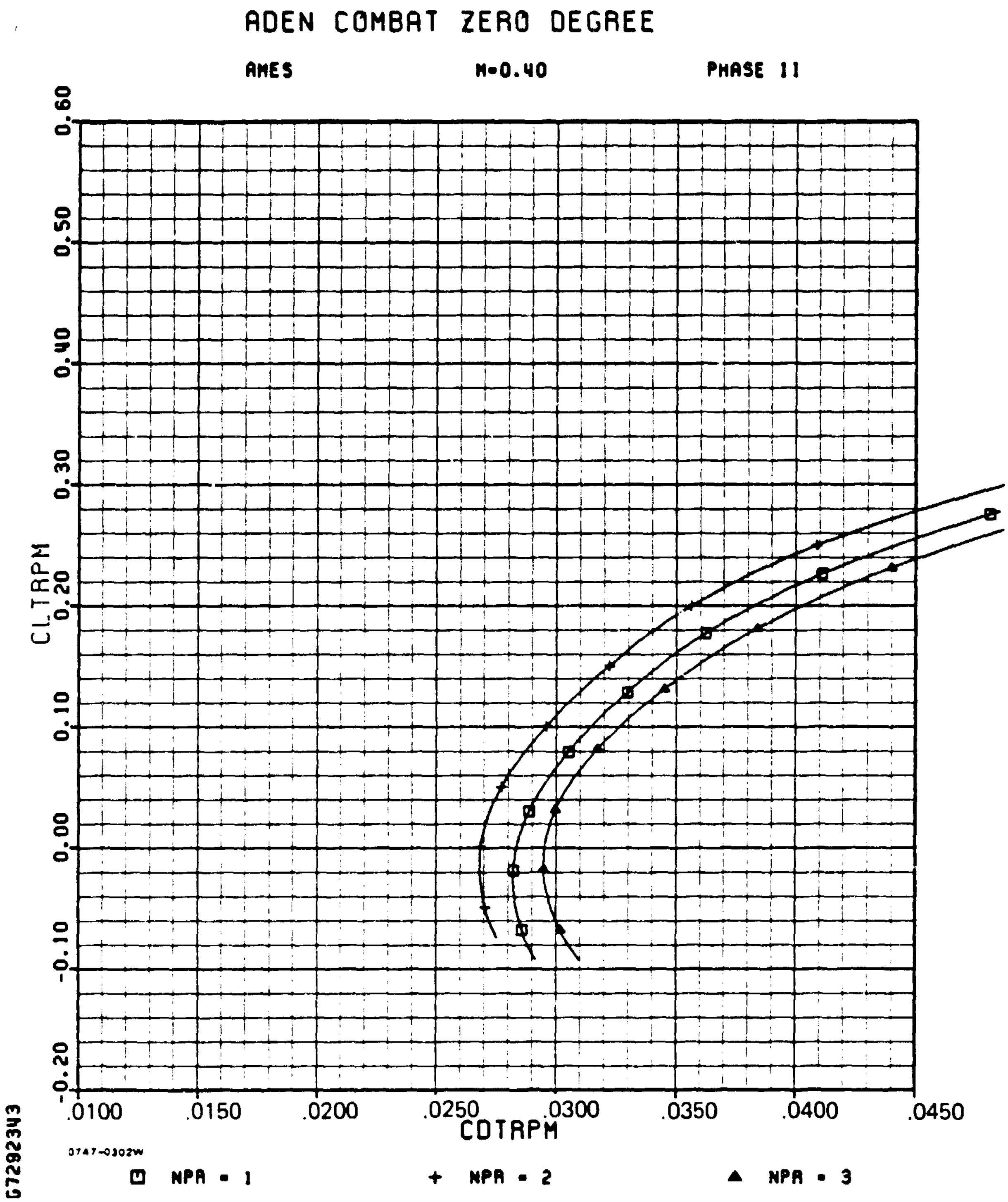
AMES M=0.40 PHASE II



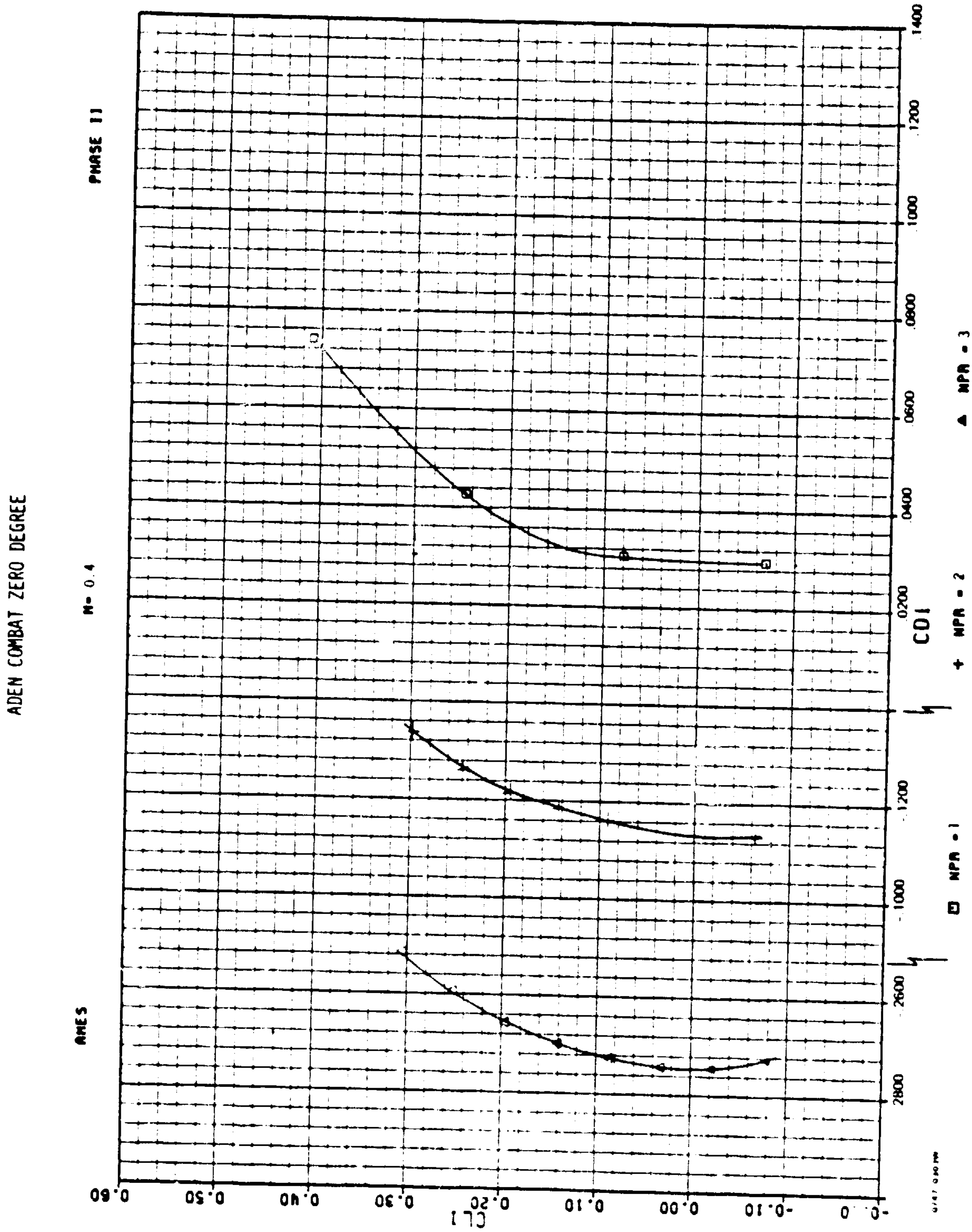
G7292343

0747-0246W

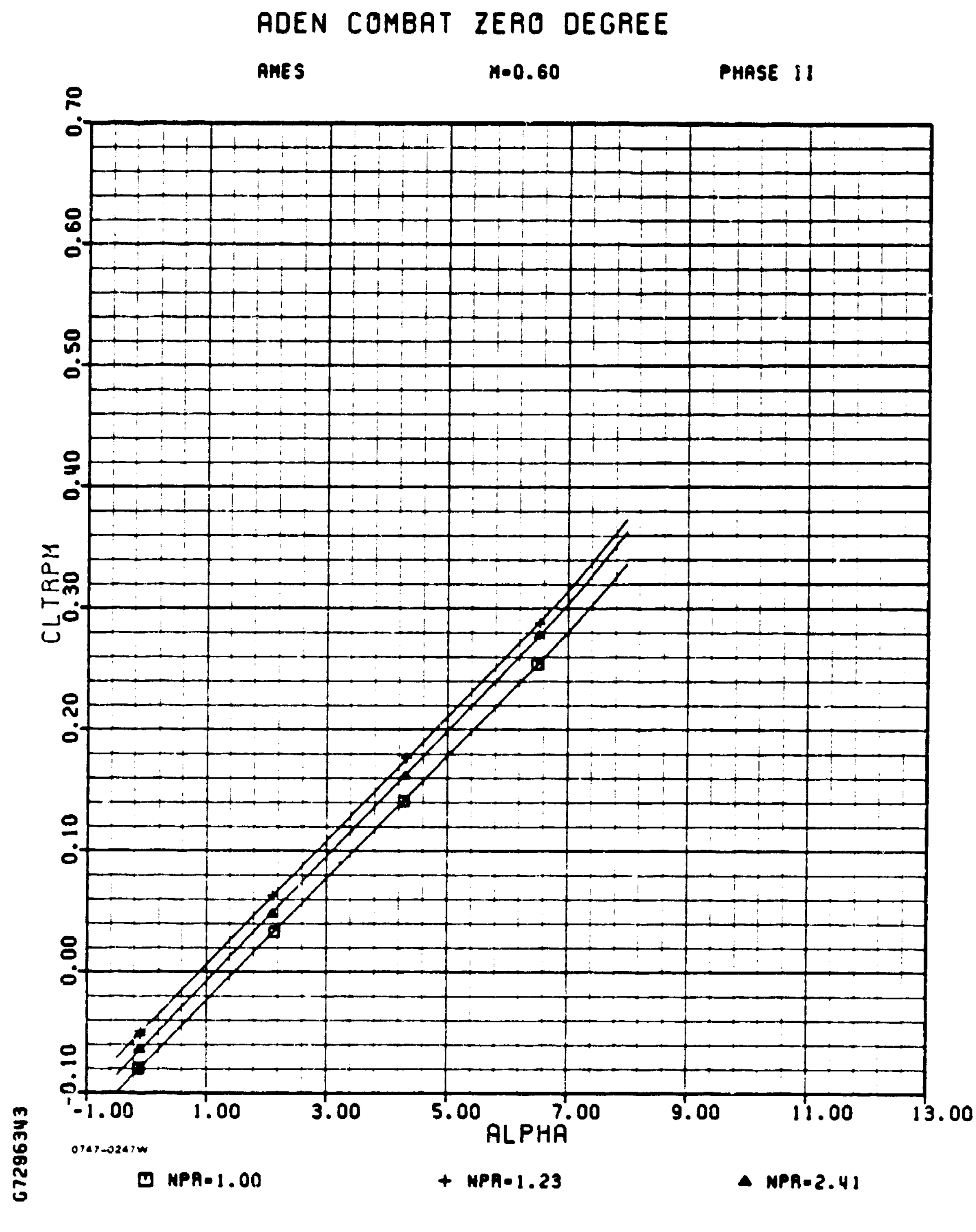
□ NPR = 1 + NPR = 2 ▲ NPR = 3



ADEN COMBAT ZERO DEGREE
AMES
M=0.40
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0100
.0150
.0200
.0250
.0300
.0350
.0400
.0450
CDTRPM
G7292343
0747-0302W
NPR = 1
NPR = 2
NPR = 3


ADEN COMBAT ZERO DEGREE
AMES
M= 0.4
PHASE II
CDI
CL1
□ NPR = 1
+ NPR = 2
▲ NPR = 3

I-1(f)


ADEN COMBAT ZERO DEGREE
AMES
M=0.60
PHASE II
CLTRPM
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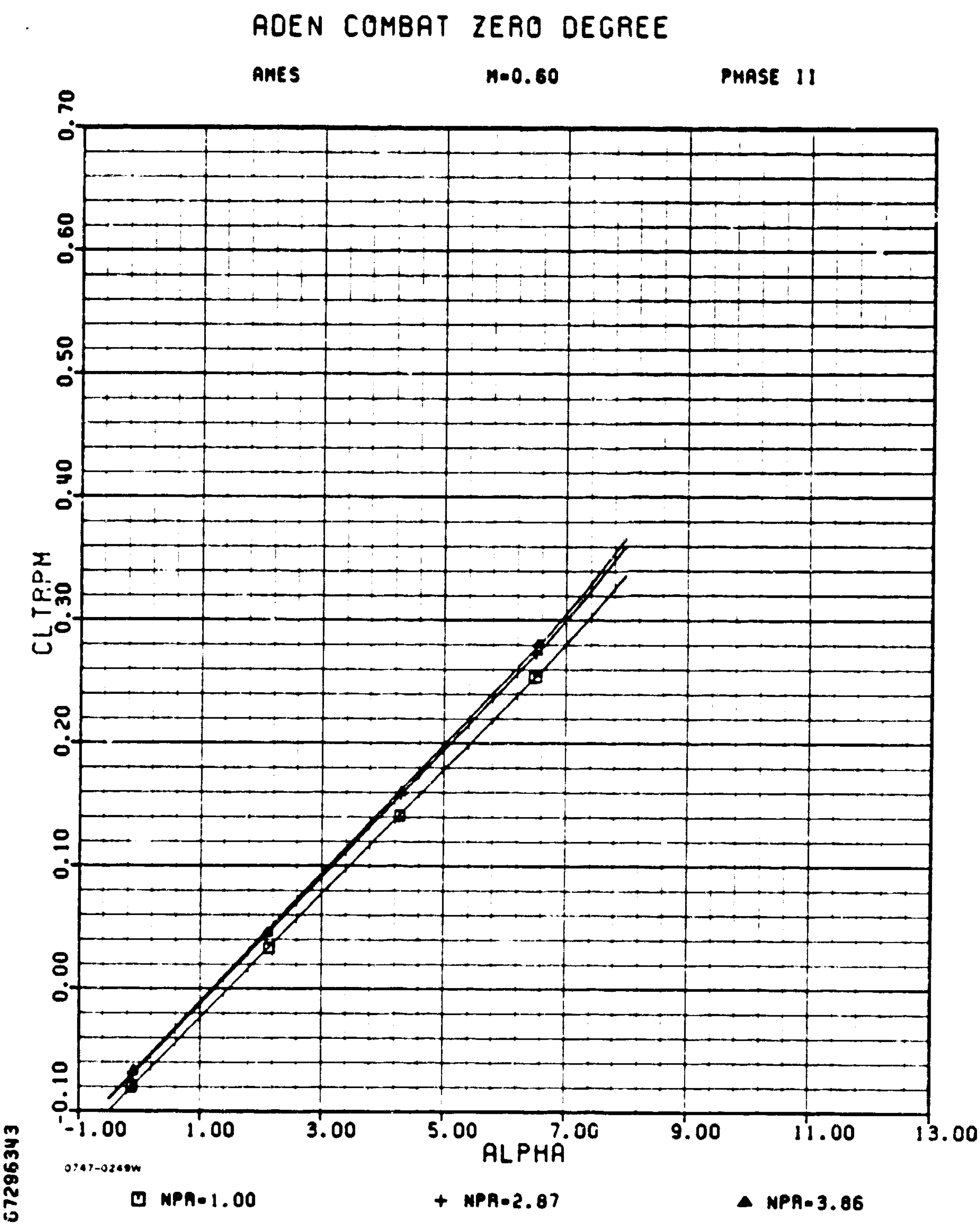
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0247W
G7296343
NPR=1.00
NPR=1.23
NPR=2.41

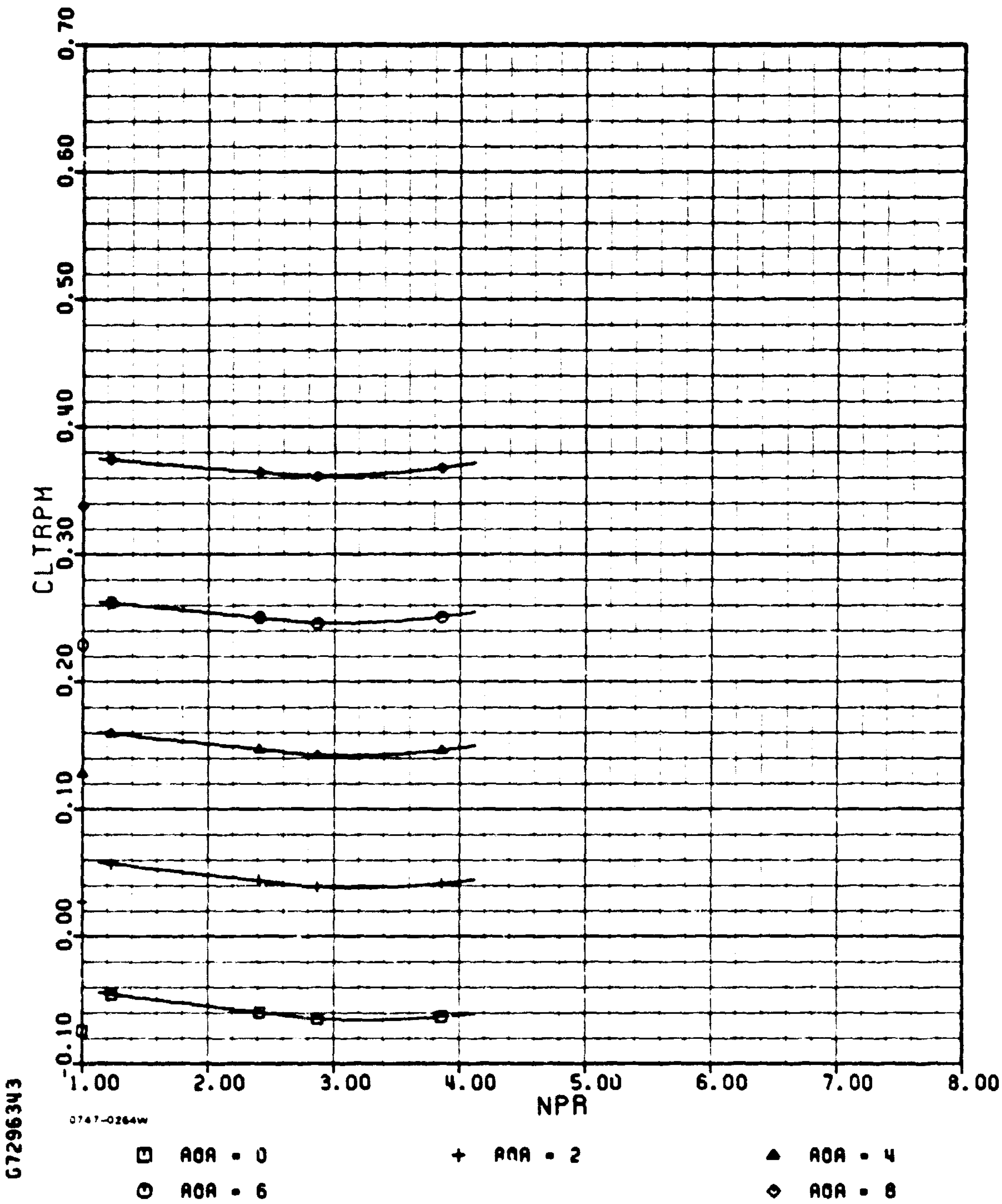


G7296343

I-2(a) (concl.)

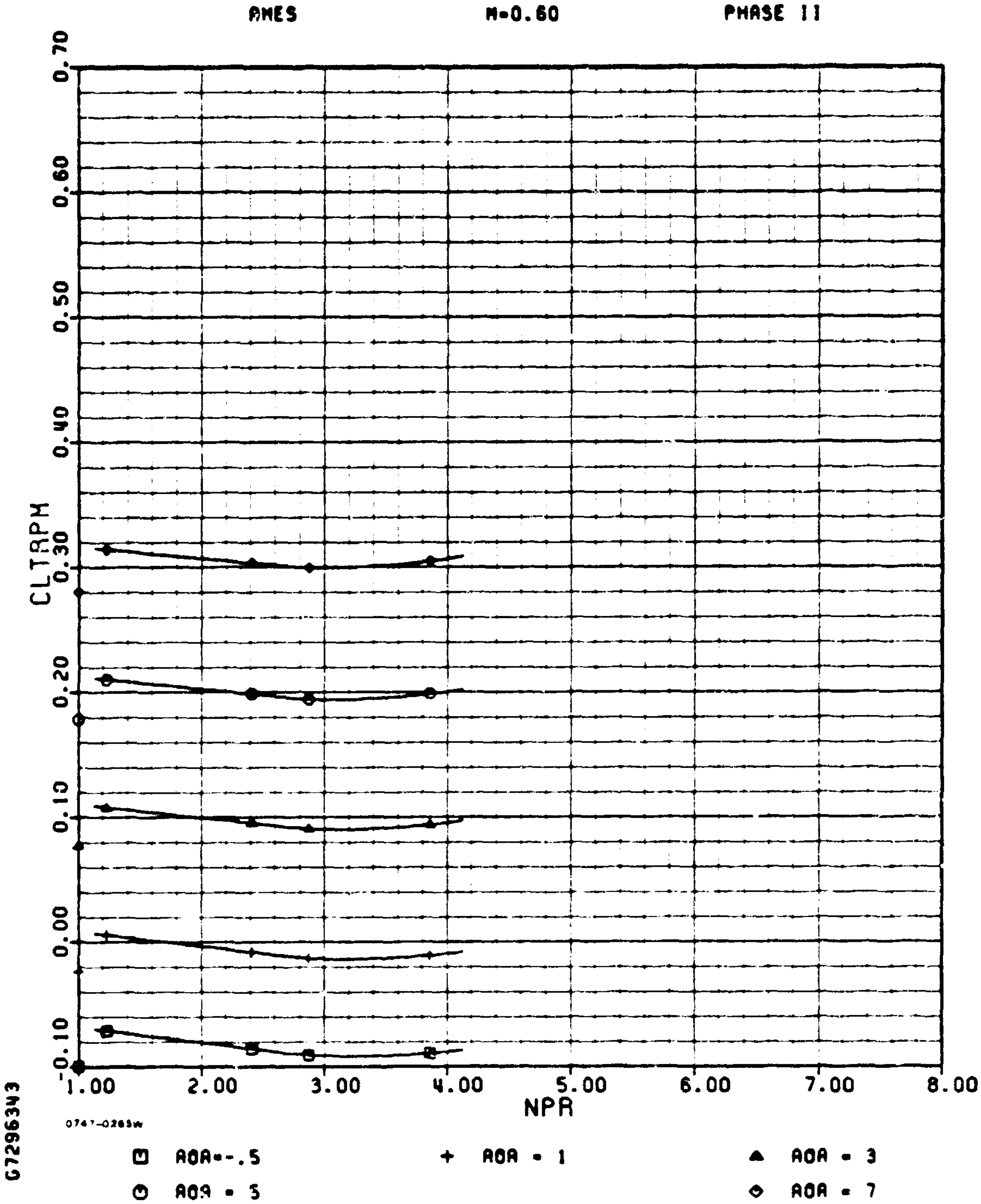
ADEN COMBAT ZERO DEGREE

AMES M=0.60 PHASE II



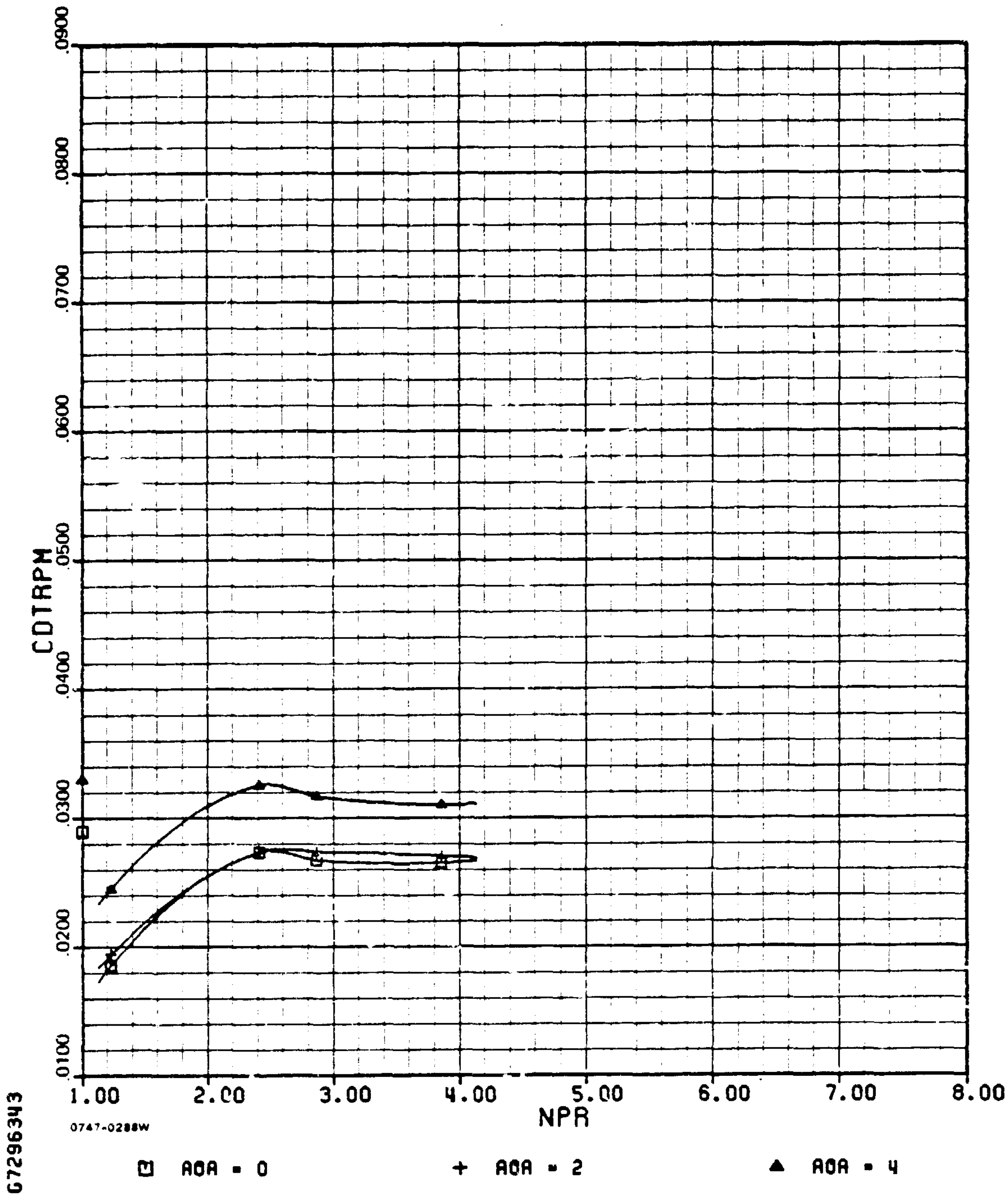
ADEN COMBAT ZERO DEGREE

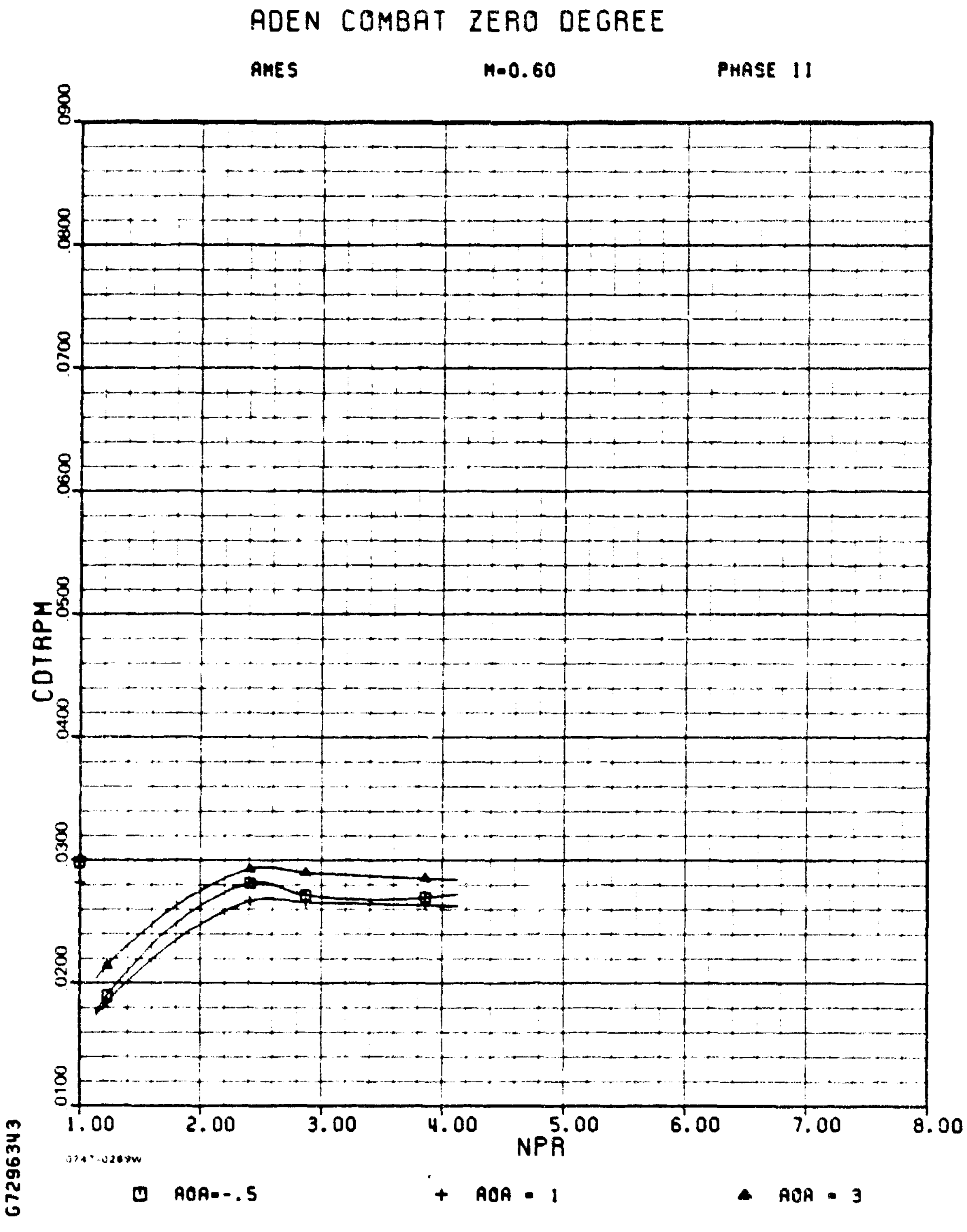
AMES M=0.60 PHASE II



ADEN COMBAT ZERO DEGREE

AMES M=0.60 PHASE II




ADEN COMBAT ZERO DEGREE
AMES
M=0.60
PHASE II
CDTRPM
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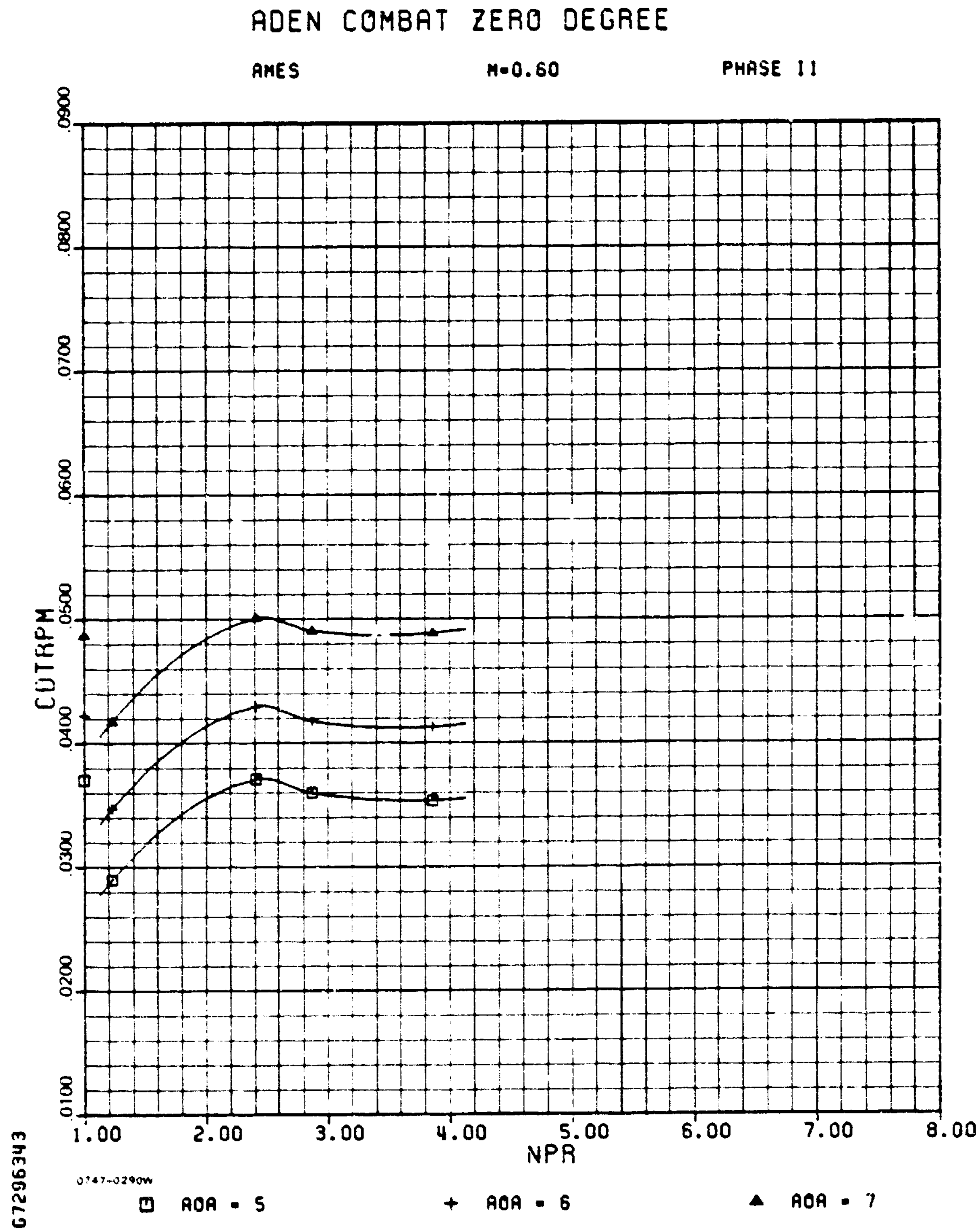
.0400
.0500
.0600
.0700
.0800
.0900
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA=-.5
AOA = 1
AOA = 3
G7296343

1-2(c)(cont.)


ADEN COMBAT ZERO DEGREE
AMES
M=0.60
PHASE II
CDTRPM
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.0600
.0500
.0400
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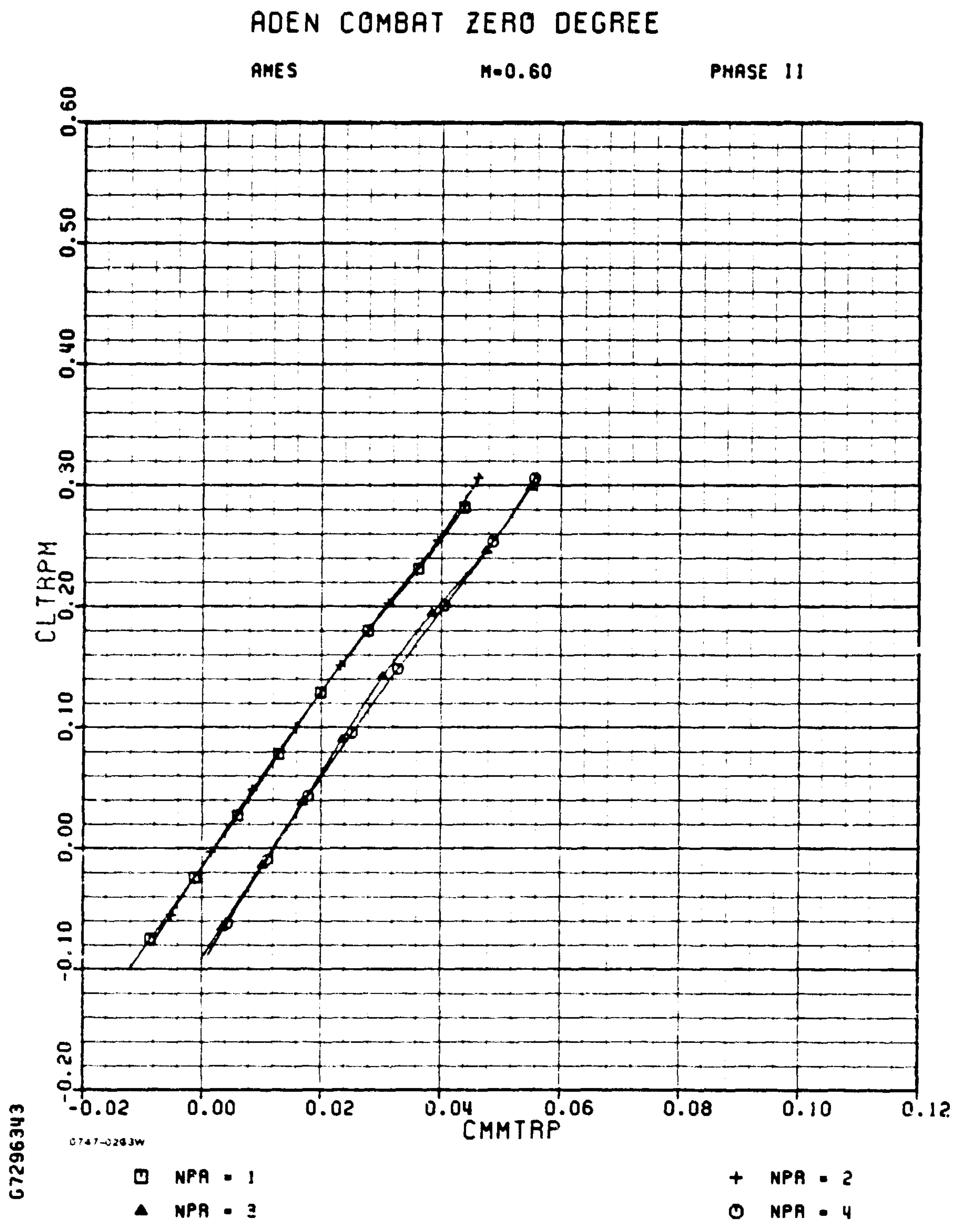
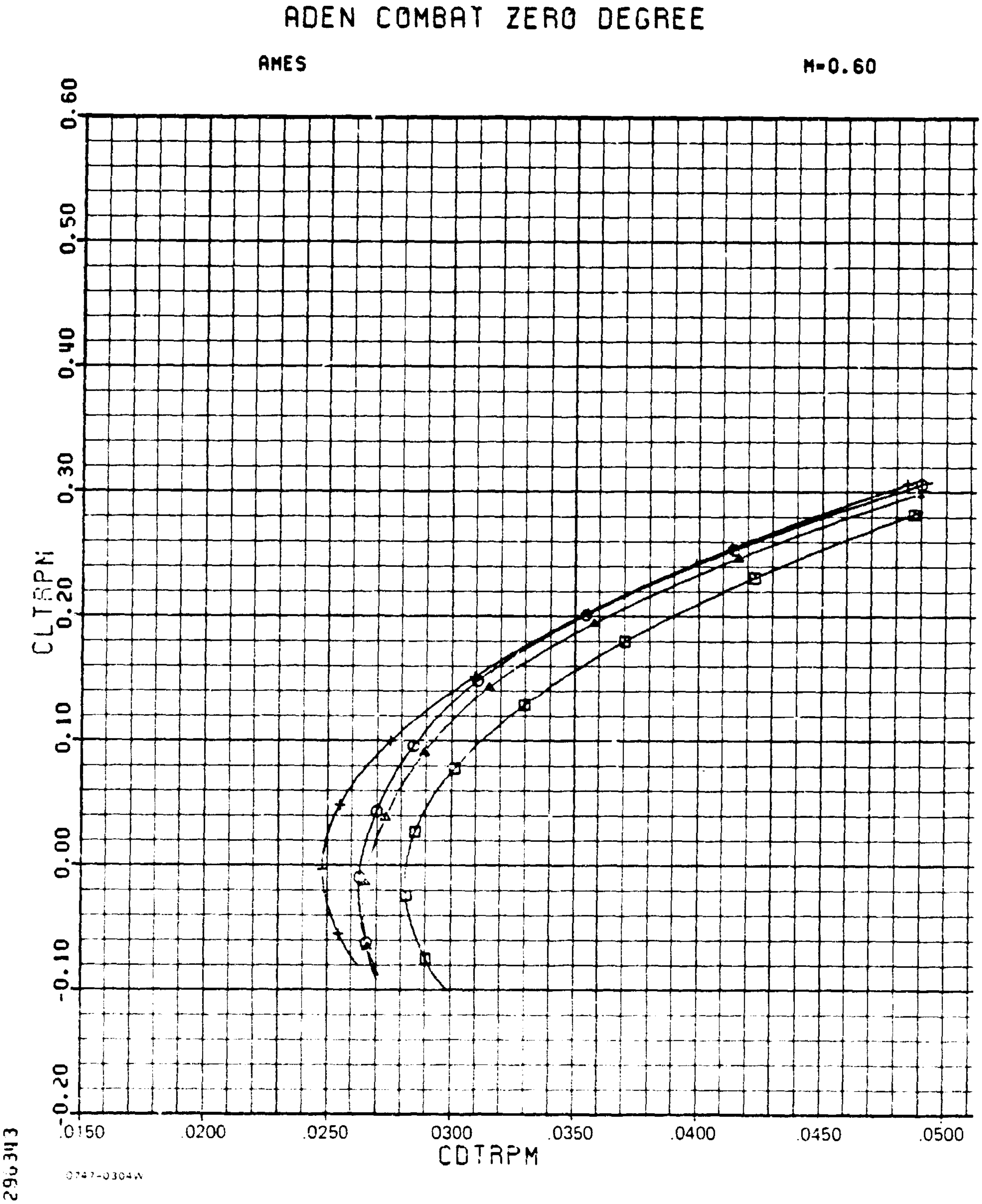
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0290W
AOA = 5
AOA = 6
AOA = 7
G7296343

I-2(c)(concl.)



ADEN COMBAT ZERO DEGREE
AMES
M=0.60
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
G7296343
NPR = 1
NPR = 2
NPR = 3
NPR = 4

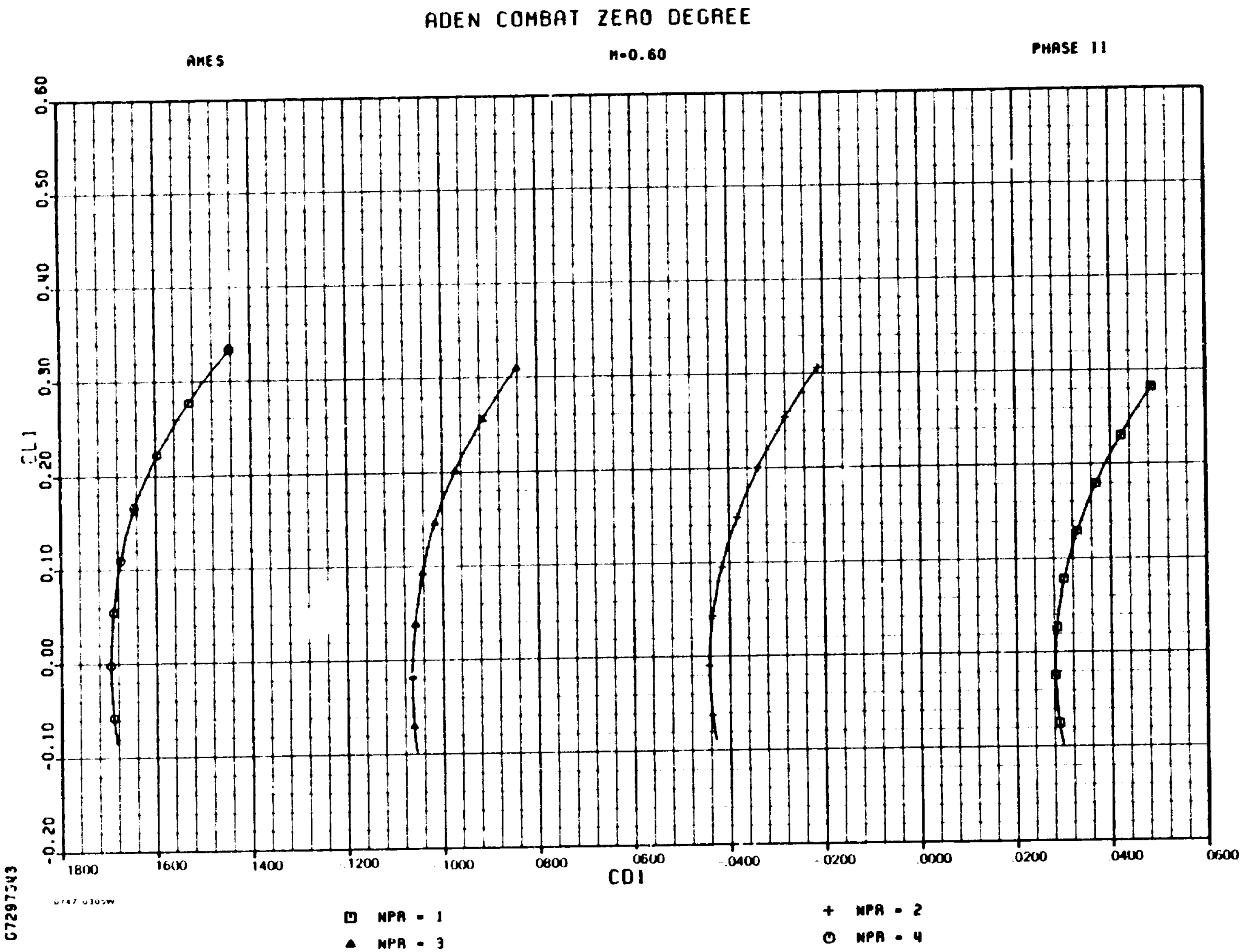


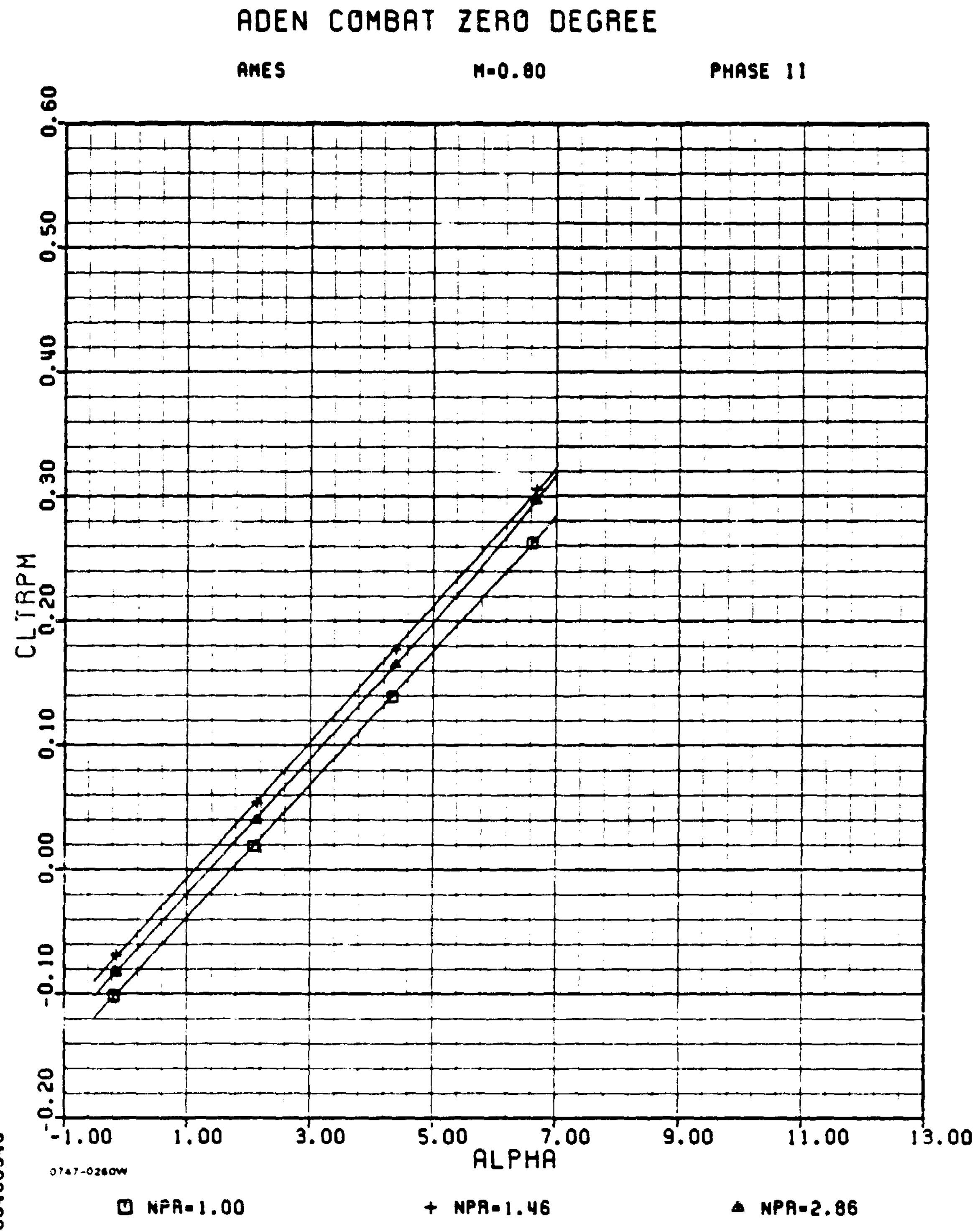
□ NPR = 1

+ NPR = 2

▲ NPR = 3

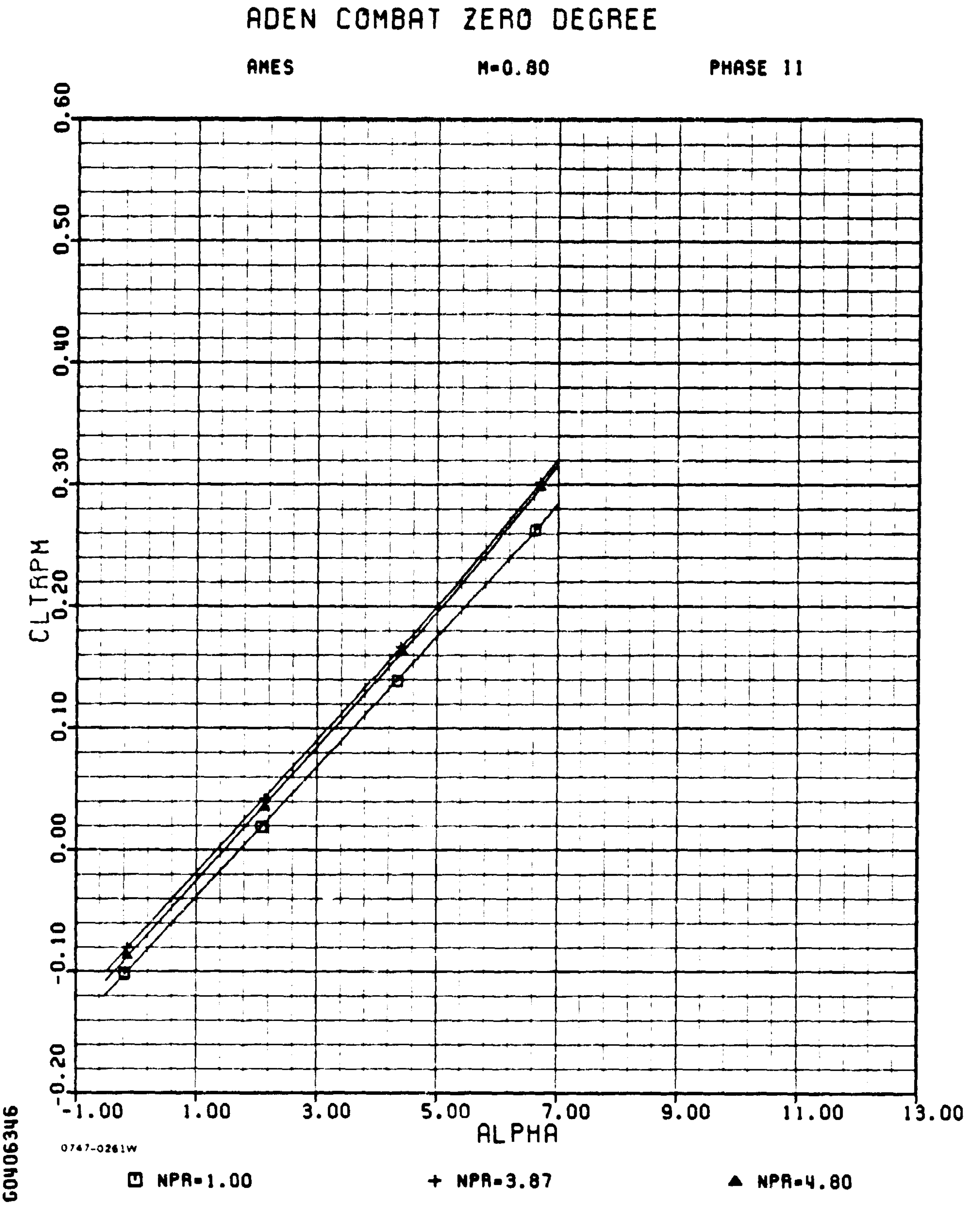
O NPR = 4


ADEN COMBAT ZERO DEGREE
AMES
M=0.60
PHASE II
CL1
CD1
NPR = 1
NPR = 3
NPR = 2
NPR = 4
G7297343

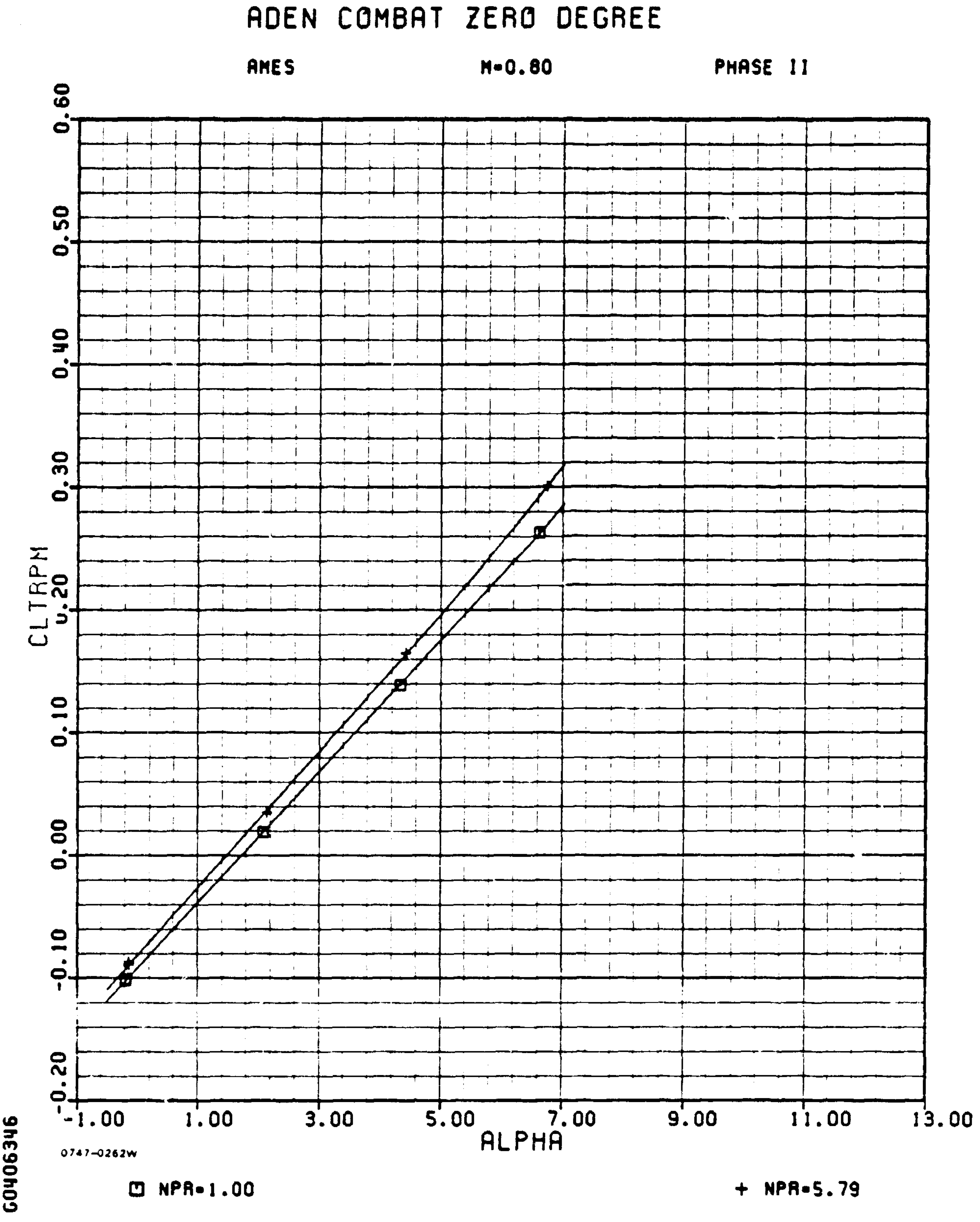


ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0260W
NPR=1.00
+ NPR=1.46
NPR=2.86

G0406346


ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
ALPHA
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0261W
G0406346
NPR=1.00
+ NPR=3.87
▲ NPR=4.80

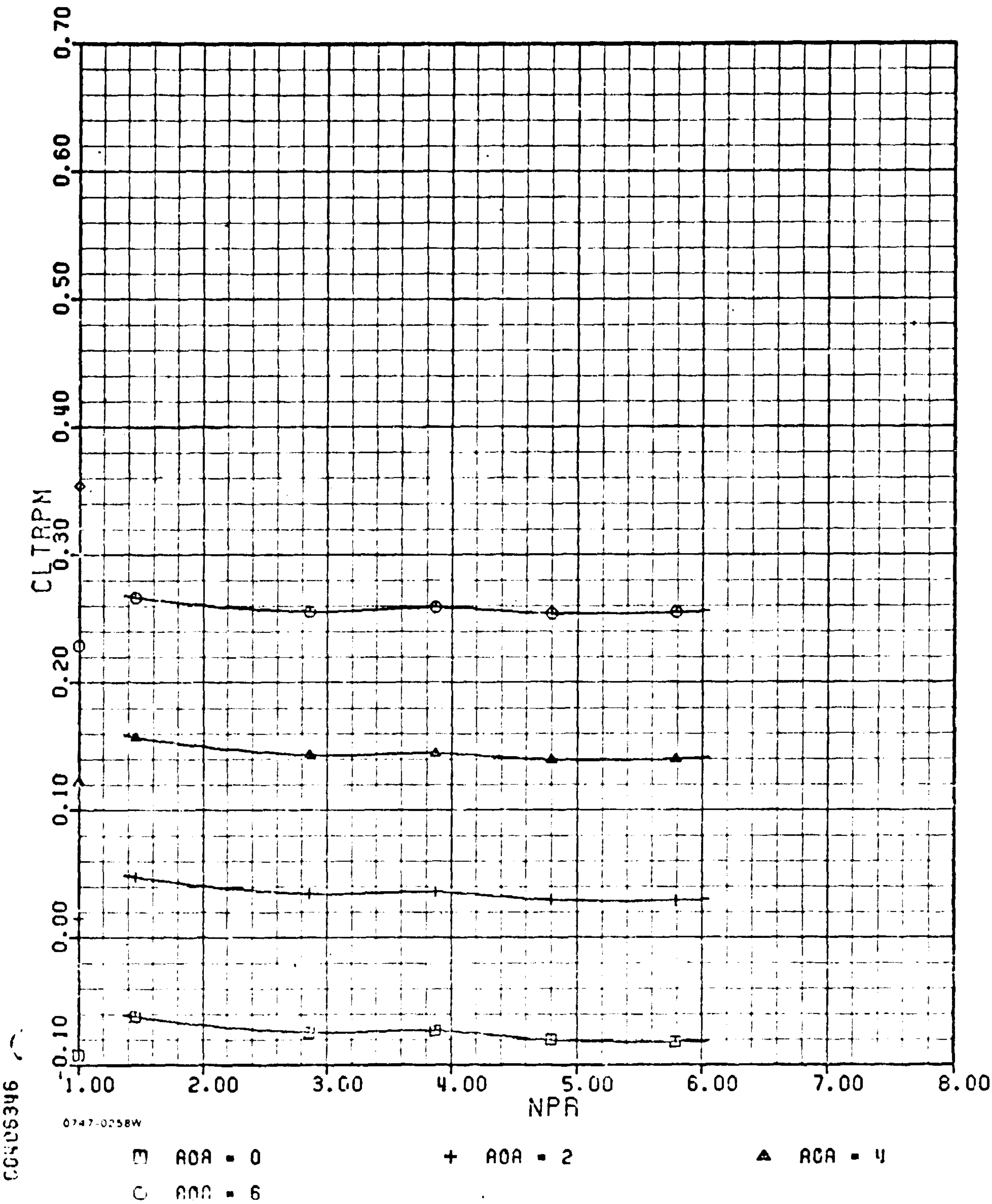
I-3(a)(cont.)


ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0262W
G0406346
NPR=1.00
+ NPR=5.79

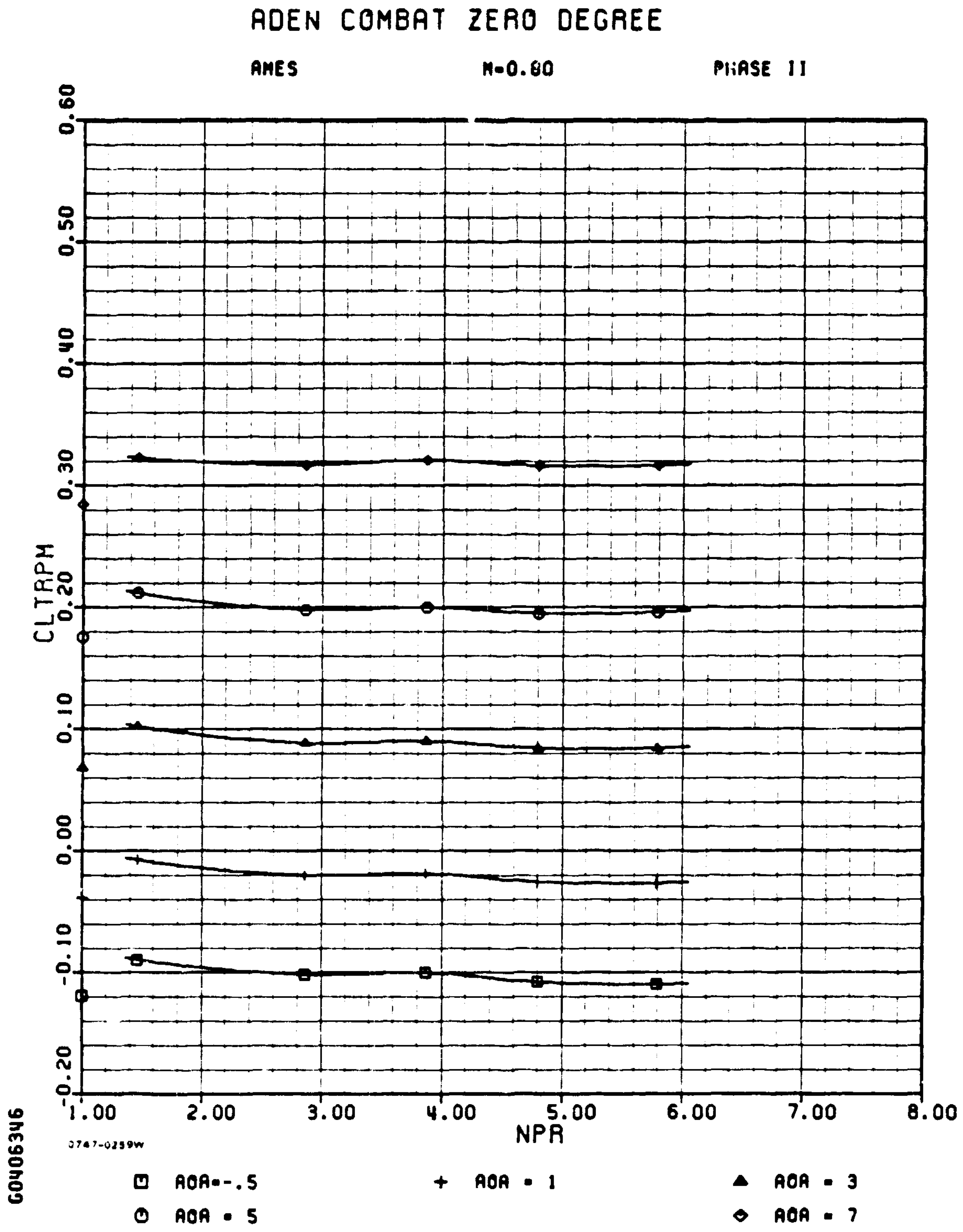
I-3(a)(concl.)

ADEN COMBAT ZERO DEGREE

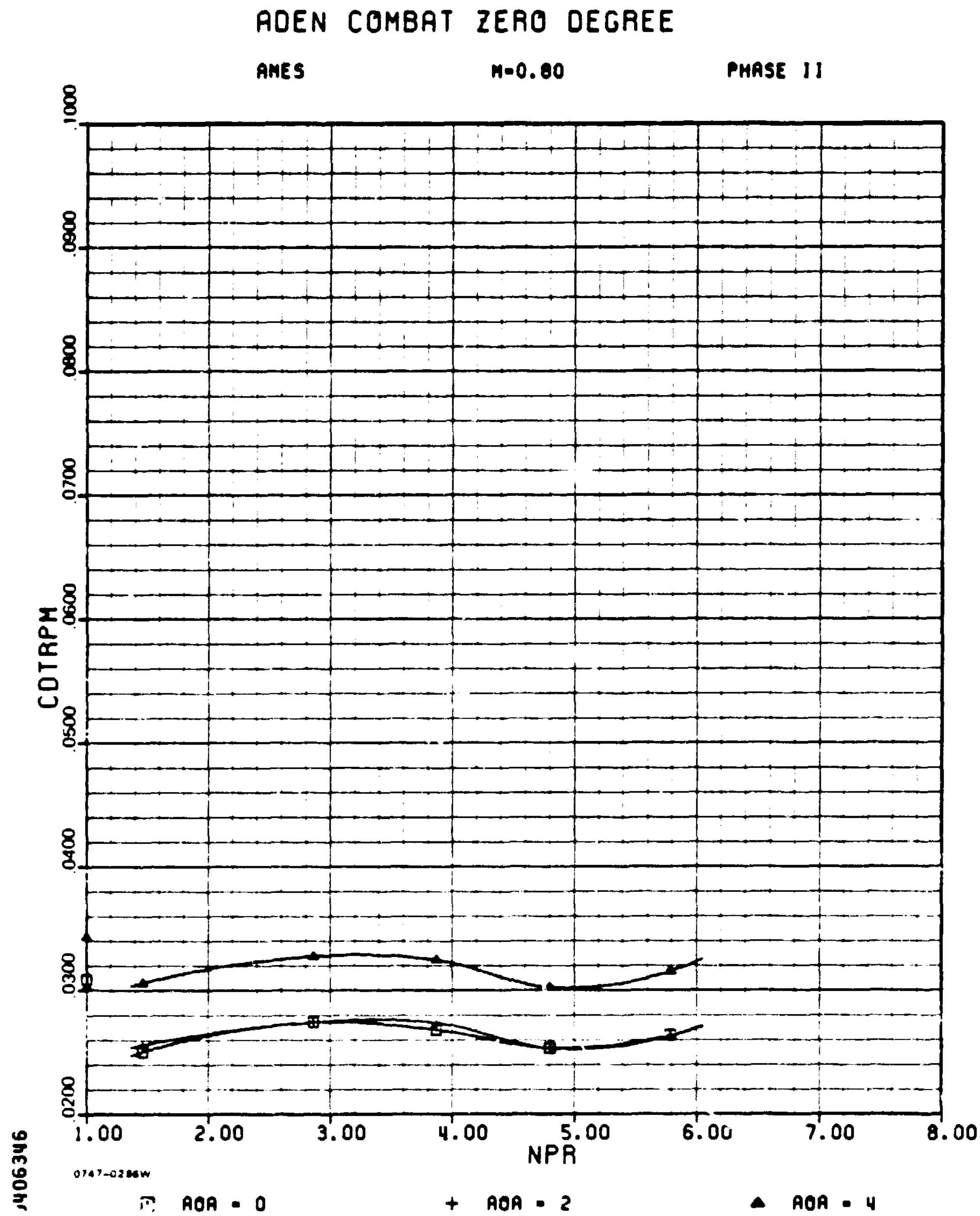
AMES M=0.80 PHASE II

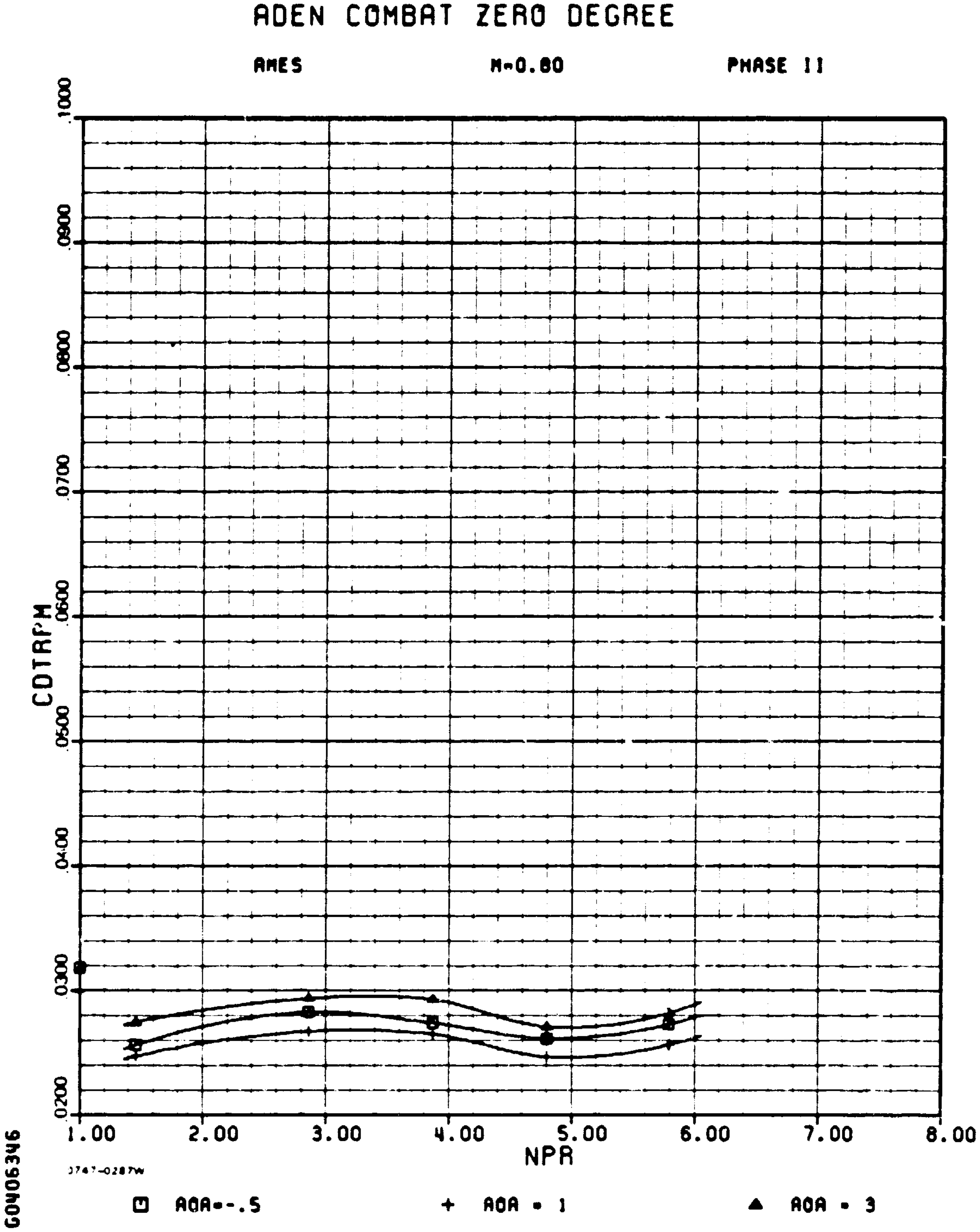


CC405346

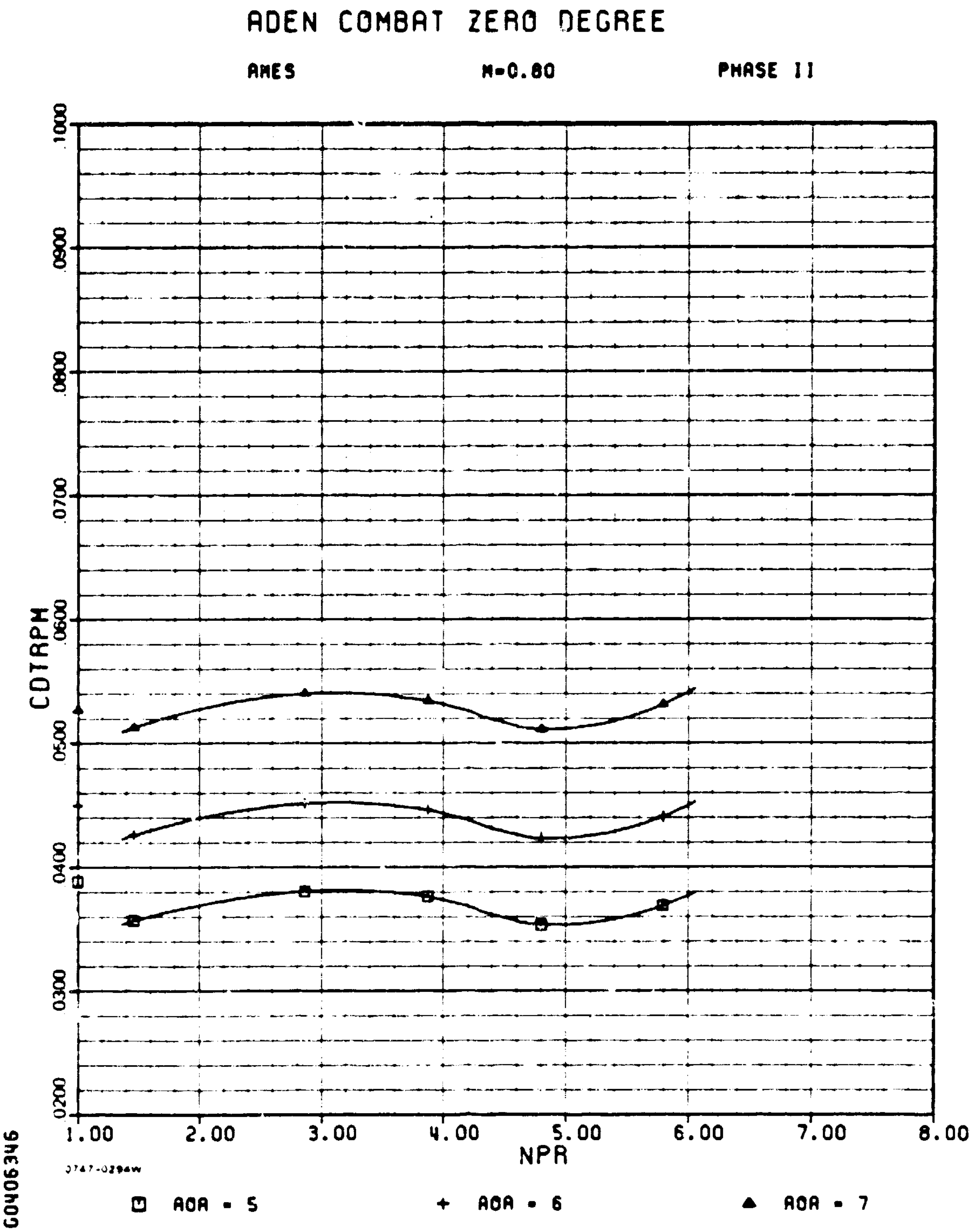

ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
NPR
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G0406346
0747-0259W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

I-3(b)(concl.)

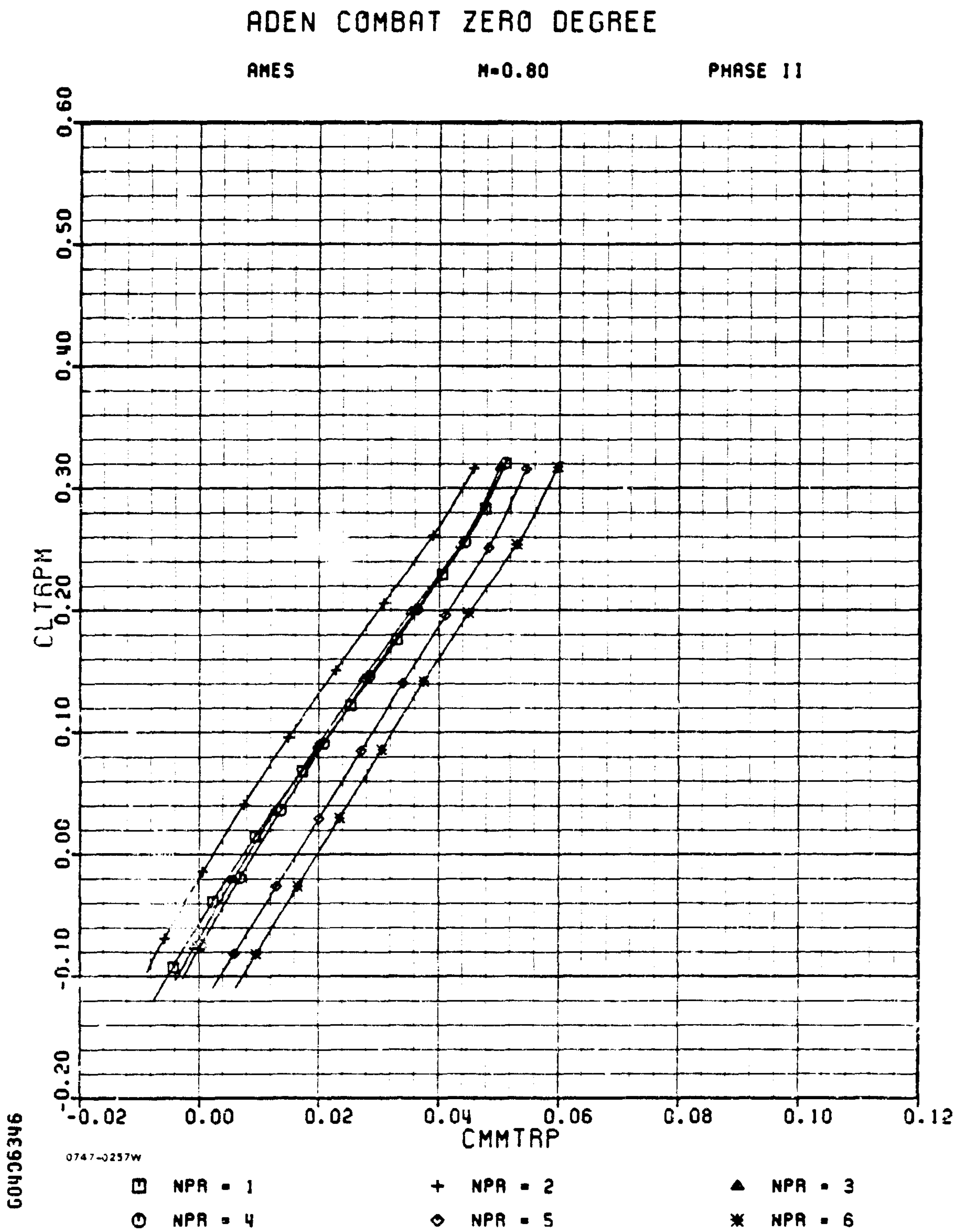

ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
J406346
0747-0286W
AOA = 0
+ AOA = 2
AOA = 4


ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA=-.5
AOA = 1
AOA = 3
G0406346

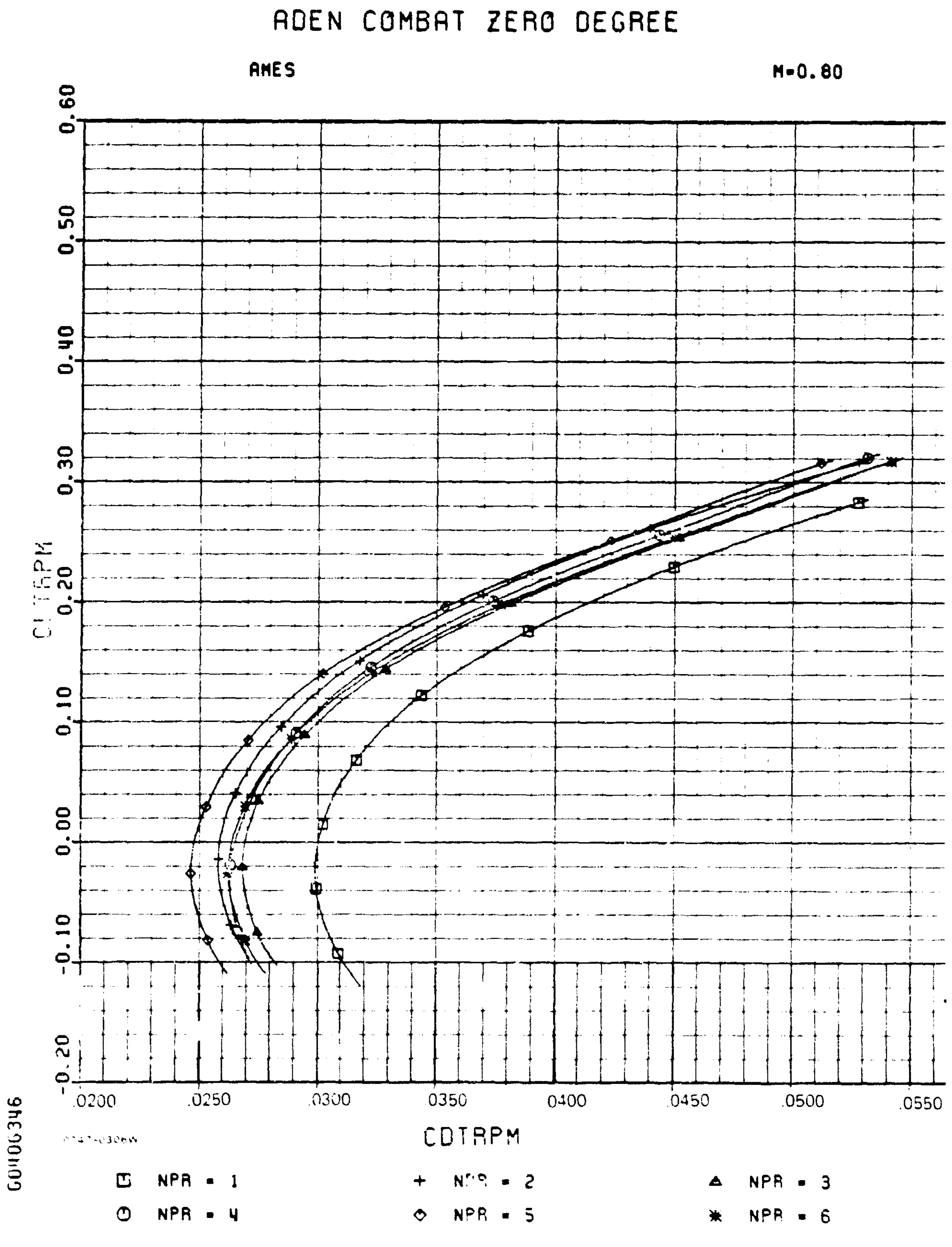
I-3(c) (cont.)

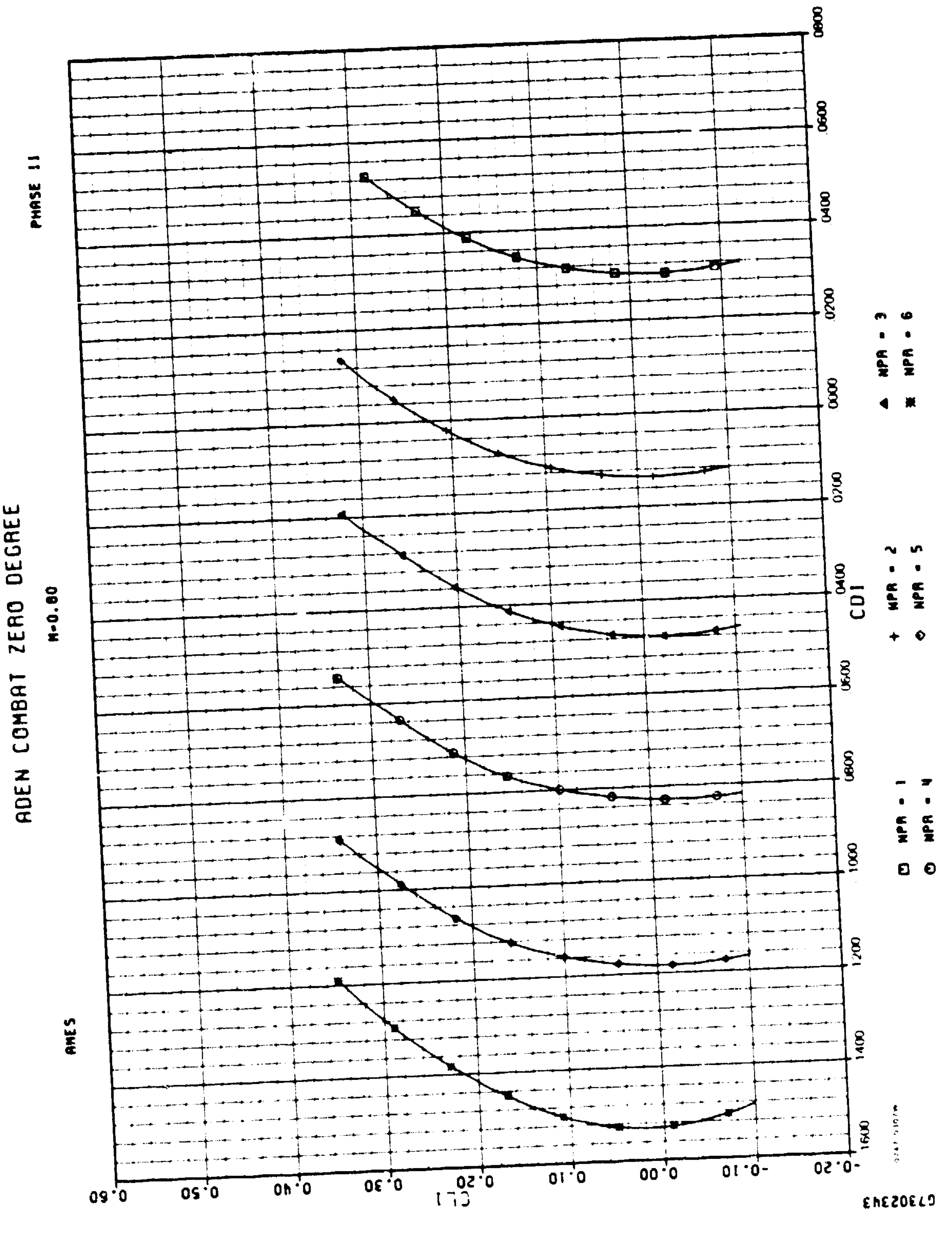

ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 5
AOA = 6
AOA = 7
G0406346

I-3(c)(concl.)



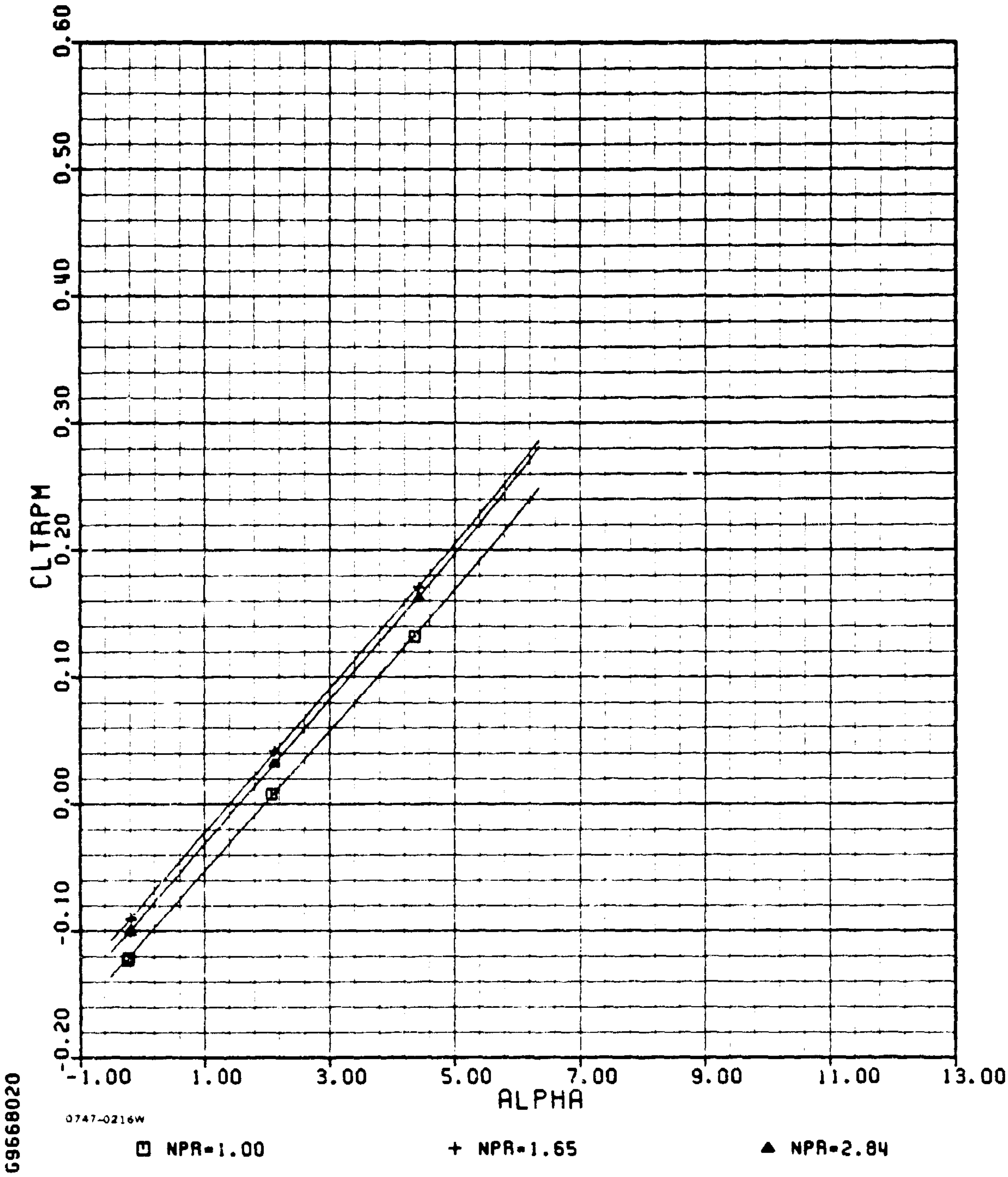
ADEN COMBAT ZERO DEGREE
AMES
M=0.80
PHASE II
CLTRPM
CMMTRP
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.12
G0406346
0747-0257W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN COMBAT ZERO DEGREE
AMES
M=0.80
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0200
.0250
.0300
.0350
.0400
.0450
.0500
.0550
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
G0406346


ADEN COMBAT ZERO DEGREE
M=0.80
AMES
PHASE II
CDI
CLI
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

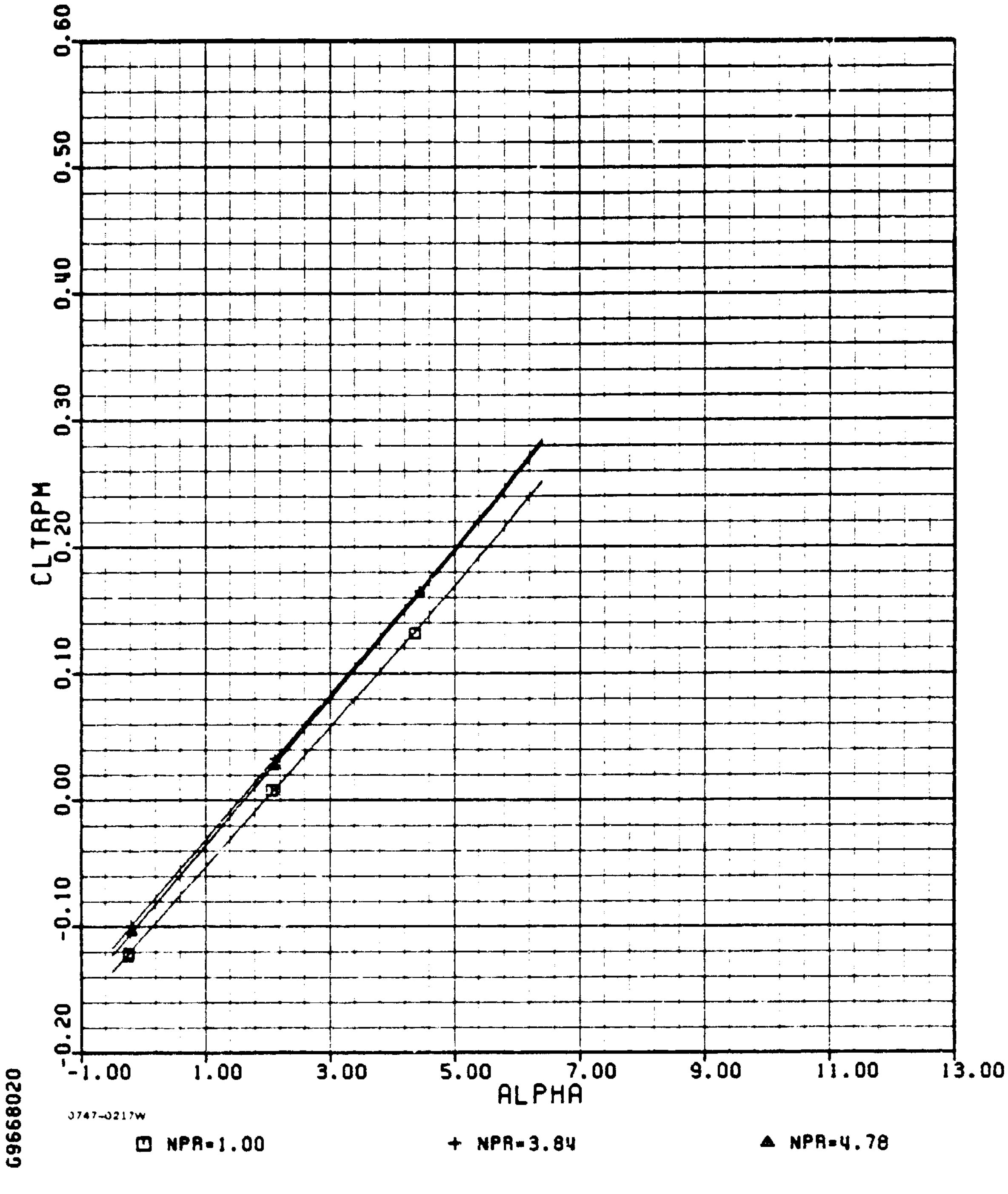
ADEN COMBAT ZERO DEGREE

AMES M=0.90 PHASE II

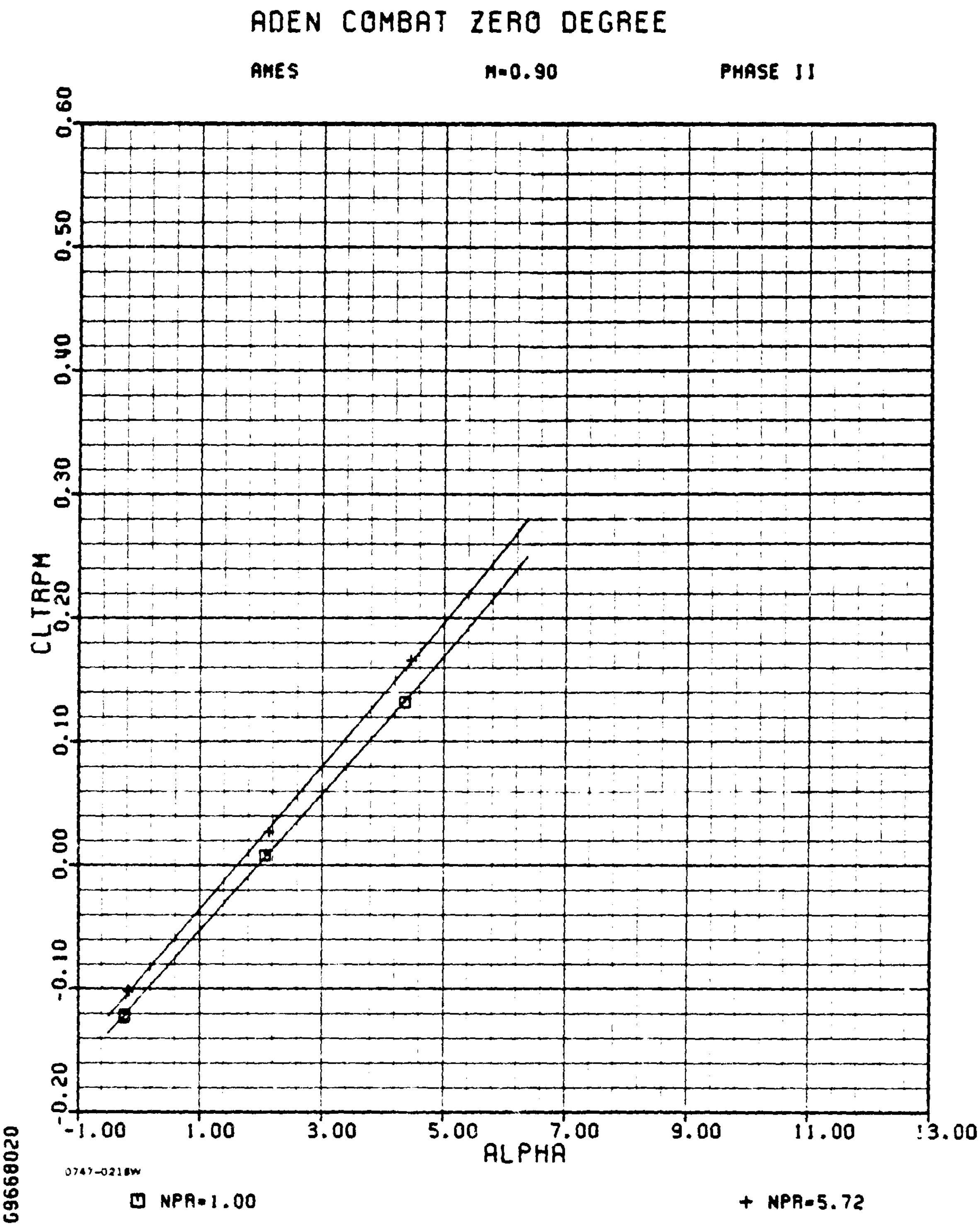


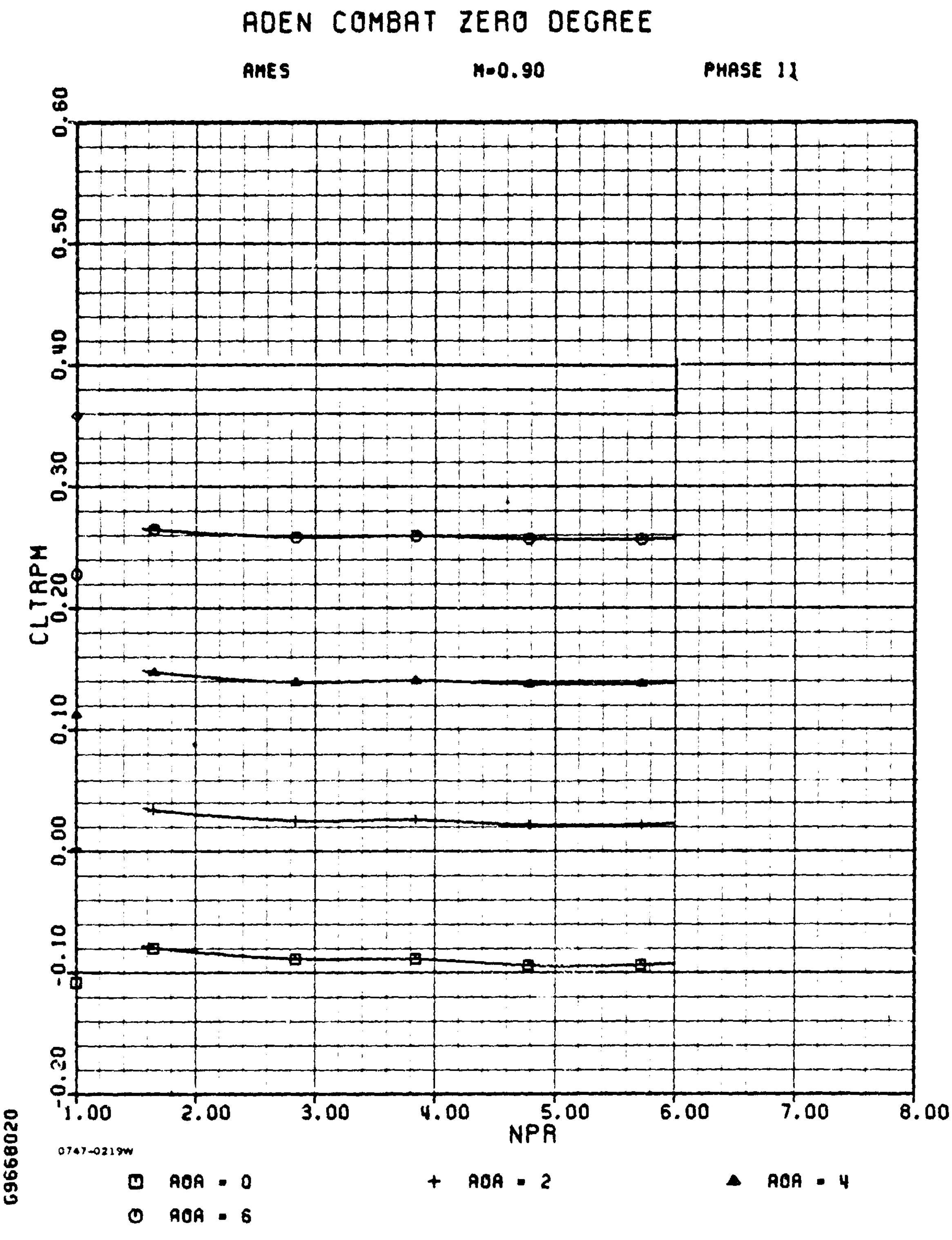
ADEN COMBAT ZERO DEGREE

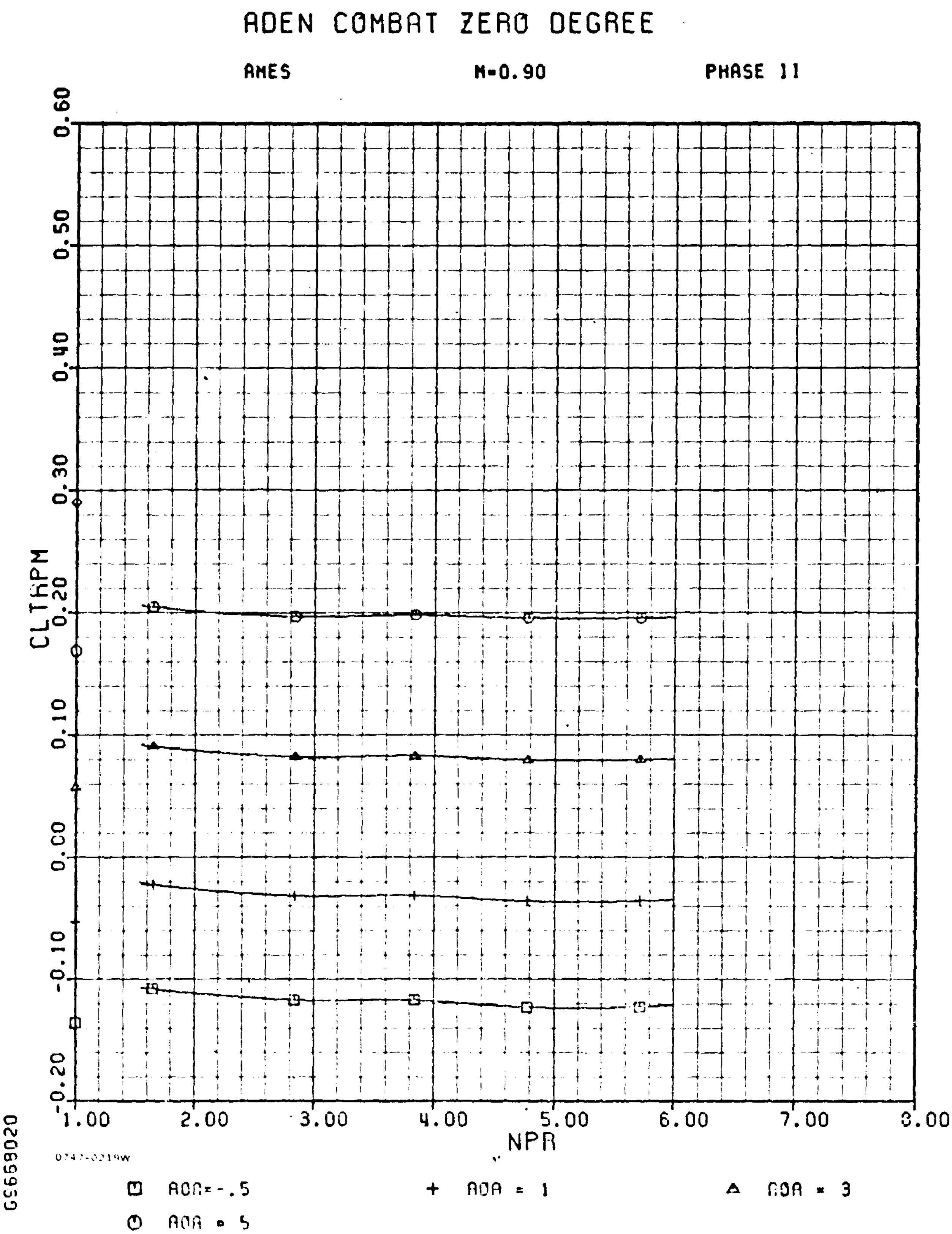
AMES M=0.90 PHASE II



I-4(a)(cont.)


ADEN COMBAT ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G9668020
0747-0218W
NPR=1.00
+ NPR=5.72


ADEN COMBAT ZERO DEGREE
AMES
M=0.90
PHASE II
CLTRPM
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0219W
G9668020
AOA = 0
AOA = 2
AOA = 4
AOA = 6

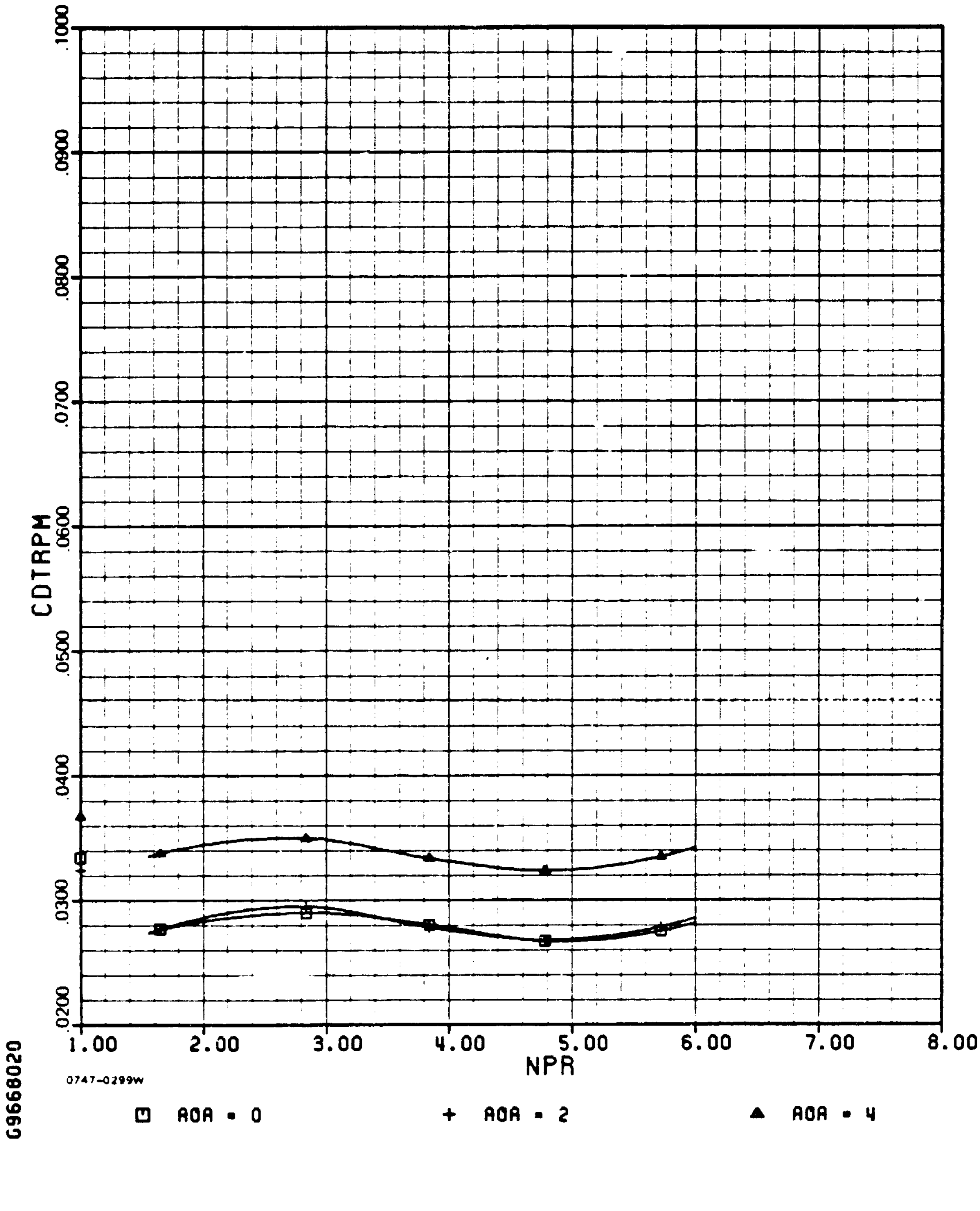


ADEN COMBAT ZERO DEGREE
AMES
M=0.90
PHASE 11
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CLTHPM
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

I-4(b)(concl.)

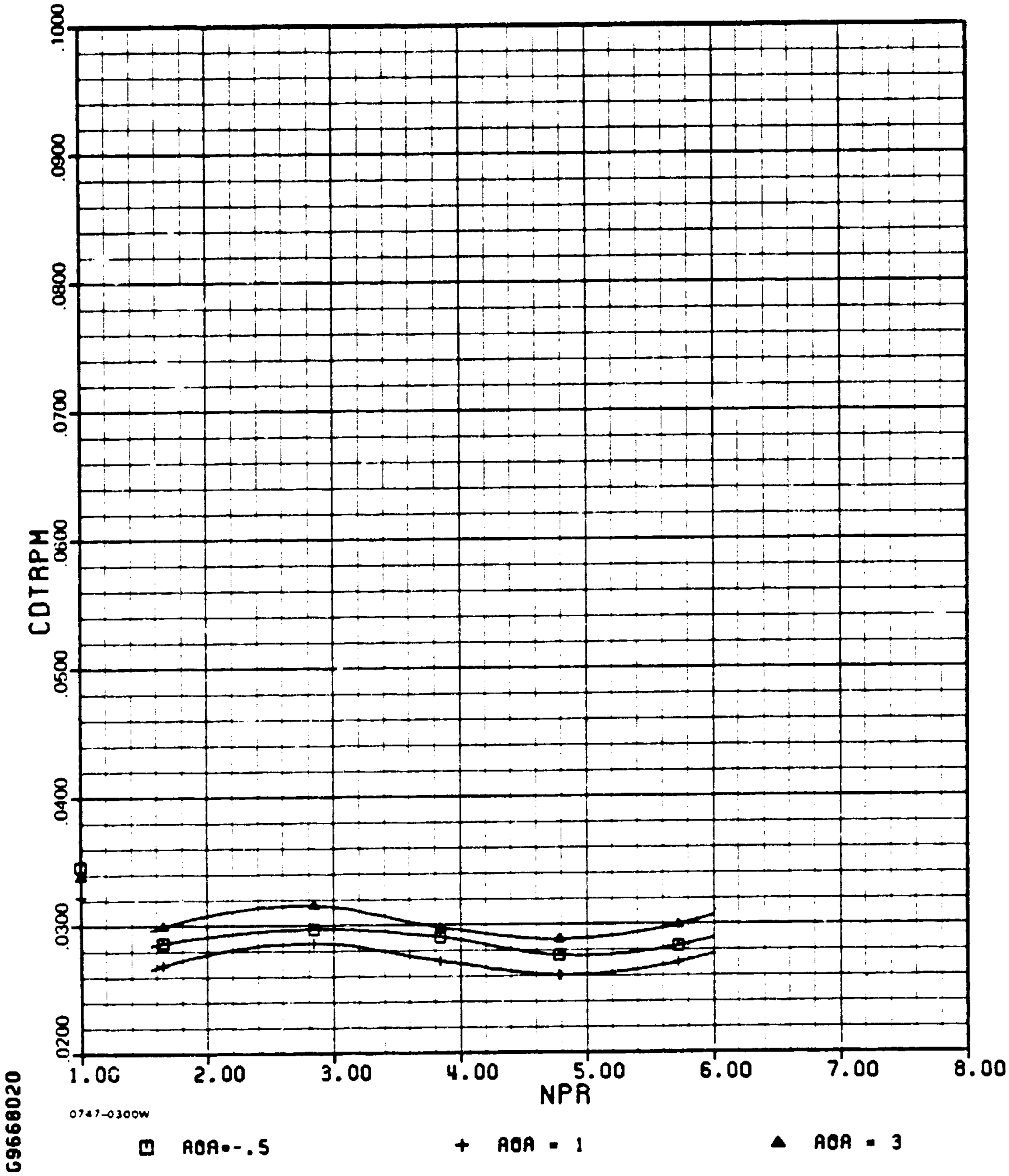
ADEN COMBAT ZERO DEGREE

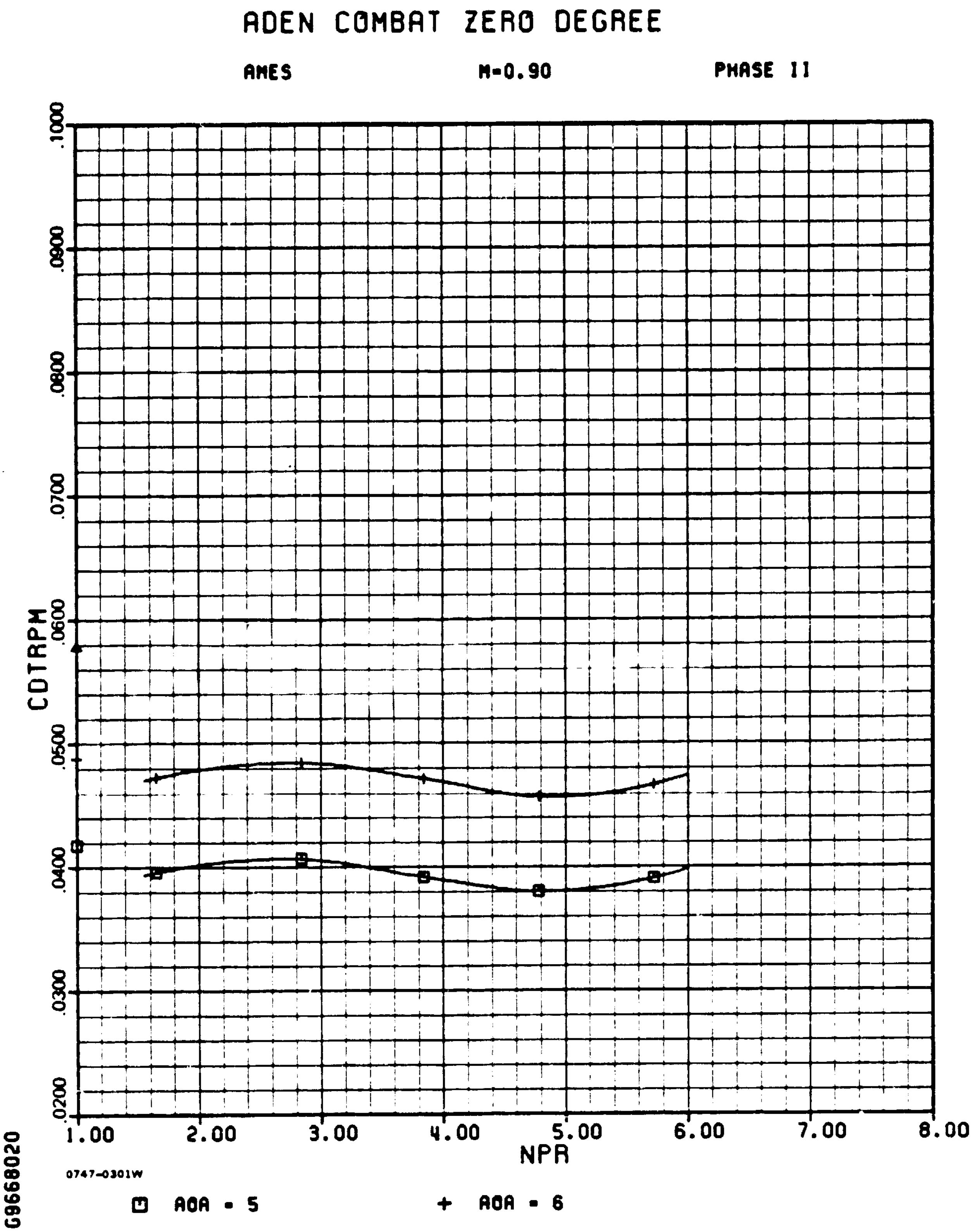
AMES M=0.90 PHASE II



ADEN COMBAT ZERO DEGREE

AMES M=0.90 PHASE II

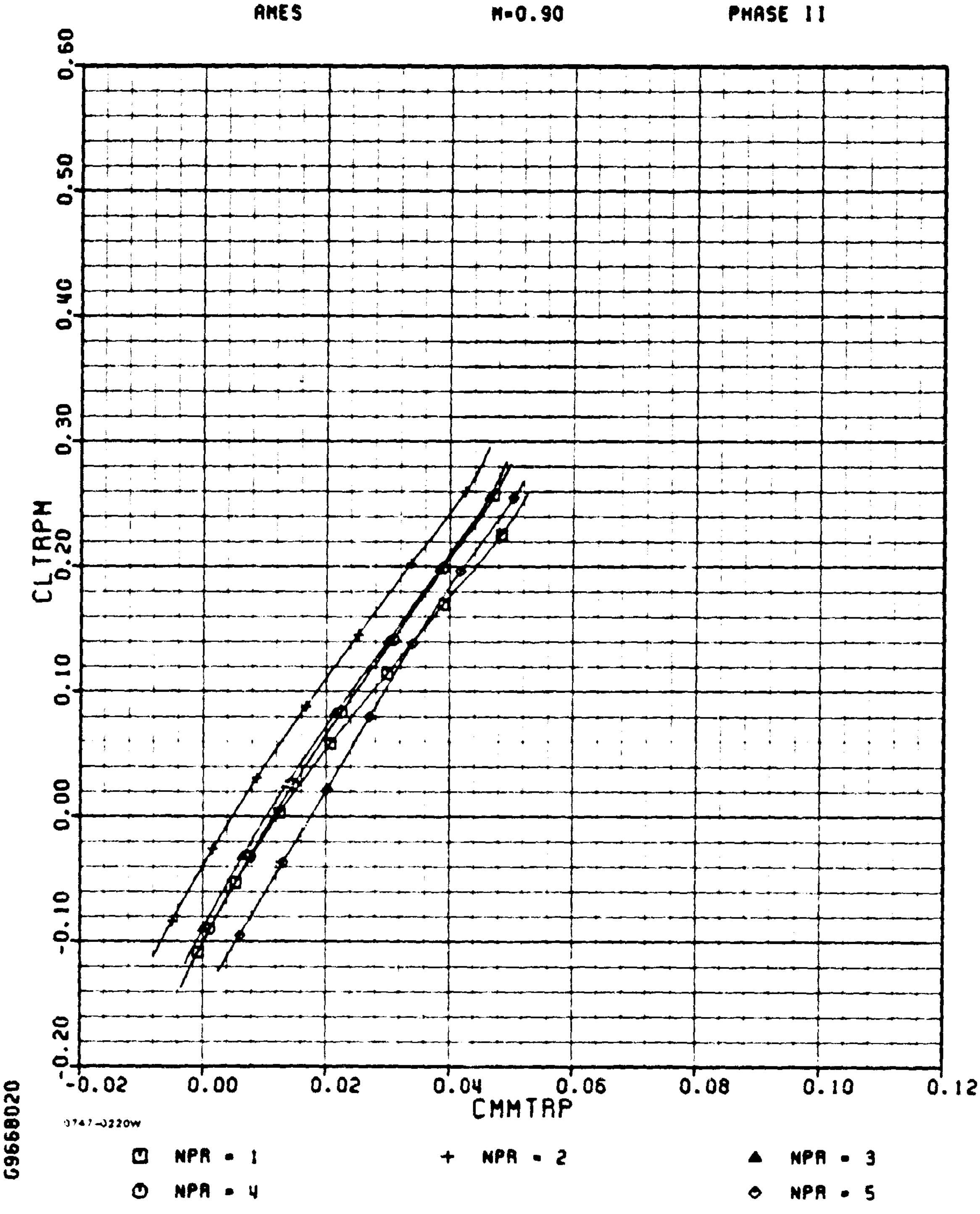



ADEN COMBAT ZERO DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0301W
AOA = 5
AOA = 6
G9668020

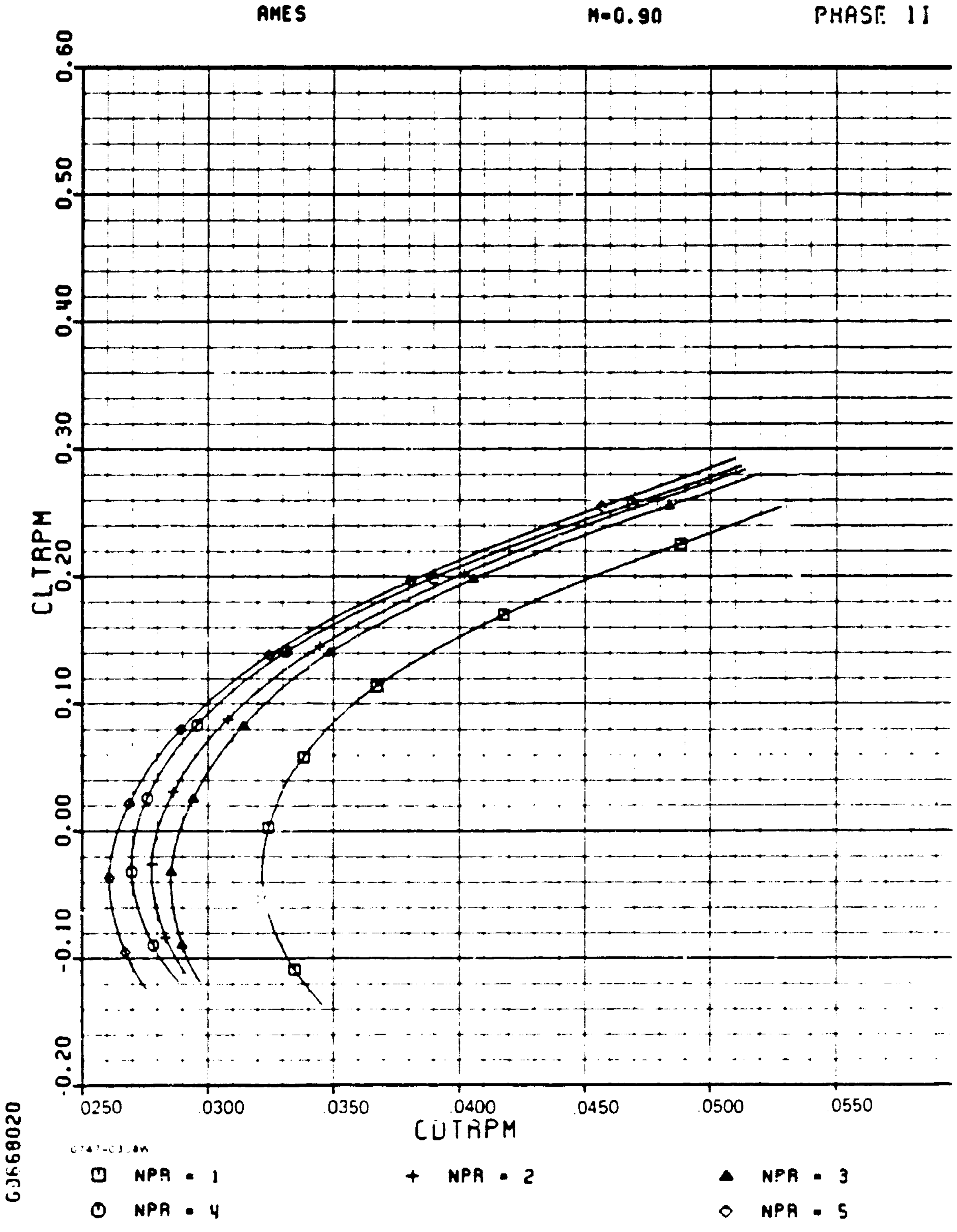
I-4(c)(concl.)

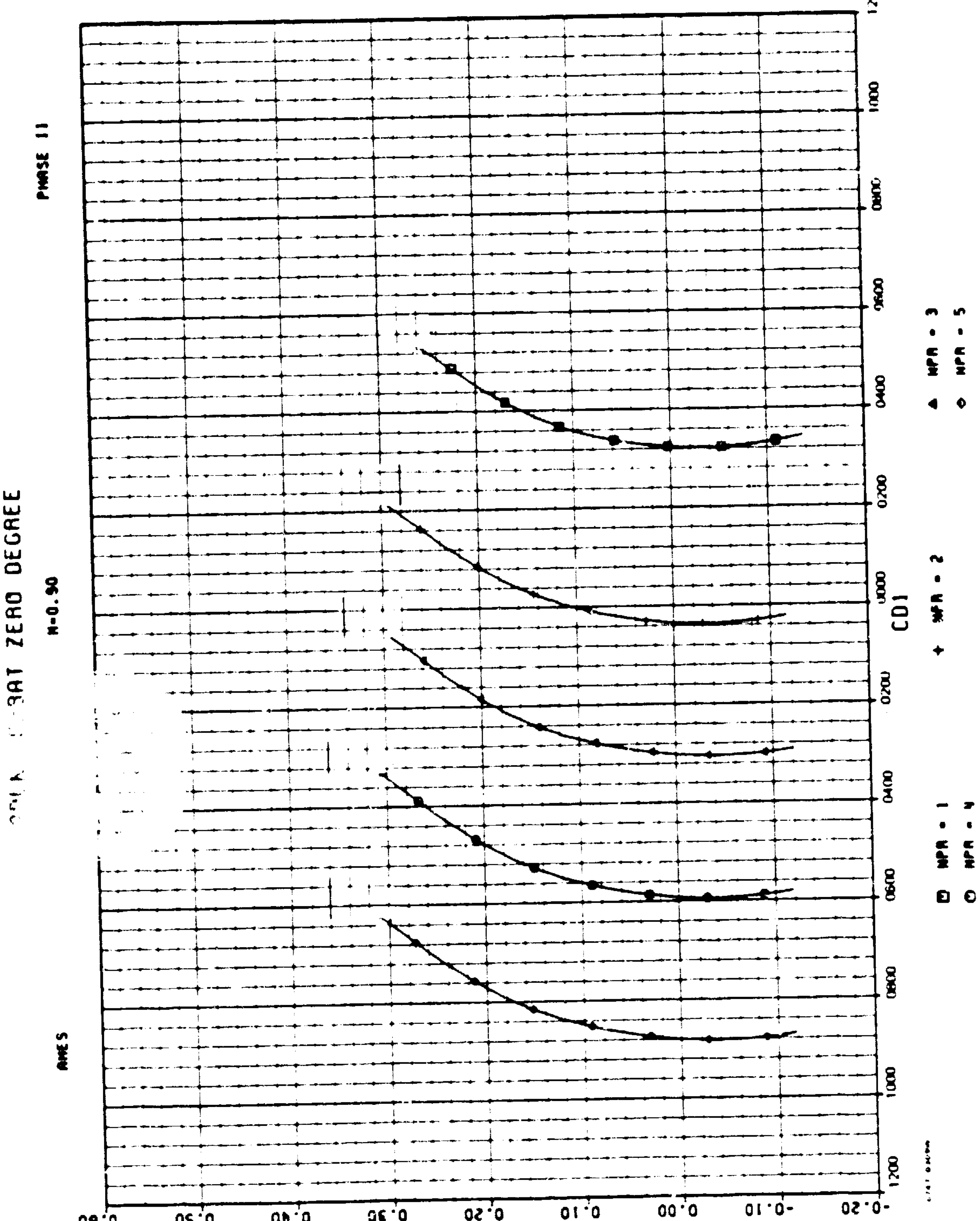
ADEN COMBAT ZERO DEGREE

AMES M=0.90 PHASE II



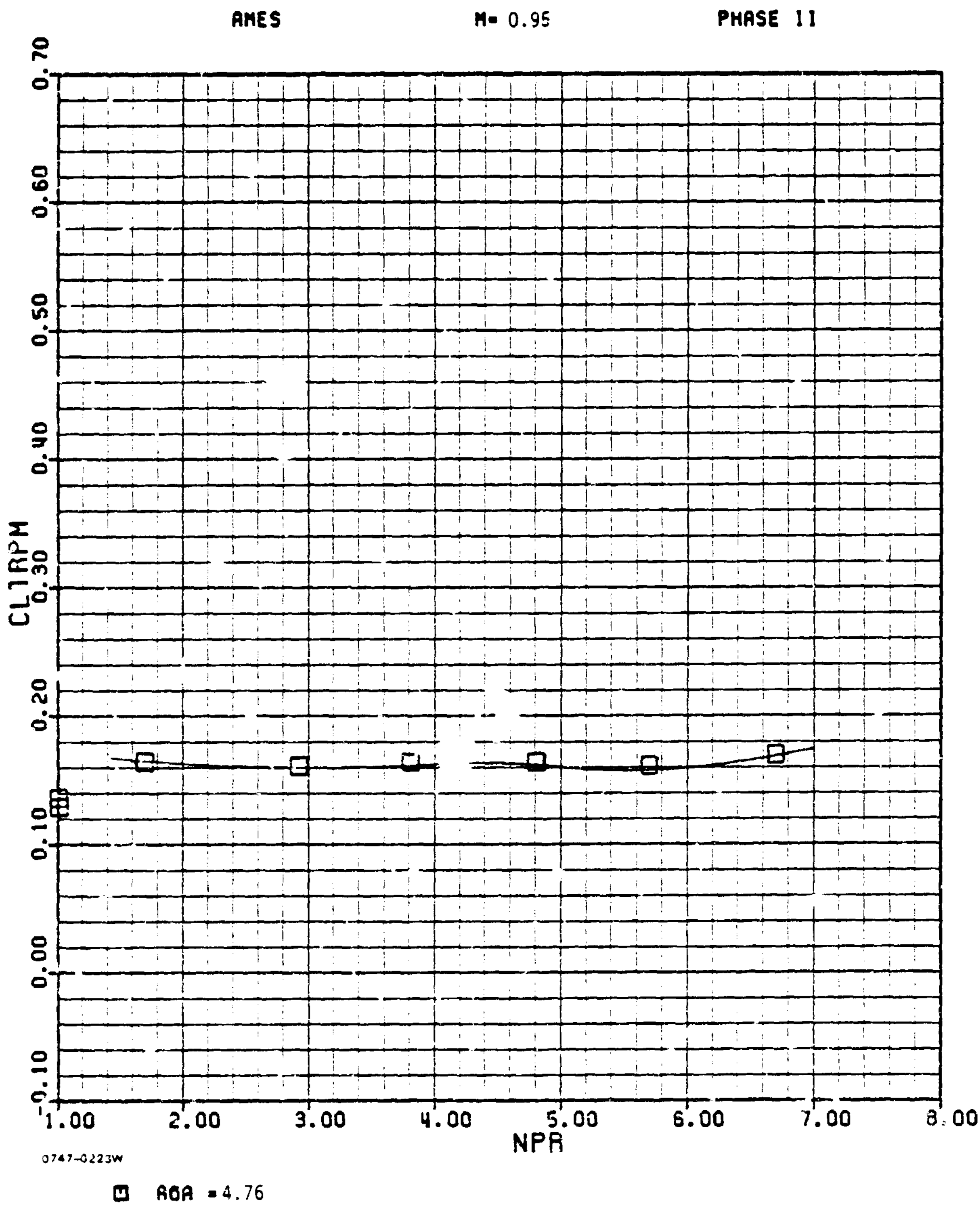
ADEN COMBAT ZERO DEGREE





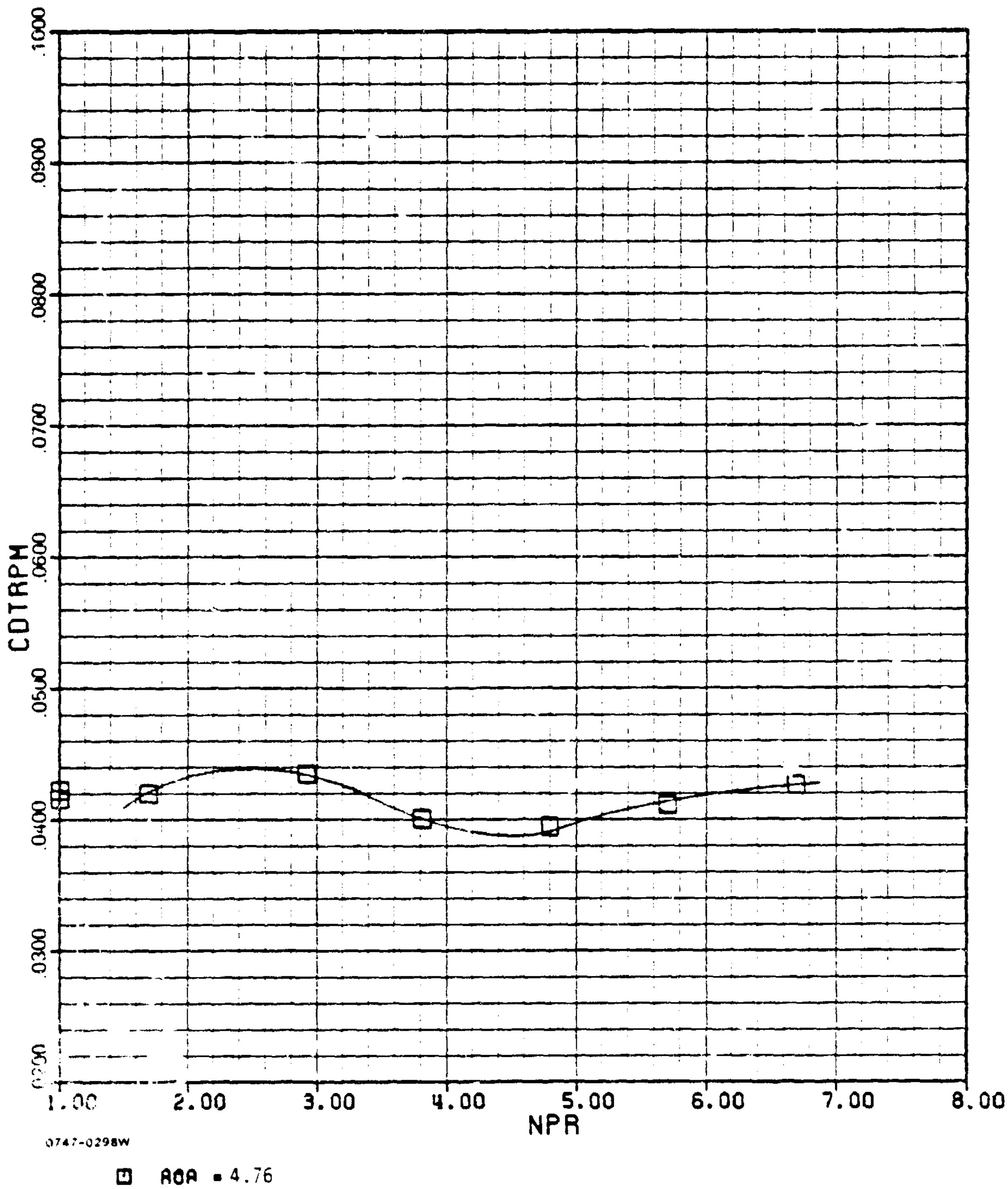
ZERO DEGREE
AMES
M=0.90
PHASE II
CD1
CL1
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5

ADEN COMBAT ZERO DEGREE

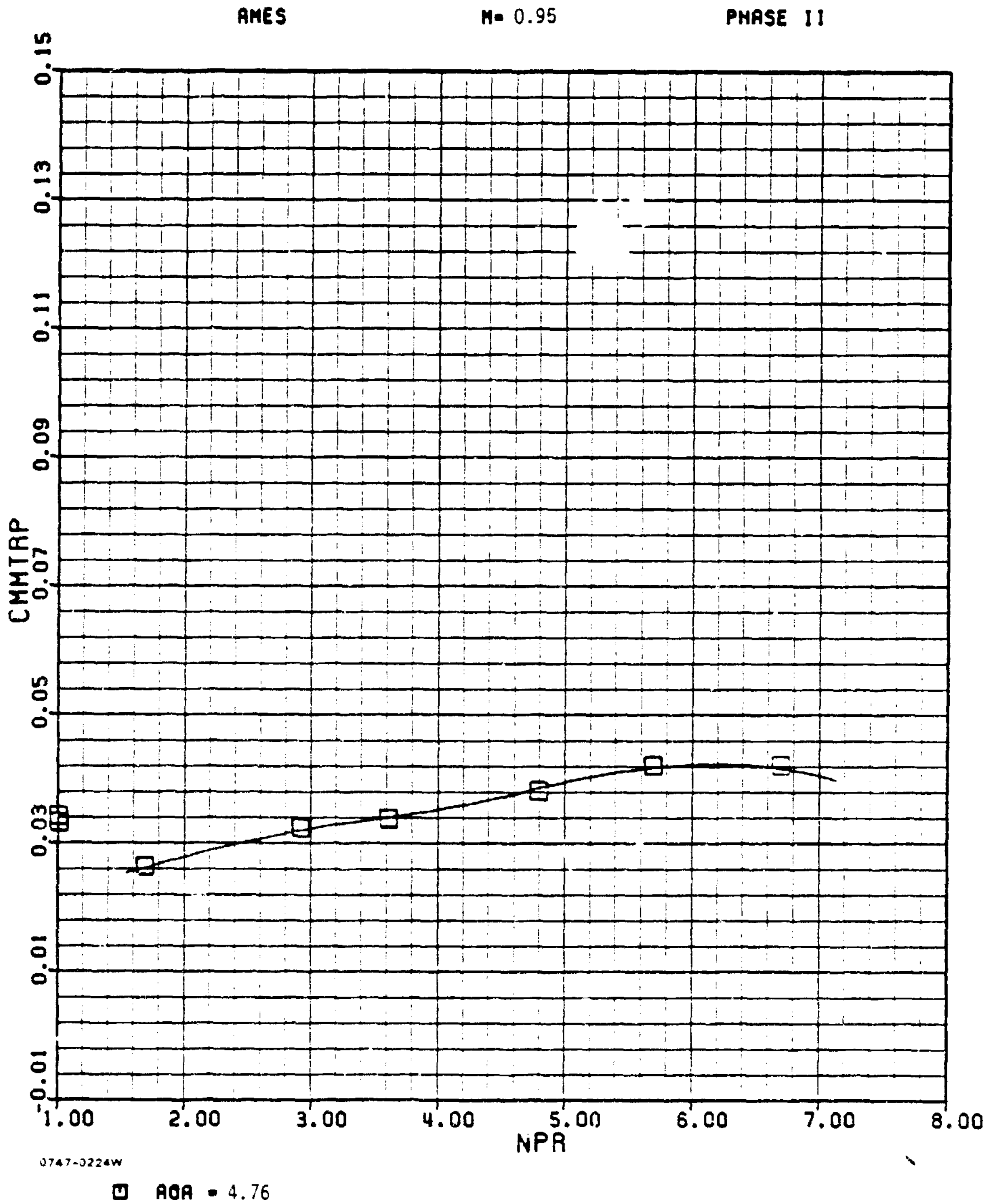


ADEN COMBAT ZERO DEGREE

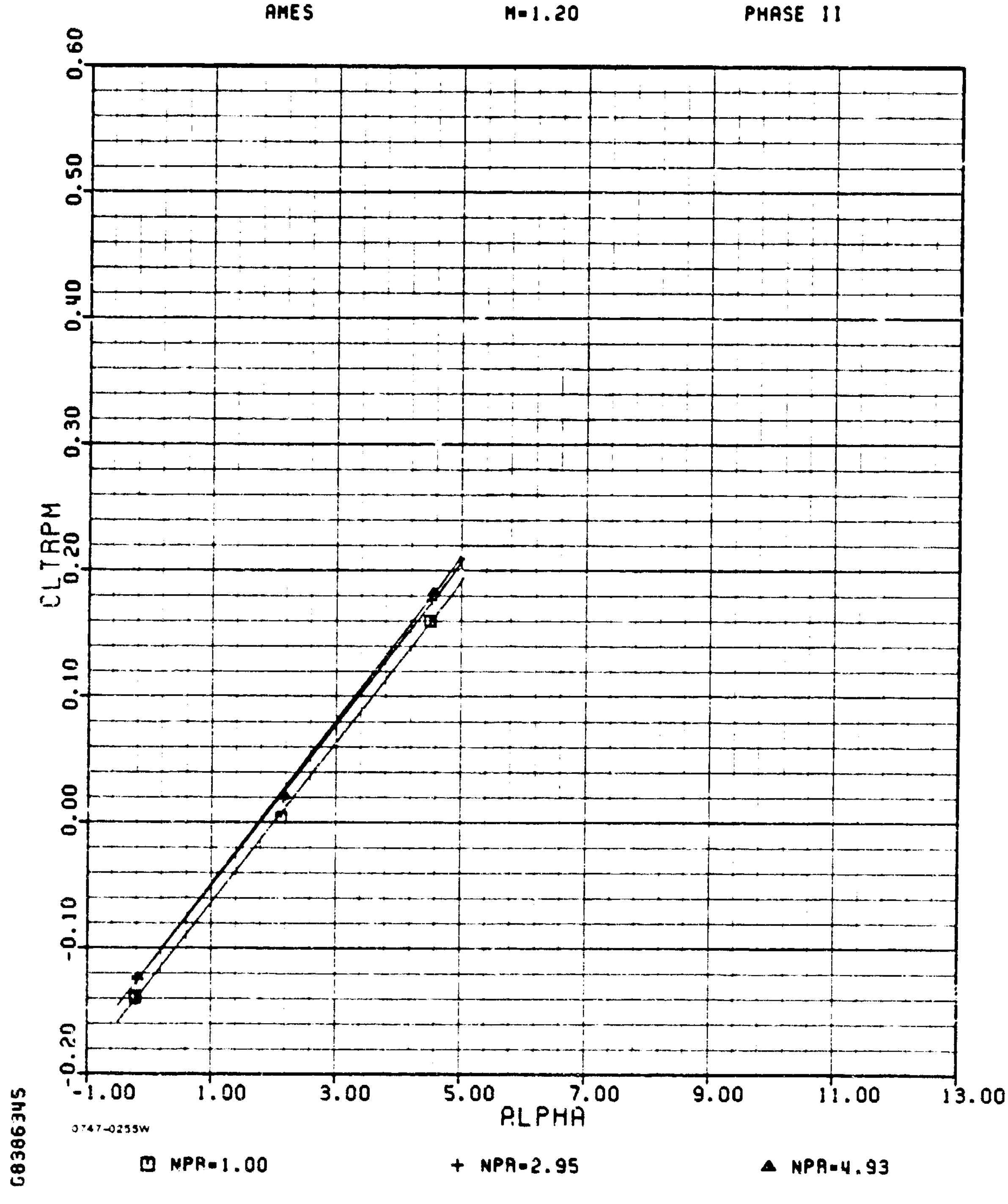
AMES M= 0.95 PHASE II

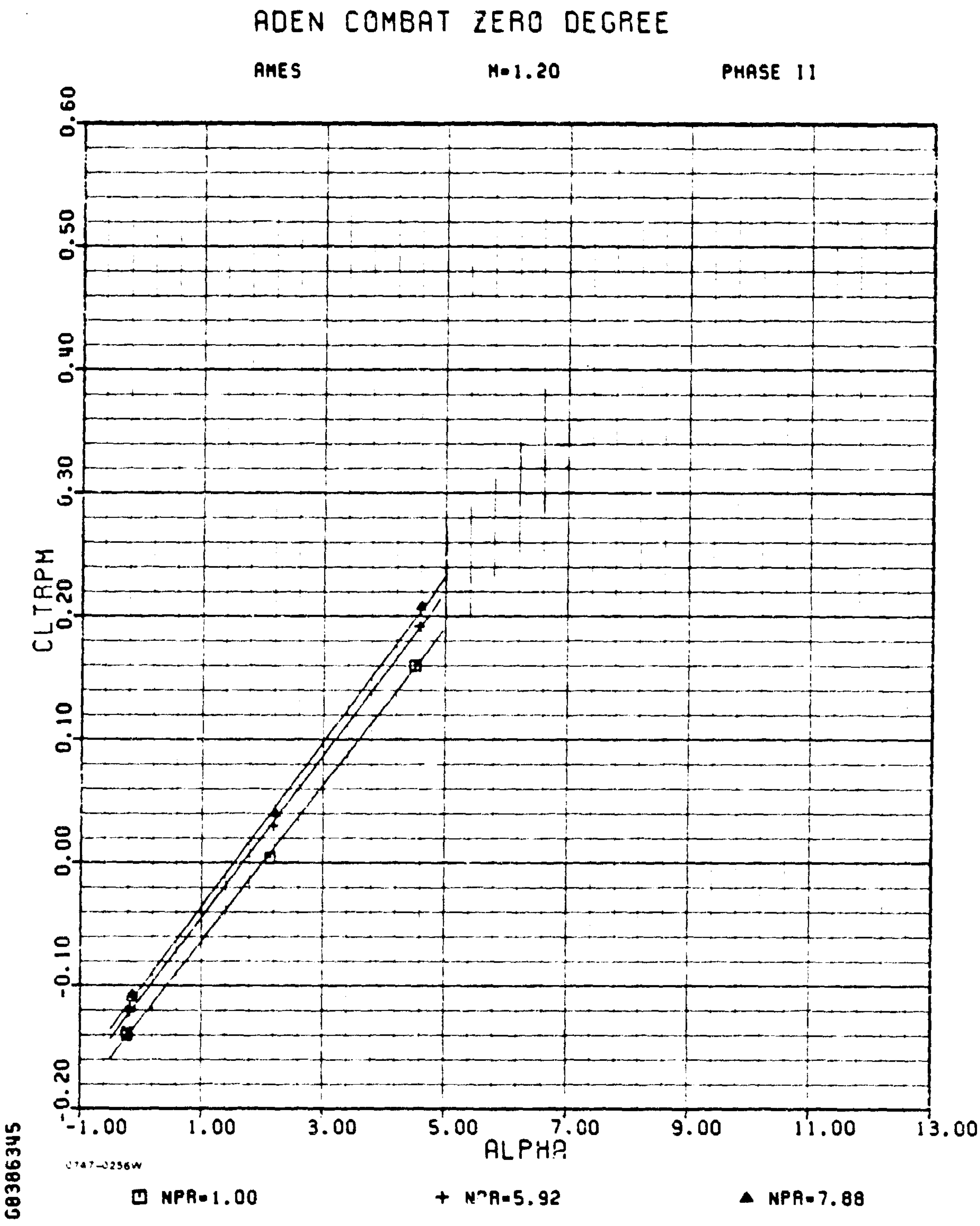


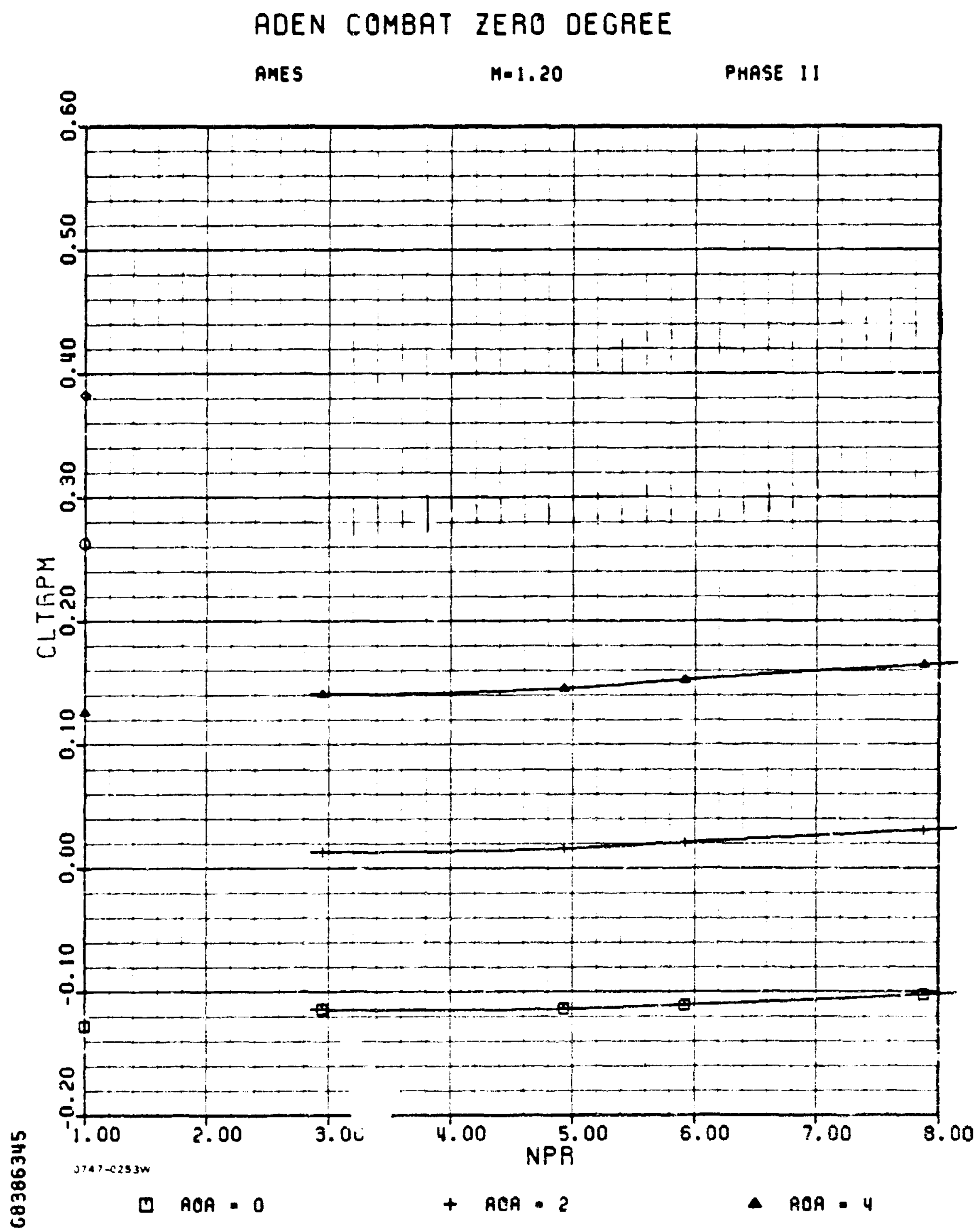
ADEN COMBAT ZERO DEGREE



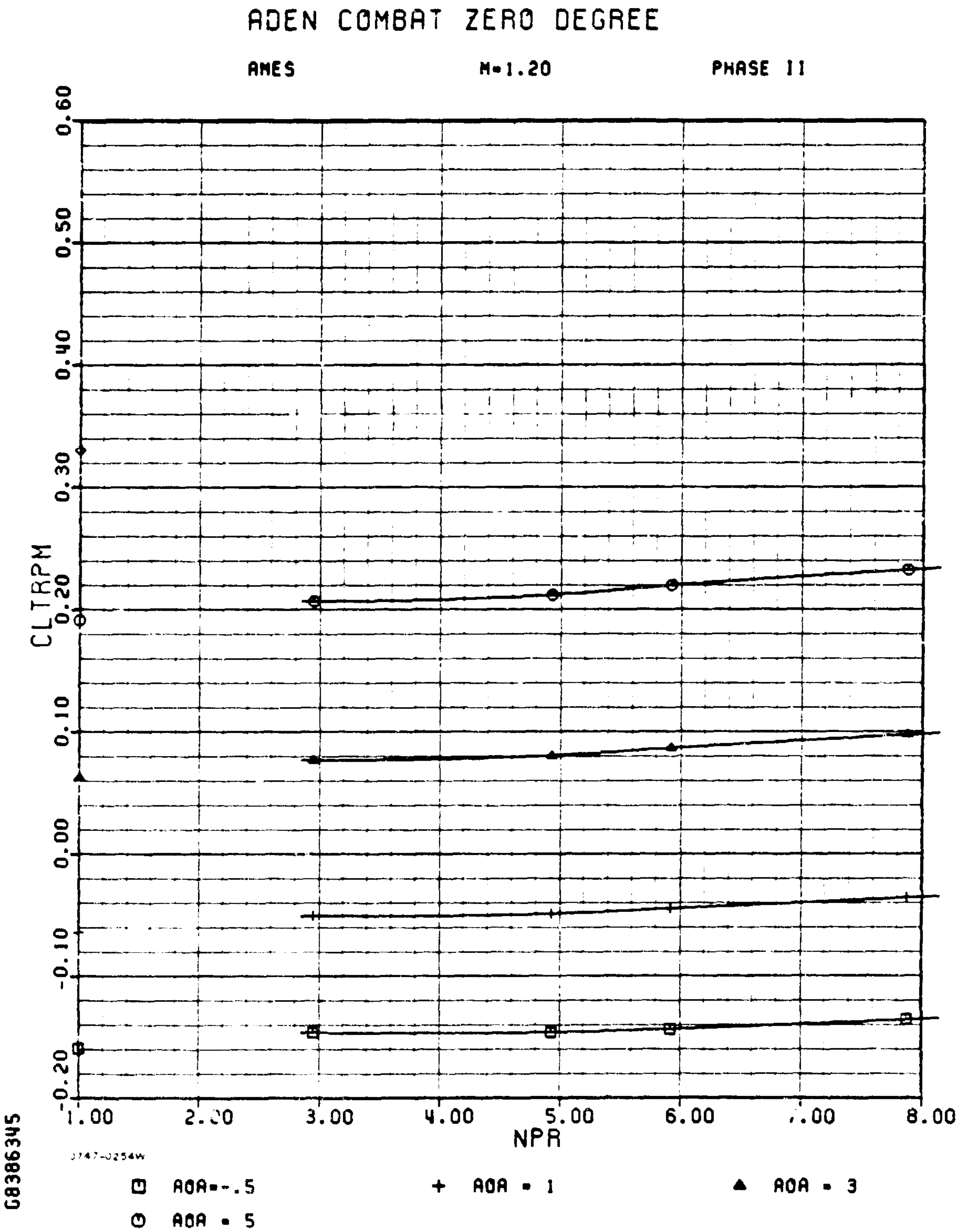
ADEN COMBAT ZERO DEGREE



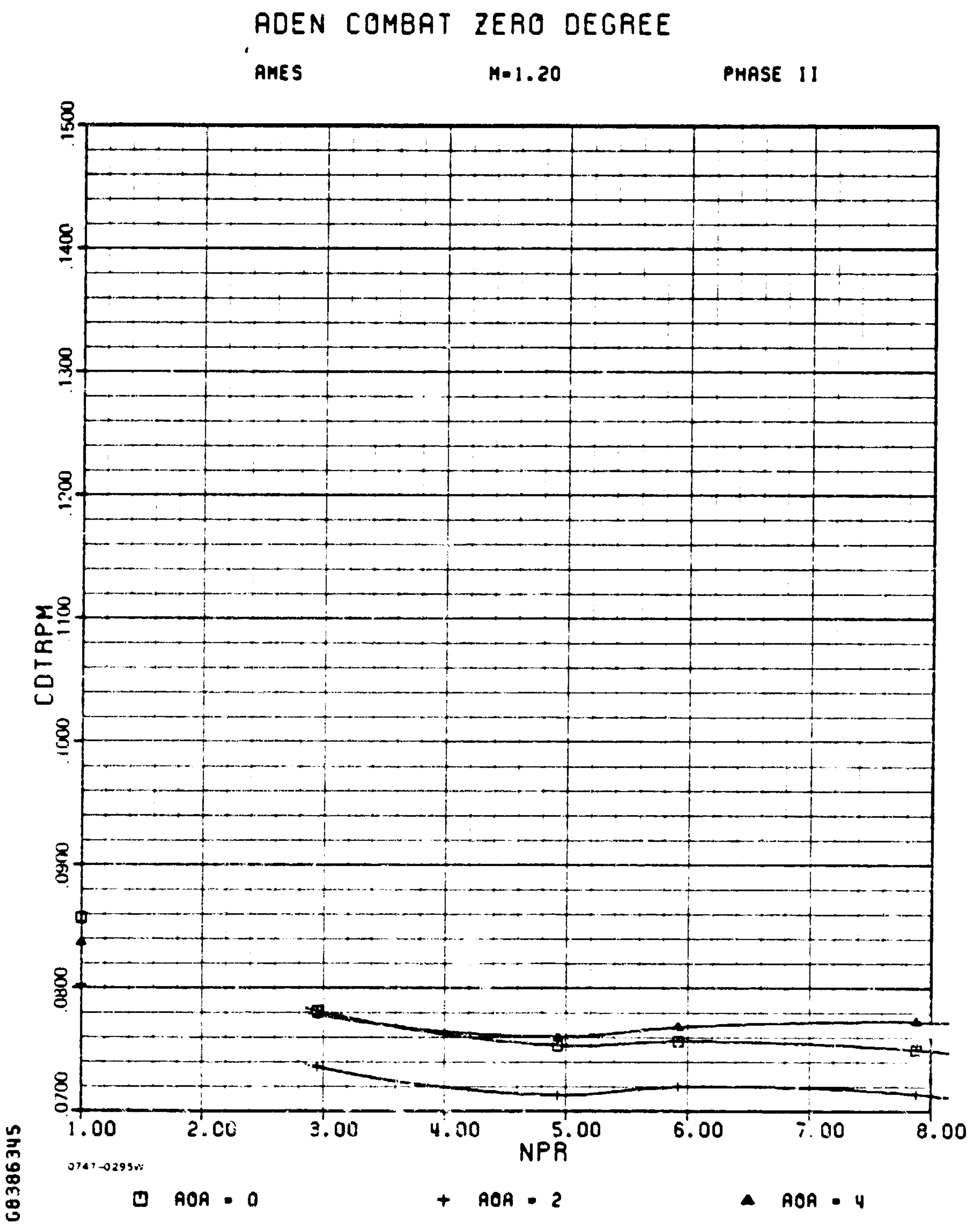

ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CLTRPM
ALPHA
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
NPR=1.00
NPR=5.92
NPR=7.88
G8386345



ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CLTAPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G8386345
AOA = 0
AOA = 2
AOA = 4

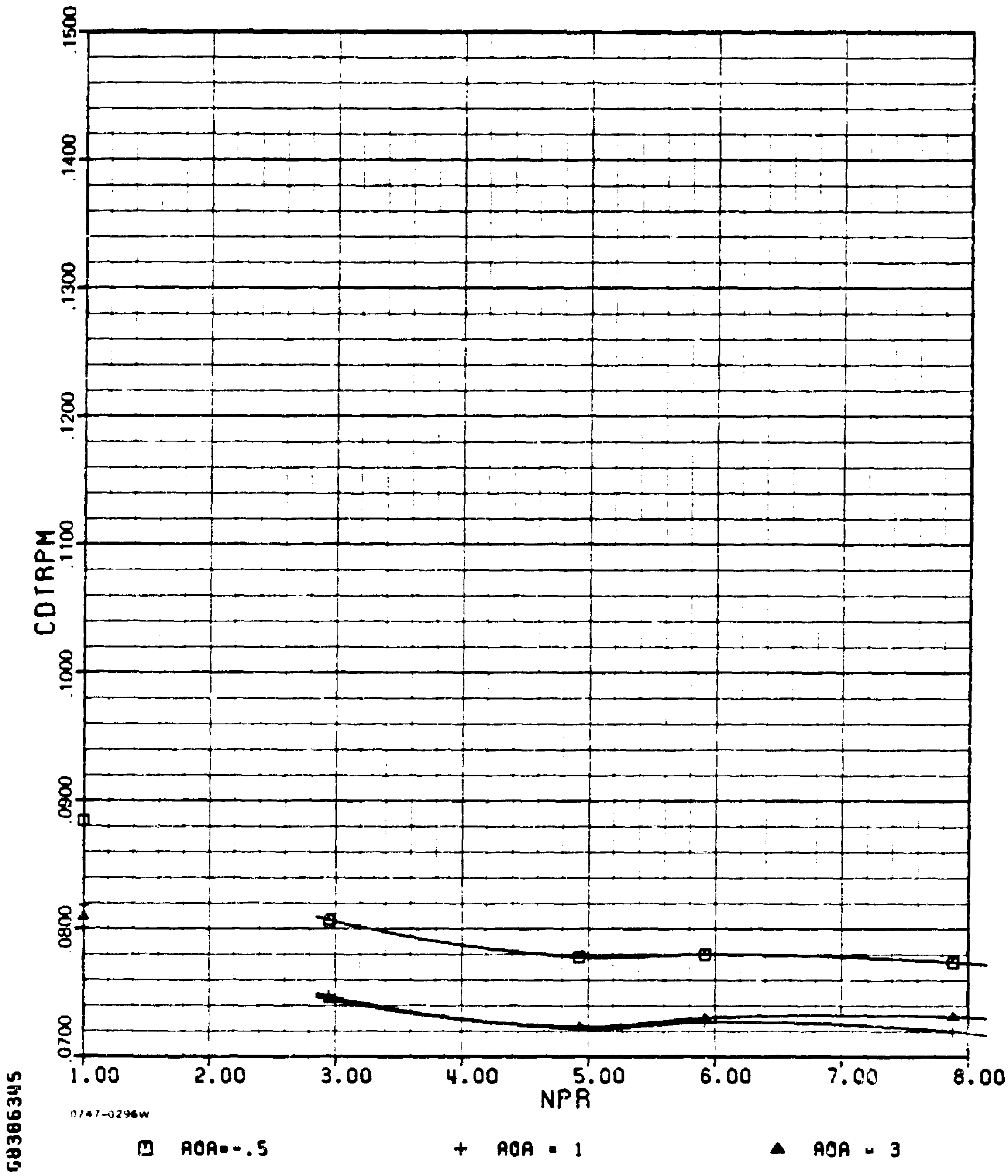

ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CLTRPM
NPR
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
3.00
4.00
5.00
6.00
8.00
G8386345
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

I-6(b)(concl.)


ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CDTRPM
.1500
.1400
.1300
.1200
.1100
.1000
.0900
.0800
.0700
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0295W
AOA = 0
AOA = 2
AOA = 4
GB386345

ADEN COMBAT ZERO DEGREE

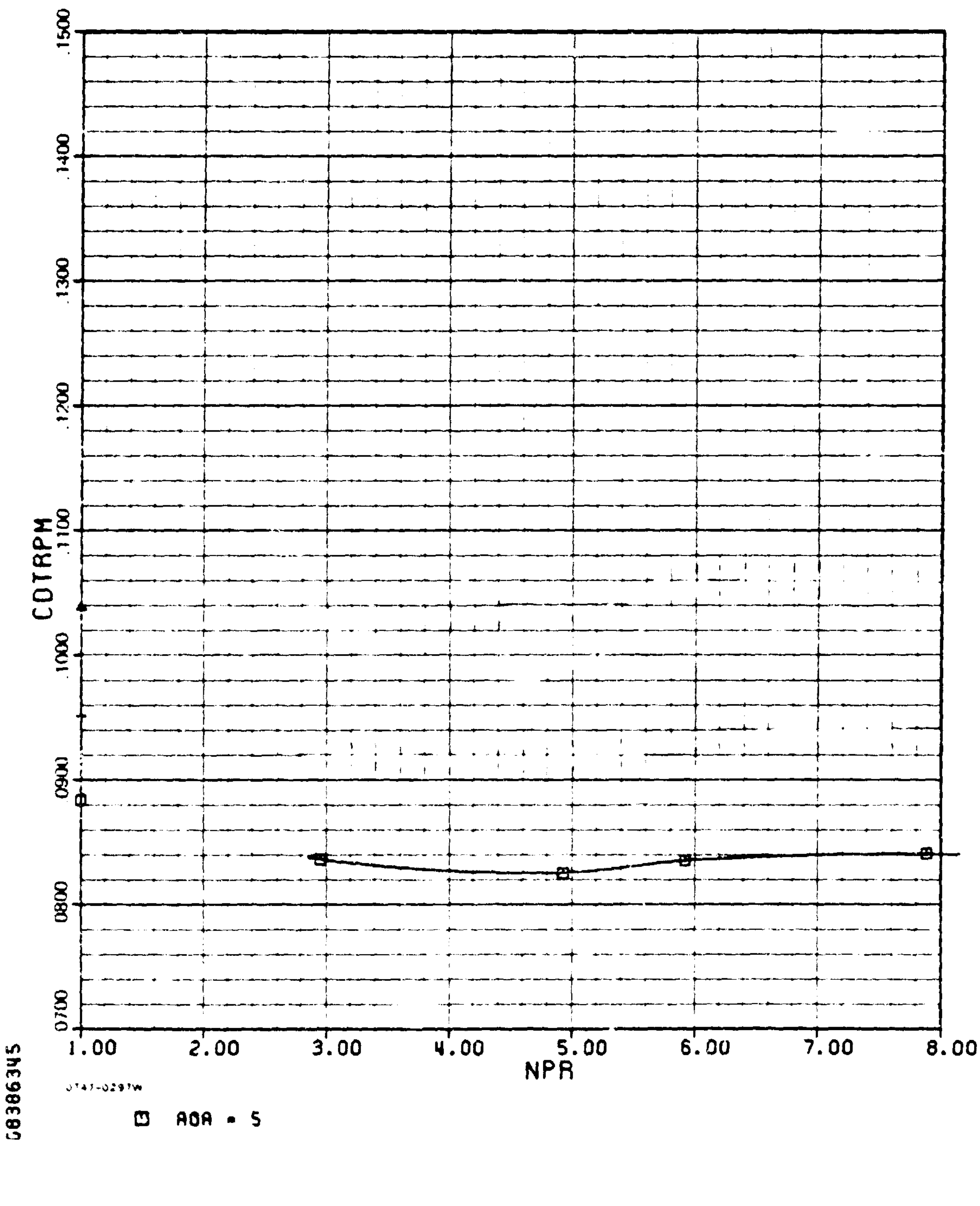
AMES M=1.20 PHASE II



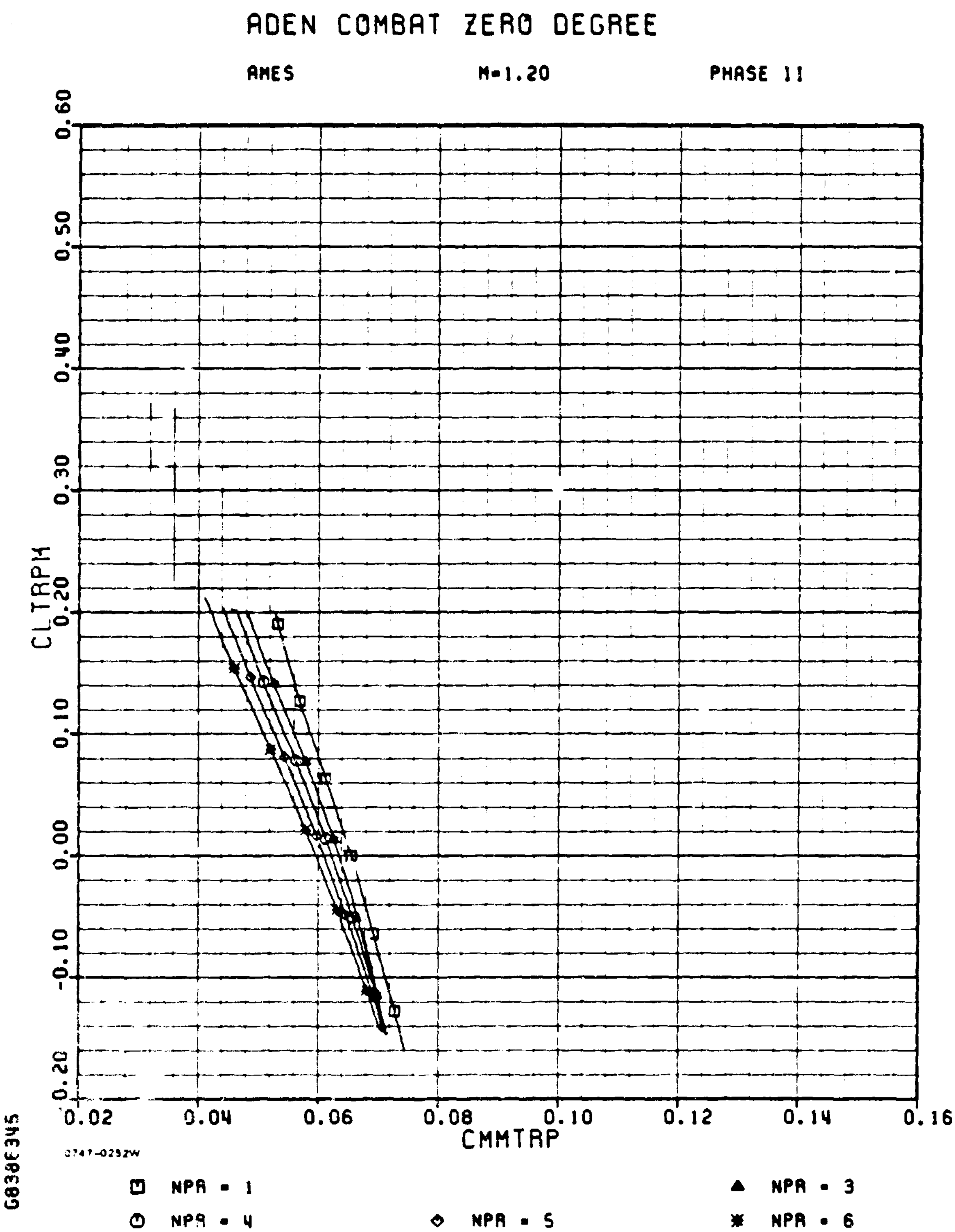
I-6(c)(cont.)

ADEN COMBAT ZERO DEGREE

AMES M=1.20 PHASE II

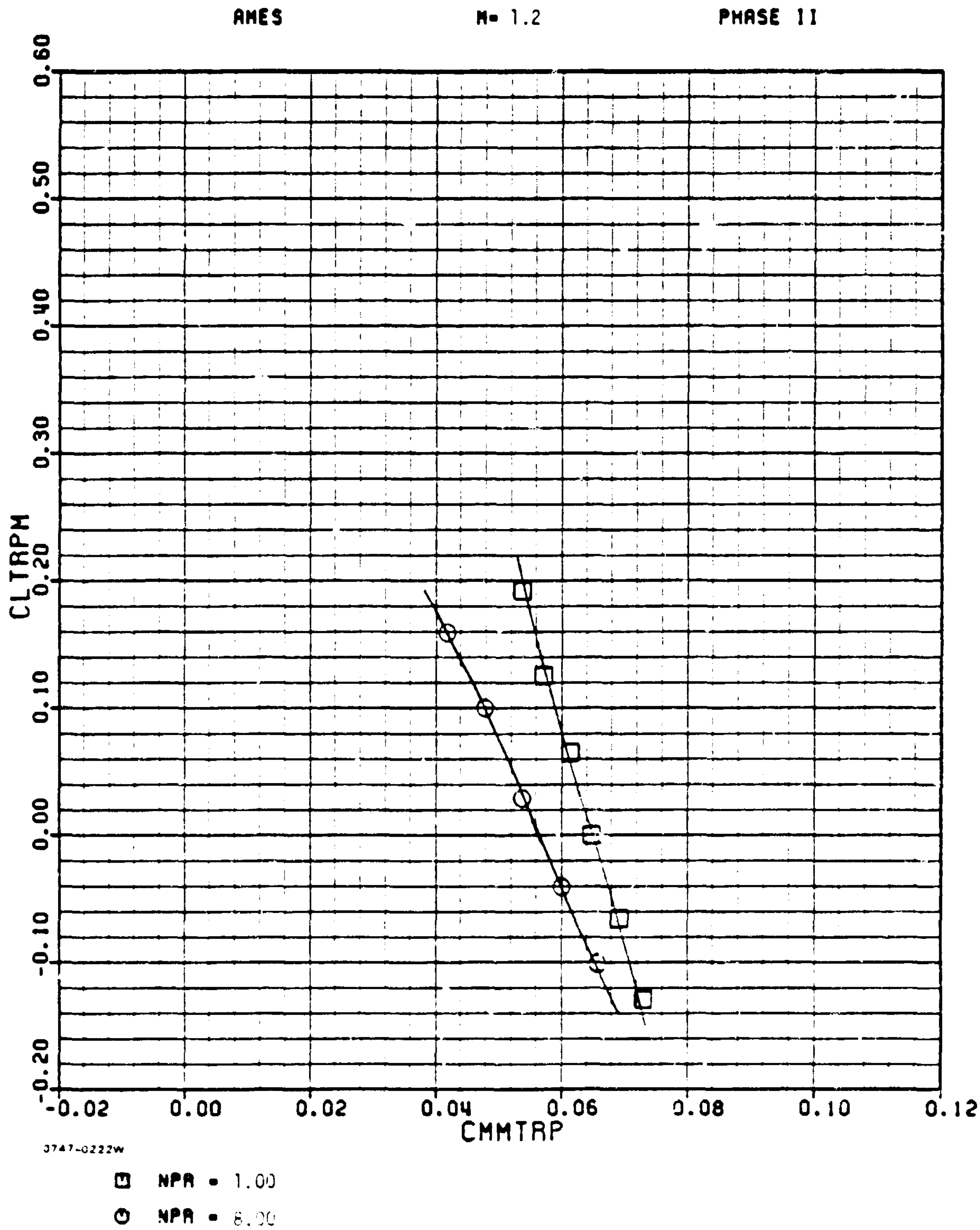


I-6(c)(concl.)

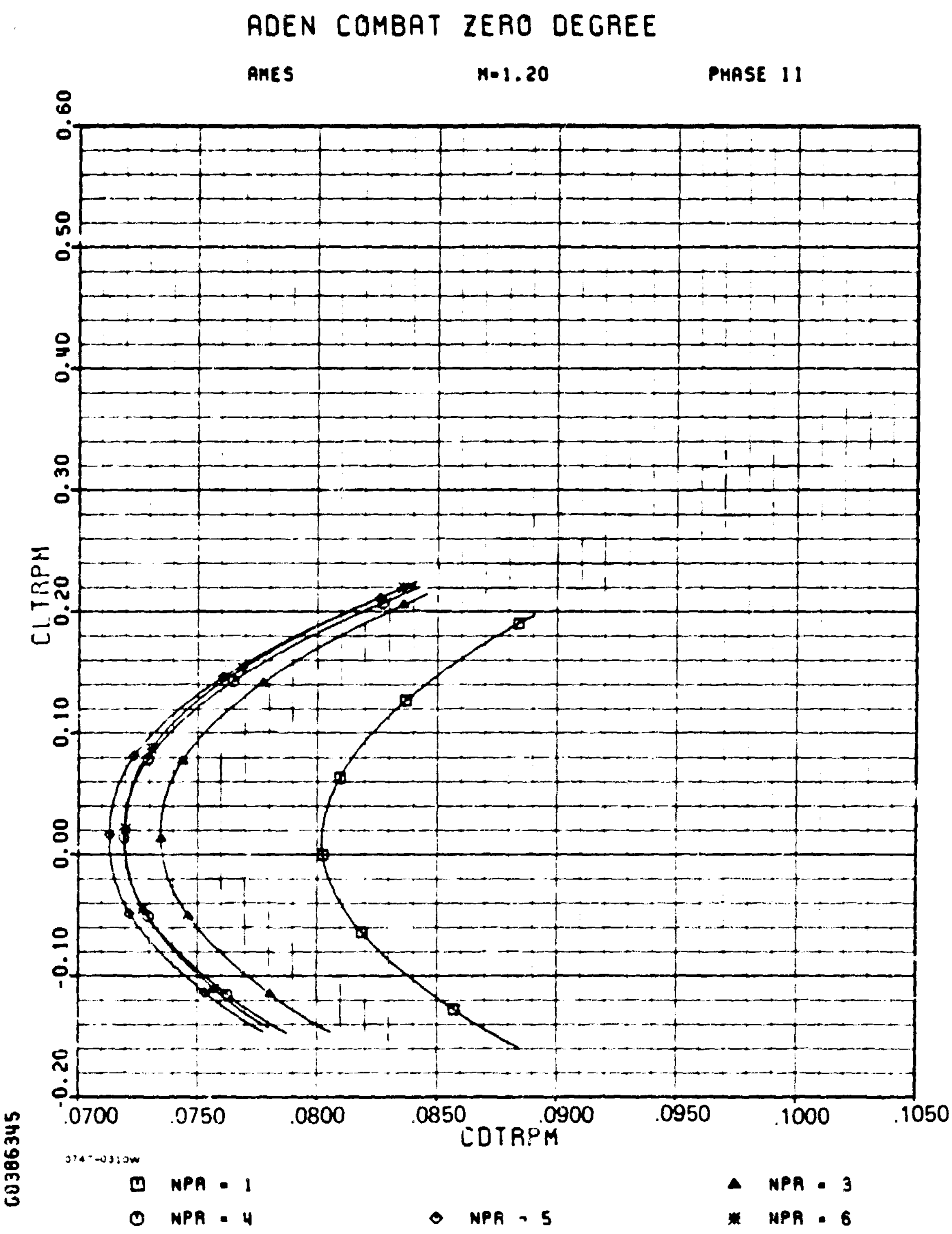


ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
G838E345
0747-0252W
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN COMBAT ZERO DEGREE

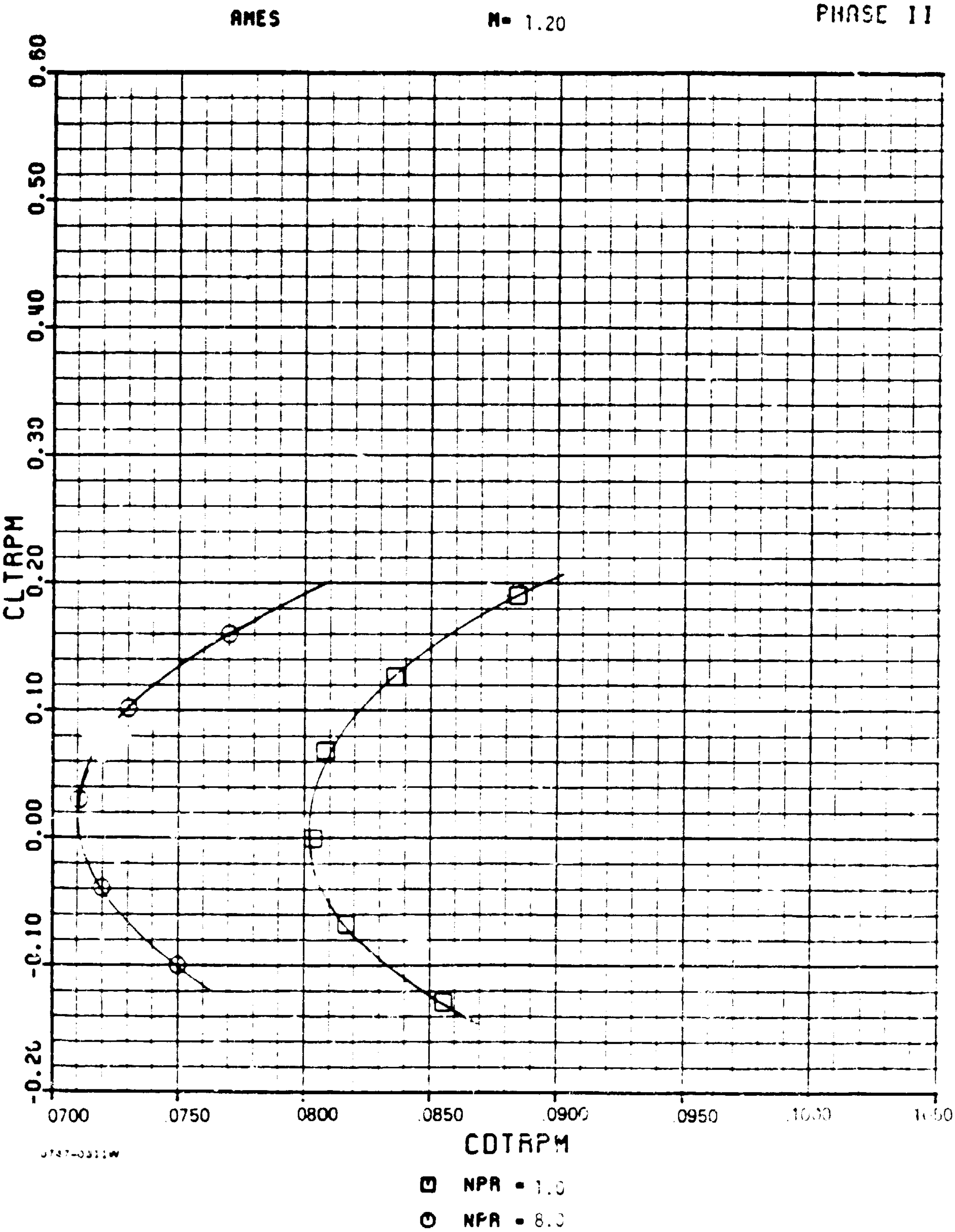


I-6(d)(concl.)

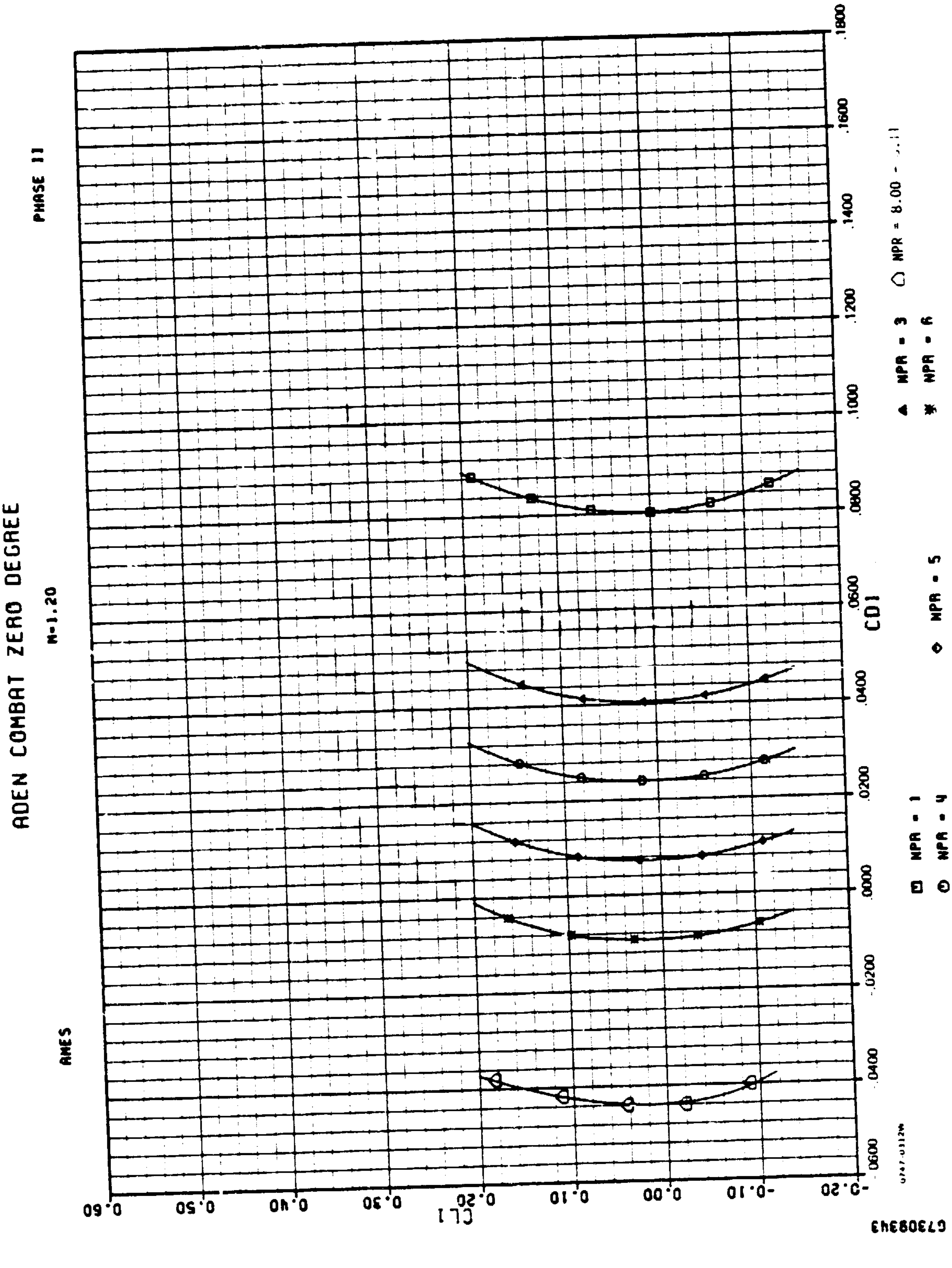


ADEN COMBAT ZERO DEGREE
AMES
M=1.20
PHASE II
CLTRPM
CDTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0700
.0750
.0800
.0850
.0900
.0950
.1000
.1050
G0386345
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN COMBAT ZERO DEGREE



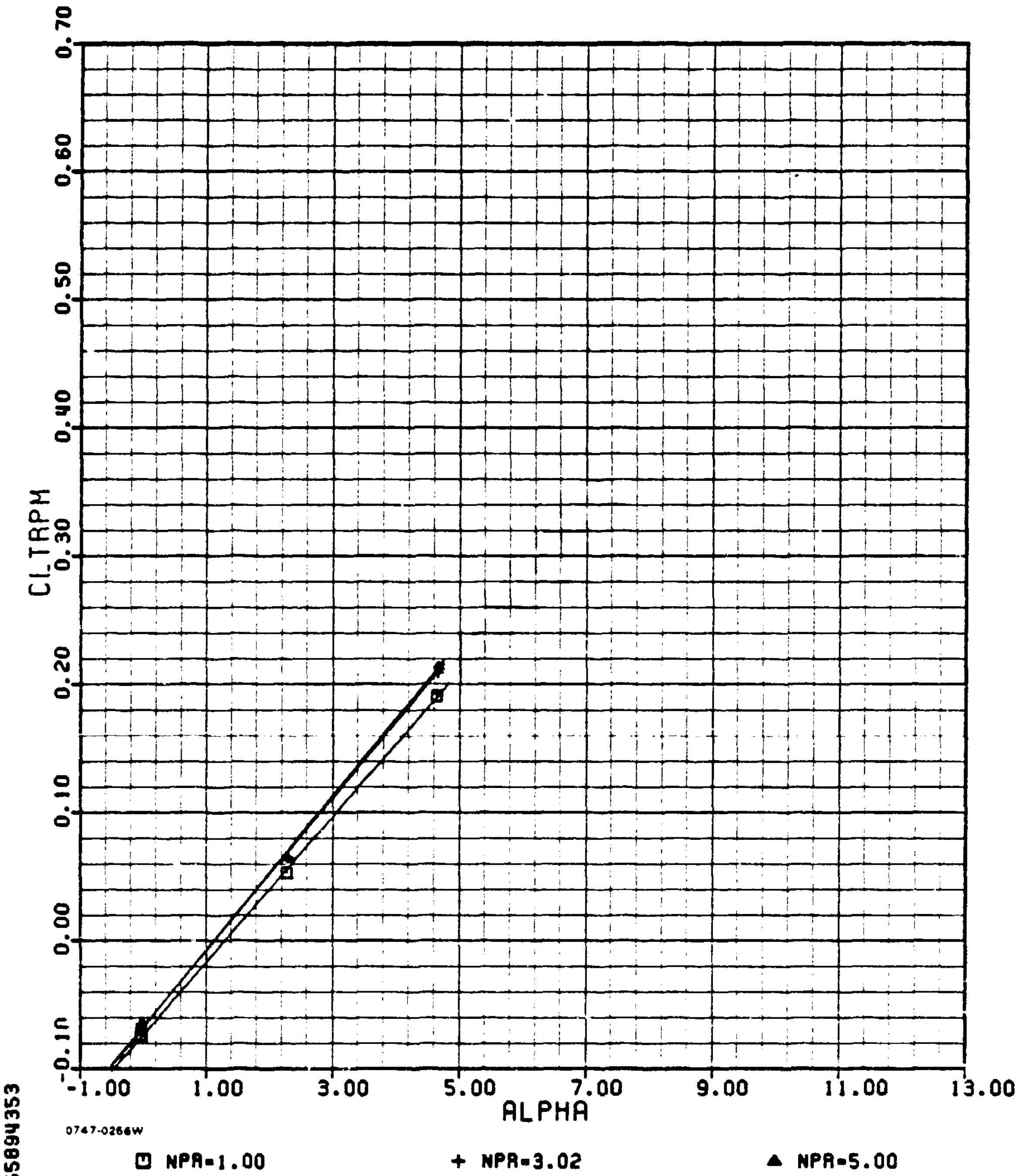
I-6(e)(concl.)


ADEN COMBAT ZERO DEGREE
M=1.20
PHASE II
AMES
CD1
CL1
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6
NPR = 8.00
C7308343

C-5

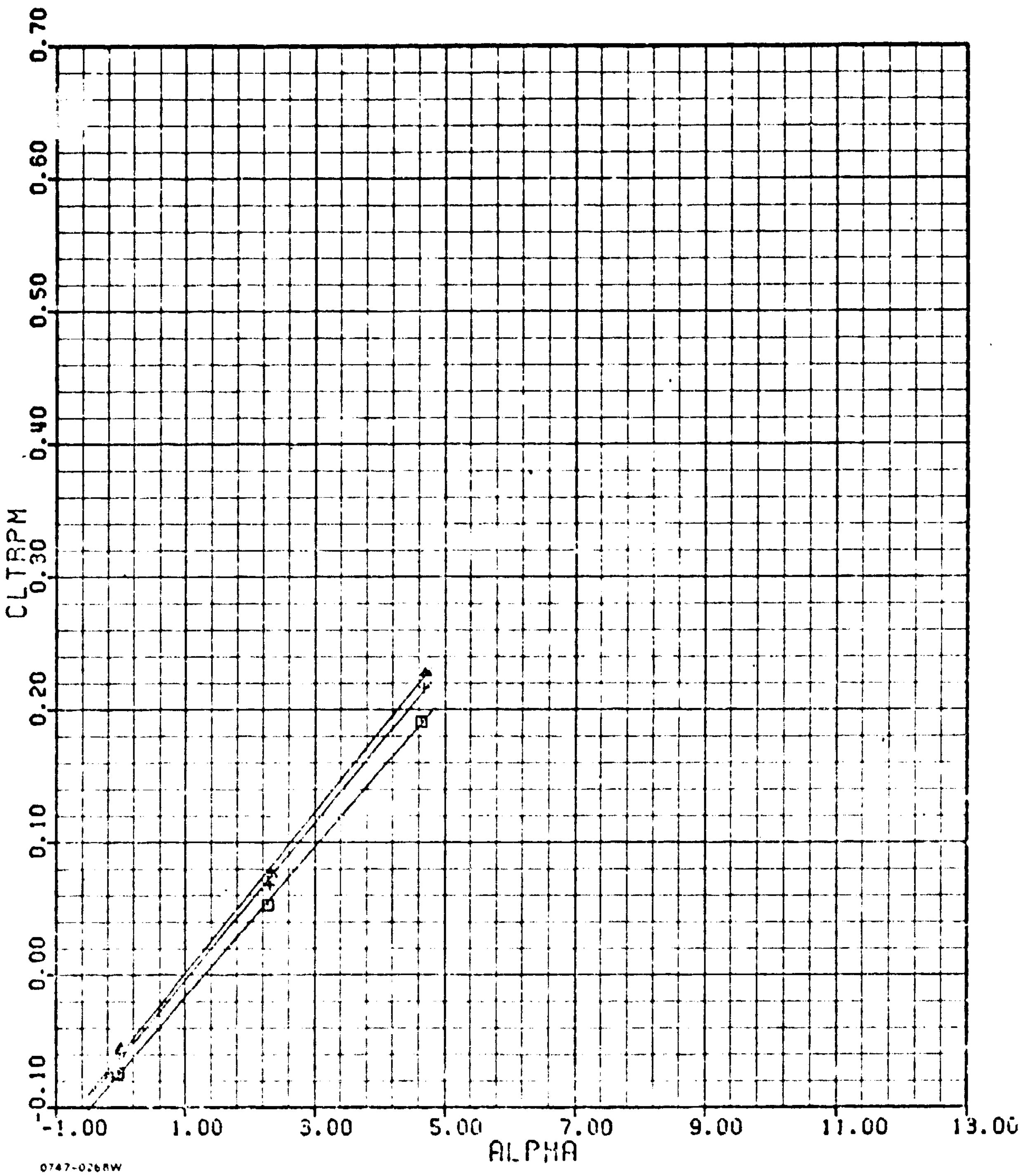
ADEN COMBAT ZERO DEGREE

AMES M=1.40 PHASE II



ADEN COMBAT ZERO DEGREE

AMES M=1.40 PHASE II



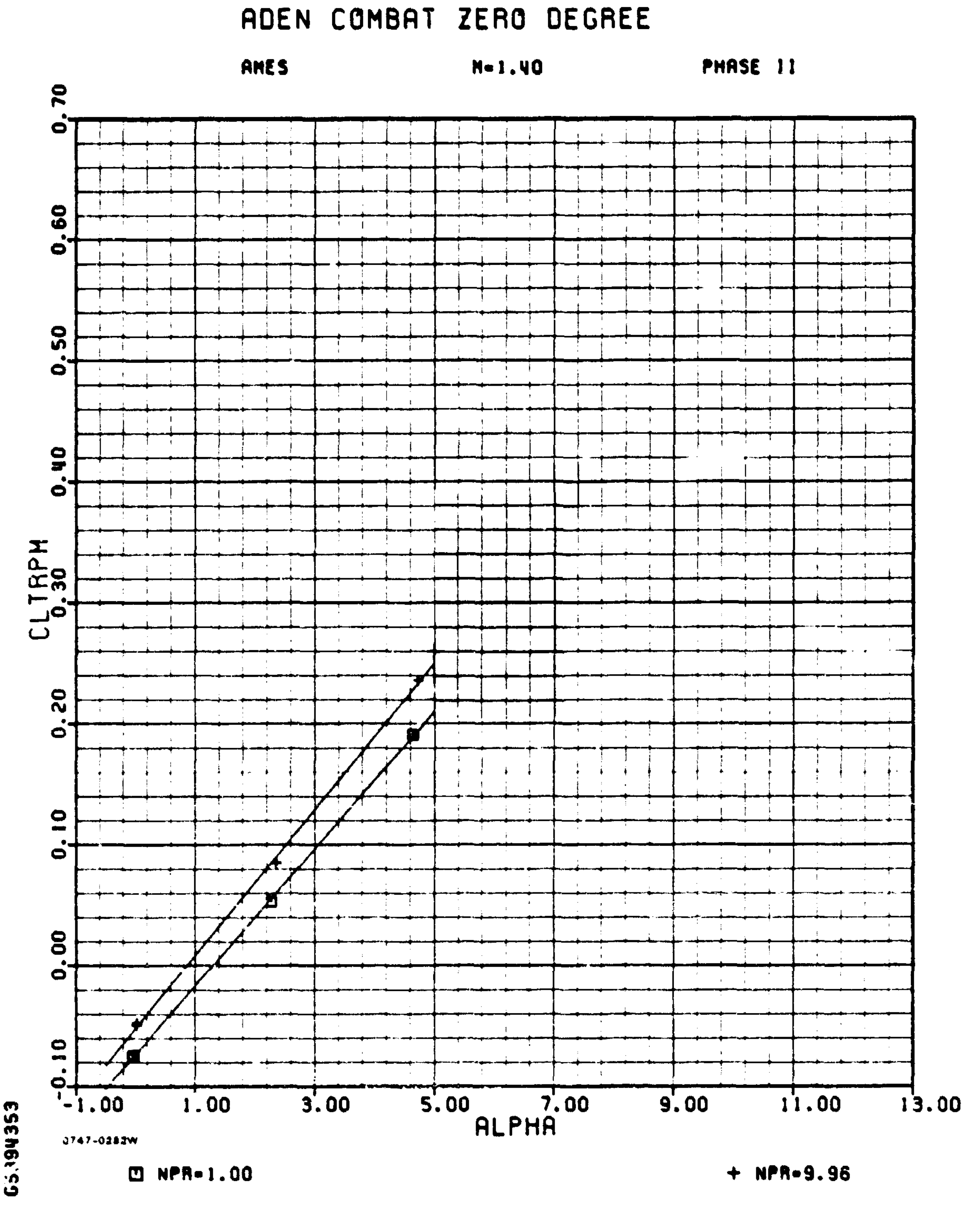
0747-026RW

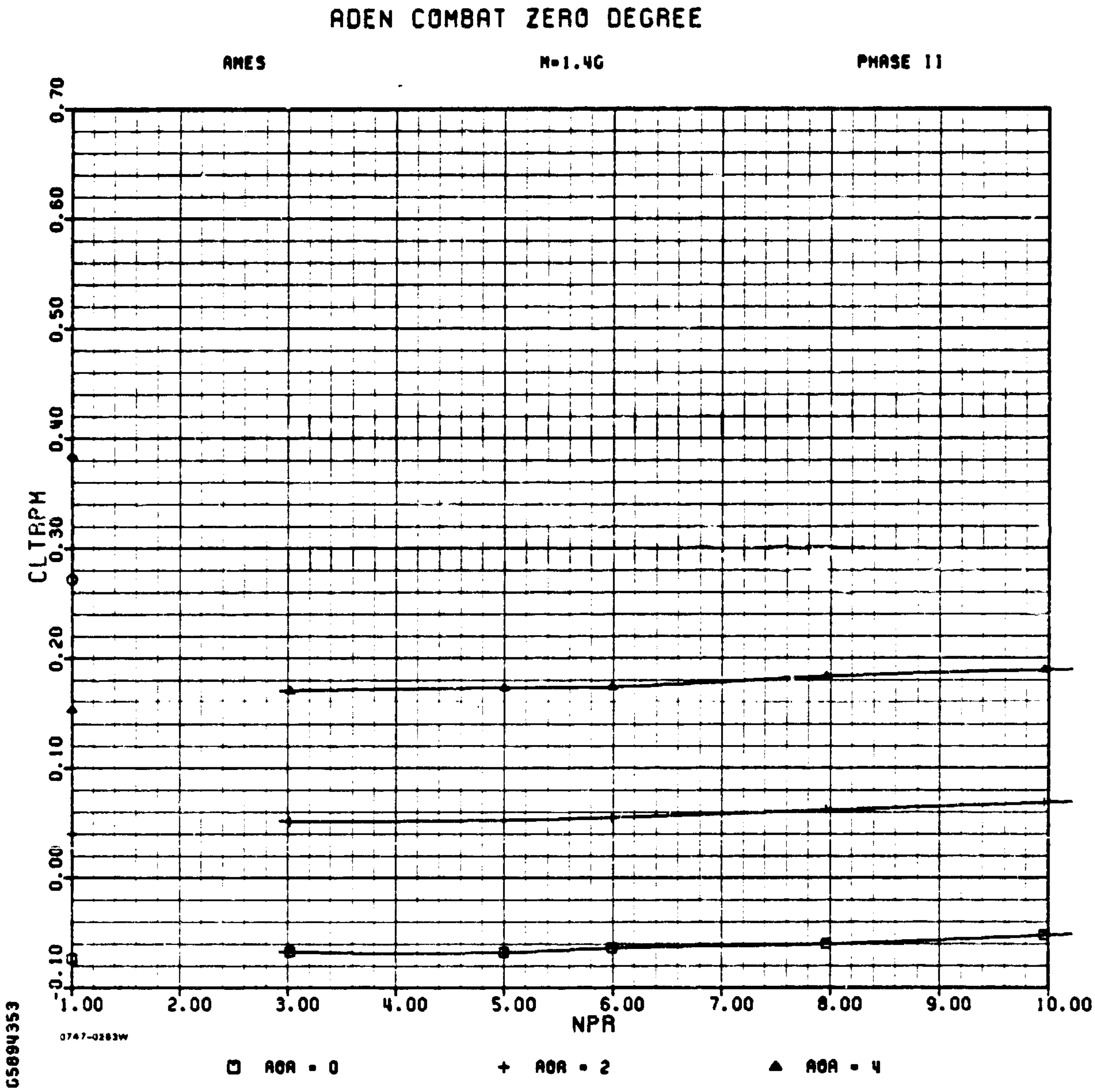
G5894353

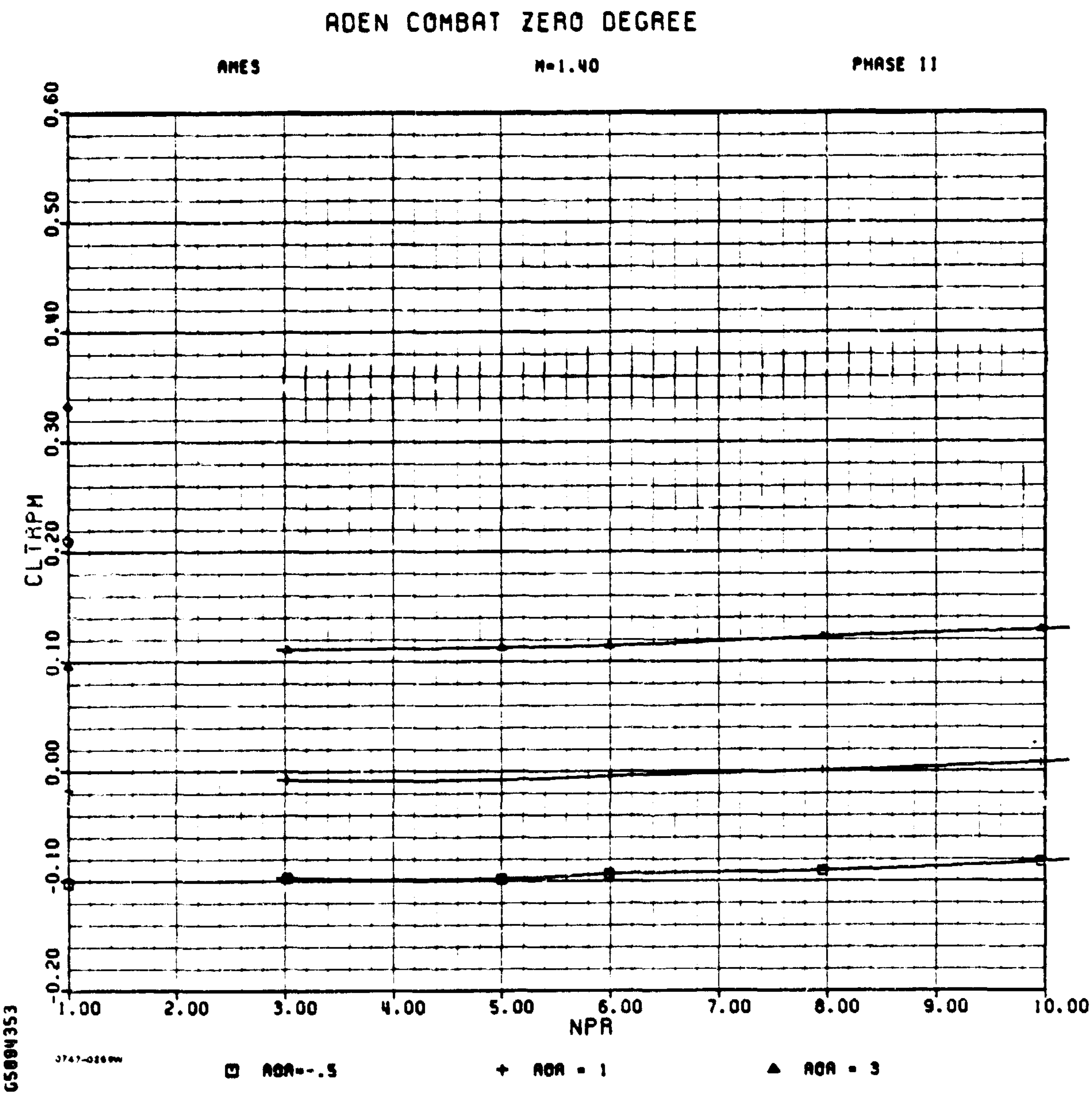
□ NPR=1.00 + NPR=5.33 ▲ NPR=7.96

ORIGINAL PAGE IS OF POOR QUALITY

I-7(a)(cont.)

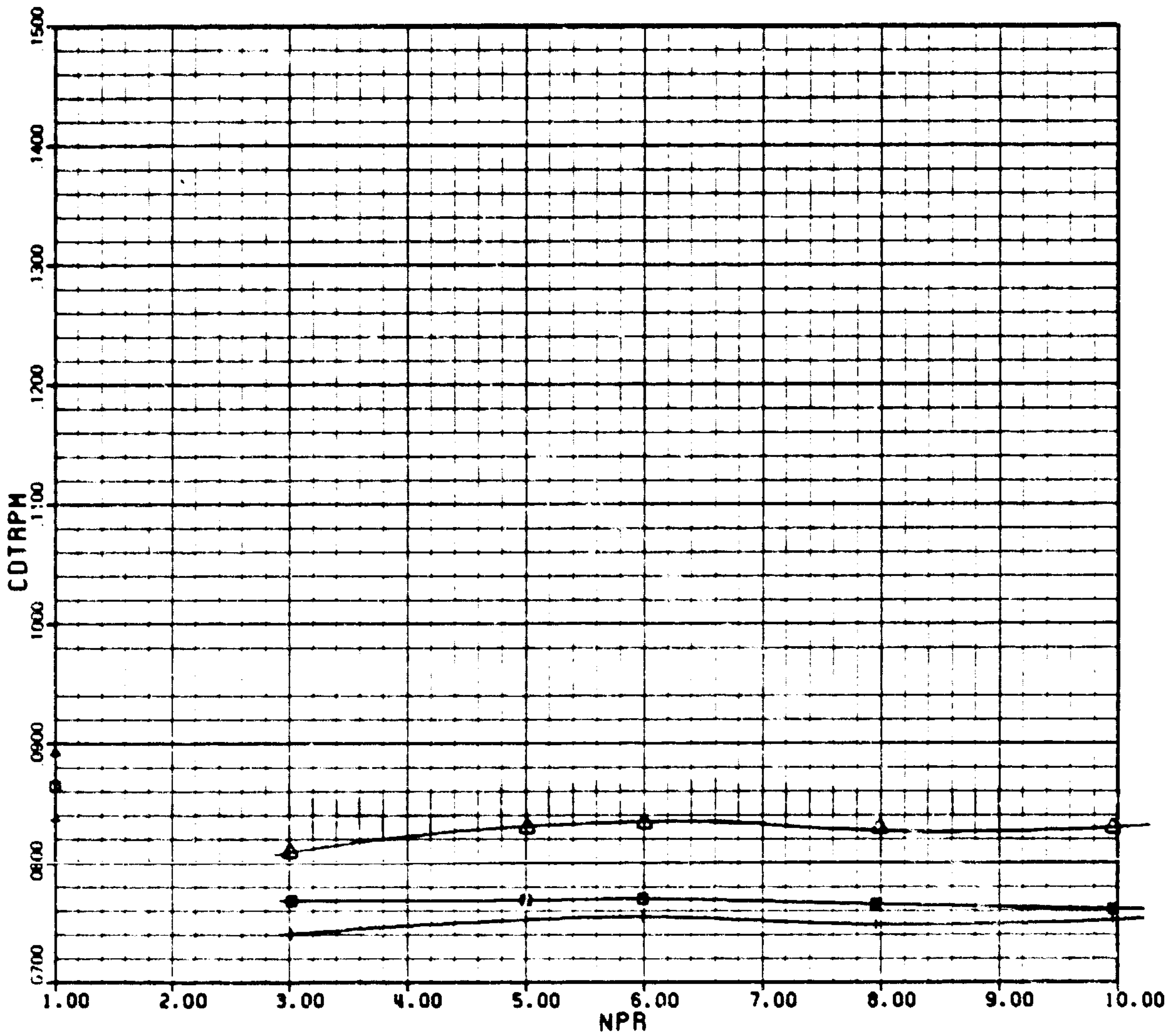

ADEN COMBAT ZERO DEGREE
AMES
M=1.40
PHASE II
CLTRPM
ALPHA
0747-0282W
NPR=1.00
NPR=9.96


ADEN COMBAT ZERO DEGREE
AMES
M=1.4G
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
NPR
0747-0283W
G5894353
AOA = 0
AOA = 2
AOA = 4


ADEN COMBAT ZERO DEGREE
AMES
M=1.40
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
NPR
G5804353
AOA=-.5
AOA = 1
AOA = 3

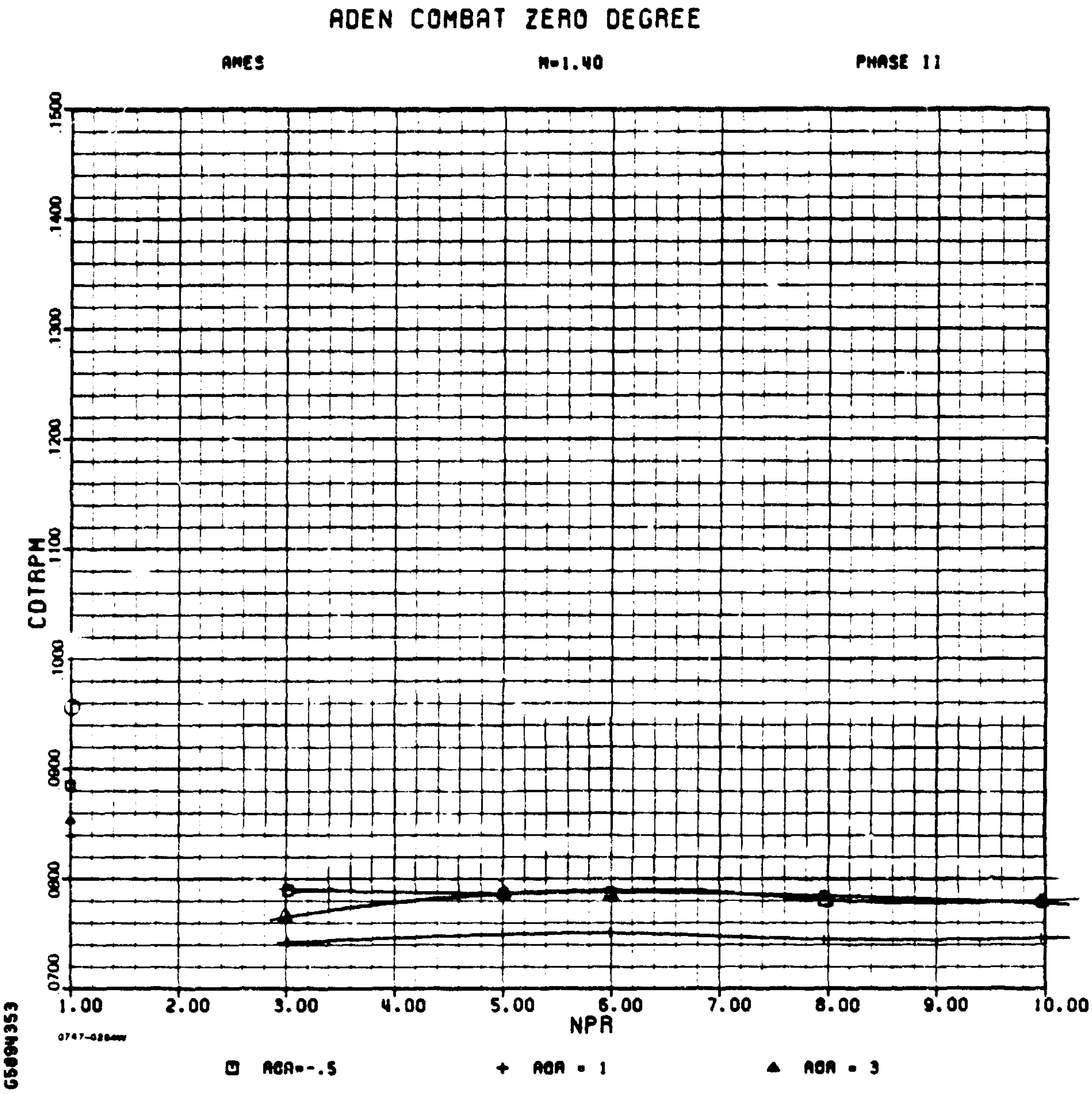
ADEN COMBAT ZERO DEGREE

AMES M=1.40 PHASE II



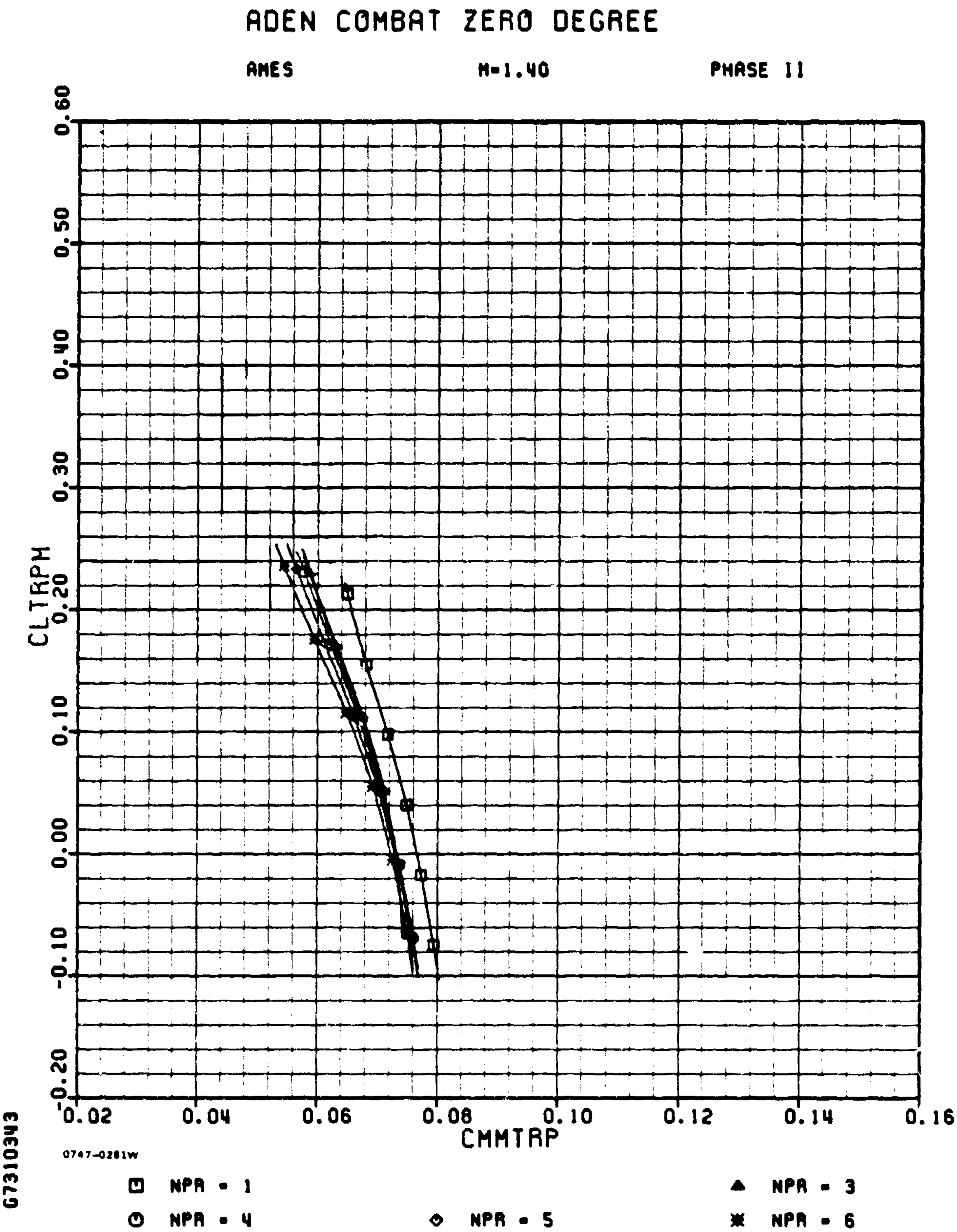
G5894353

▫ AOA = 0 + AOA = 2 ▲ AOA = 4

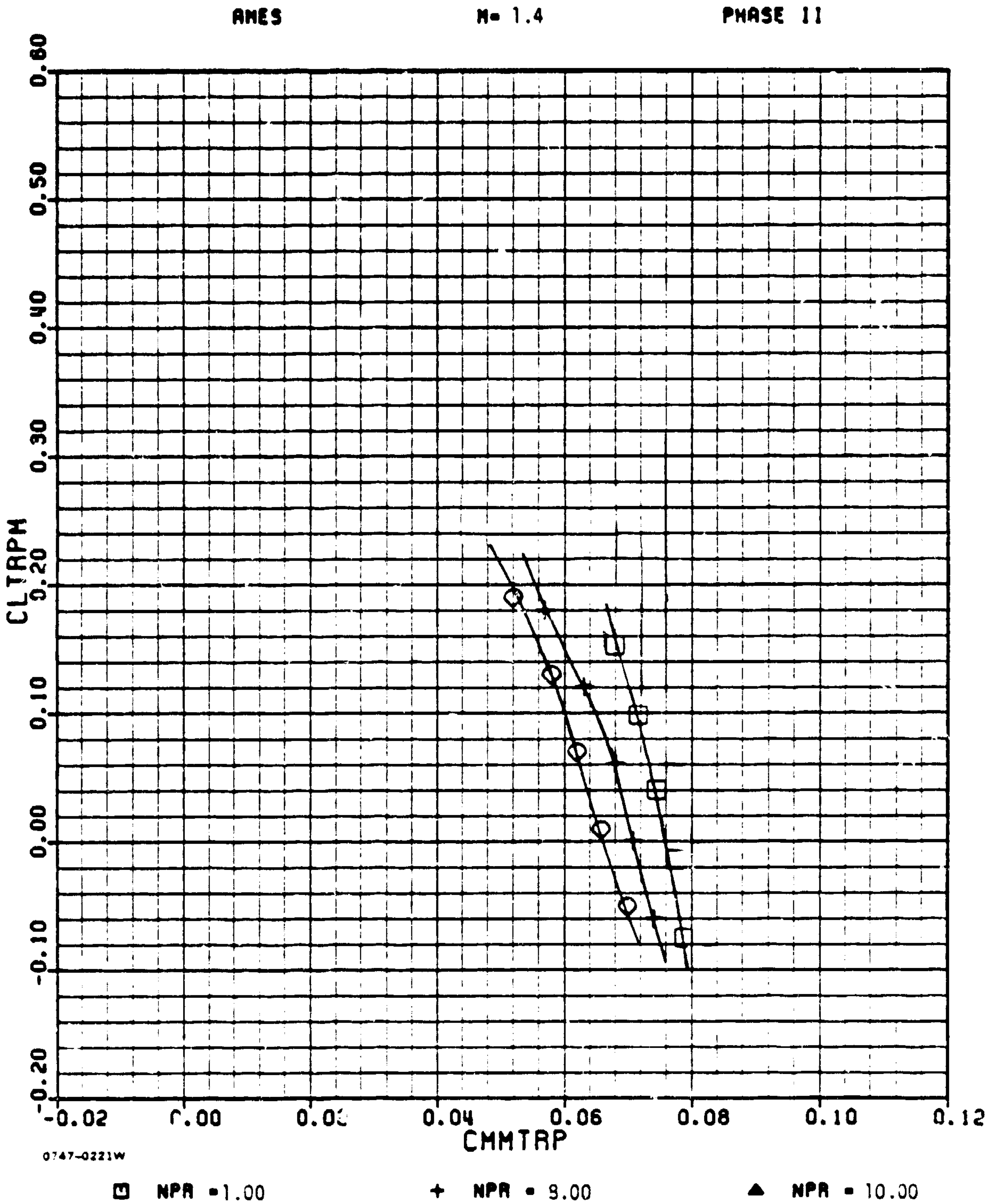


ADEN COMBAT ZERO DEGREE
AMES
M=1.40
PHASE II
CDTRPM
NPR
.0700
.0800
.0900
.1000
.1100
.1200
.1300
.1400
.1500
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
AOA=-.5
AOA = 1
AOA = 3
G5804353

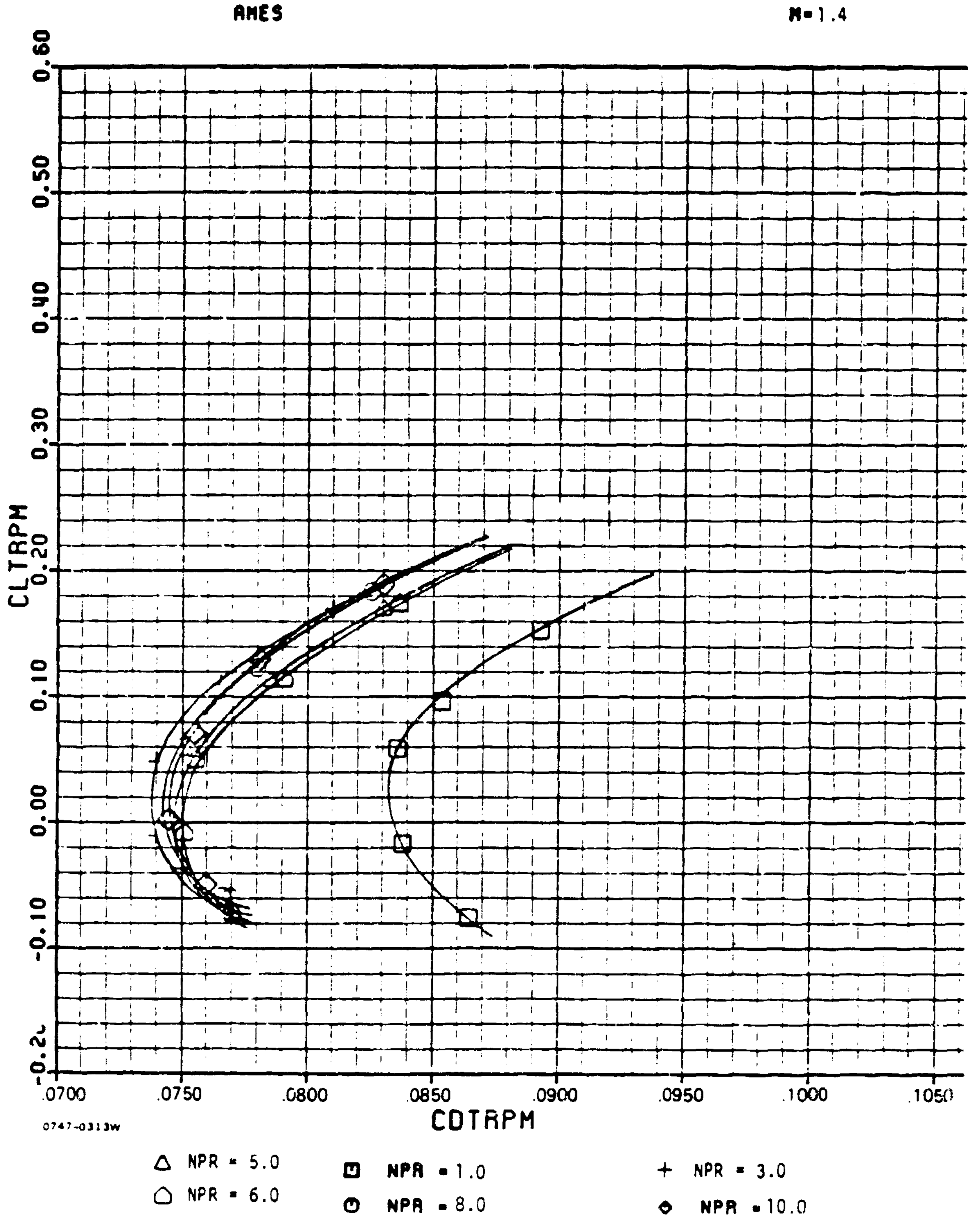
I-7(c)(concl.)

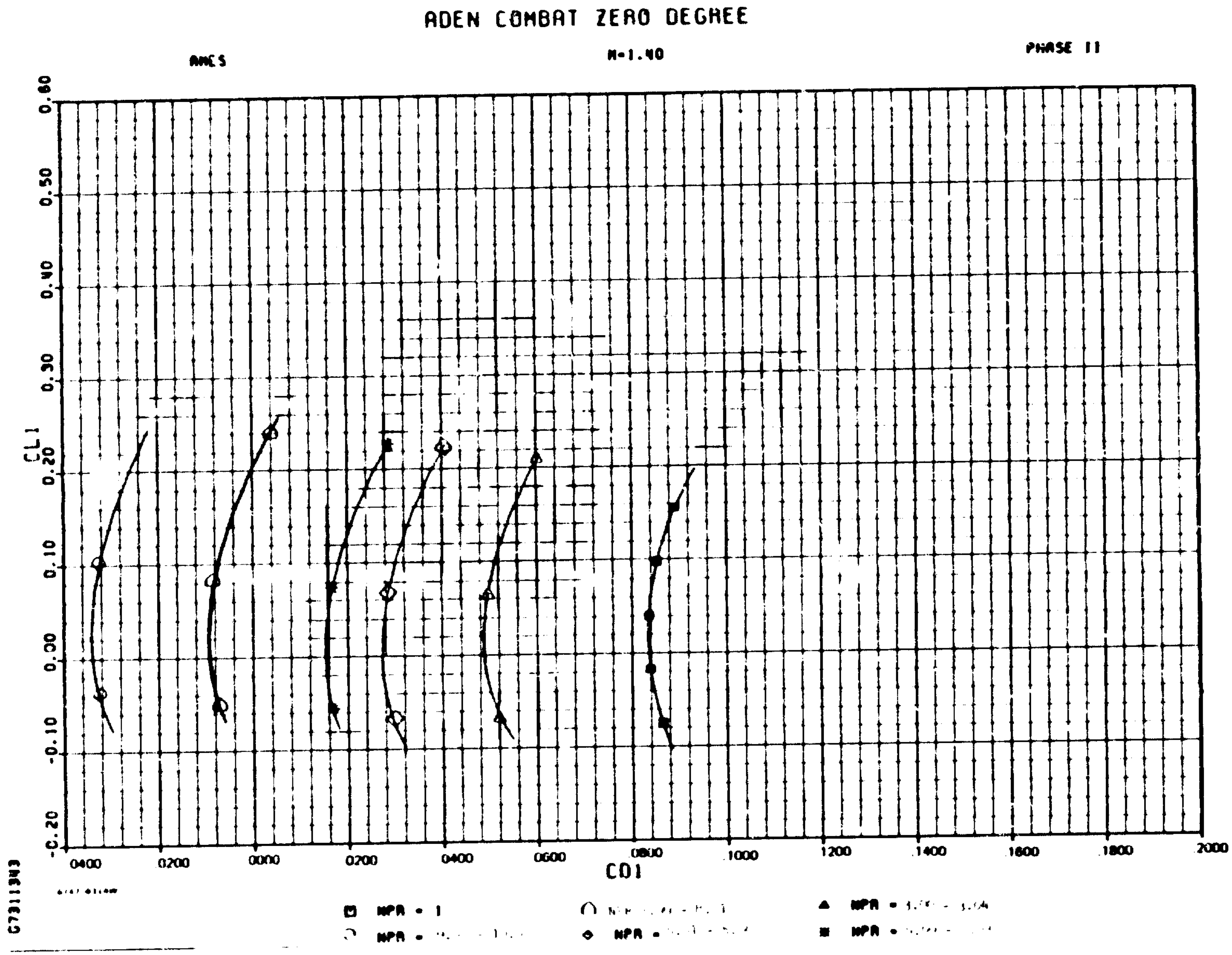

ADEN COMBAT ZERO DEGREE
AMES
M=1.40
PHASE II
CLTRPH
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
CMMTRP
G7310343
0747-0281W
NPR = 1
NPR = 3
NPR = 4
NPR = 5
NPR = 6

ADEN COMBAT ZERO DEGREE



ADEN COMBAT ZERO DEGREE

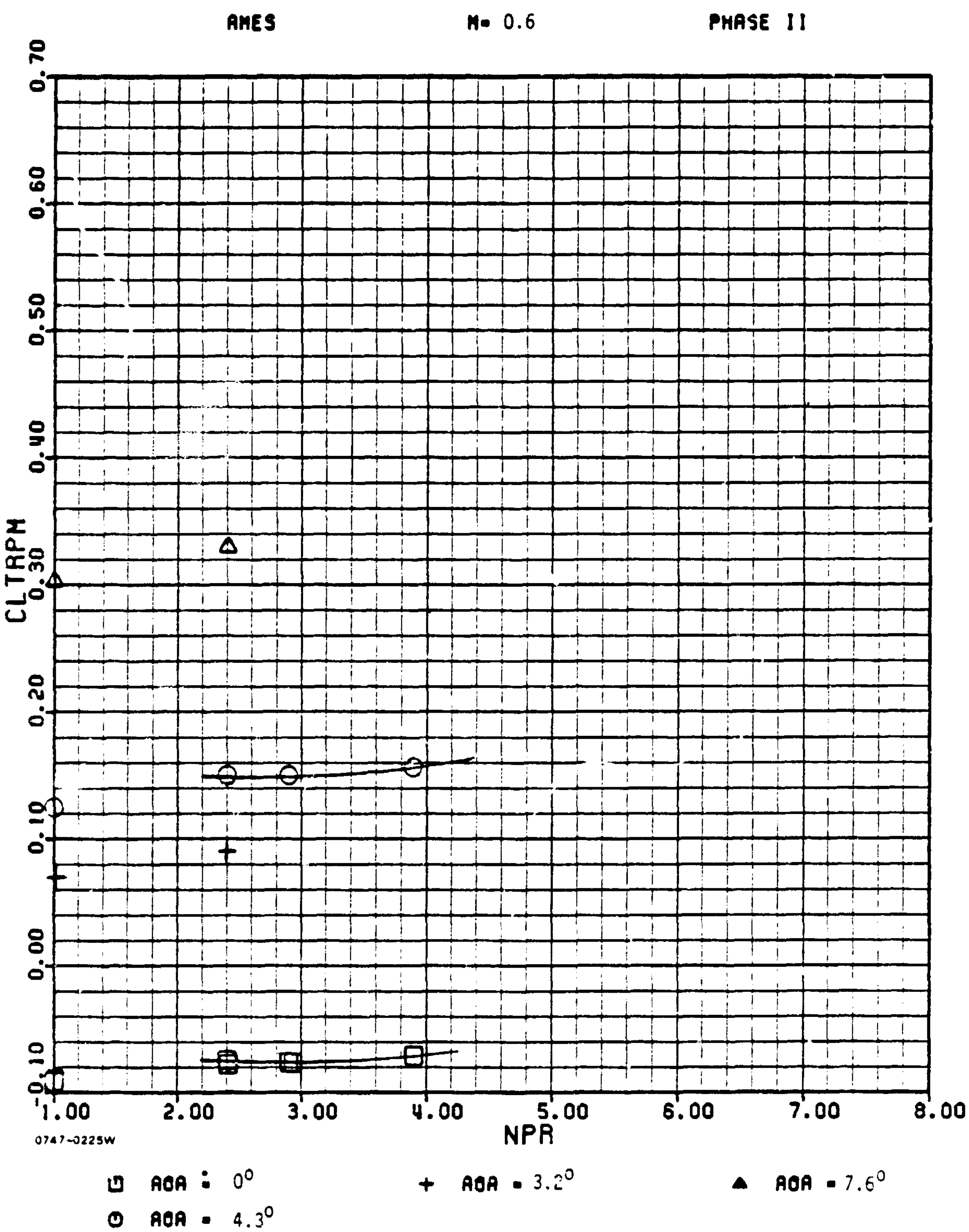



ADEN COMBAT ZERO DEGREE
AMES
M=1.40
PHASE II
CL1
CD1
NPR = 1
NPR =
NPR =
NPR =
NPR =
G7311343

APPENDIX J

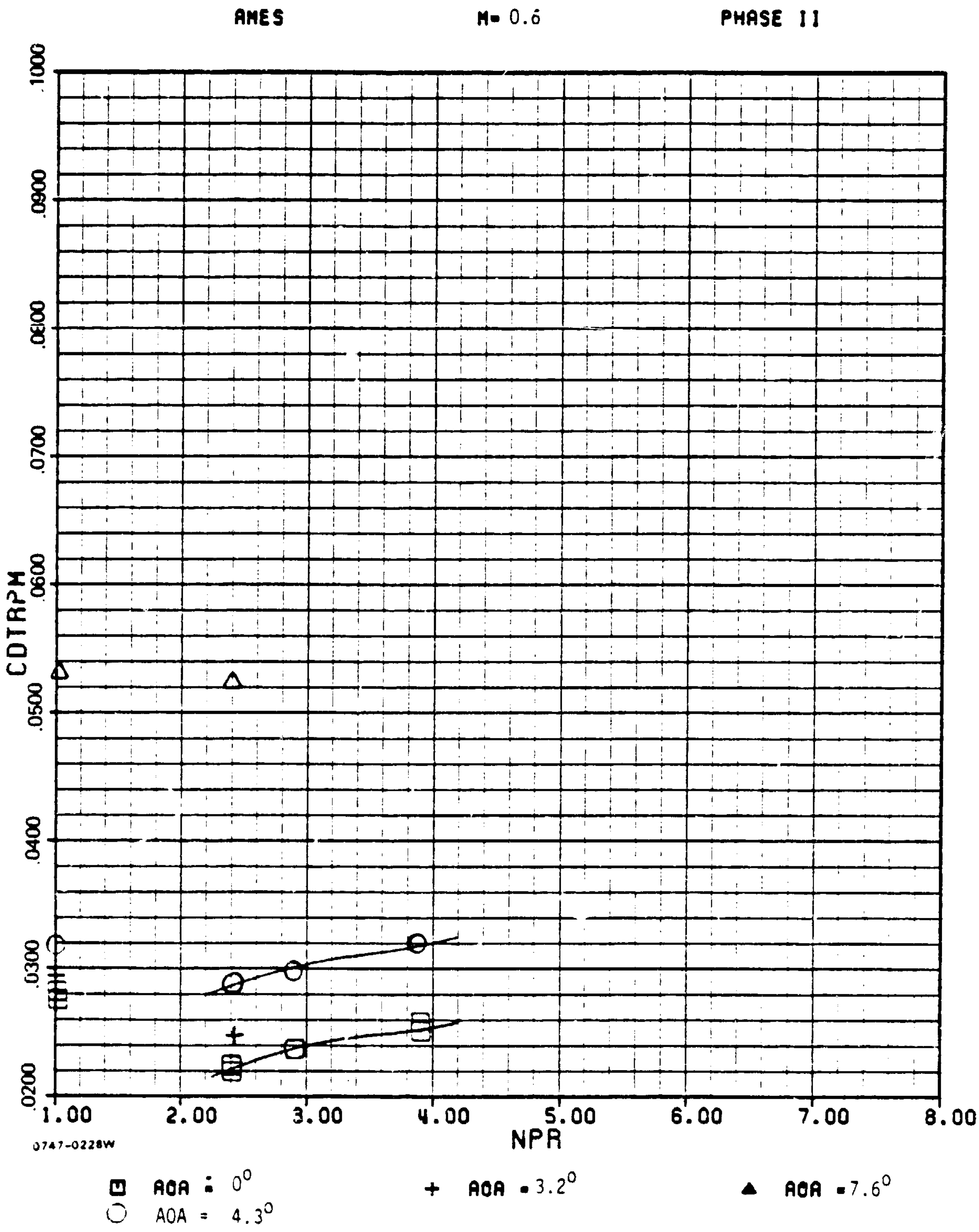
ADEN COMBAT 0° ALT WIND-ON DATA

ADEN COMBAT ZERO DEGREE ALT.

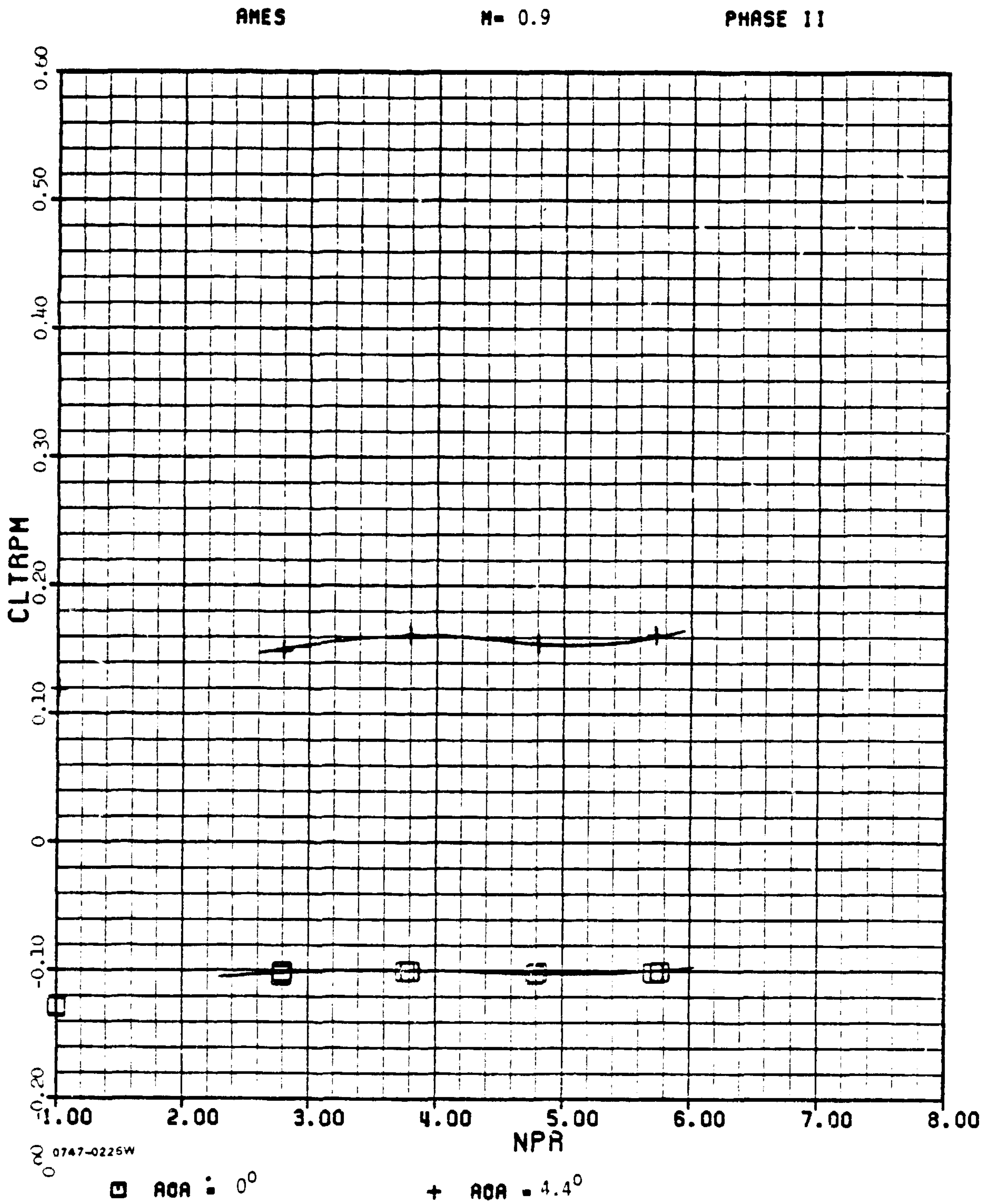


J-1(a)

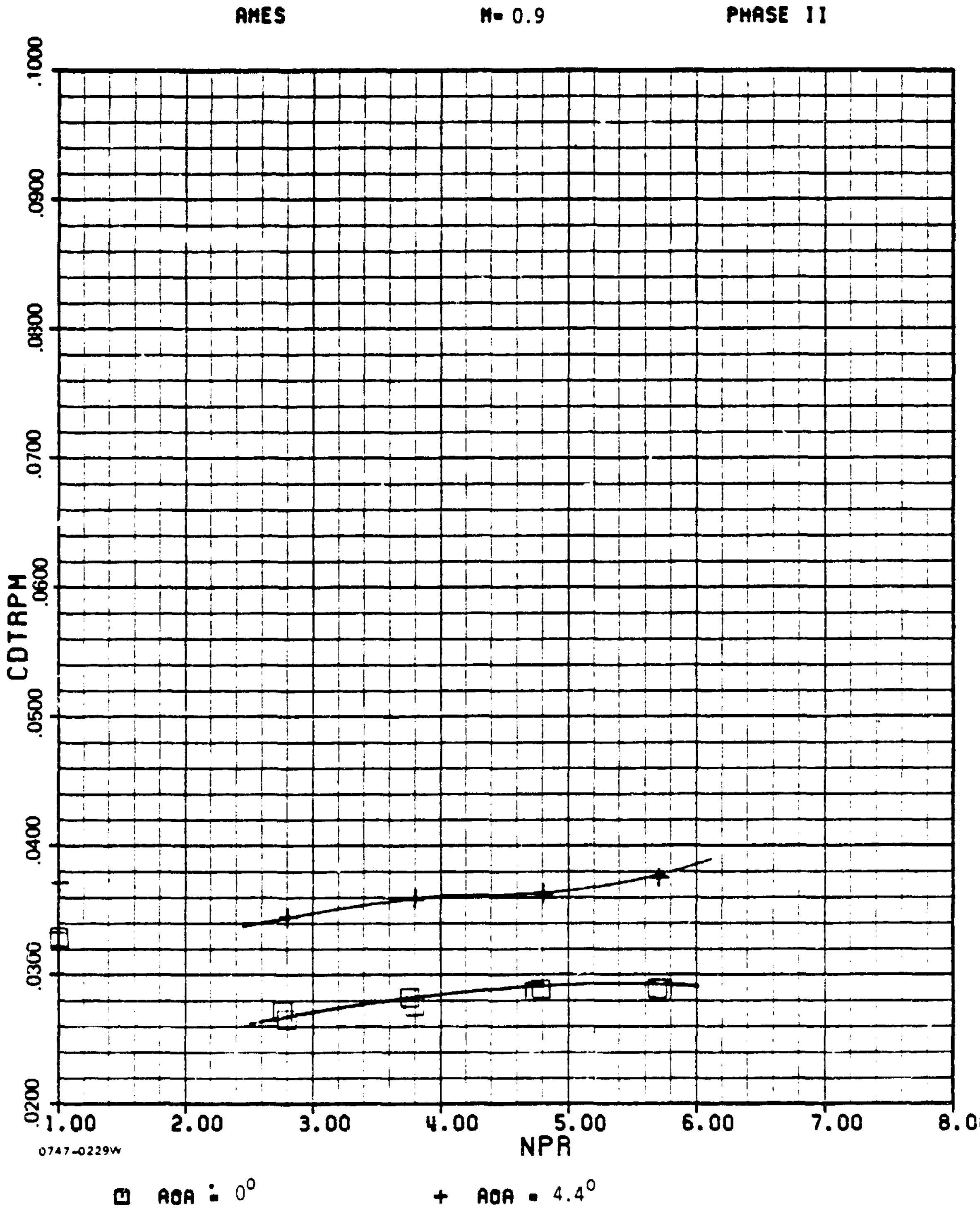
ADEN COMBAT ZERO DEGREE ALT.



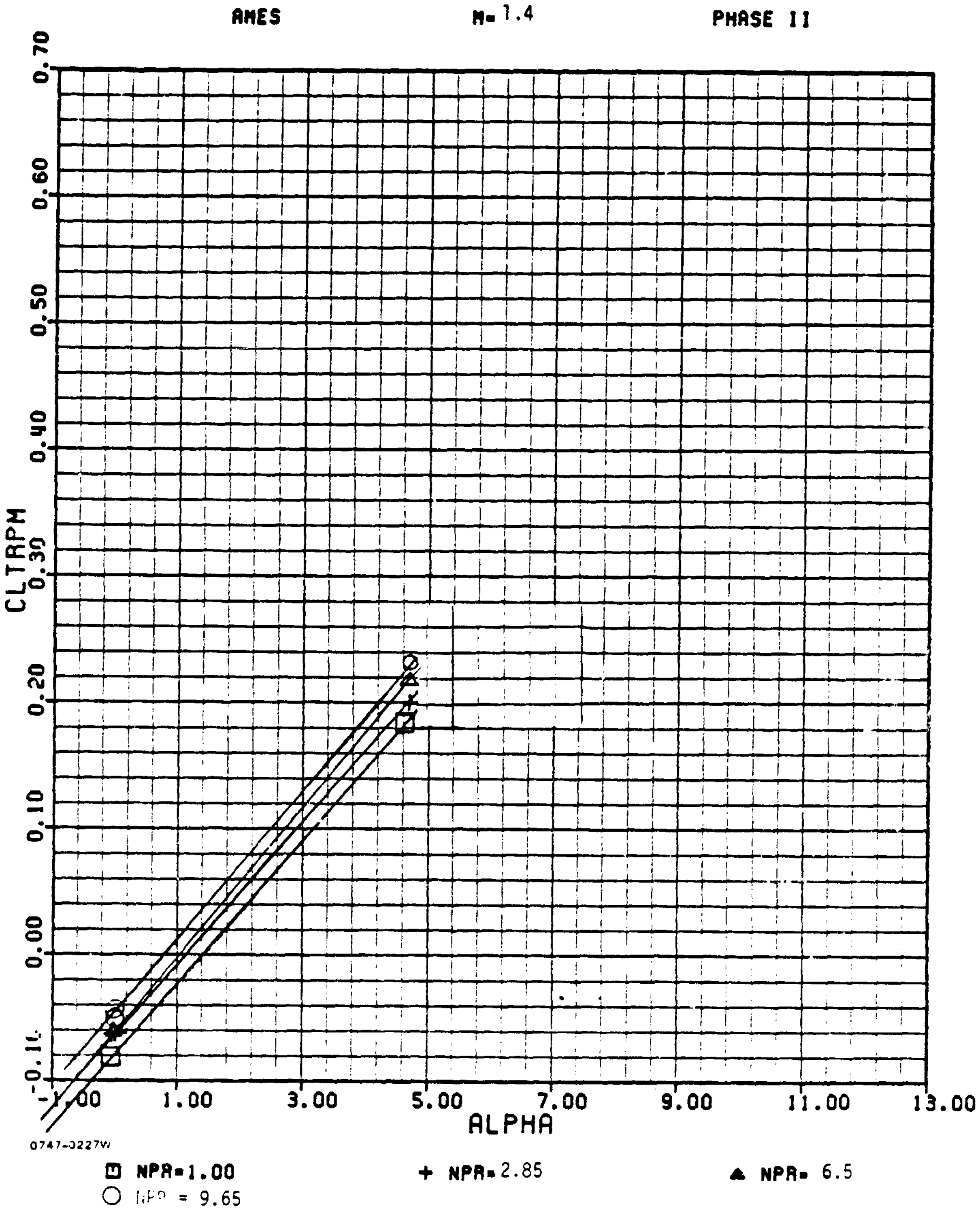
ADEN COMBAT ZERO DEGREE ALT.



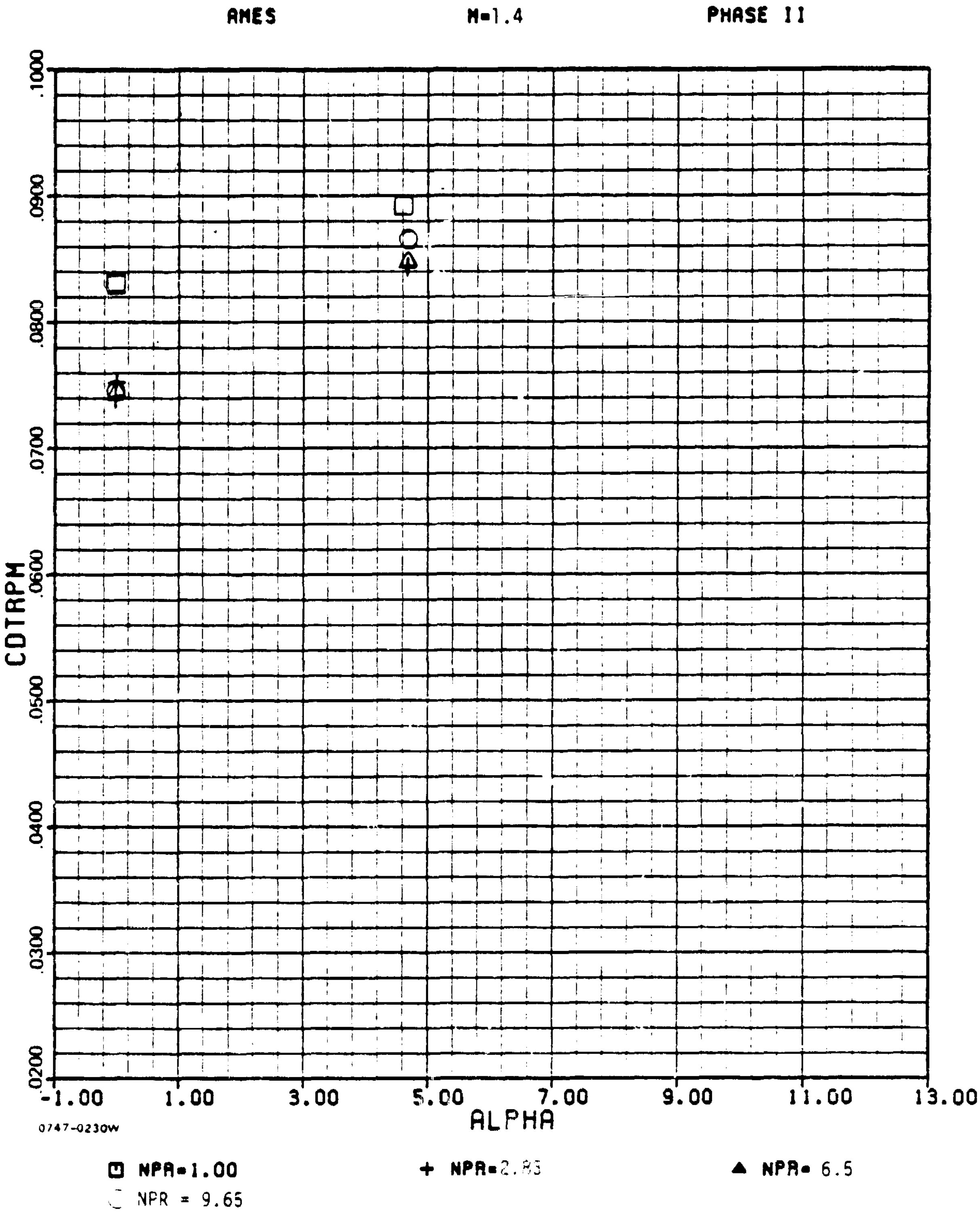
ADEN COMBAT ZERO DEGREE ALT.



ADEN COMBAT ZERO DEGREE ALT.



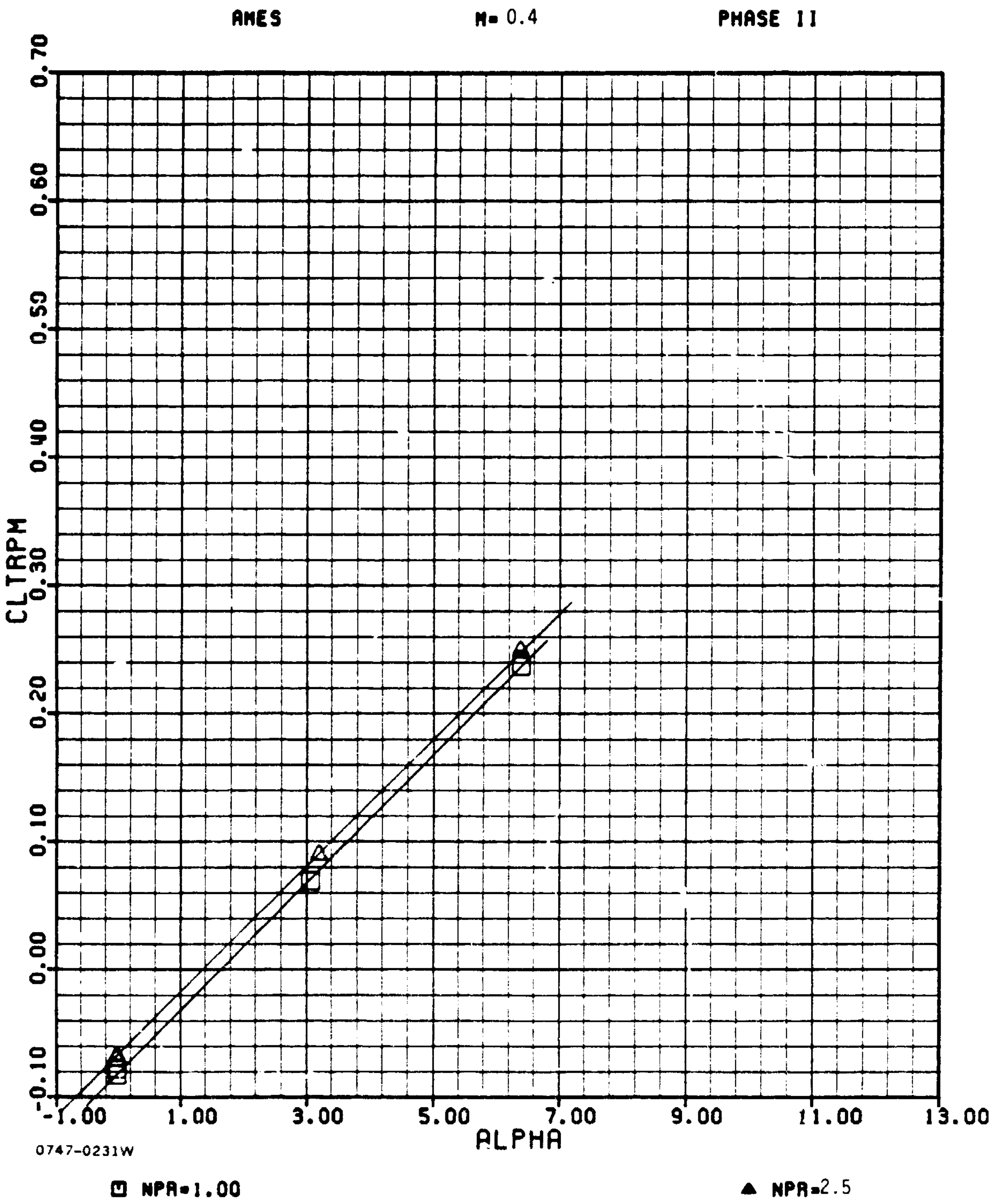
ADEN COMBAT ZERO DEGREE ALT.



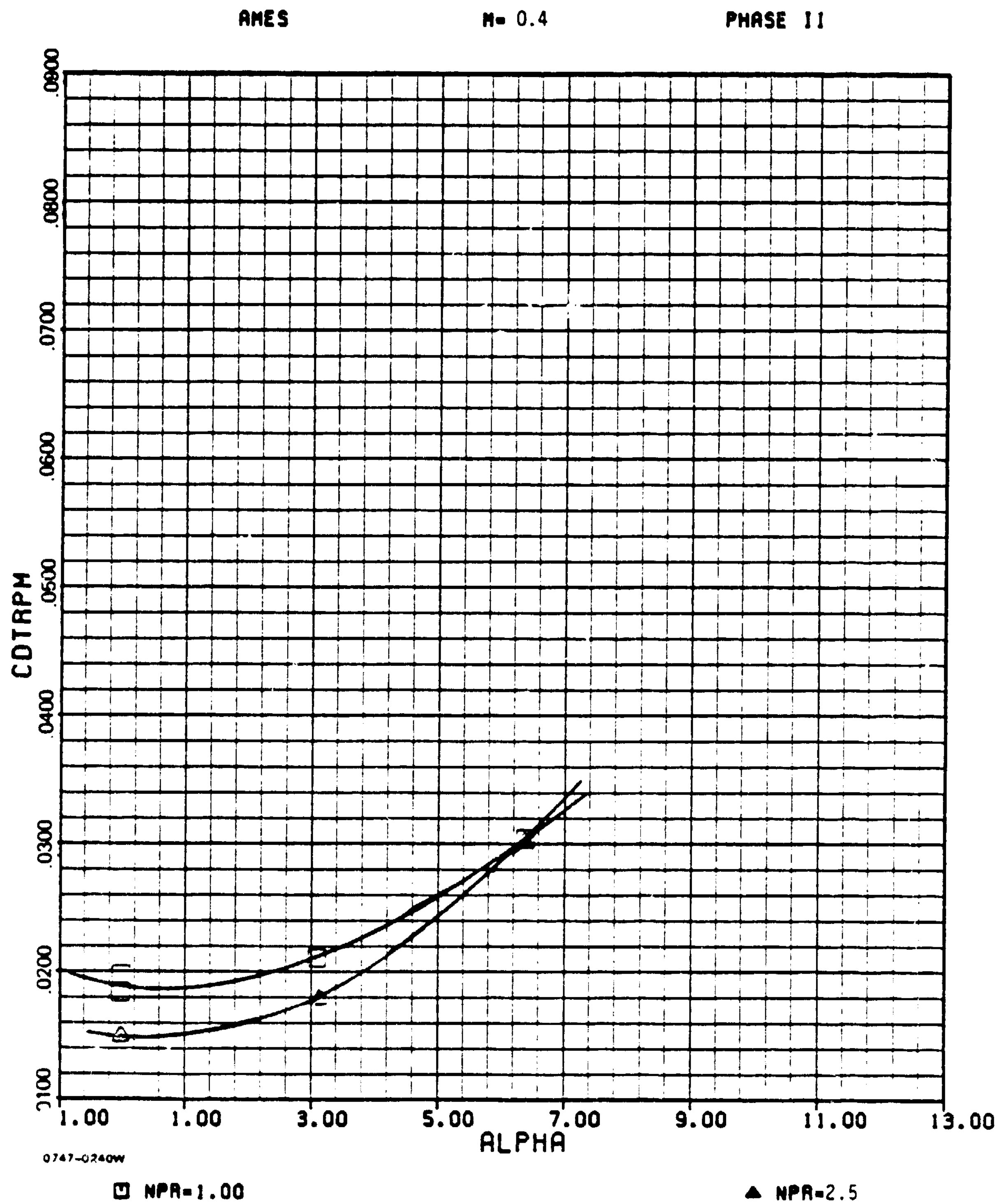
APPENDIX K

ADEN COMBAT 0° + I/F WIND-ON DATA

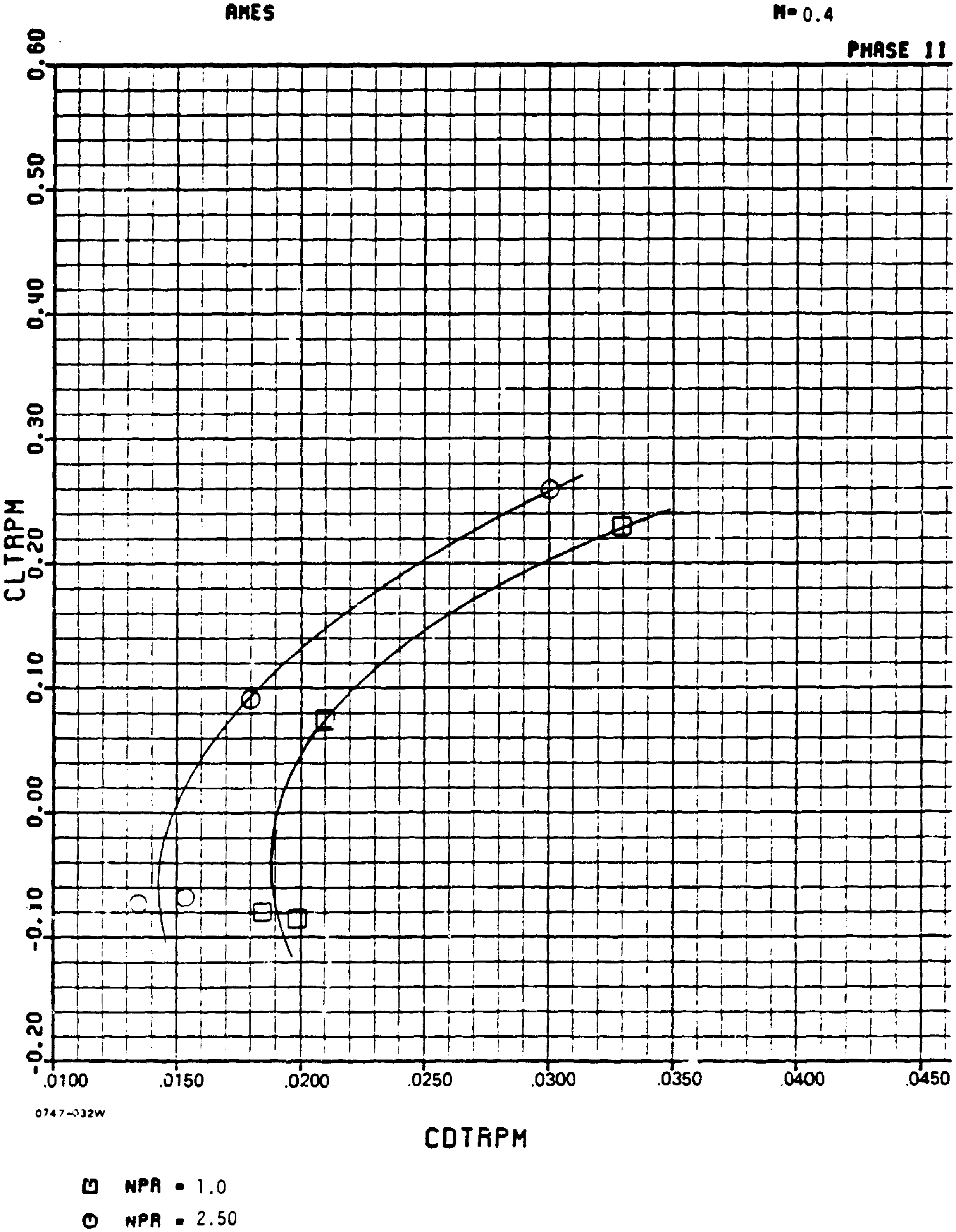
ADEN COMBAT ZERO DEGREE + I/F



ADEN COMBAT ZERO DEGREE + I/F

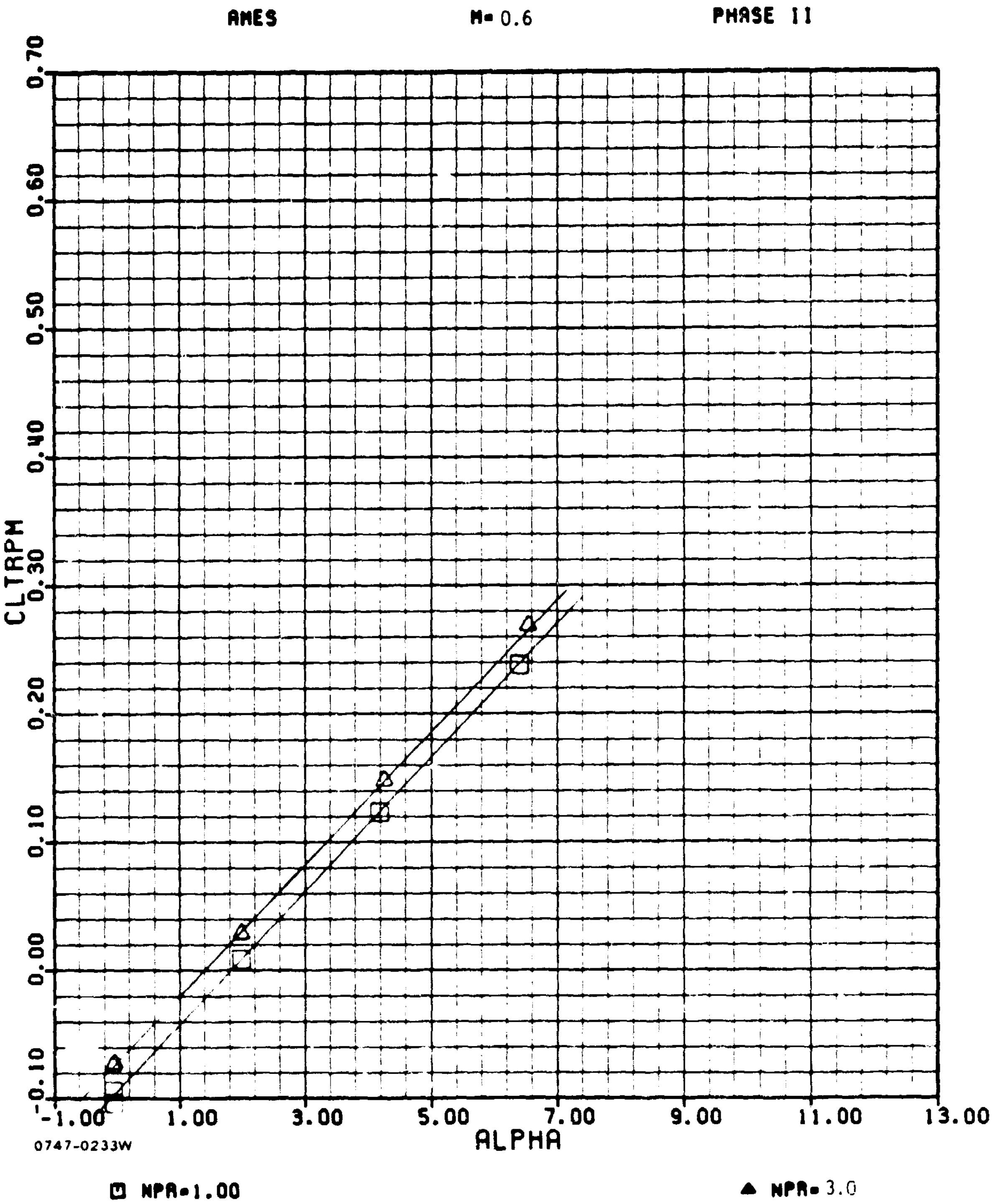


ADEN COMBAT ZERO DEGREE + I/F

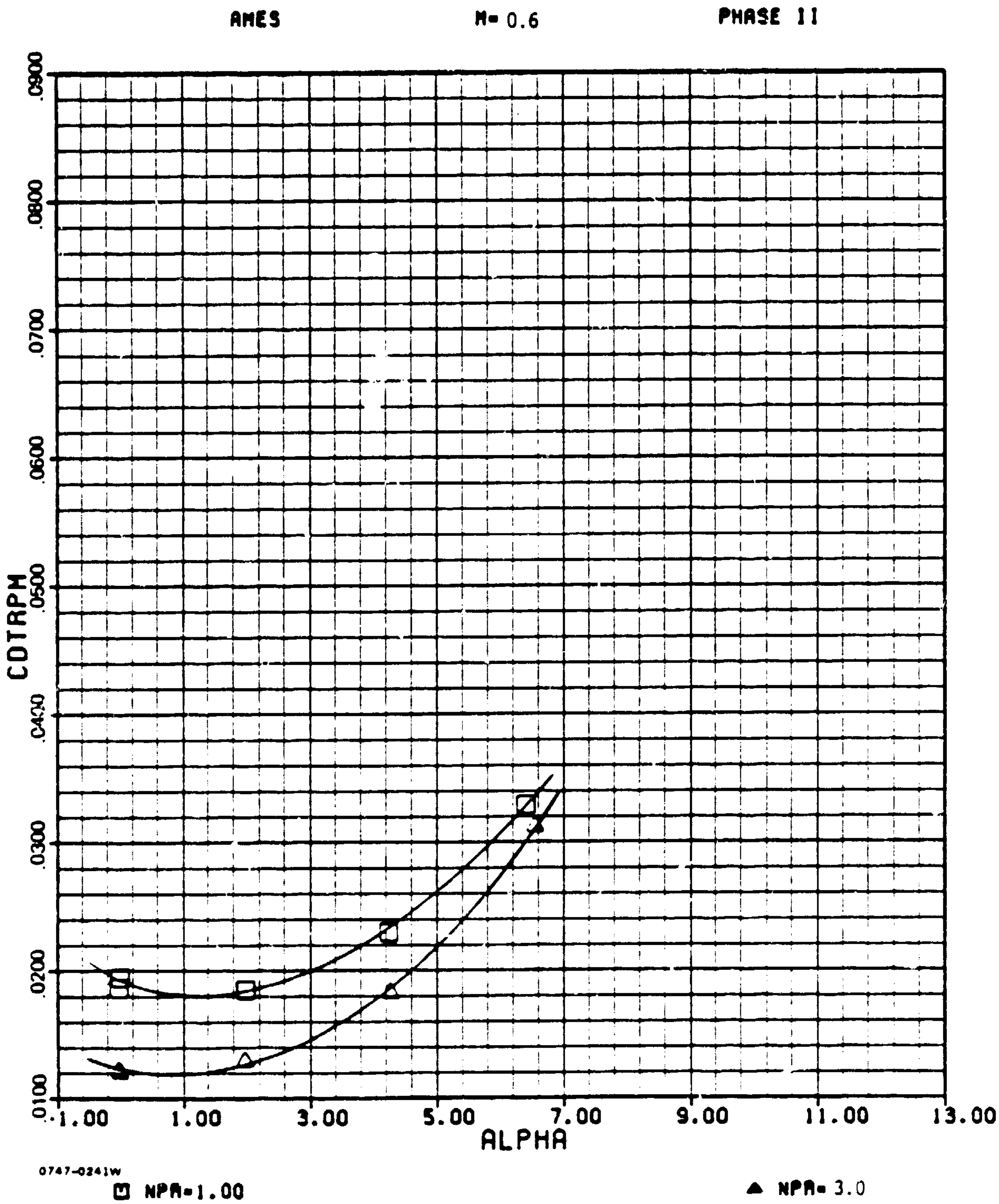


K-1(c)

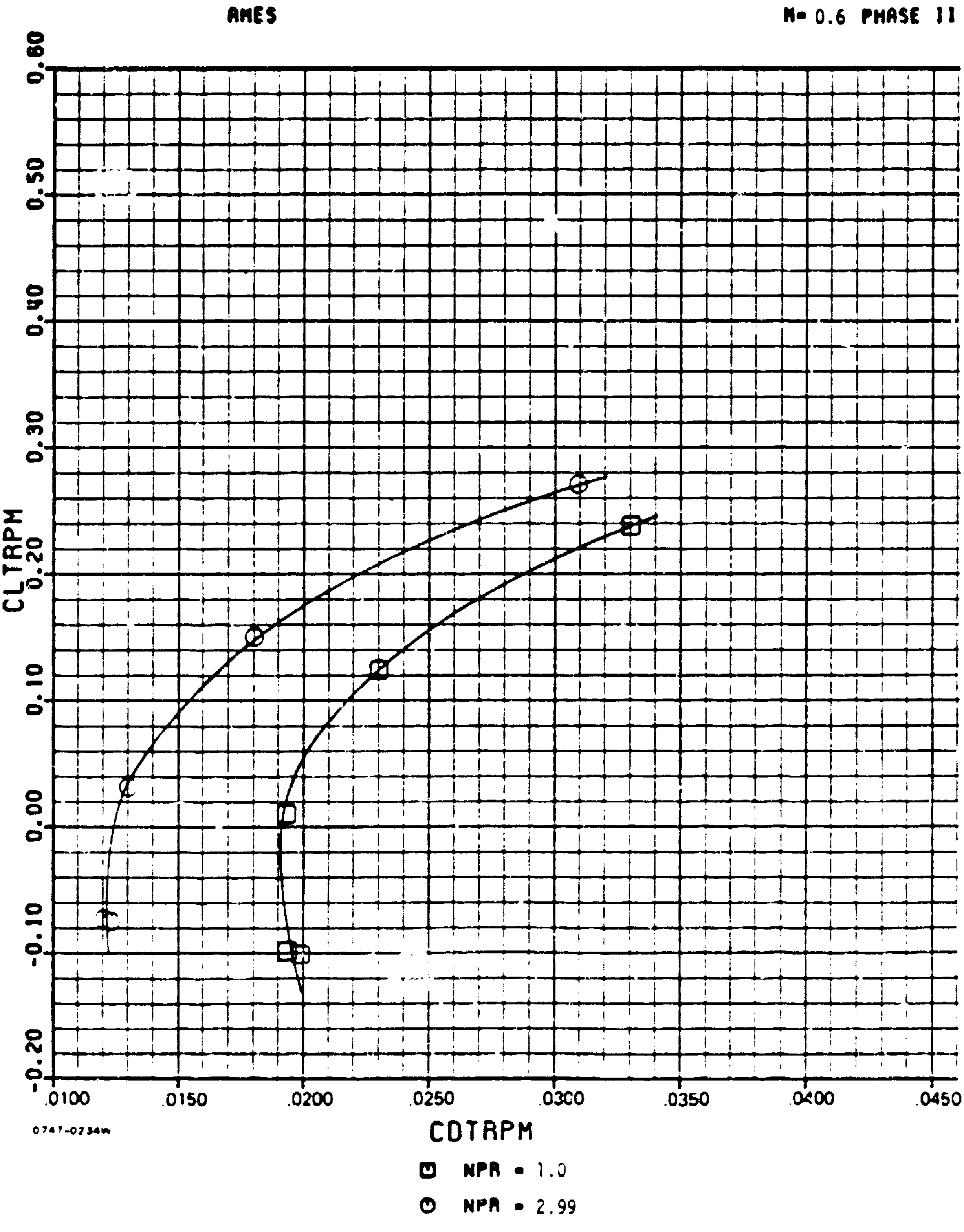
ADEN COMBAT ZERO DEGREE + I/F



ADEN COMBAT ZERO DEGREE + I/F

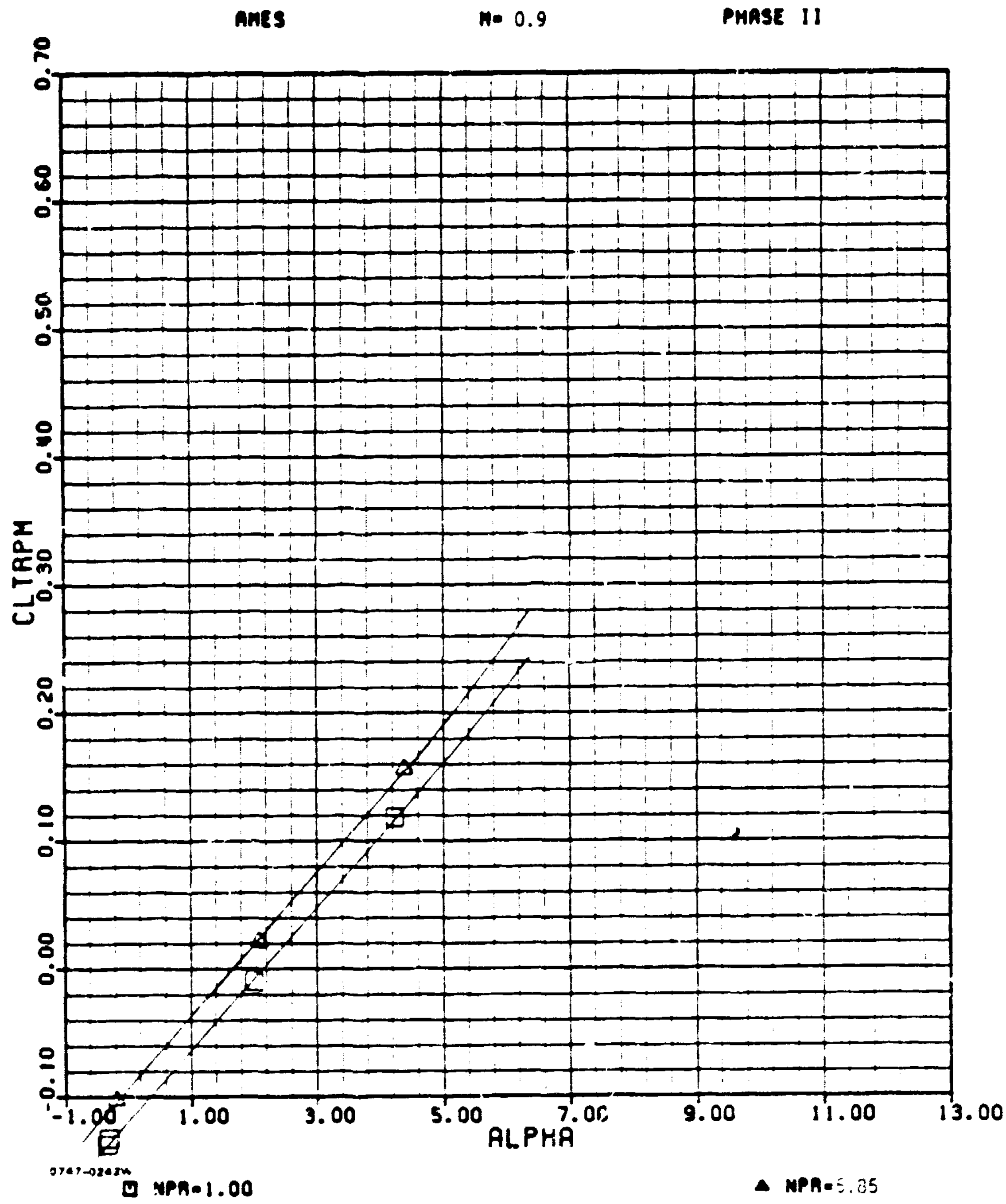


ADEN COMBAT ZERO DEGREE + I/F

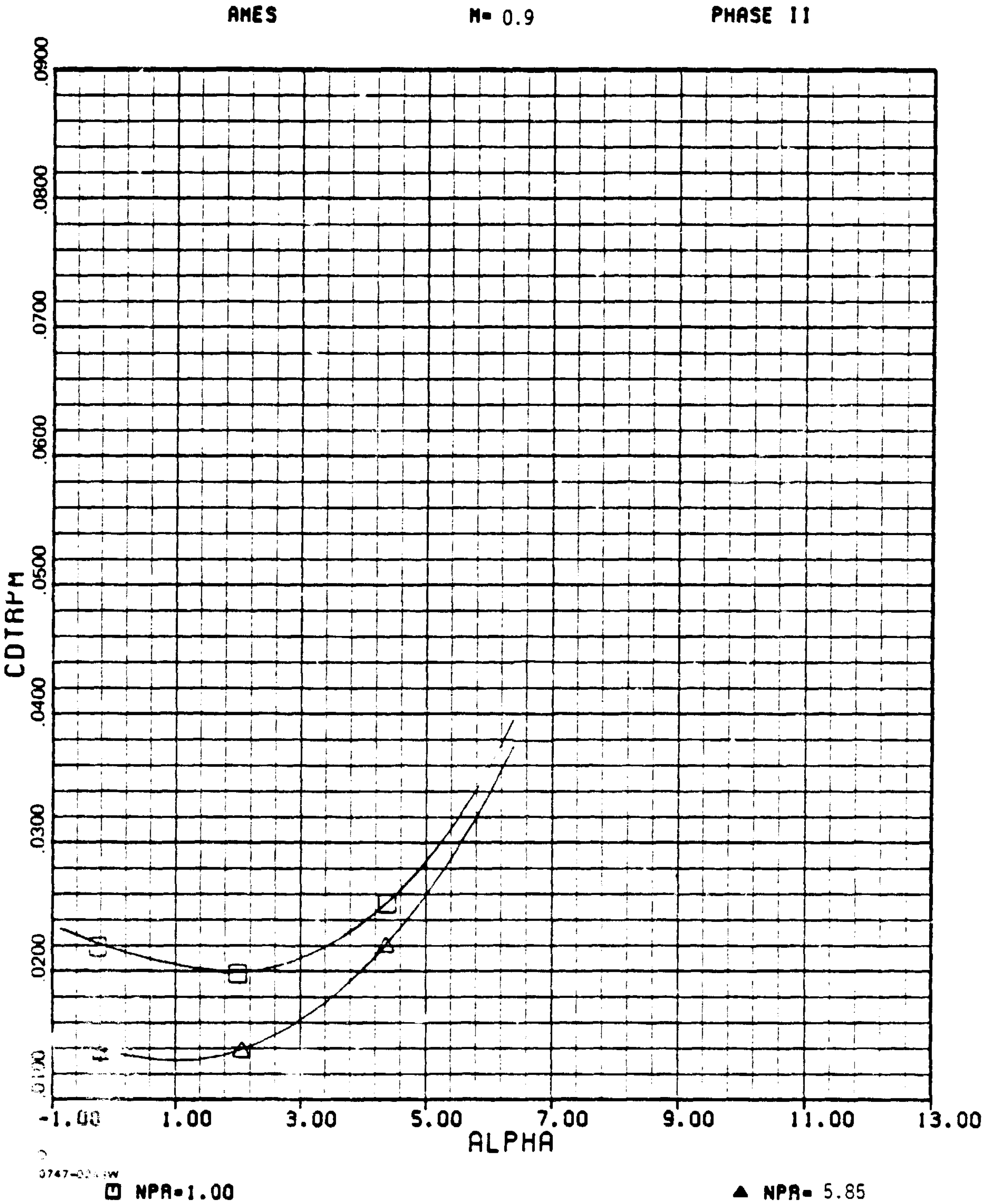


K-2(c)

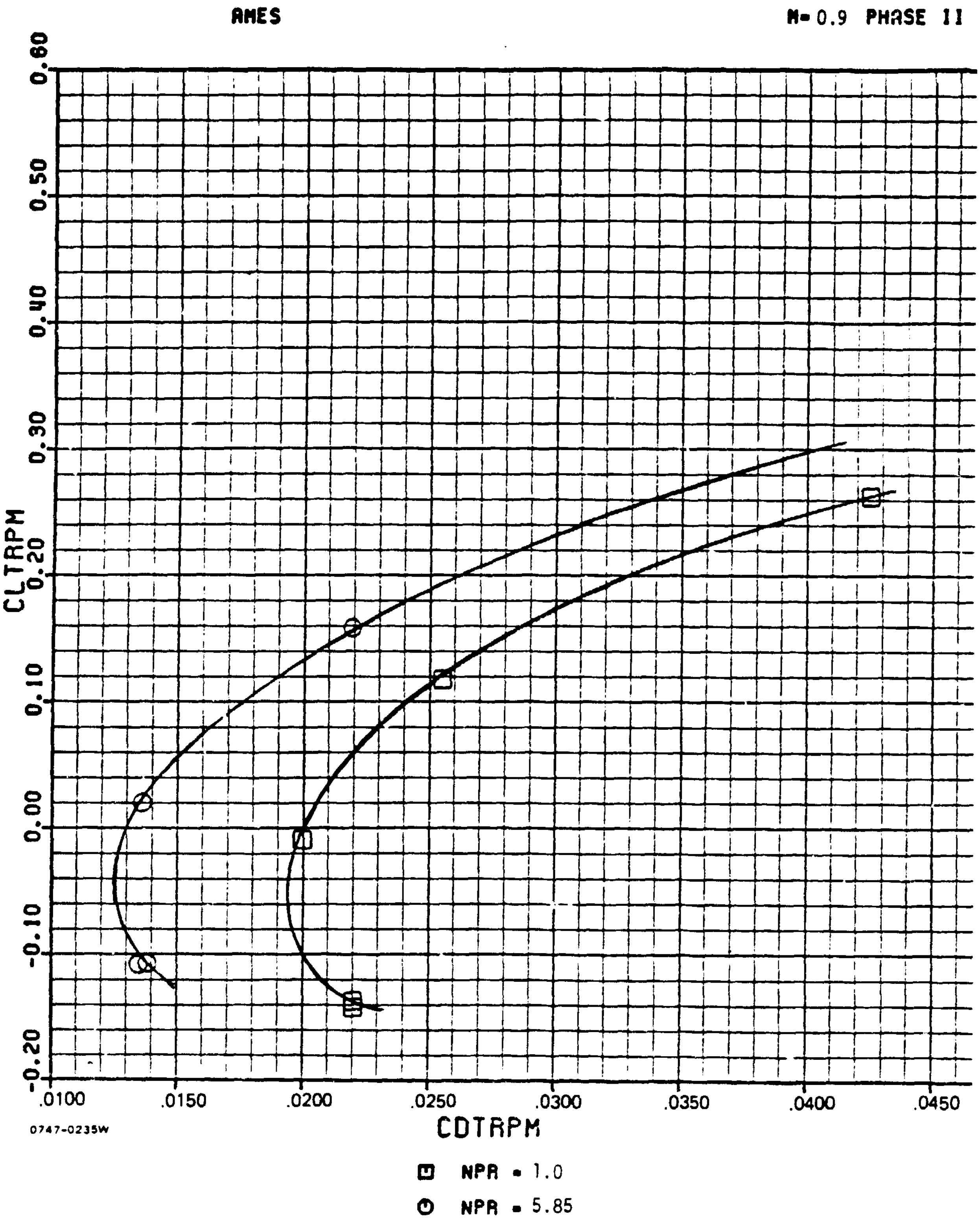
ADEN COMBAT ZERO DEGREE + I/F



ADEN COMBAT ZERO DEGREE + I/F

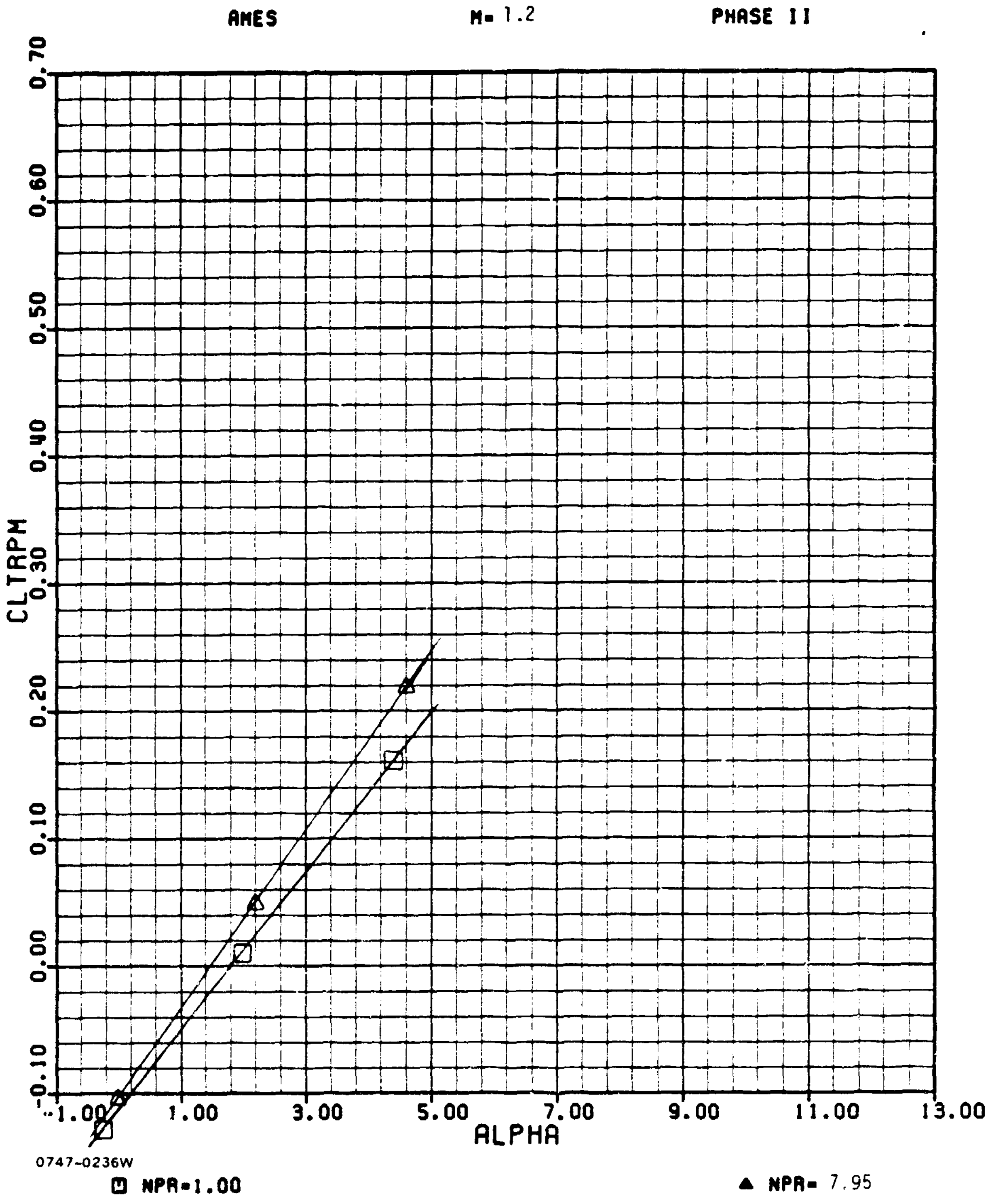


ADEN COMBAT ZERO DEGREE + I/F



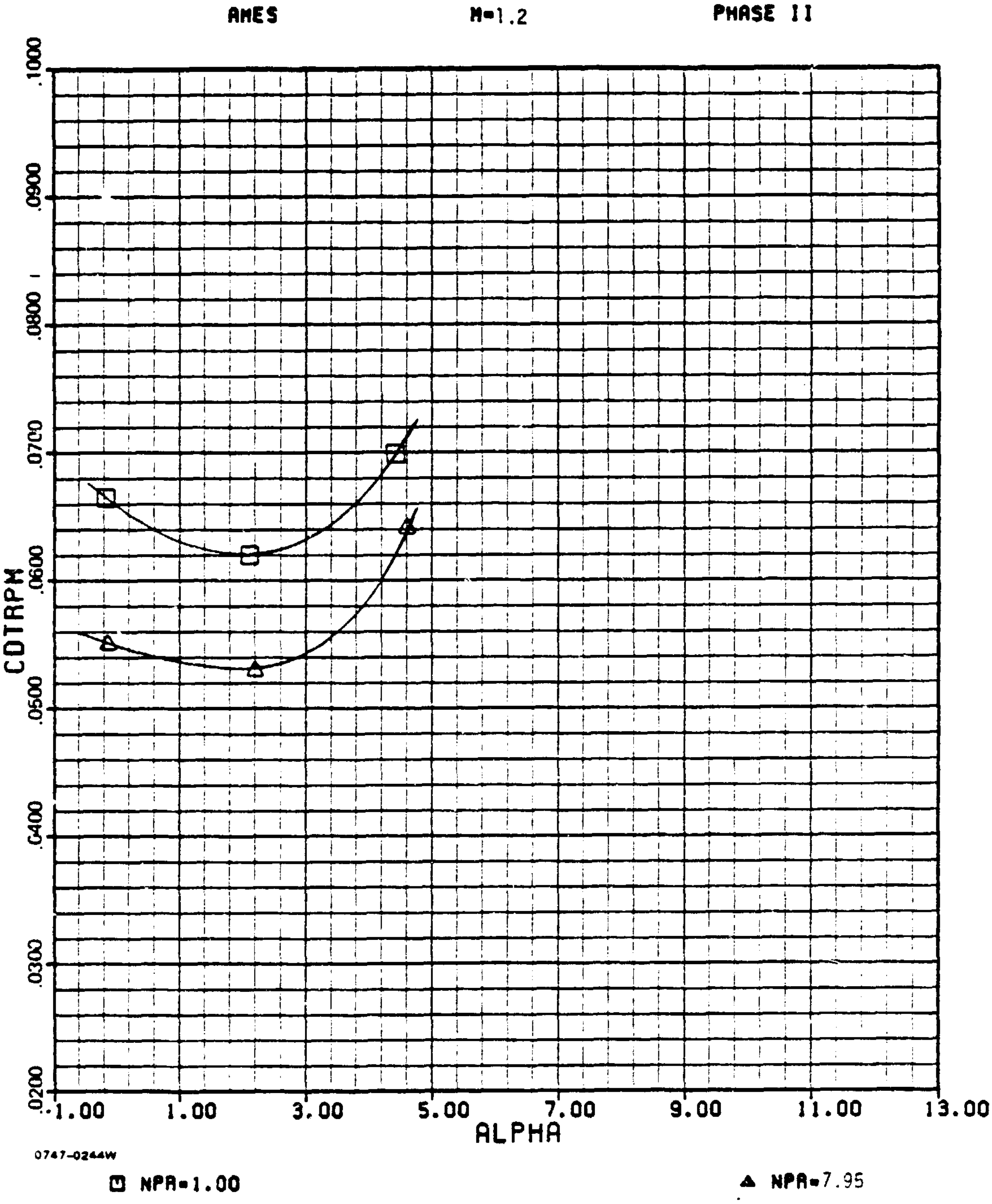
K-3(c)

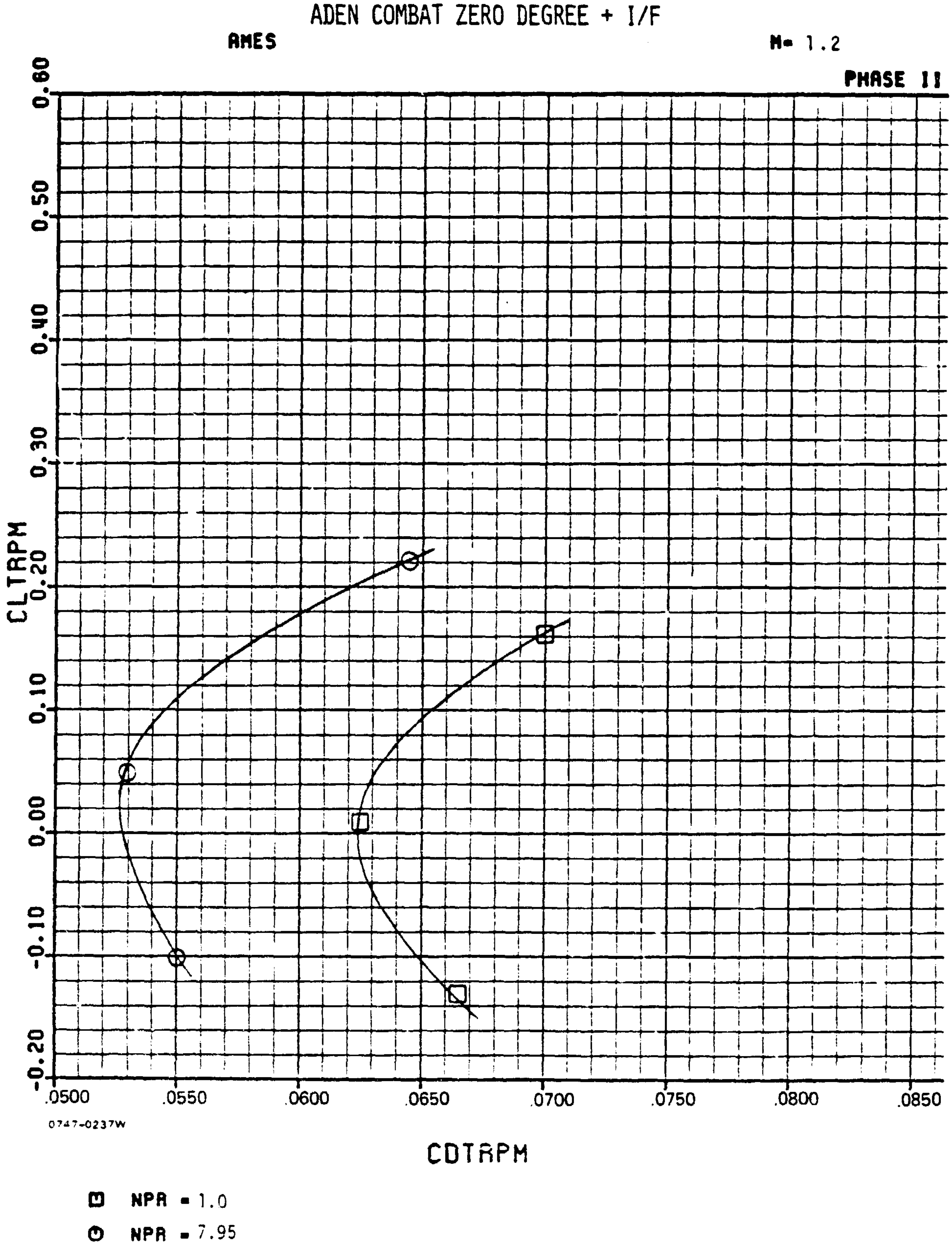
ADEN COMBAT ZERO DEGREE + I/F 4520



K-4(a)

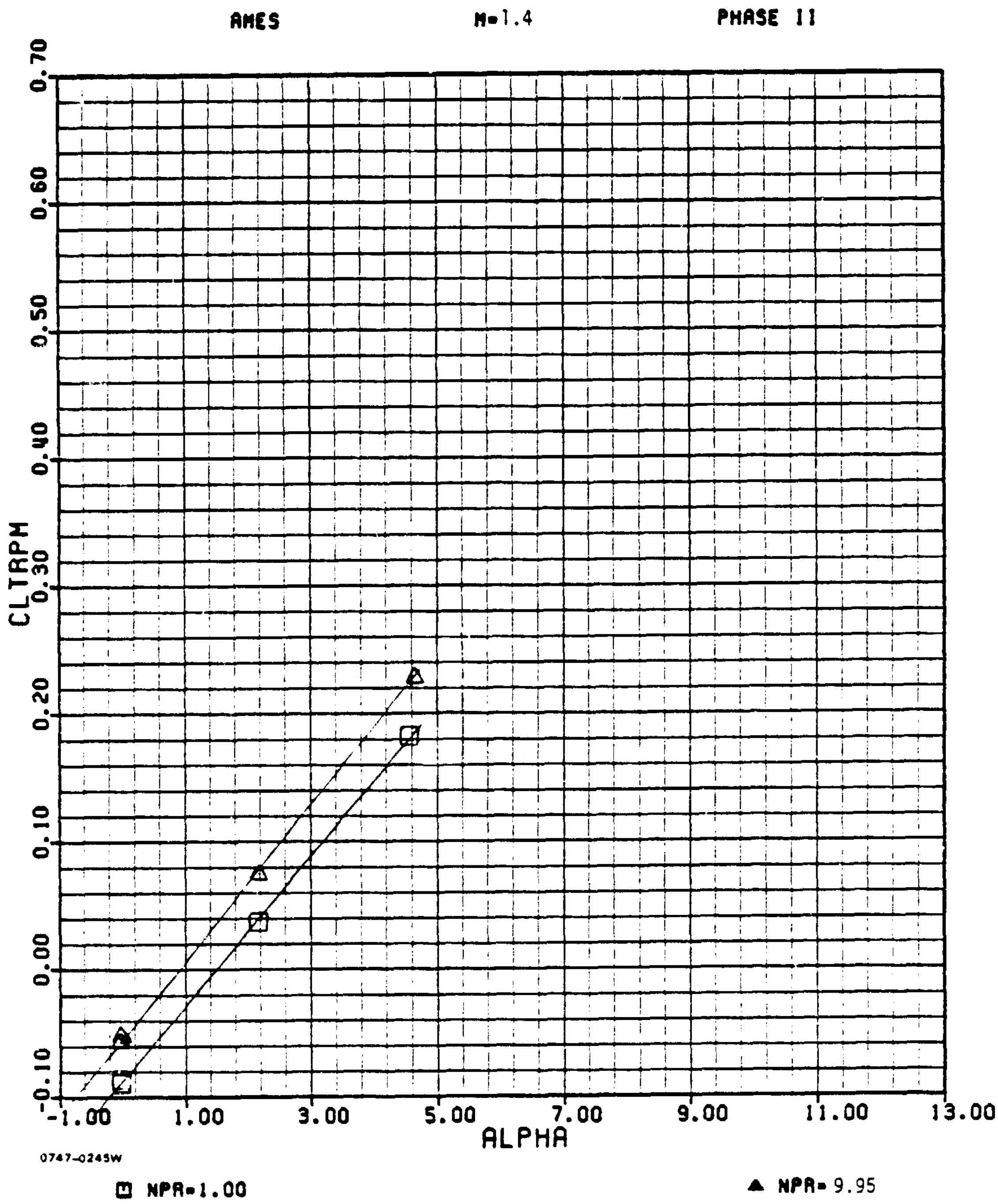
ADEN COMBAT ZERO DEGREE + I/F



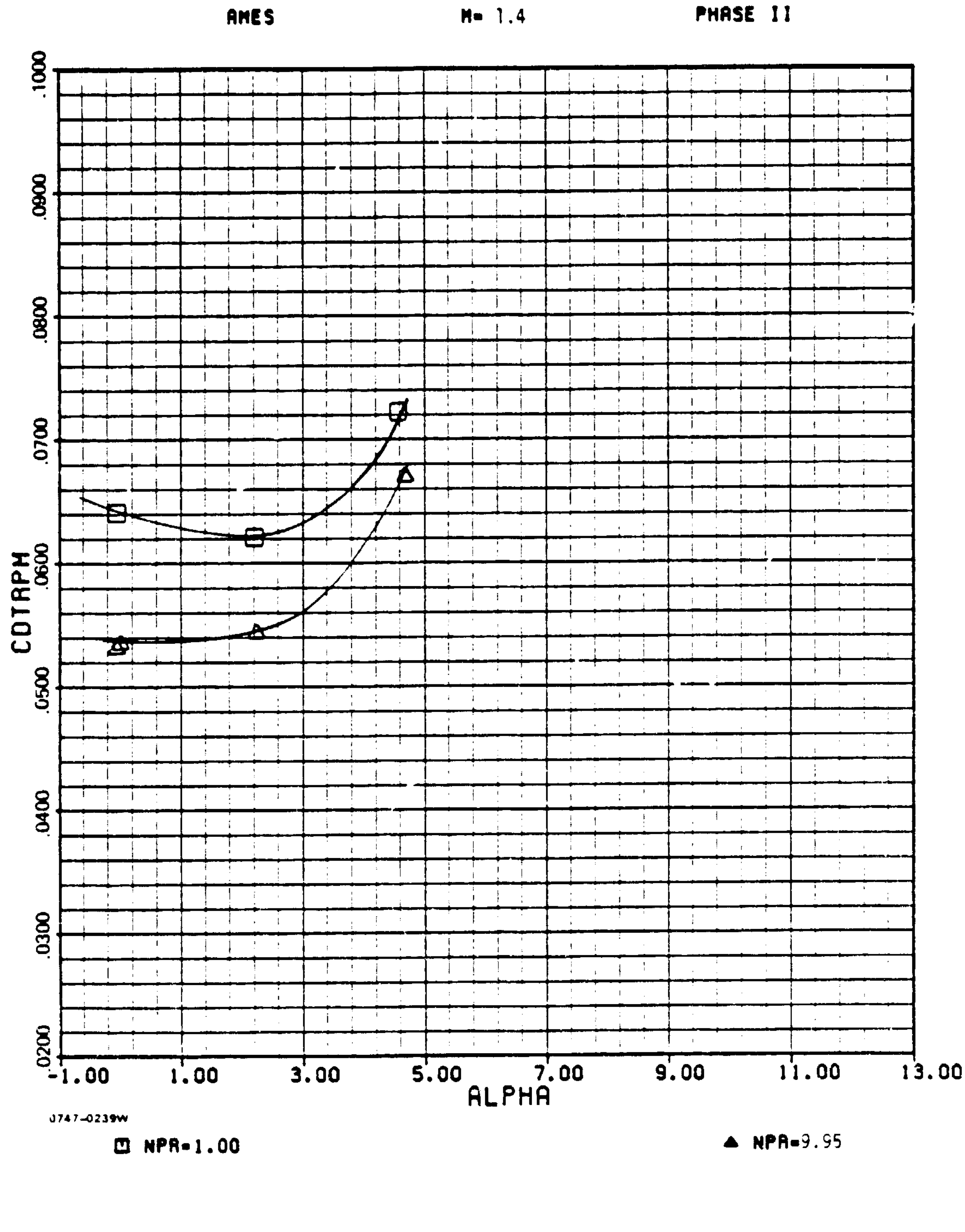


ADEN COMBAT ZERO DEGREE + I/F
AMES
M= 1.2
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0500
.0550
.0600
.0650
.0700
.0750
.0800
.0850
0747-0237W
CDTRPM
NPR = 1.0
NPR = 7.95

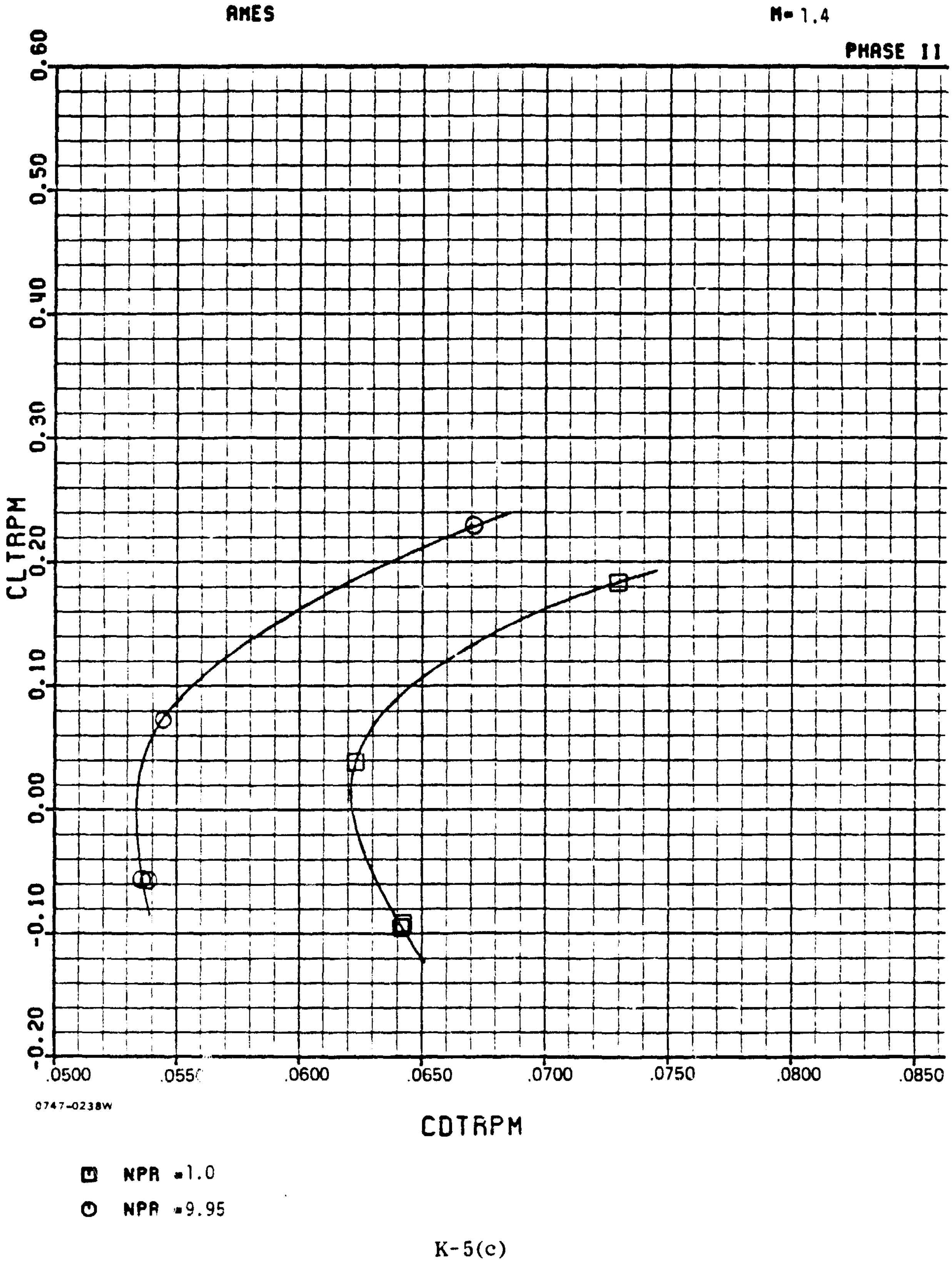
ADEN COMBAT ZERO DEGREE + I/F



ADEN COMBAT ZERO DEGREE + I/F

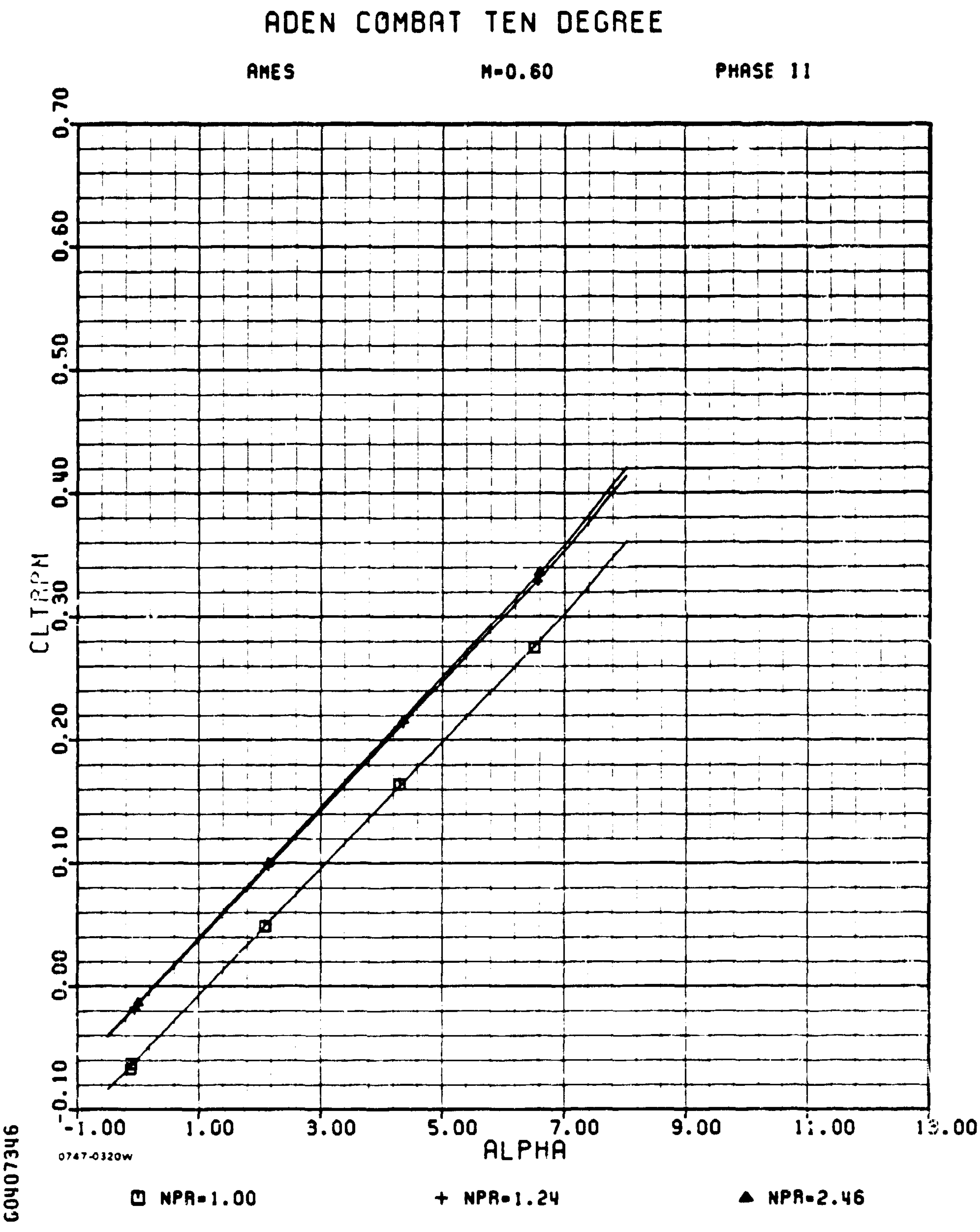


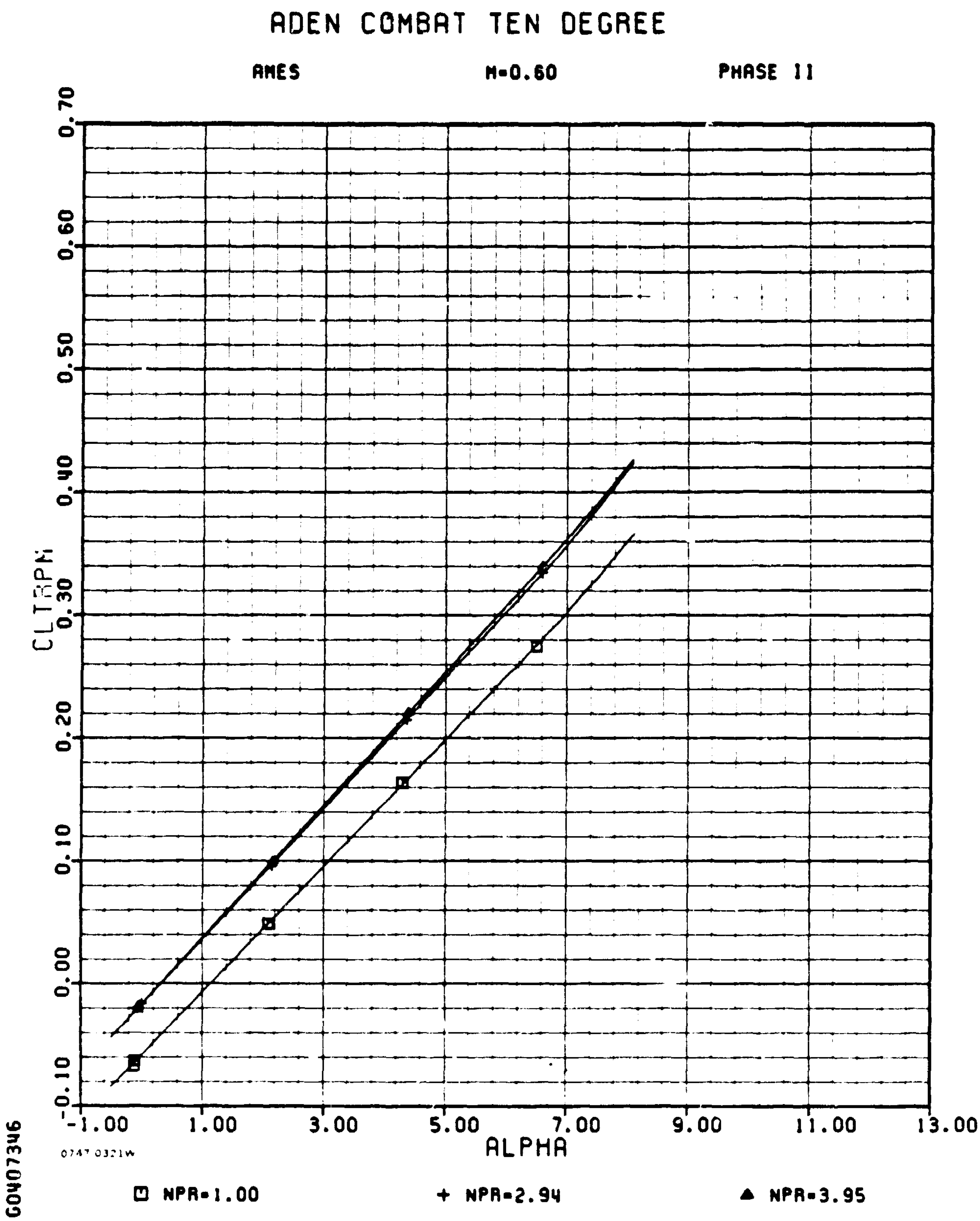
ADEN COMBAT ZERO DEGREE + I/F



APPENDIX L

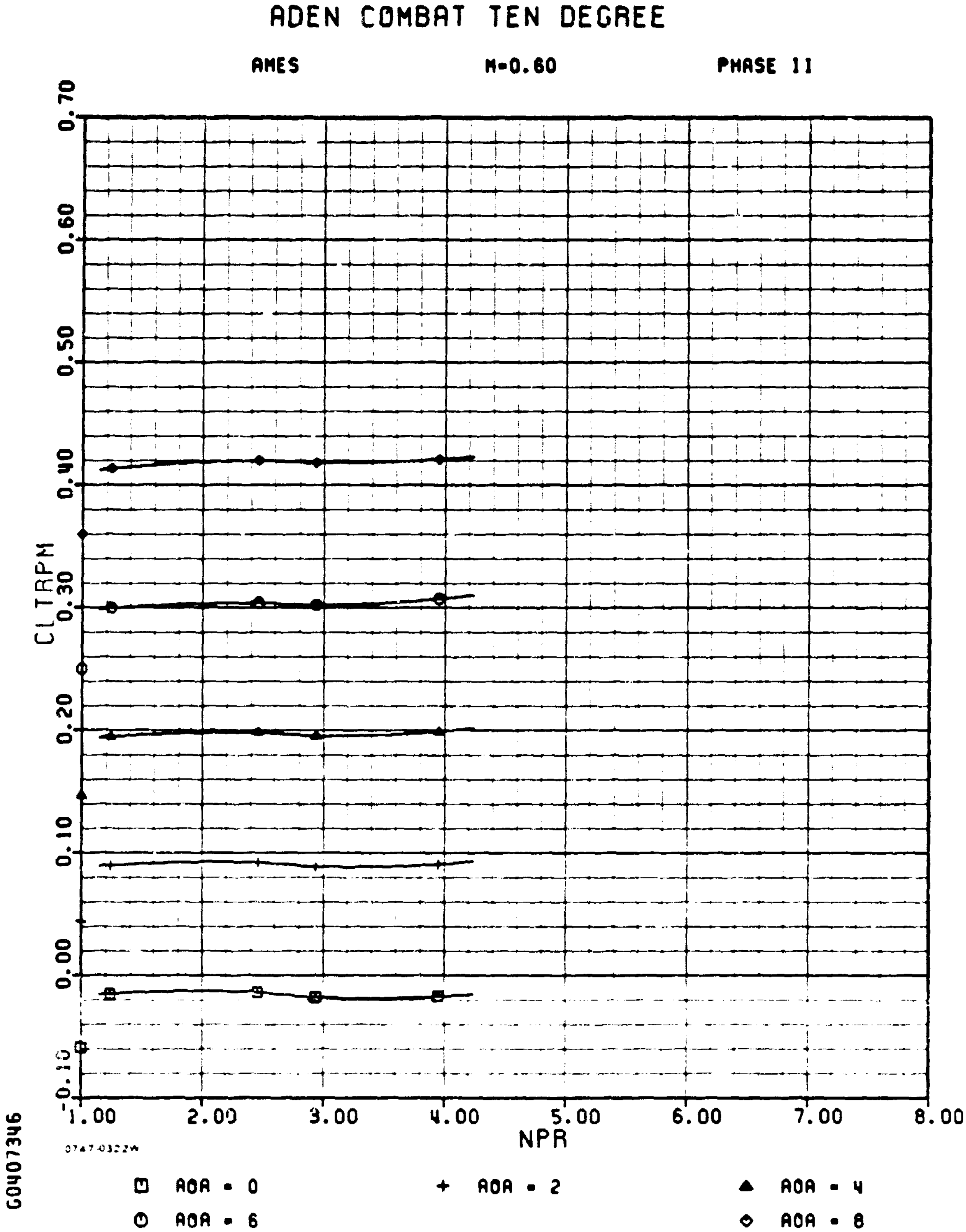
ADEN COMBAT 10° WIND-ON DATA


ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0320W
G0407346
NPR=1.00
+ NPR=1.24
▲ NPR=2.46

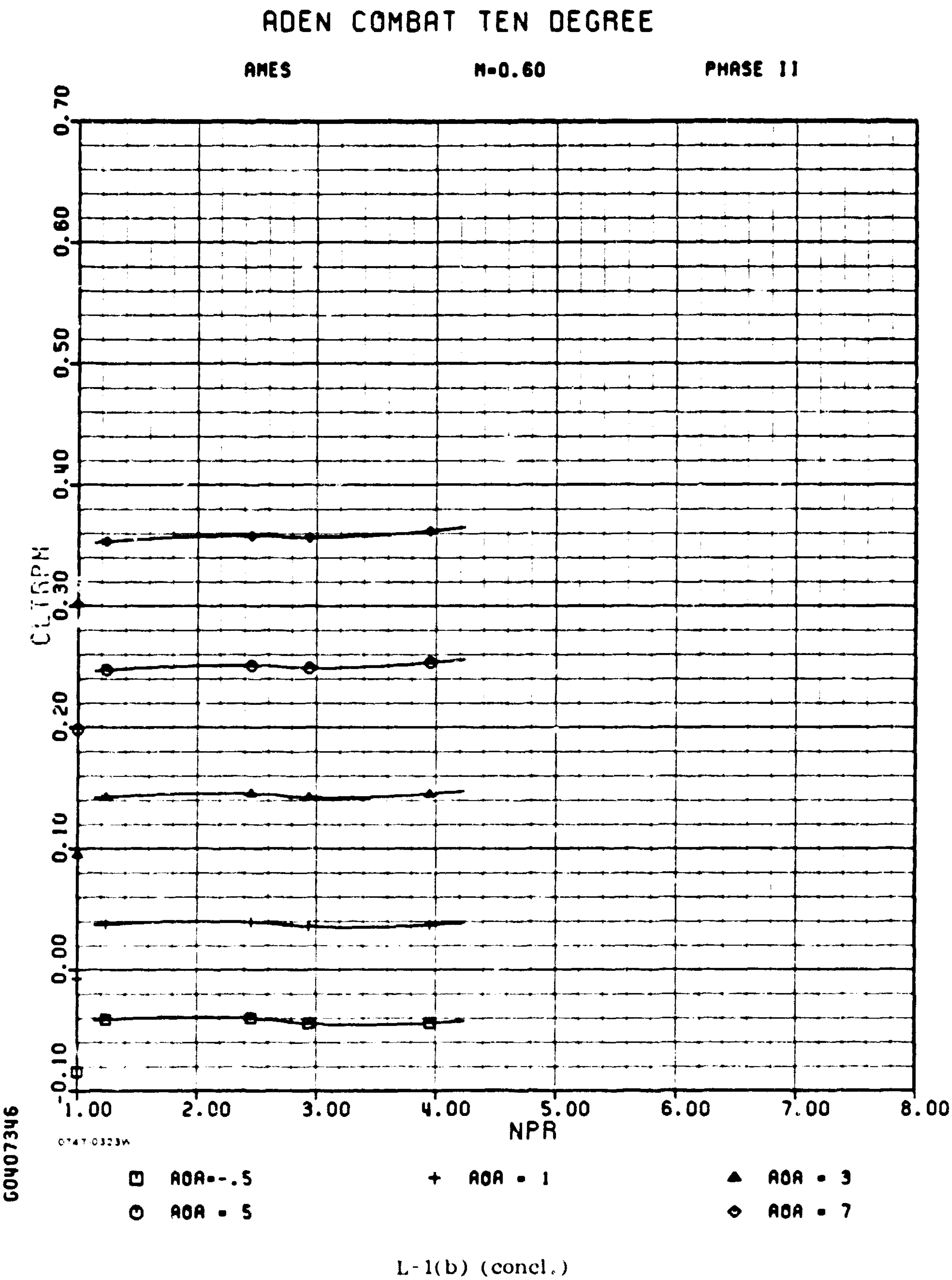


ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
ALPHA
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
NPR=1.00
+ NPR=2.94
NPR=3.95
G0407346

L-1(a) (concl.)

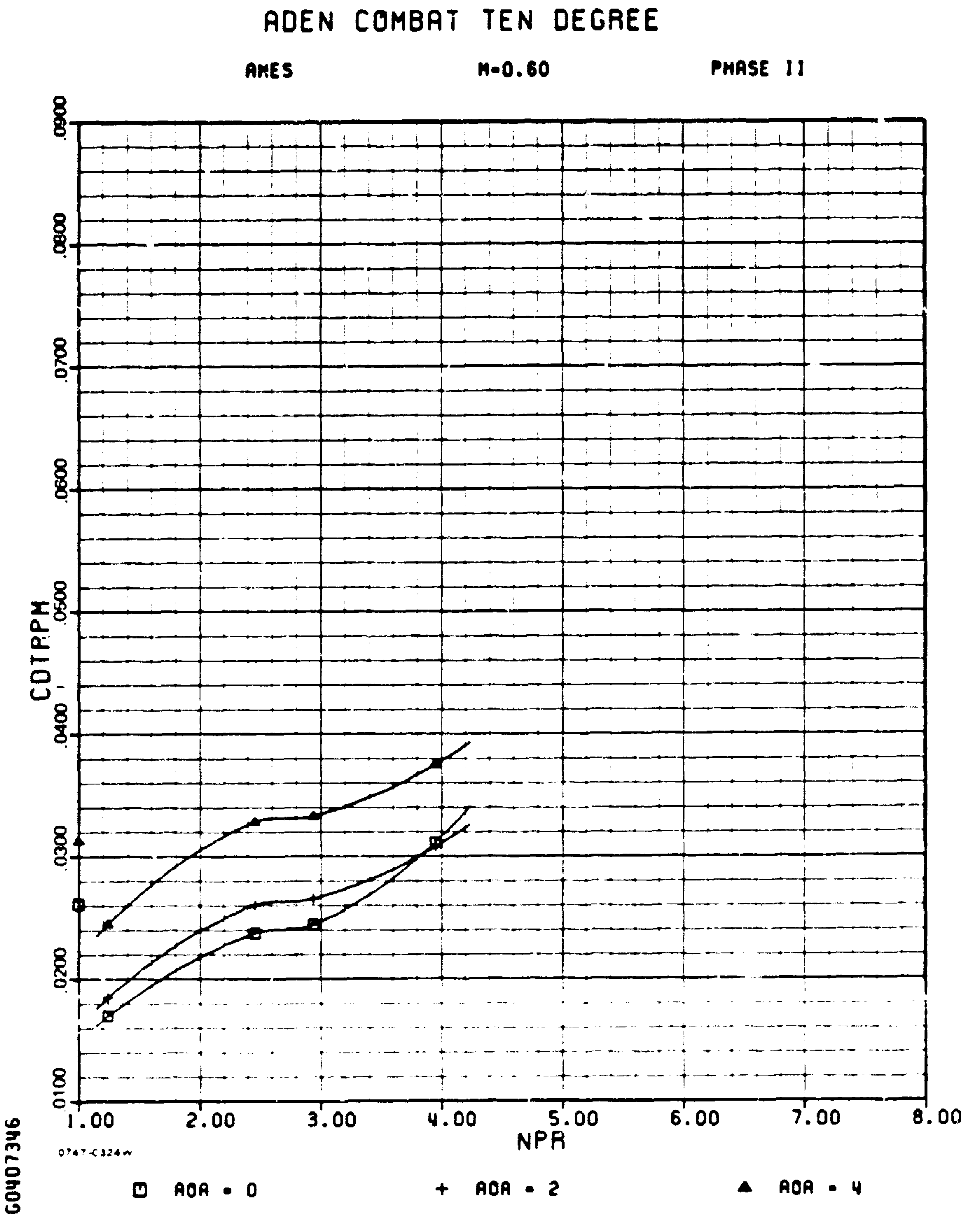


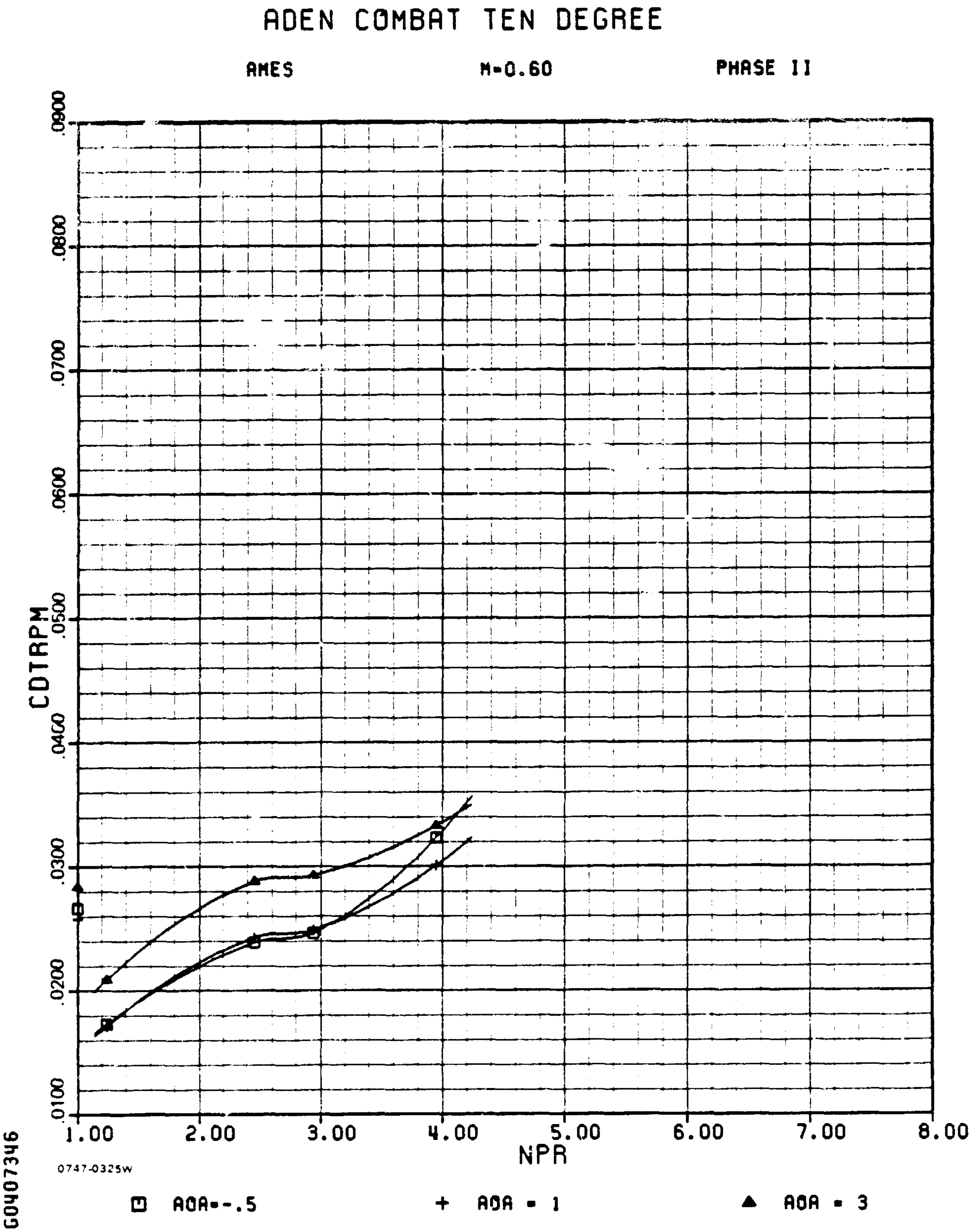
ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0322W
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8
G0407346



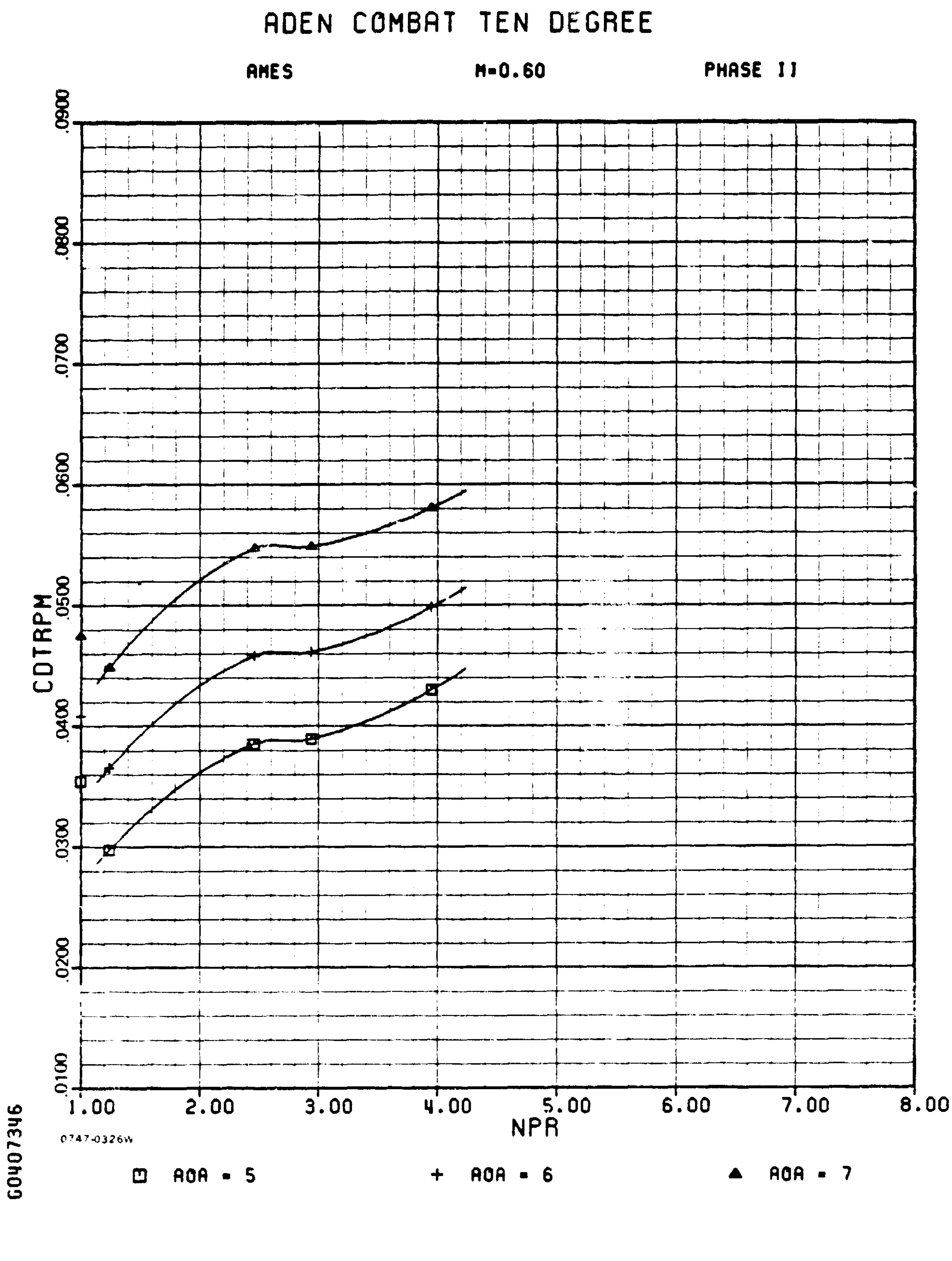
ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7
G0407346

L-1(b) (concl.)

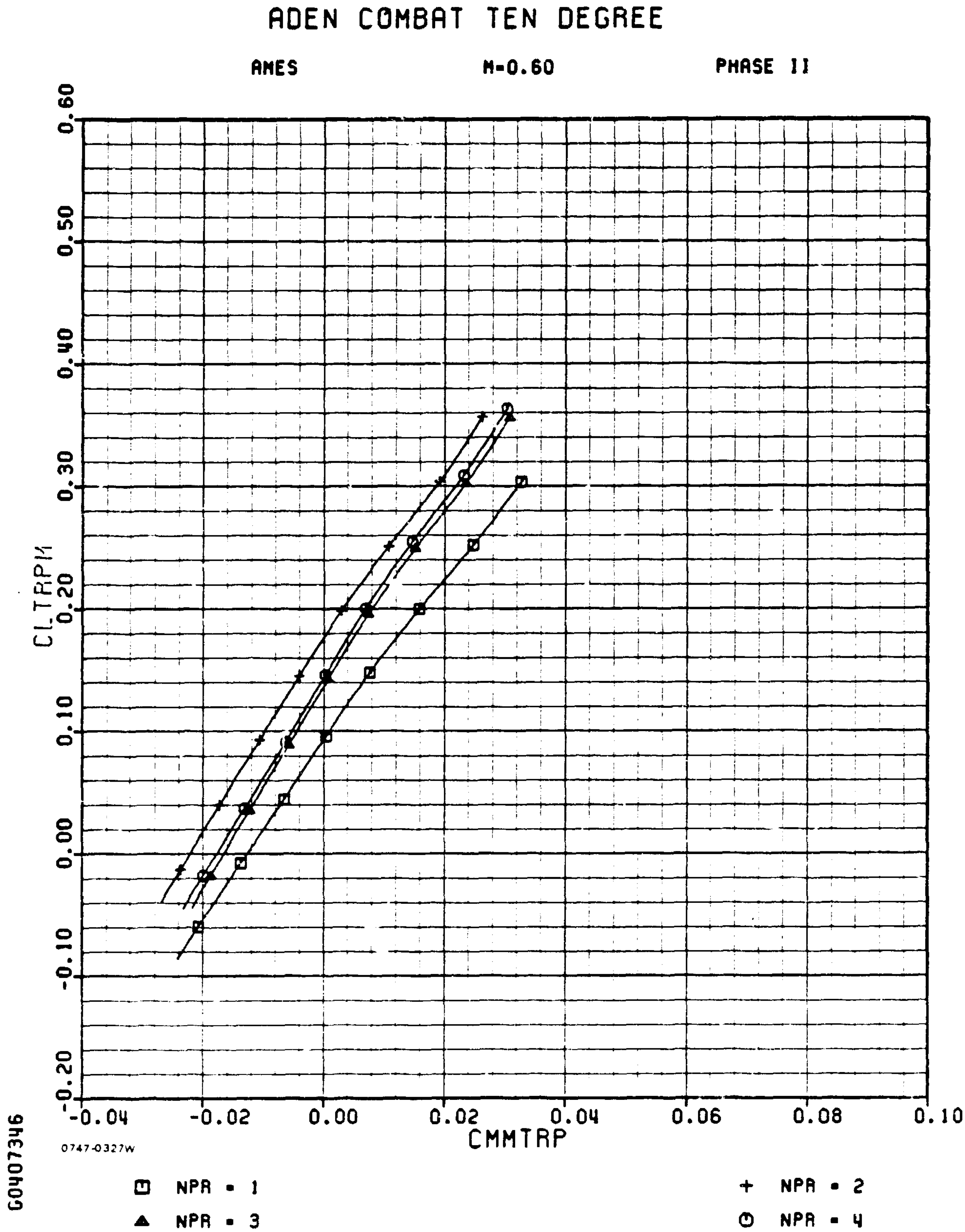

ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
NPR
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-C324W
G0407346
AOA = 0
AOA = 2
AOA = 4


ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
.0100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0325W
G0407346
AOA=-.5
AOA = 1
AOA = 3

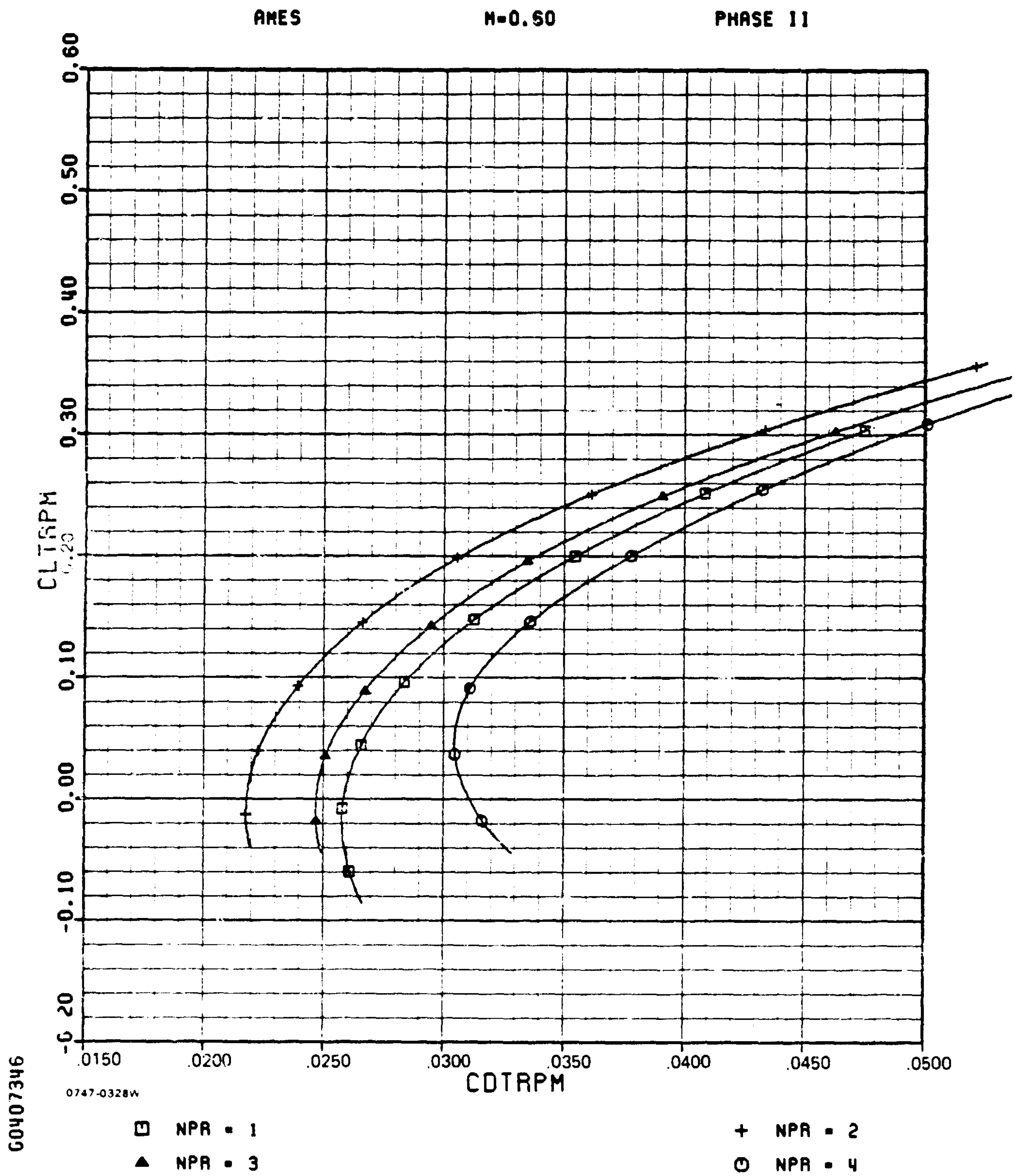
L-1(c) (cont.)

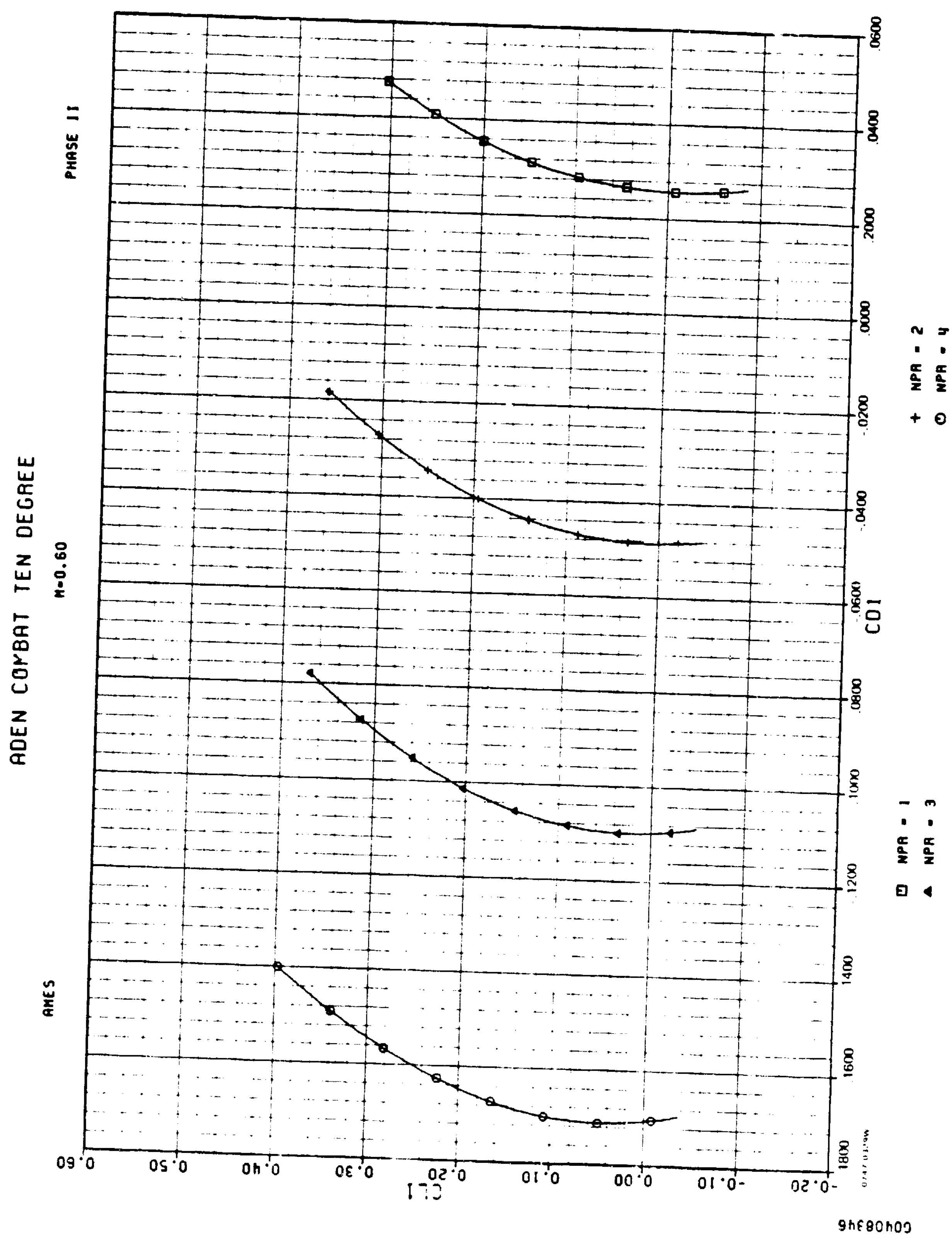

ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.0100
.0200
.0300
.0400
.0500
.0600
.0700
.0800
.0900
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0326W
G0407346
AOA = 5
AOA = 6
AOA = 7

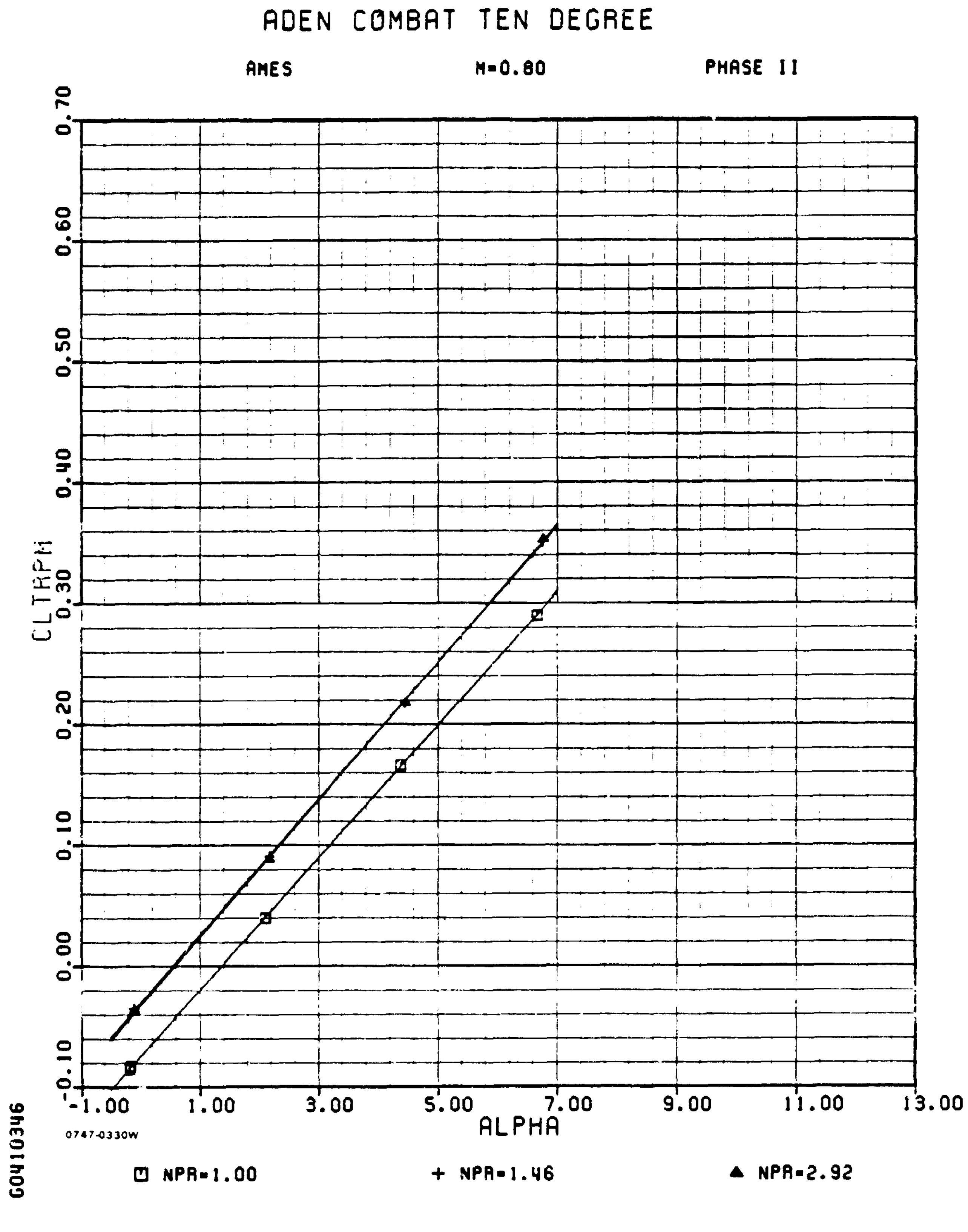
L-1(c) (concl.)


ADEN COMBAT TEN DEGREE
AMES
M=0.60
PHASE II
CLTRPM
CMMTRP
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
0747-0327W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
G0407346

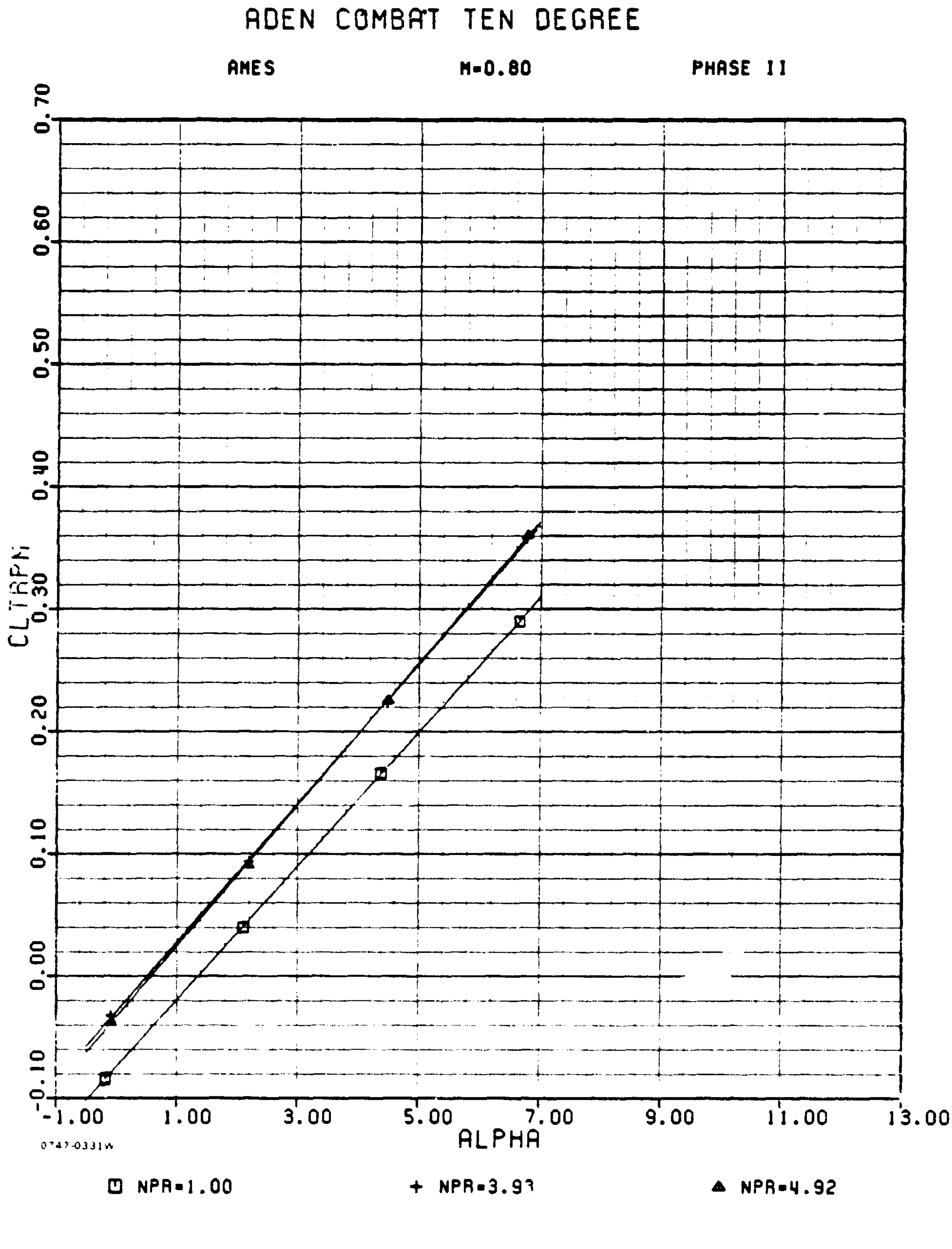
ADEN COMBAT TEN DEGREE




ADEN COMBAT TEN DEGREE
M=0.60
PHASE II
AMES
□ NPA = 1
▲ NPA = 3
+ NPA = 2
⊙ NPA = 4
CD1
CL1
.1800
.1600
.1400
.1200
.1000
.0800
.0600
.0400
.0200
.0000
.0200
.0400
.0600
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
C0408346

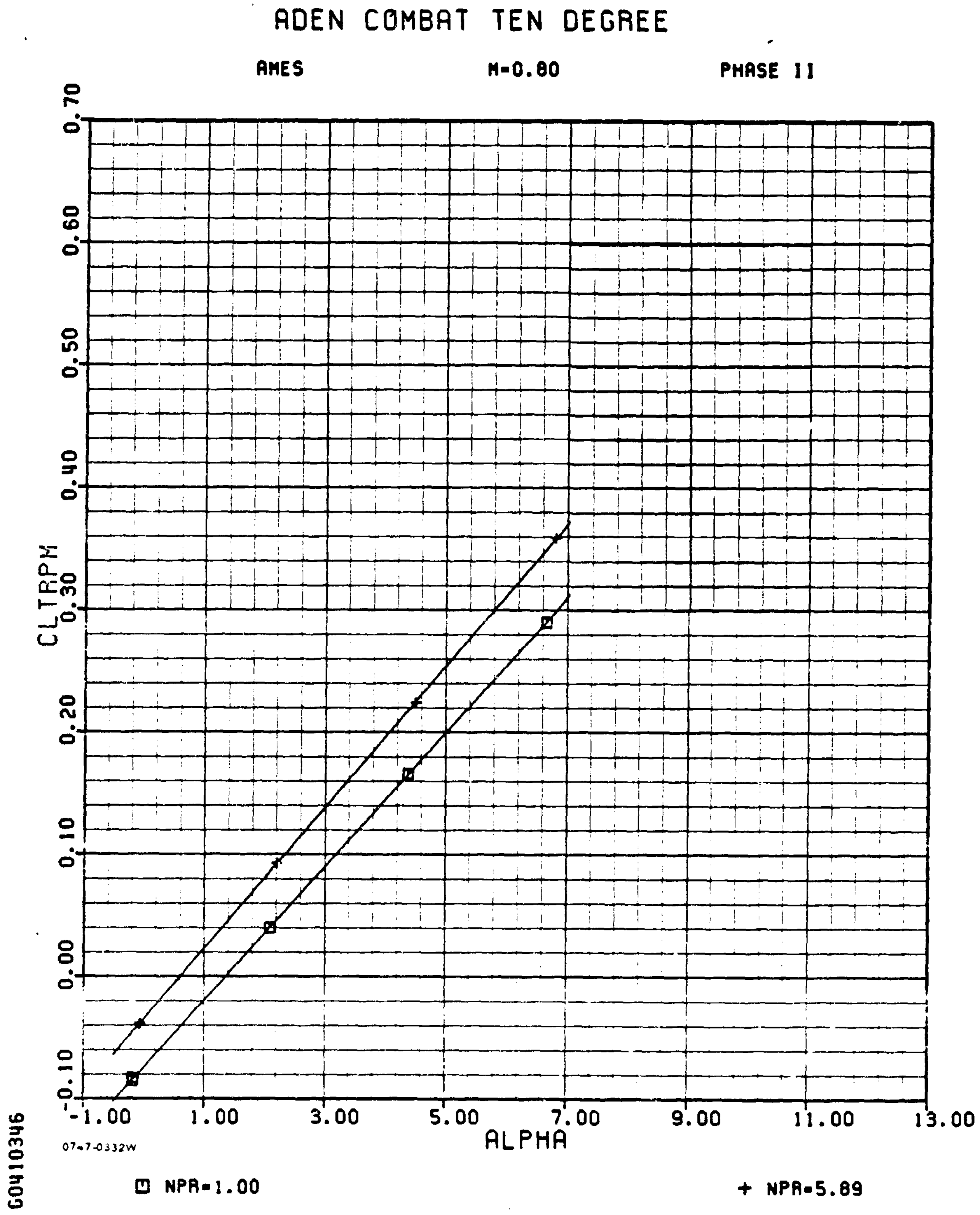


ADEN COMBAT TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
G0410346
0747-0330W
NPR=1.00
+ NPR=1.46
▲ NPR=2.92



G0410346

L-2(a) (cont.)

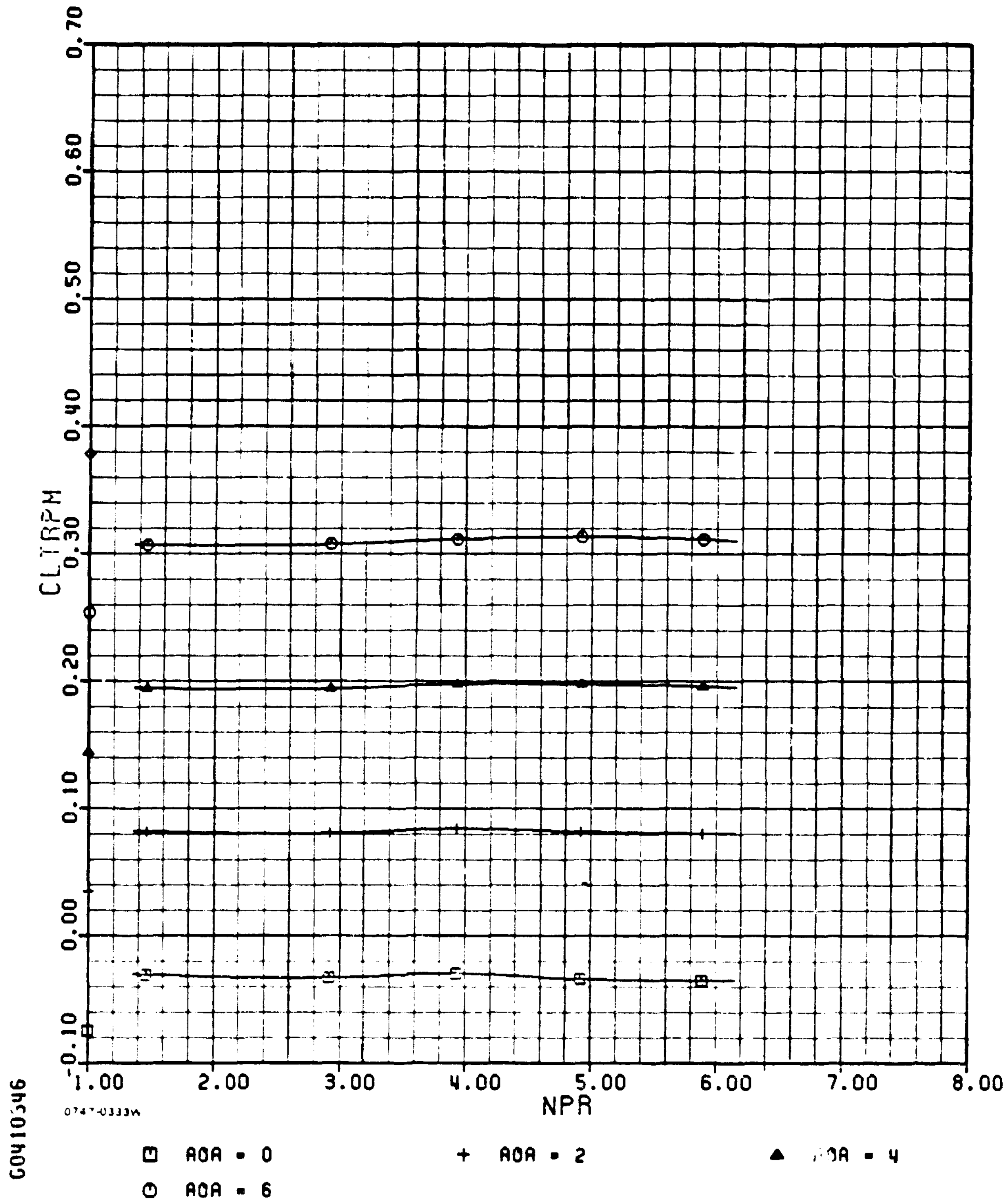


ADEN COMBAT TEN DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
07-7-0332W
G0410346
NPR=1.00
+ NPR=5.89

L-2(a) (concl.)

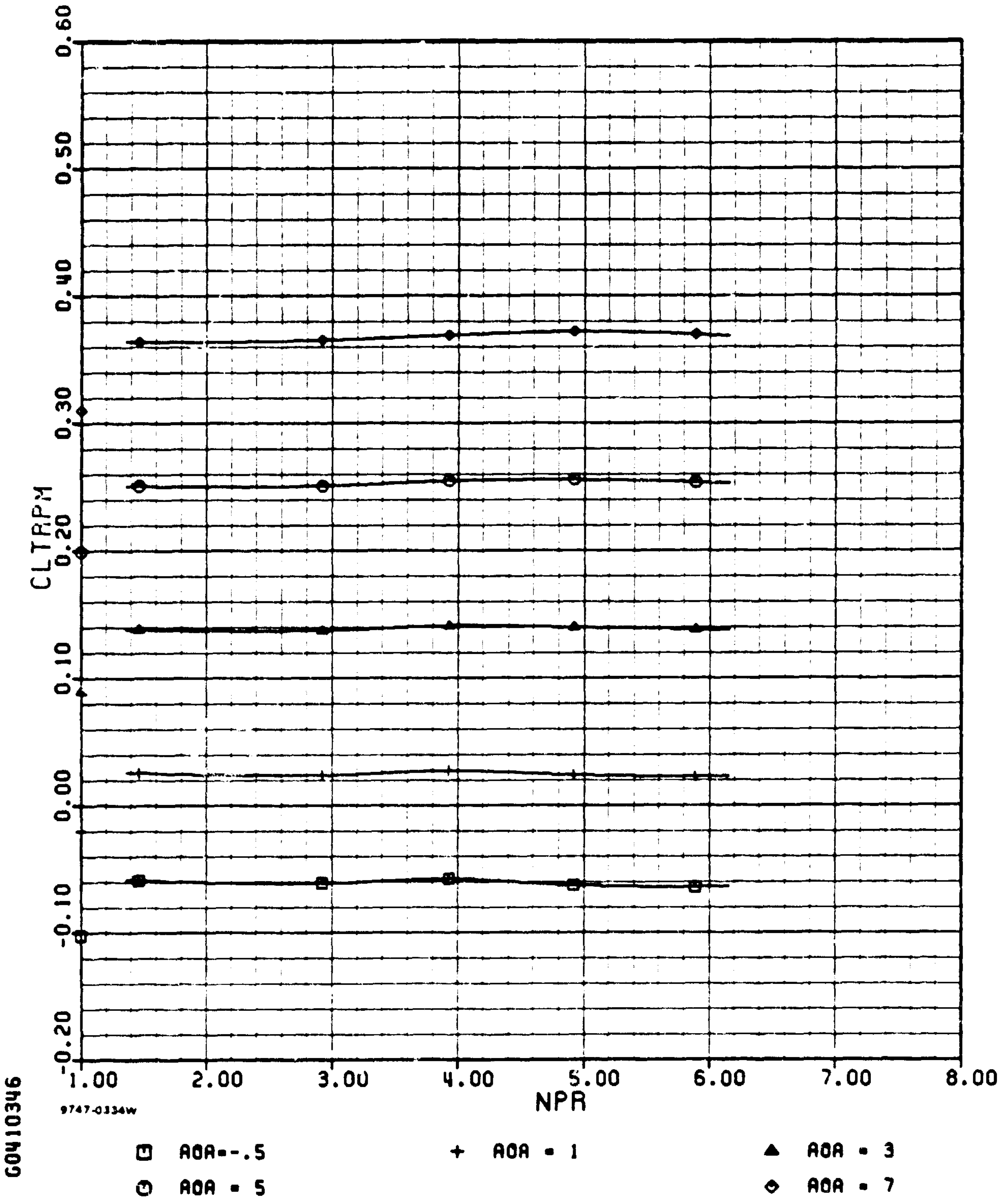
ADEN COMBAT TEN DEGREE

AMES M=0.80 PHASE II

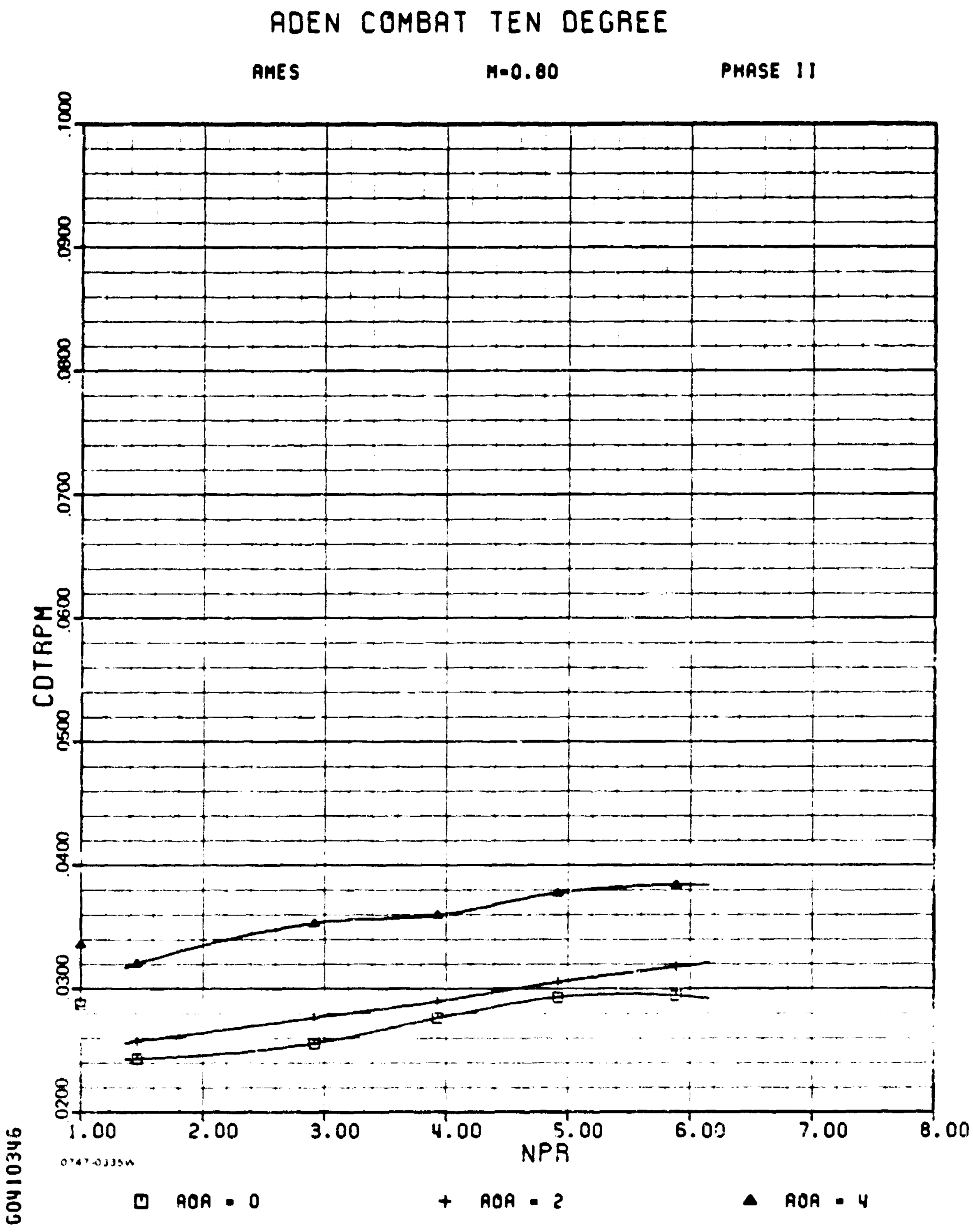


ADEN COMBAT TEN DEGREE

AMES M=0.80 PHASE II



L-2(b) (concl.)



ADEN COMBAT TEN DEGREE
AMES
M=0.80
PHASE II
CDTRPM
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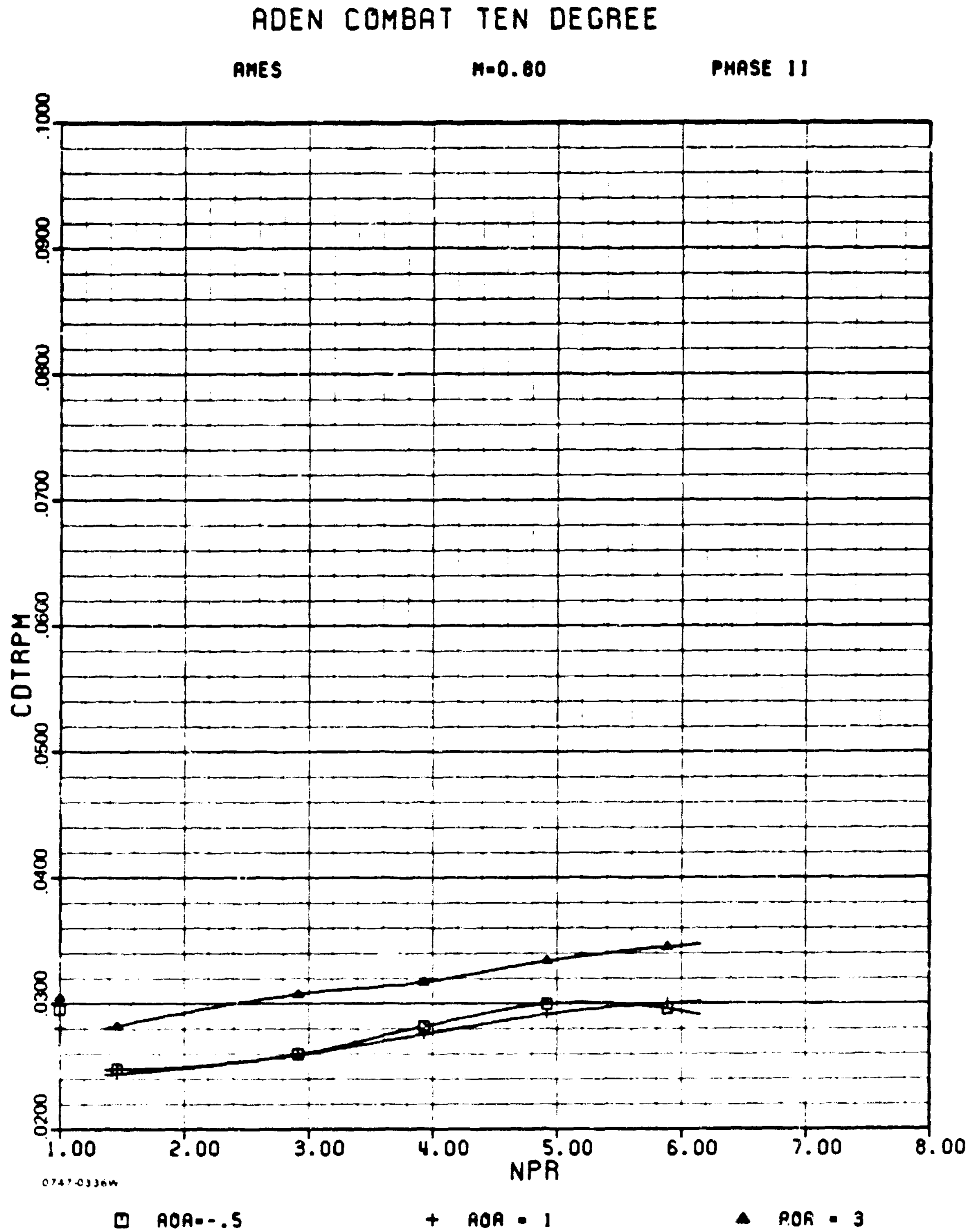
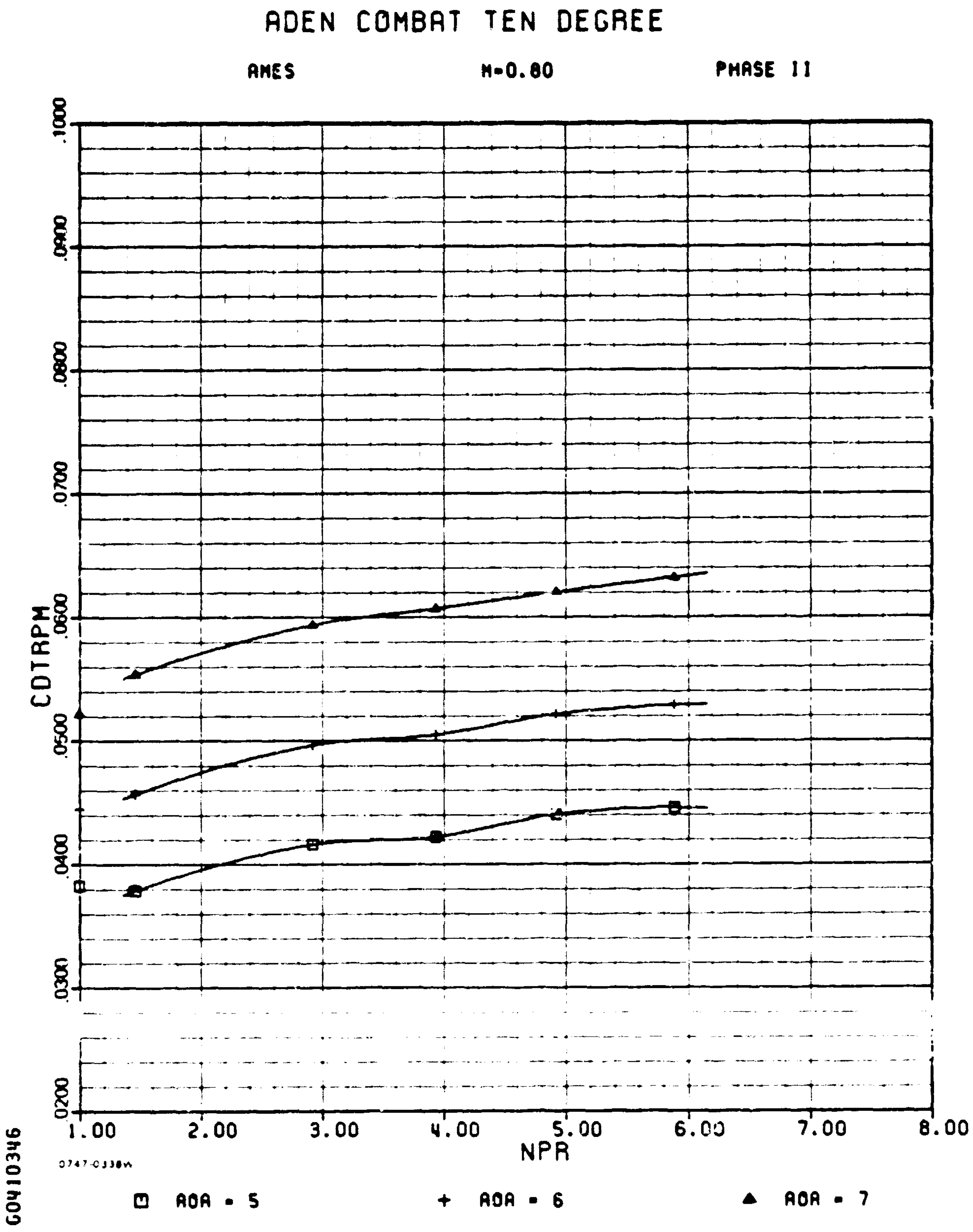
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
AOA = 0
AOA = 2
AOA = 4
G0410346



G0410346

L-2(c) (cont.)


ADEN COMBAT TEN DEGREE
AMES
M=0.80
PHASE II
CDTRPM
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.0900
.0800
.0700
.0600
.0500
.0400
.0300
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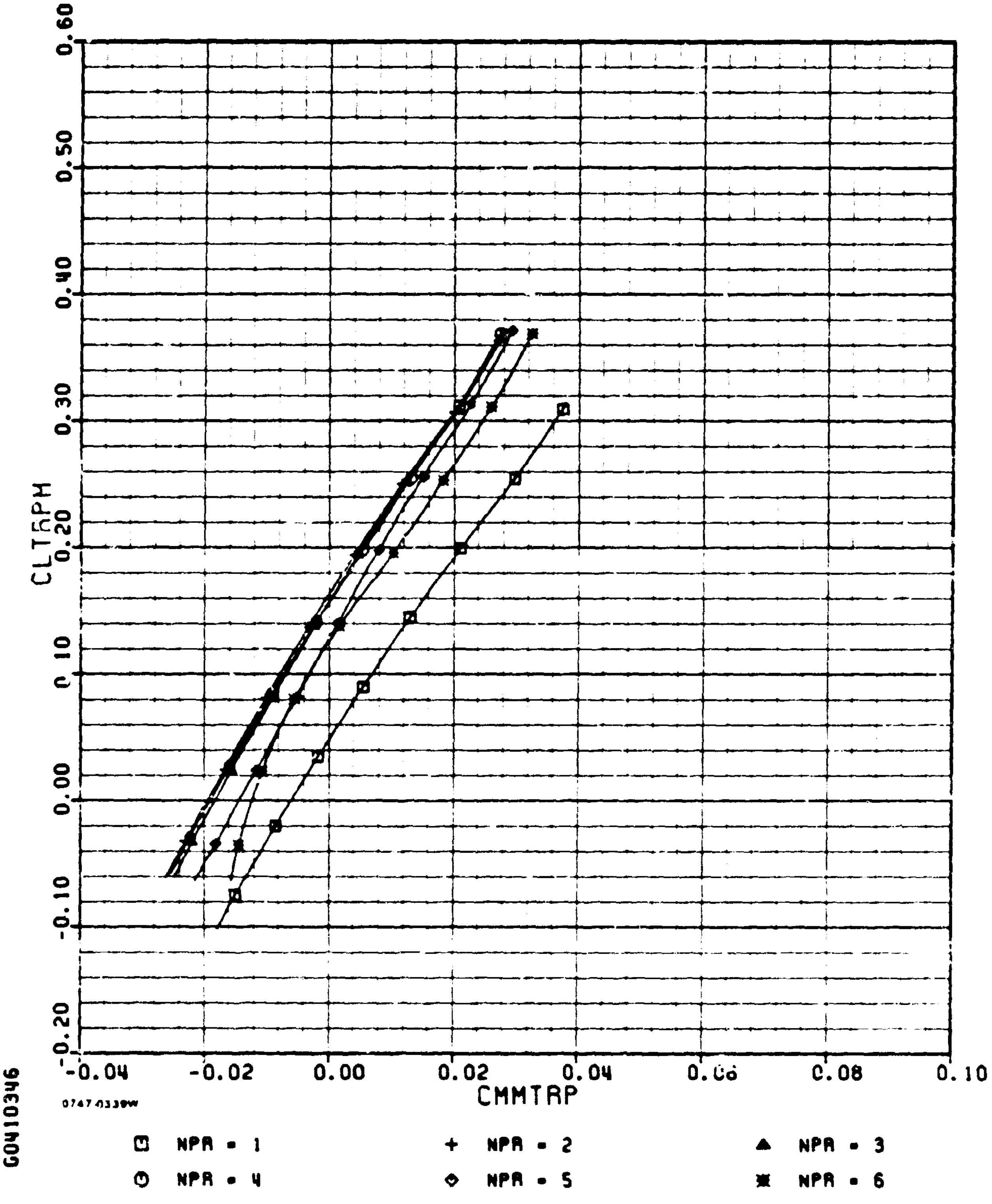
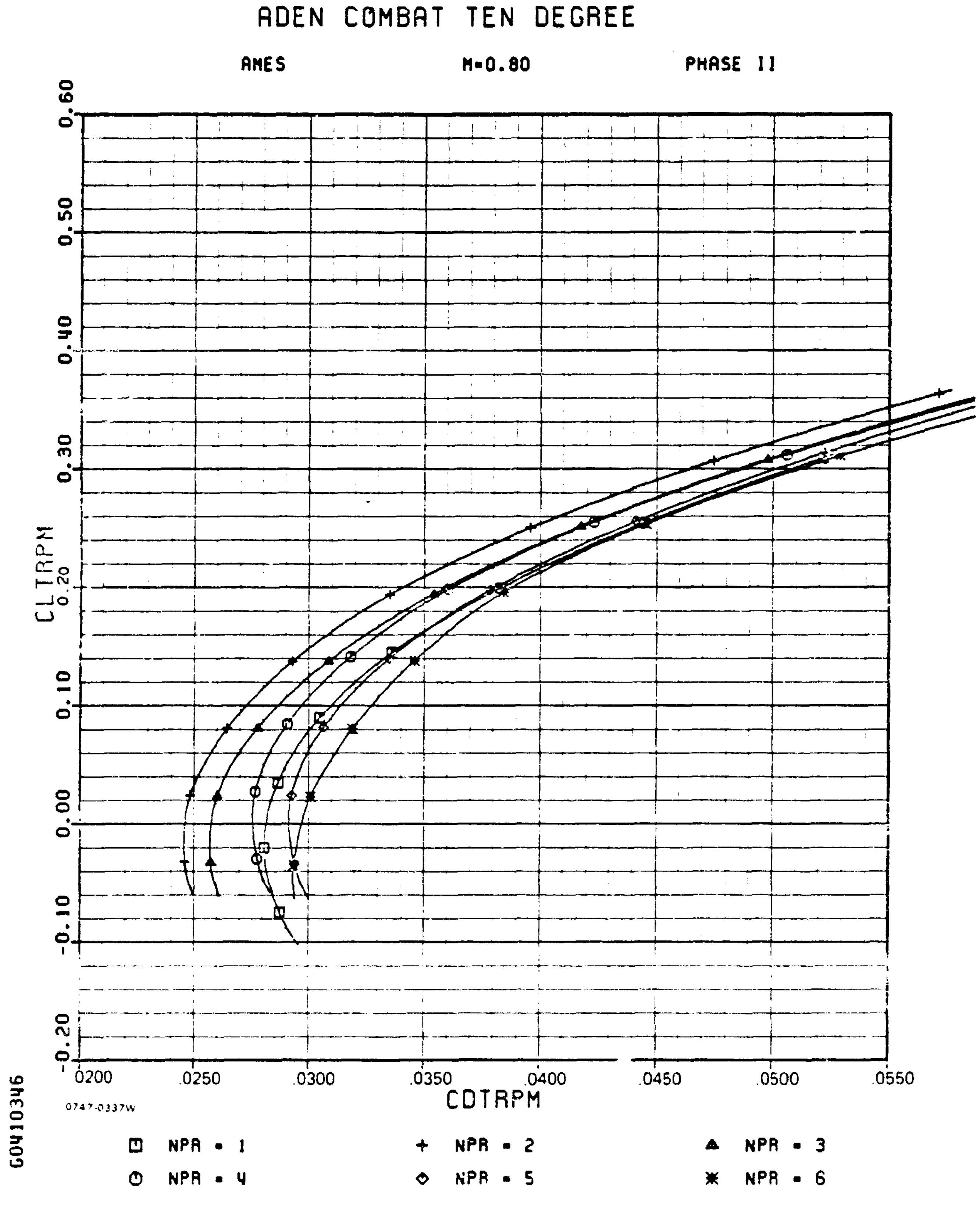
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G0410346
0747-0338W
AOA = 5
AOA = 6
AOA = 7

L-2(c) (concl.)

ADEN COMBAT TEN DEGREE

AMES M=0.80 PHASE II




ADEN COMBAT TEN DEGREE
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M=0.80
PHASE II
CLTRPM
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0.50
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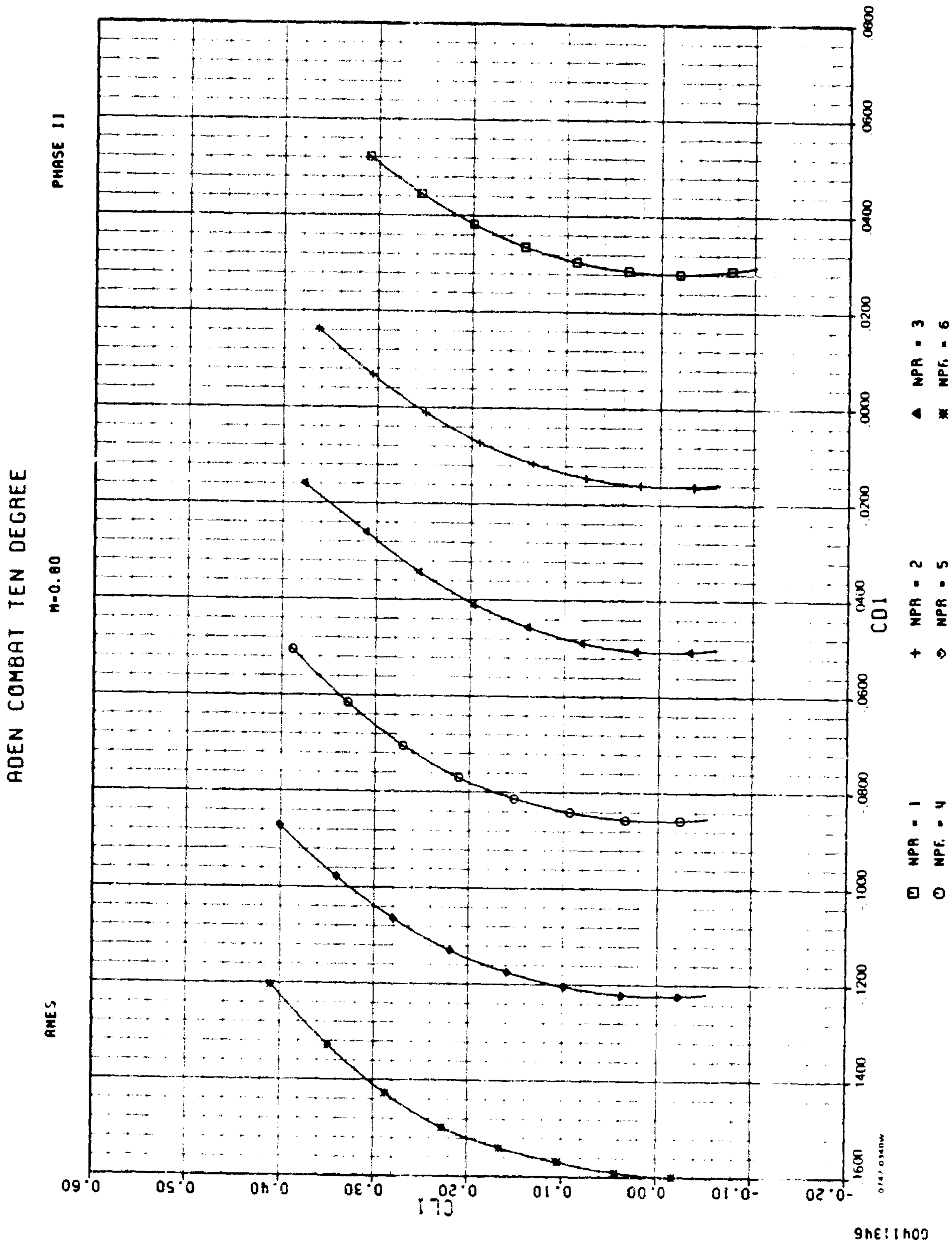
0.30
0.20
0.10
0.00
-0.10
-0.20
.0200
.0250
.0300
.0350
.0400
.0450
.0500
.0550
CDTRPM
0747-0337W
G0410346
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN COMBAT TEN DEGREE
M=0.80
PHASE II
AMES
CD1
CL1
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
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.0600
.0400
.0200
.0000
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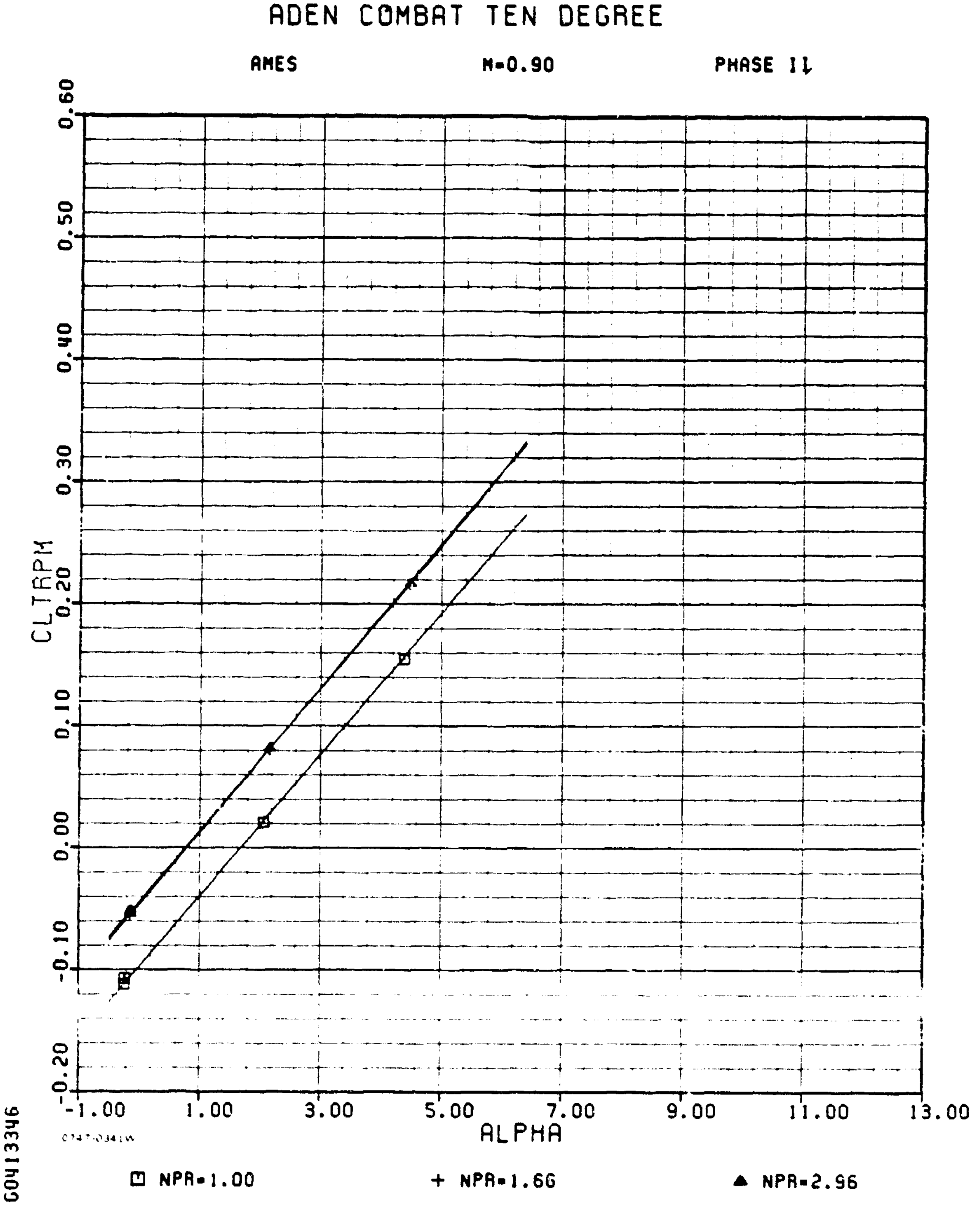
.0400
.0600
.0800
.1000
.1200
.1400
.1600


ADEN COMBAT TEN DEGREE
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0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CLTRPM
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
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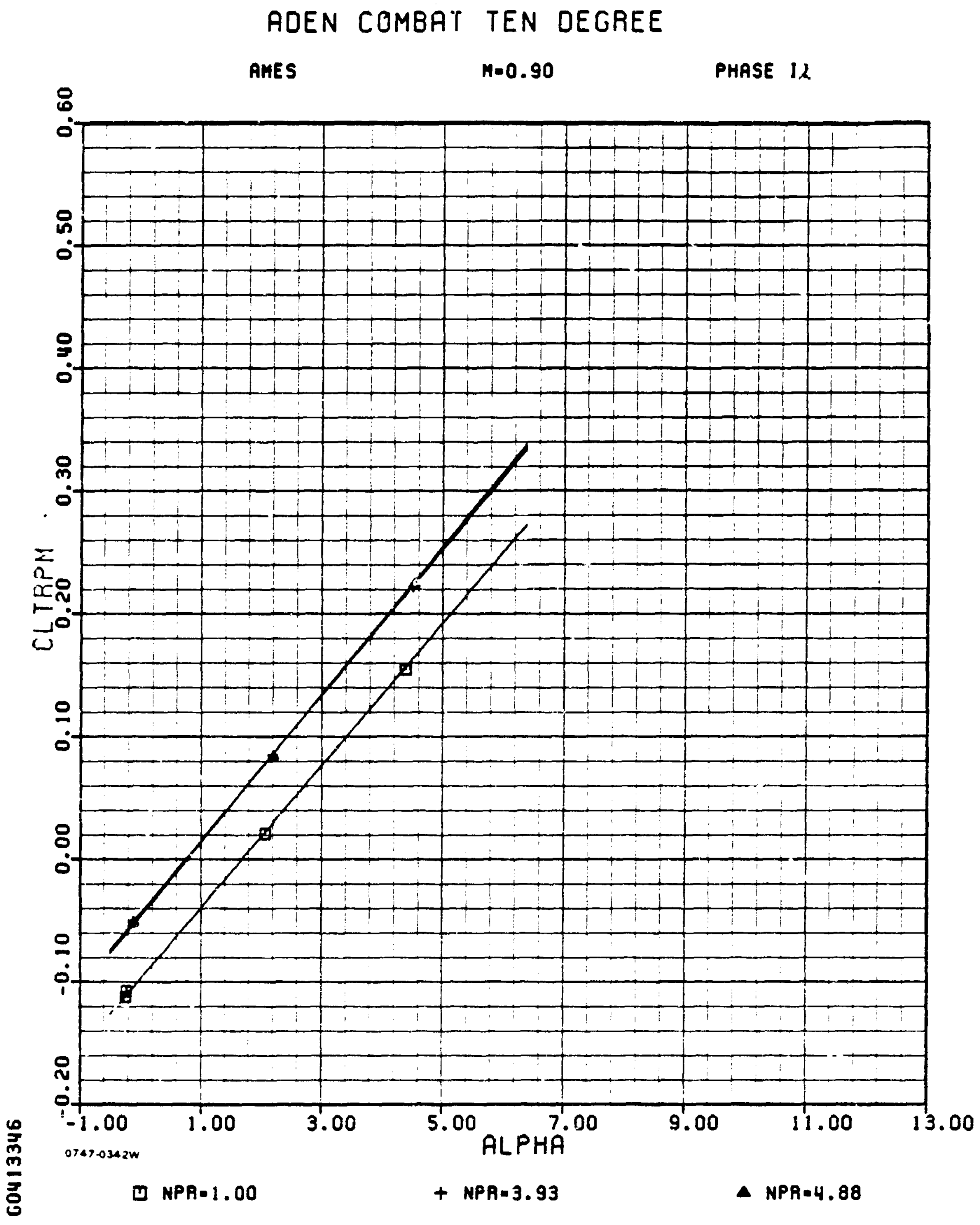
+ NPR=1.66
NPR=2.96
G0413346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PHASE 1λ
CLTRPM
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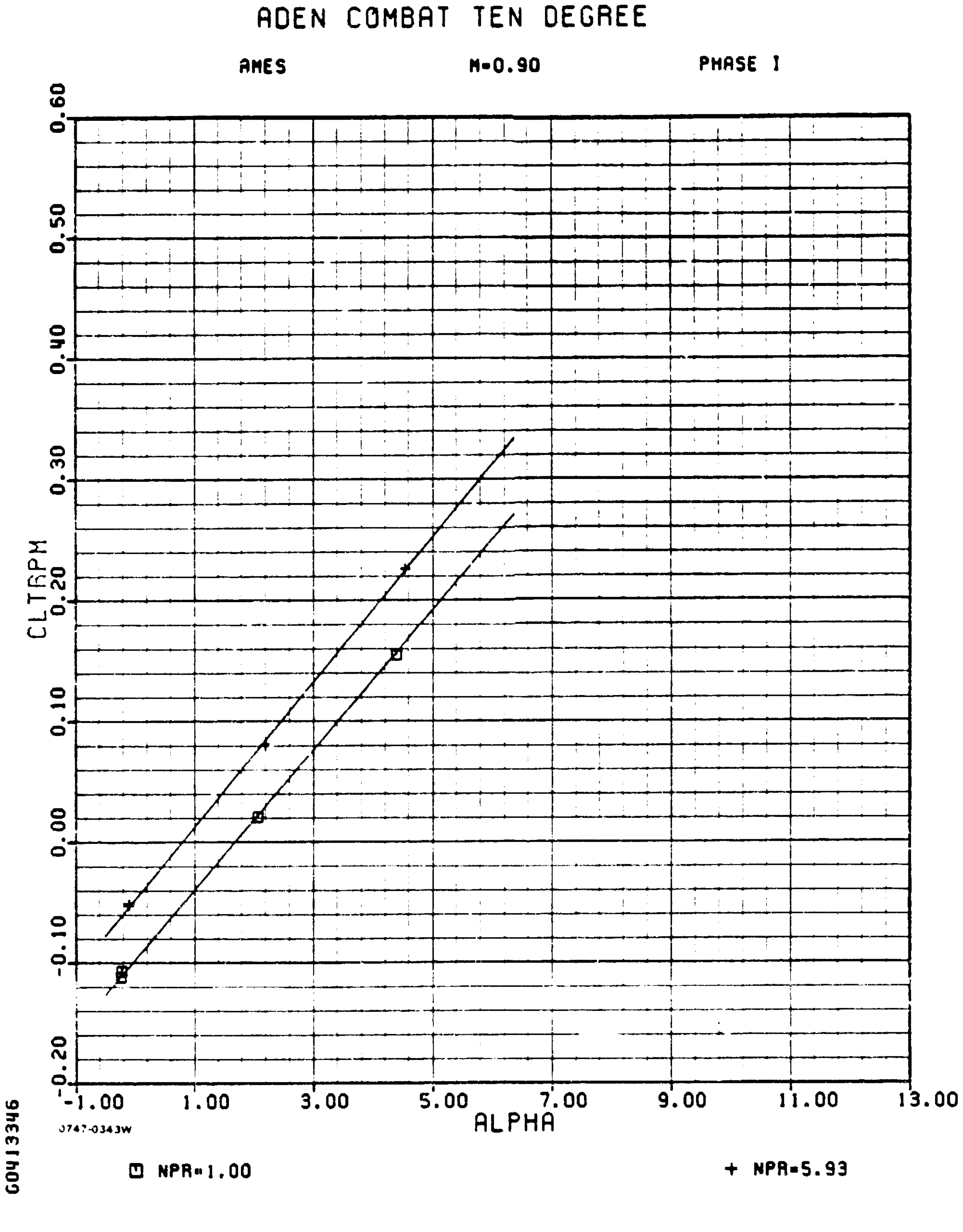
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0342W
G0413346
NPR=1.00
+ NPR=3.93
▲ NPR=4.88

L-3(a) (cont.)


ADEN COMBAT TEN DEGREE
AMES
M=0.90
PHASE I
CLTRPM
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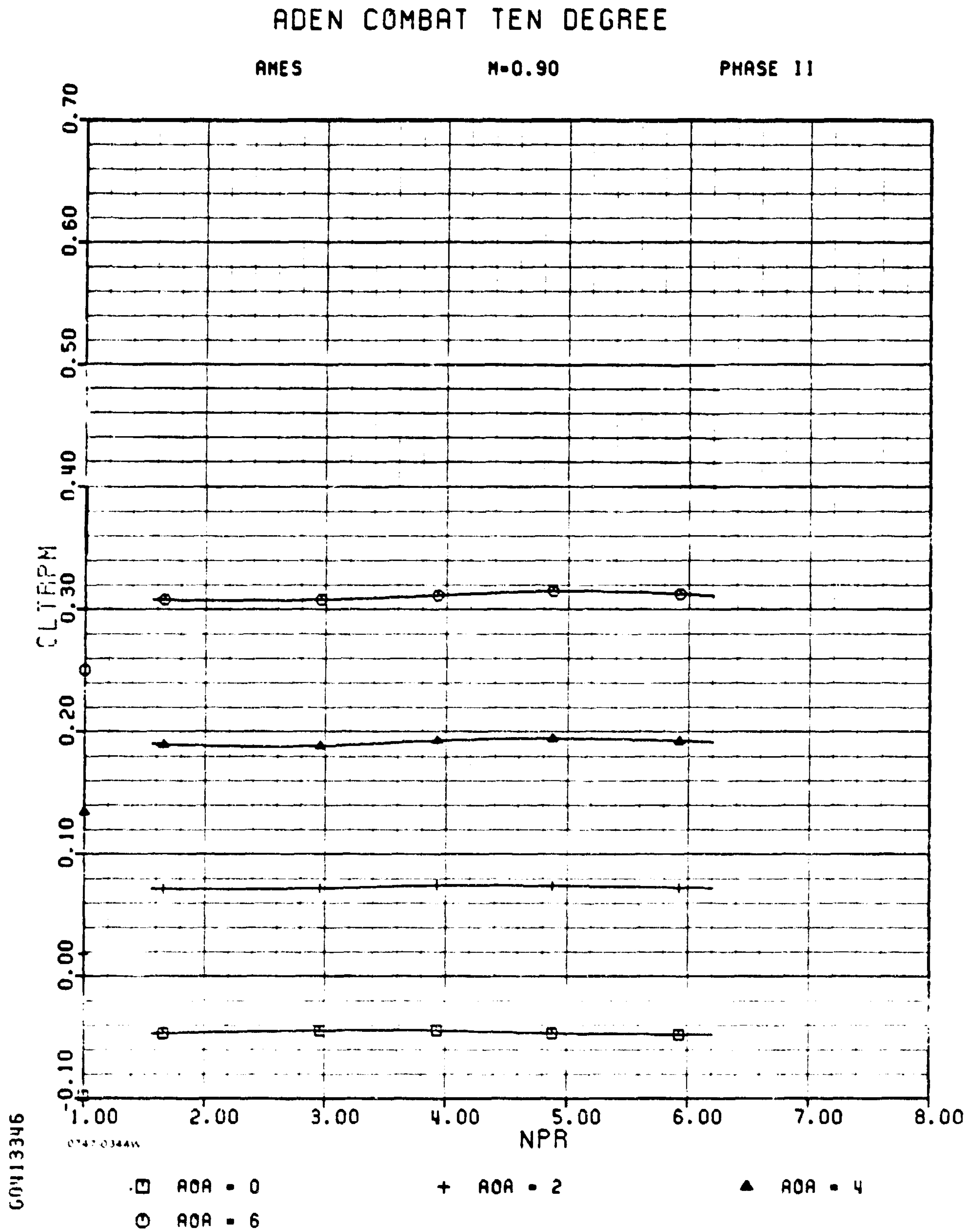
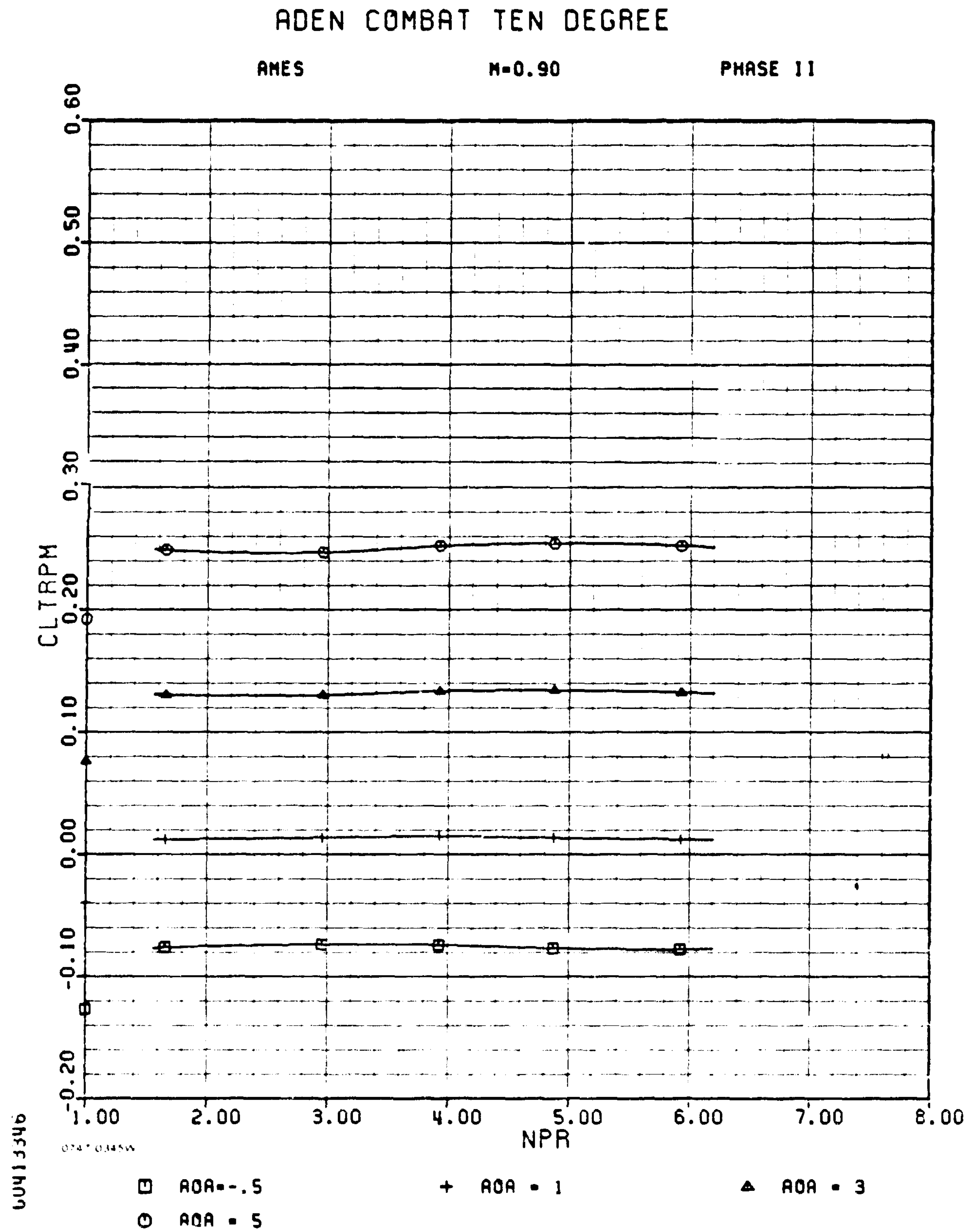
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0343W
G0413346
NPR=1.00
+ NPR=5.93

L-3(a) (concl.)


ADEN COMBAT TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA = 0
AOA = 2
AOA = 4
AOA = 6
G0413346


ADEN COMBAT TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
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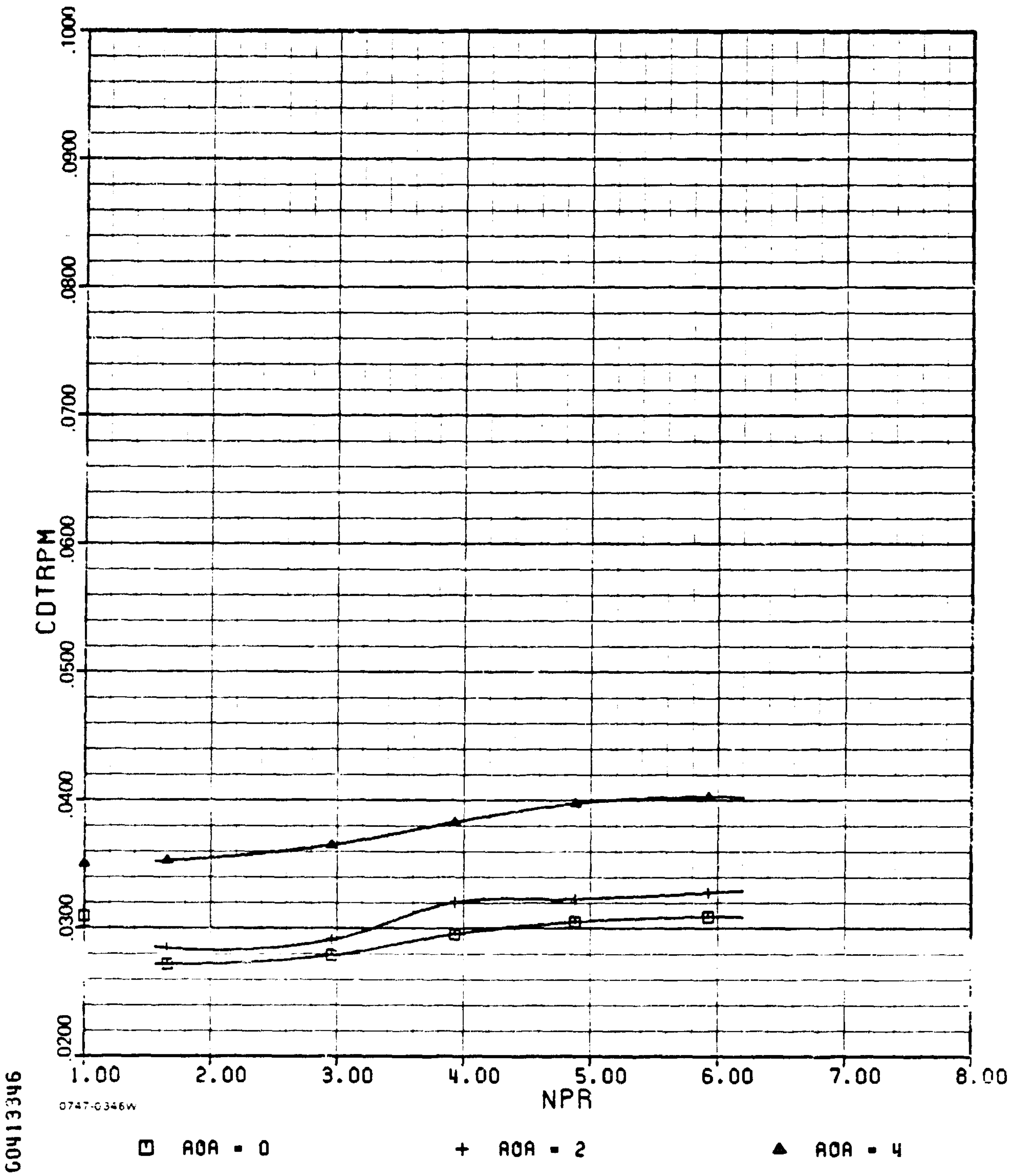
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA=-.5
AOA = 1
AOA = 3
AOA = 5

L-3(b)(concl.)

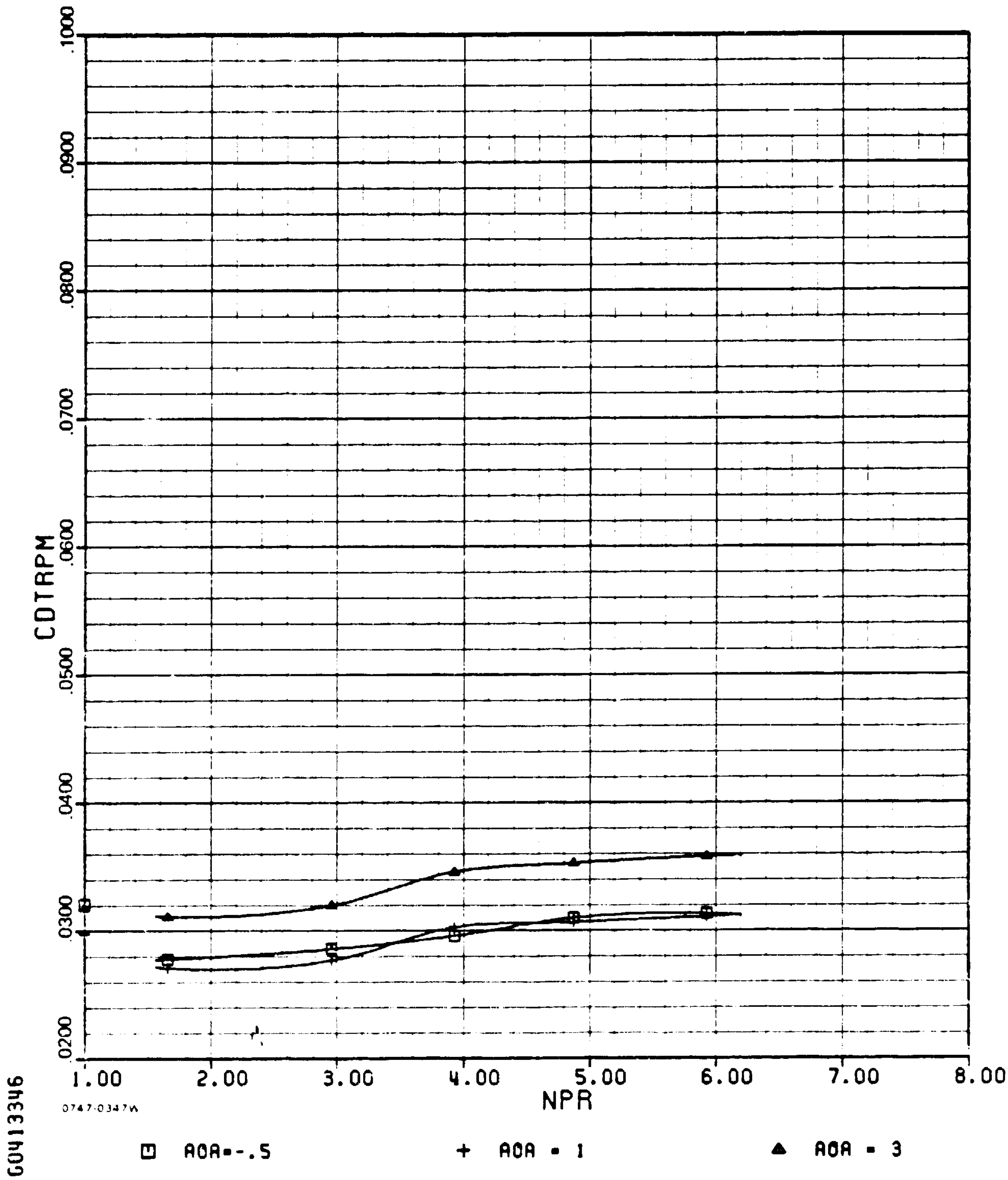
ADEN COMBAT TEN DEGREE

AMES M=0.90 PHASE II

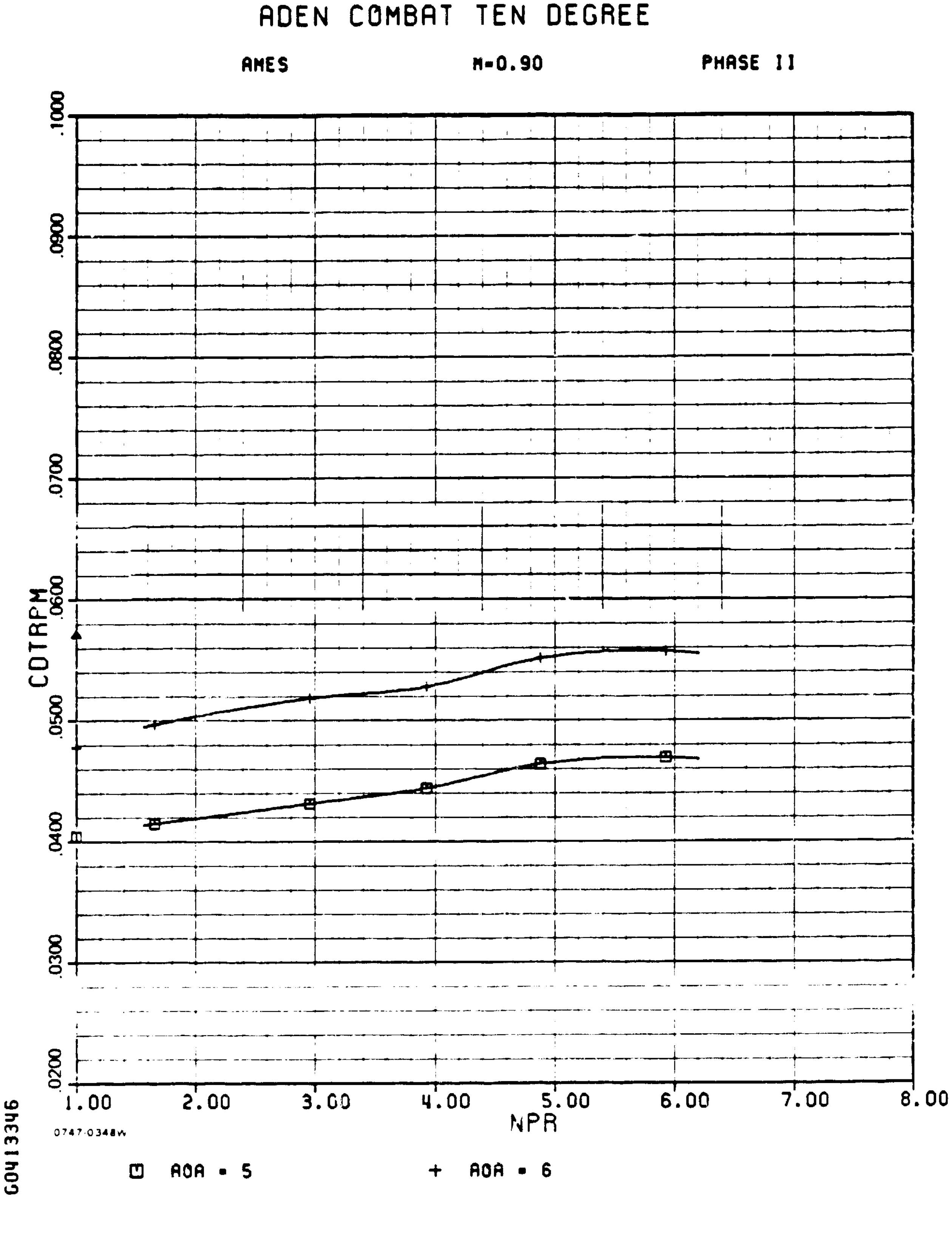


ADEN COMBAT TEN DEGREE

AMES M=0.90 PHASE II



L-3(c) (cont.)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PHASE II
CDTRPM
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.0800
.0700
.0600
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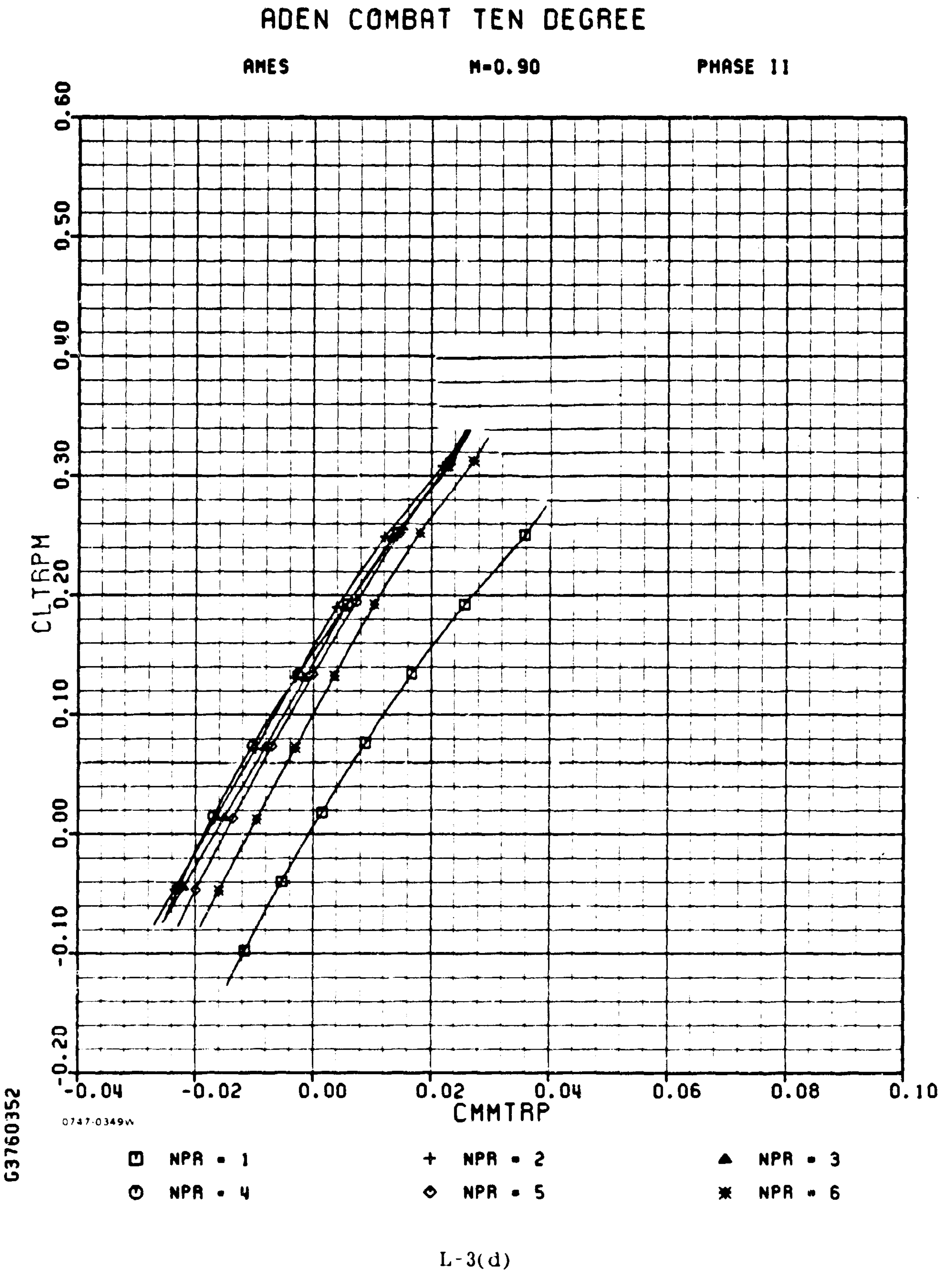
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0348W
AOA = 5
AOA = 6
GO413346

L-3(c) (concl.)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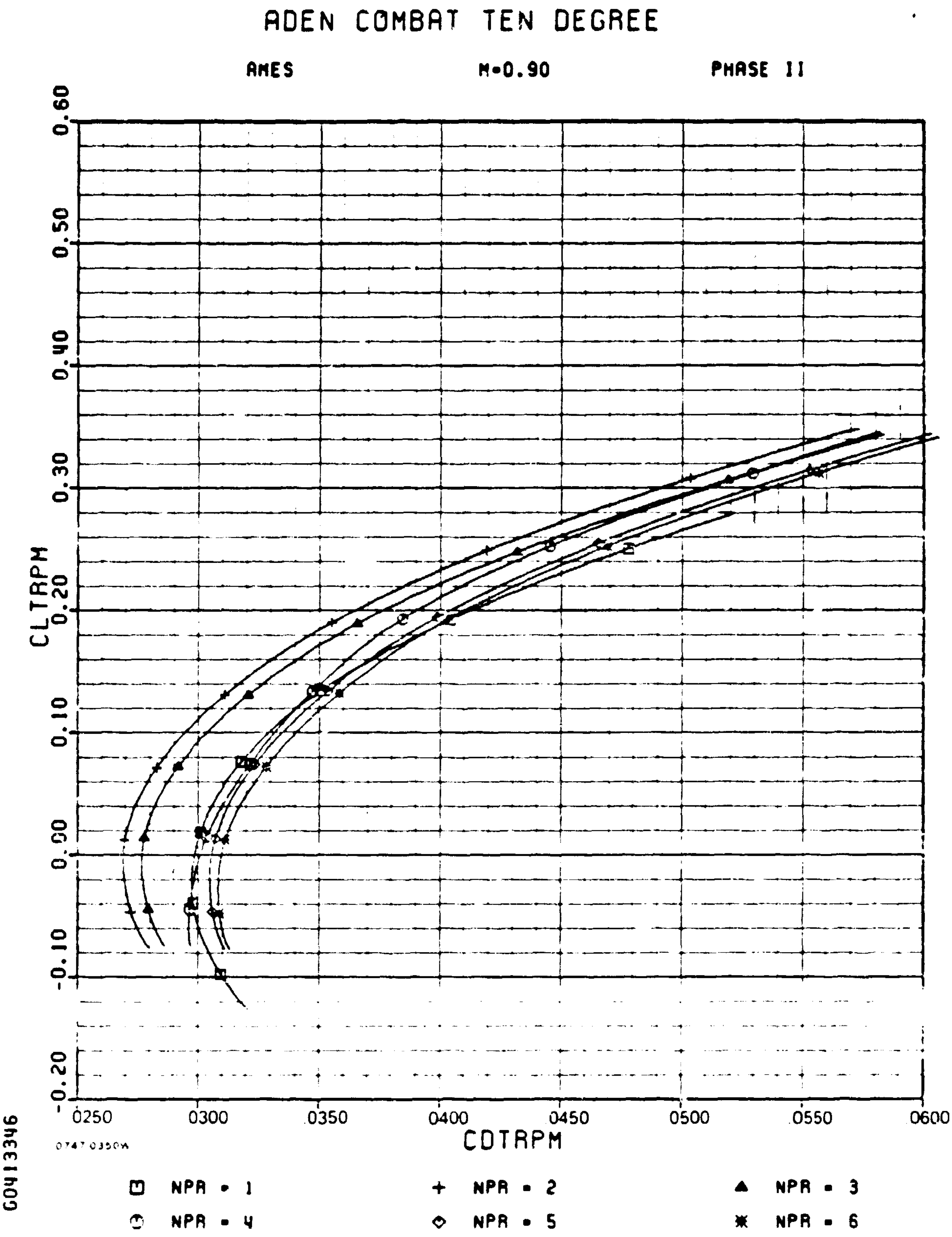
AMES
M=0.90
PHASE II
CLTRPM
CMMTRP
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
0.10
G3760352
0747-0349W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN COMBAT TEN DEGREE
AMES
M=0.90
PHASE II
CLTRPM
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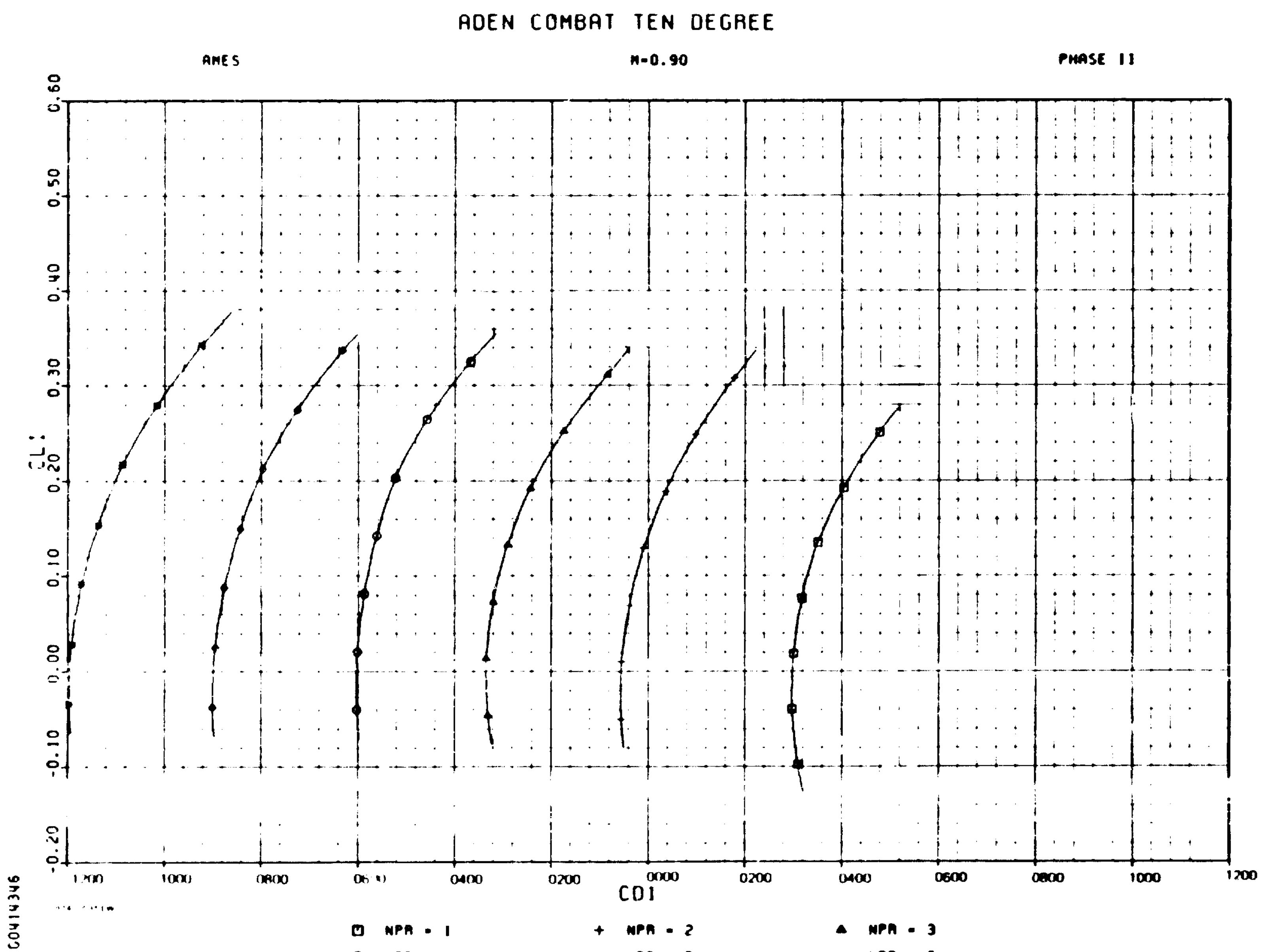
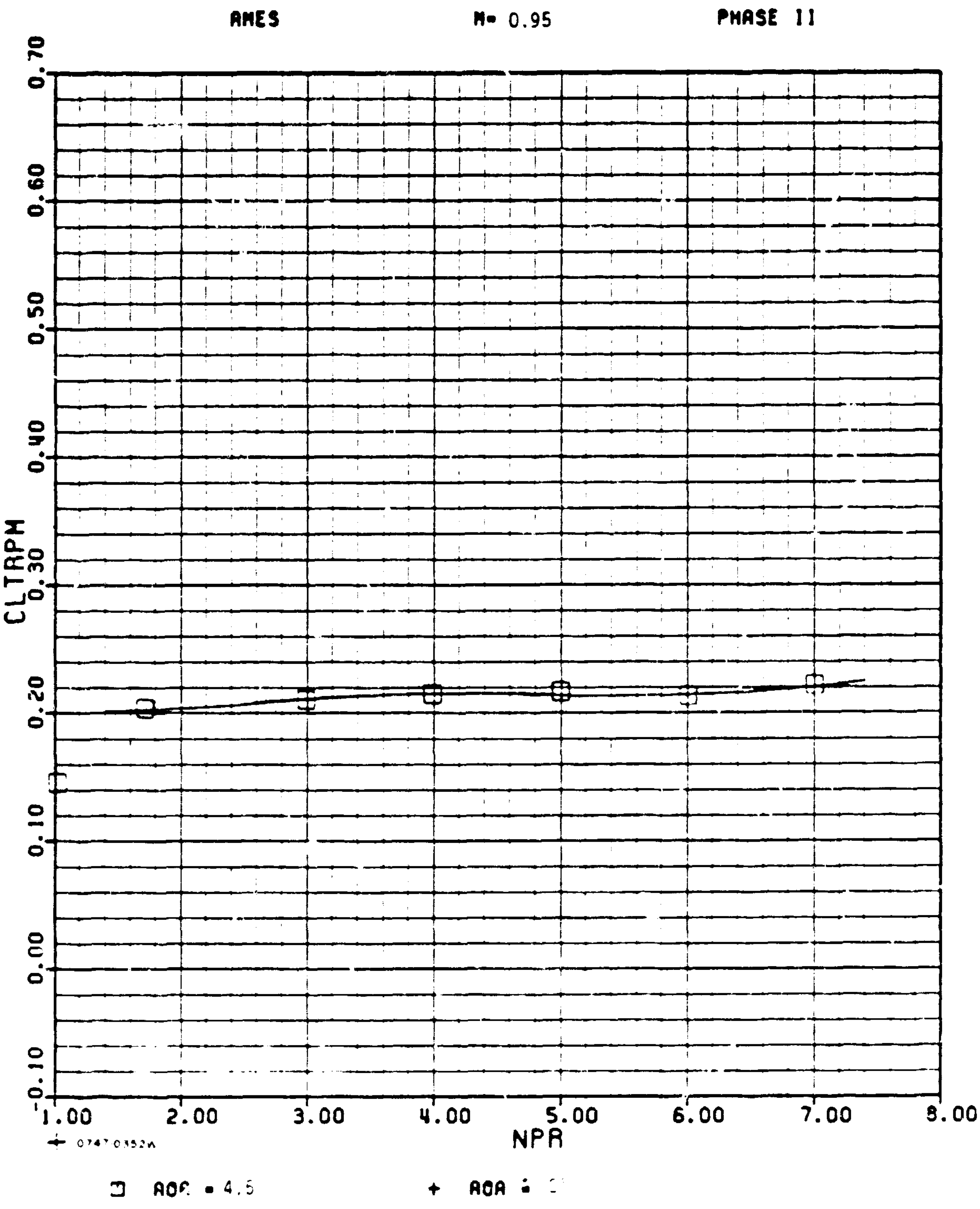
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
CDTRPM
G0413346
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6

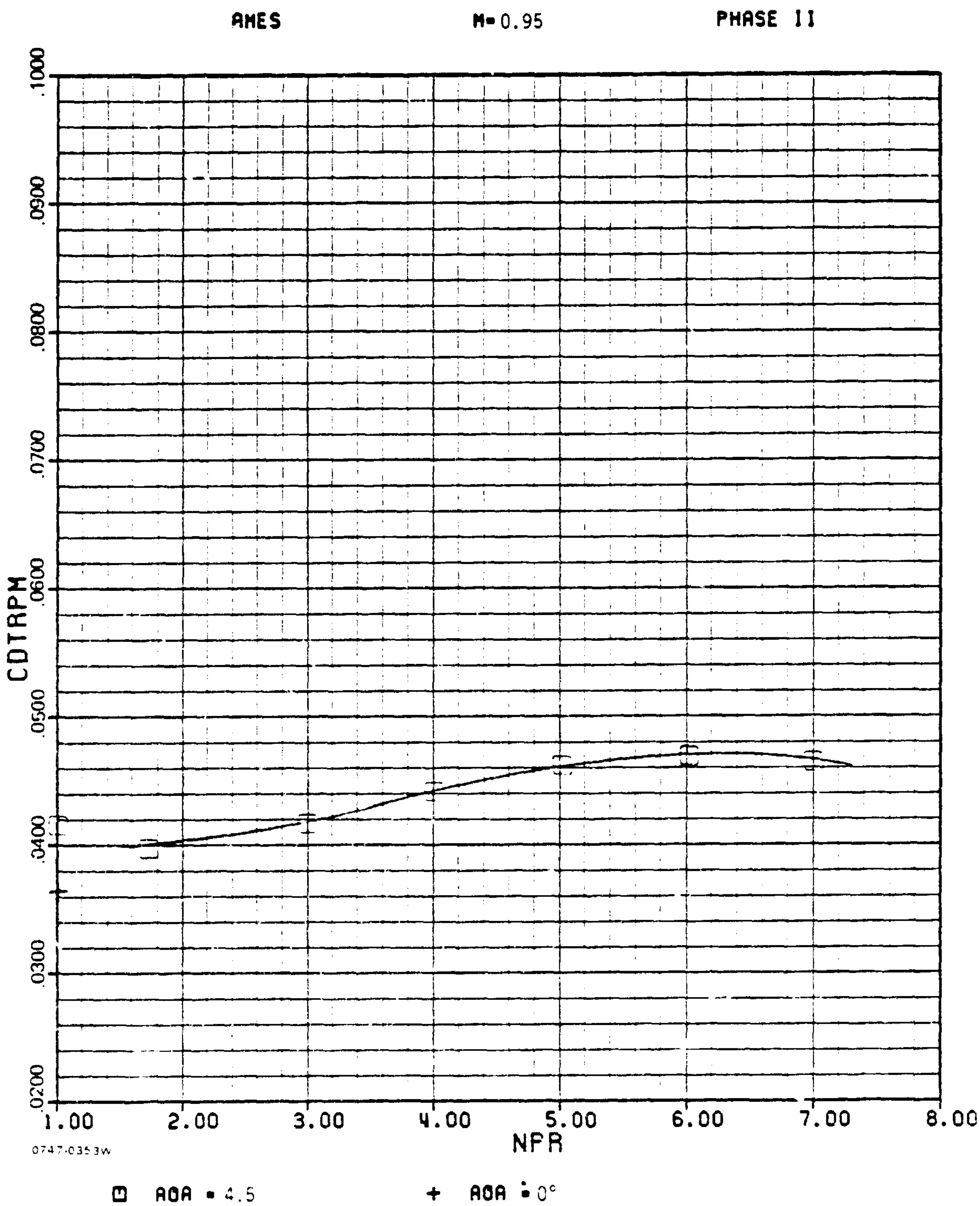


ADEN COMBAT TEN DEGREE
AMES
M=0.90
PHASE II
CL1
CD1
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
1200
1000
0800
0600
0400
0200
0000
0200
0400
0600
0800
1000
1200
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
C0414346

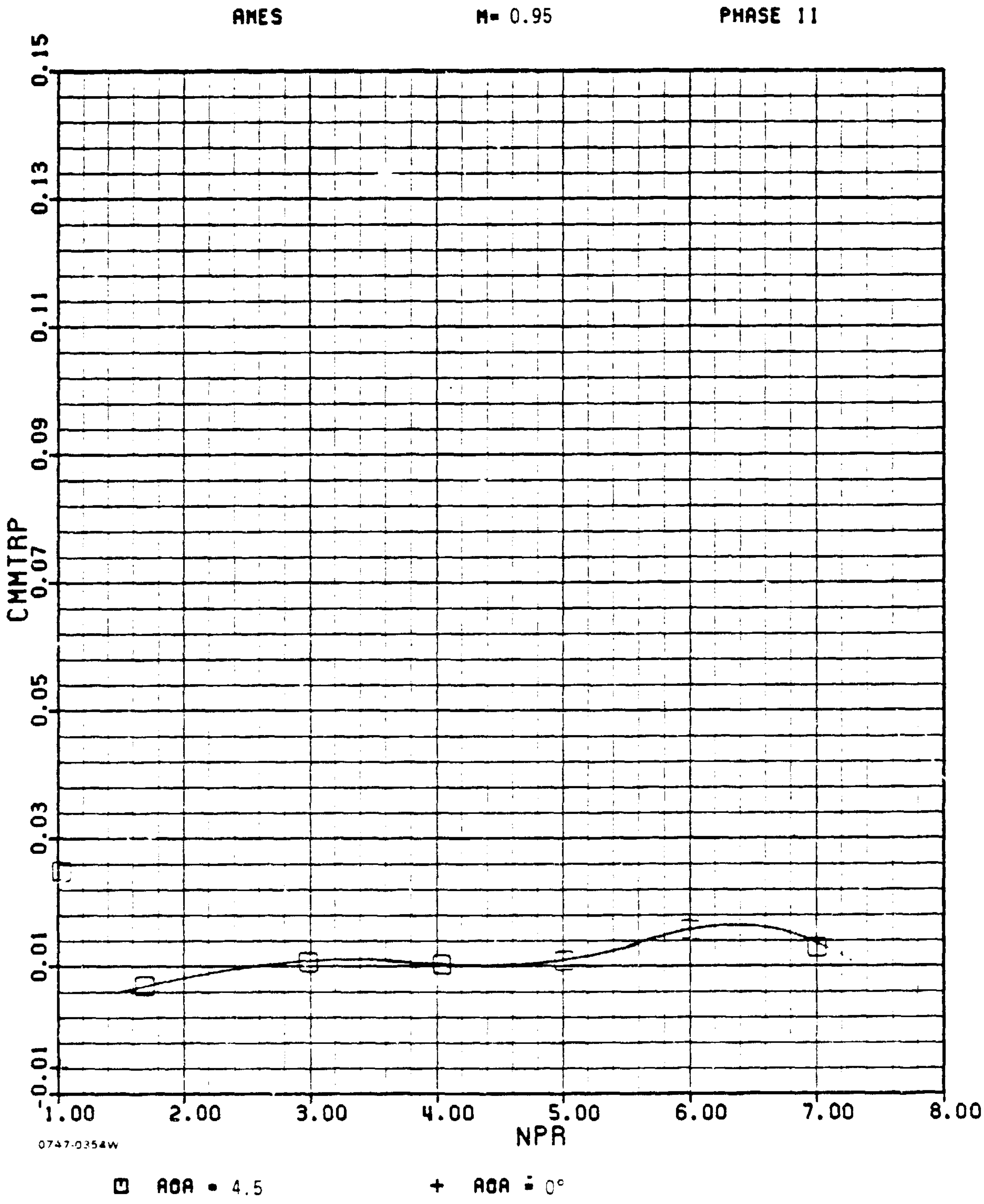
ADEN COMBAT TEN DEGREE



ADEN COMBAT TEN DEGREE

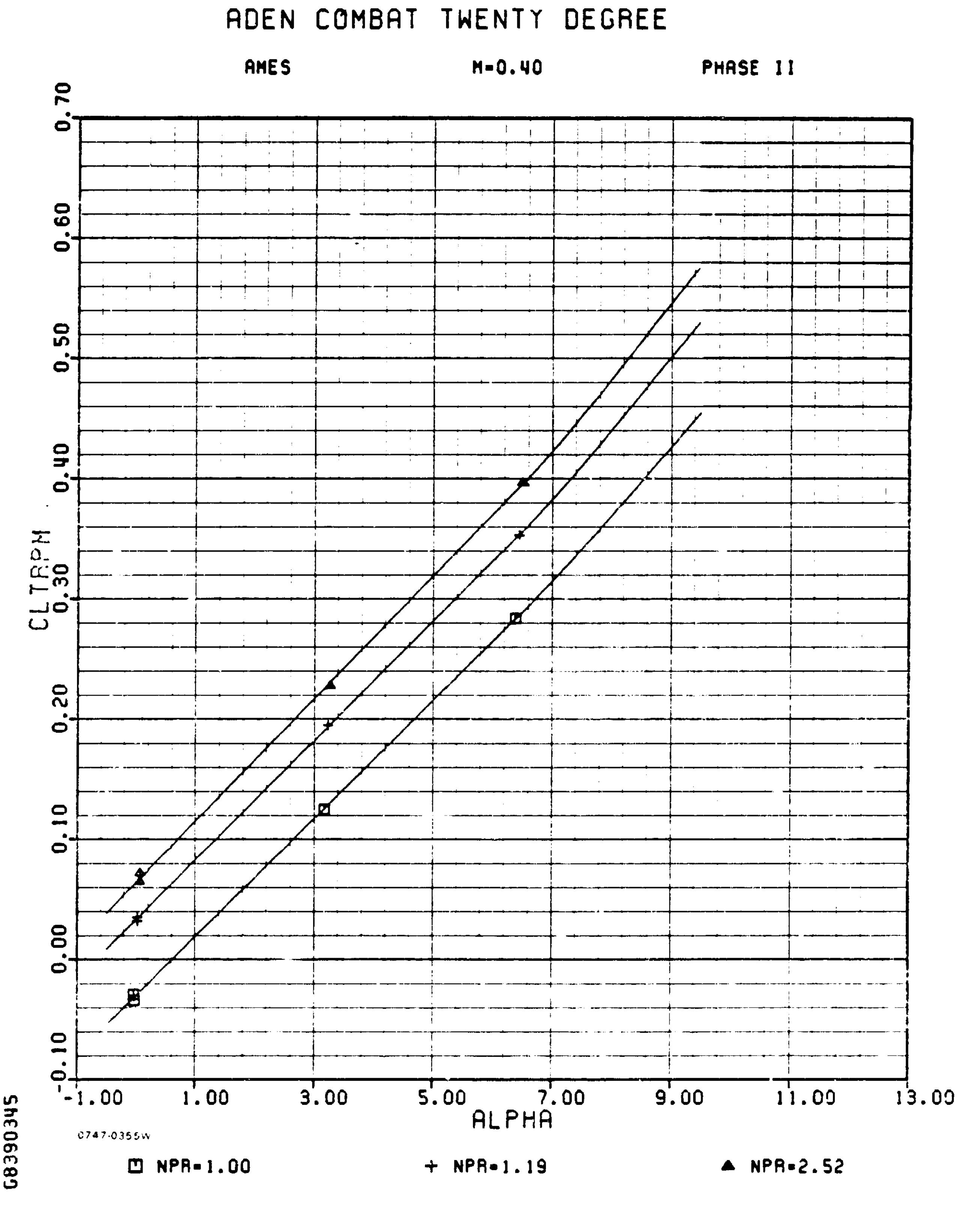


ADEN COMBAT TEN DEGREE

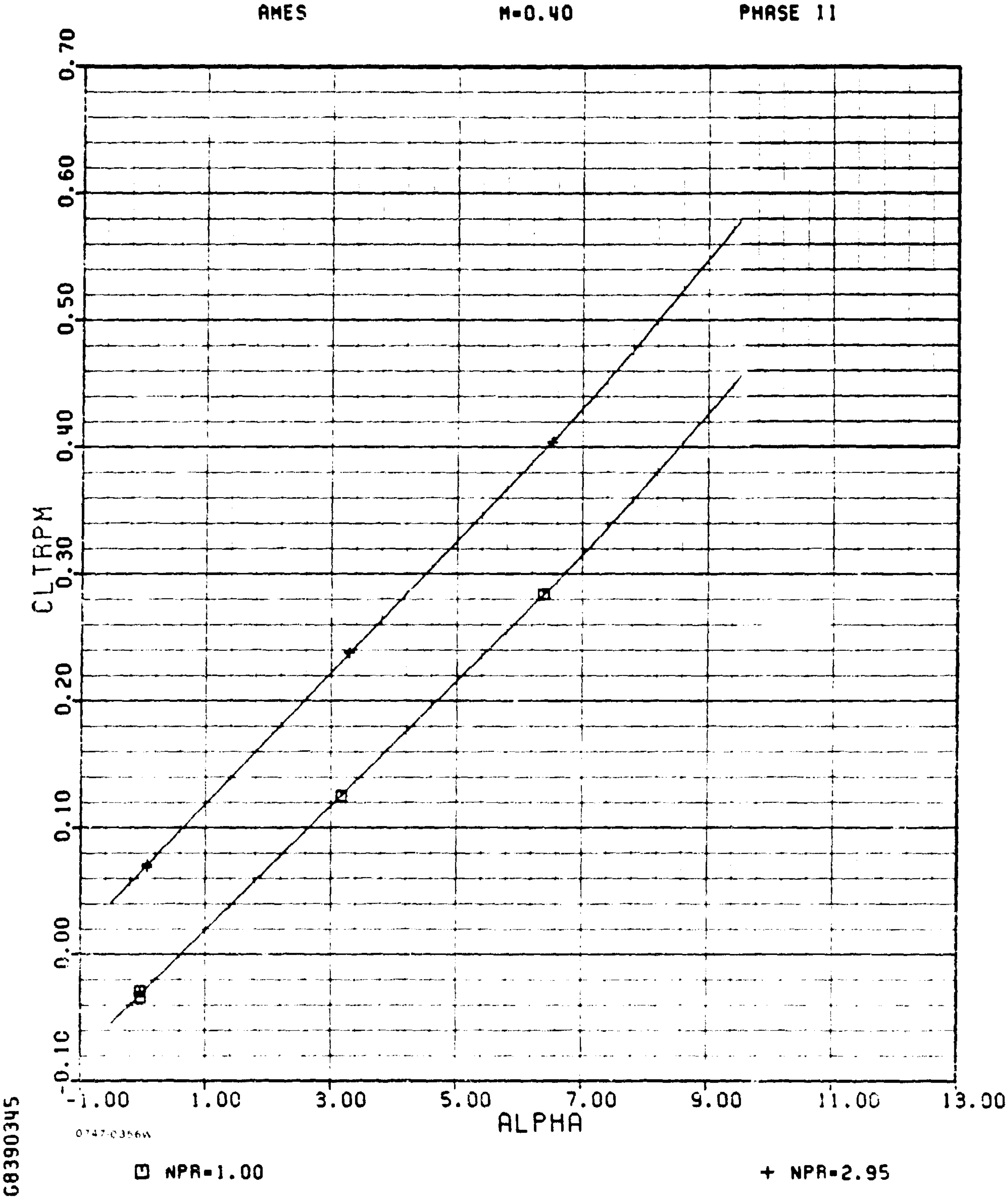


APPENDIX M

ADEN COMBAT 20° WIND-ON DATA


ADEN COMBAT TWENTY DEGREE
AMES
M=0.40
PHASE II
CLTRPM
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
G8390345
0747-0355W
NPR=1.00
+ NPR=1.19
NPR=2.52

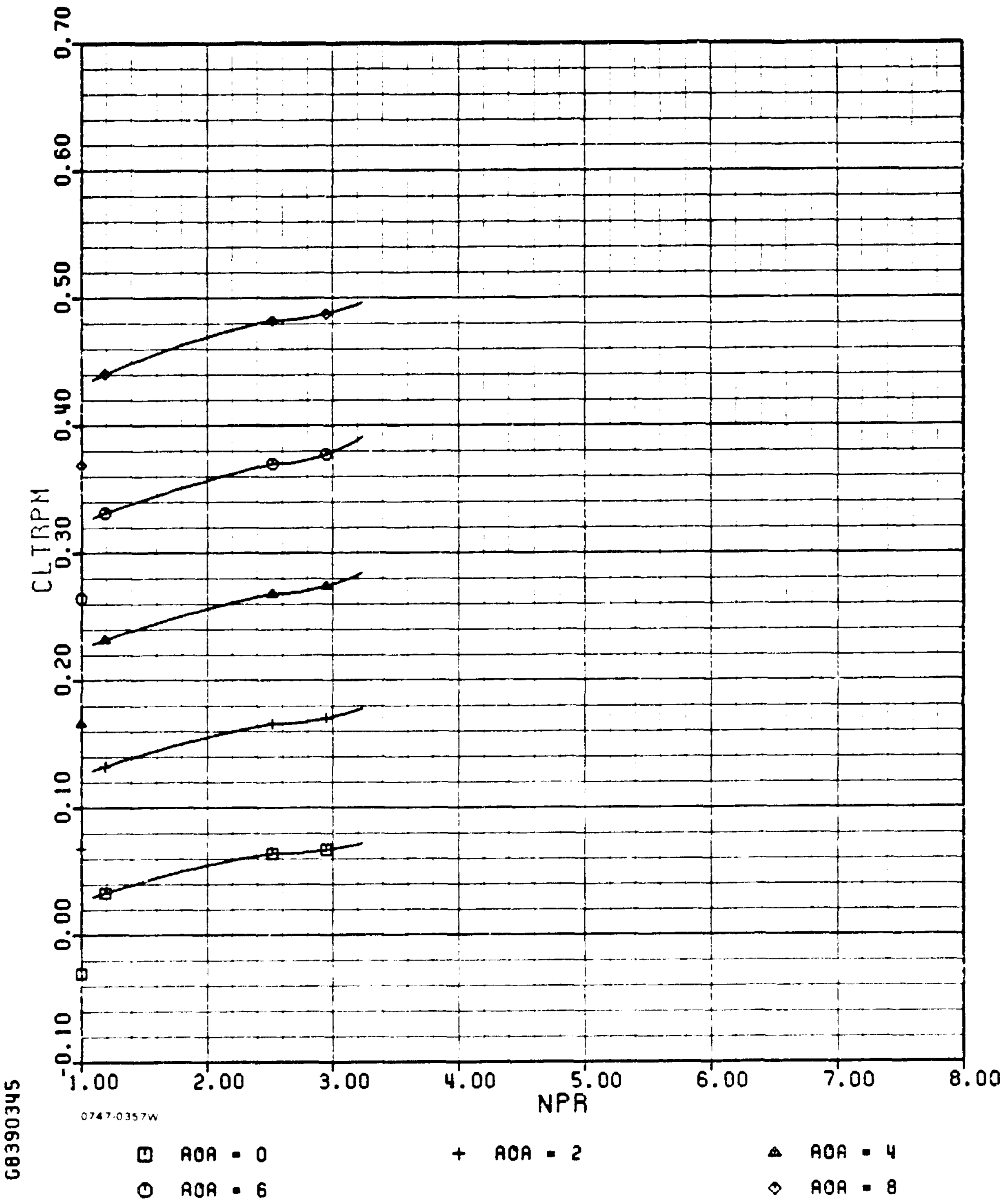
ADEN COMBAT TWENTY DEGREE

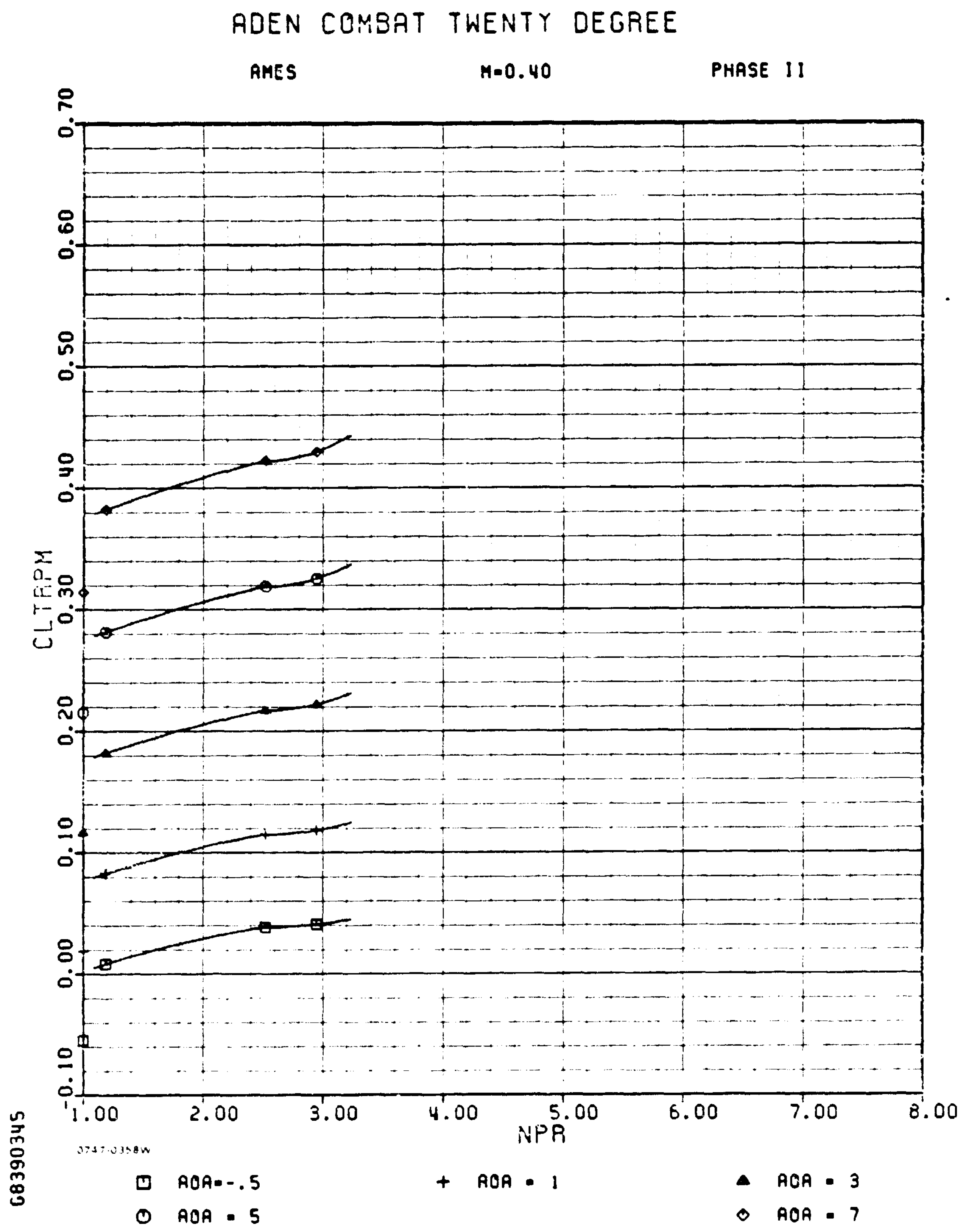


M-1(a) (concl.)

ADEN COMBAT TWENTY DEGREE

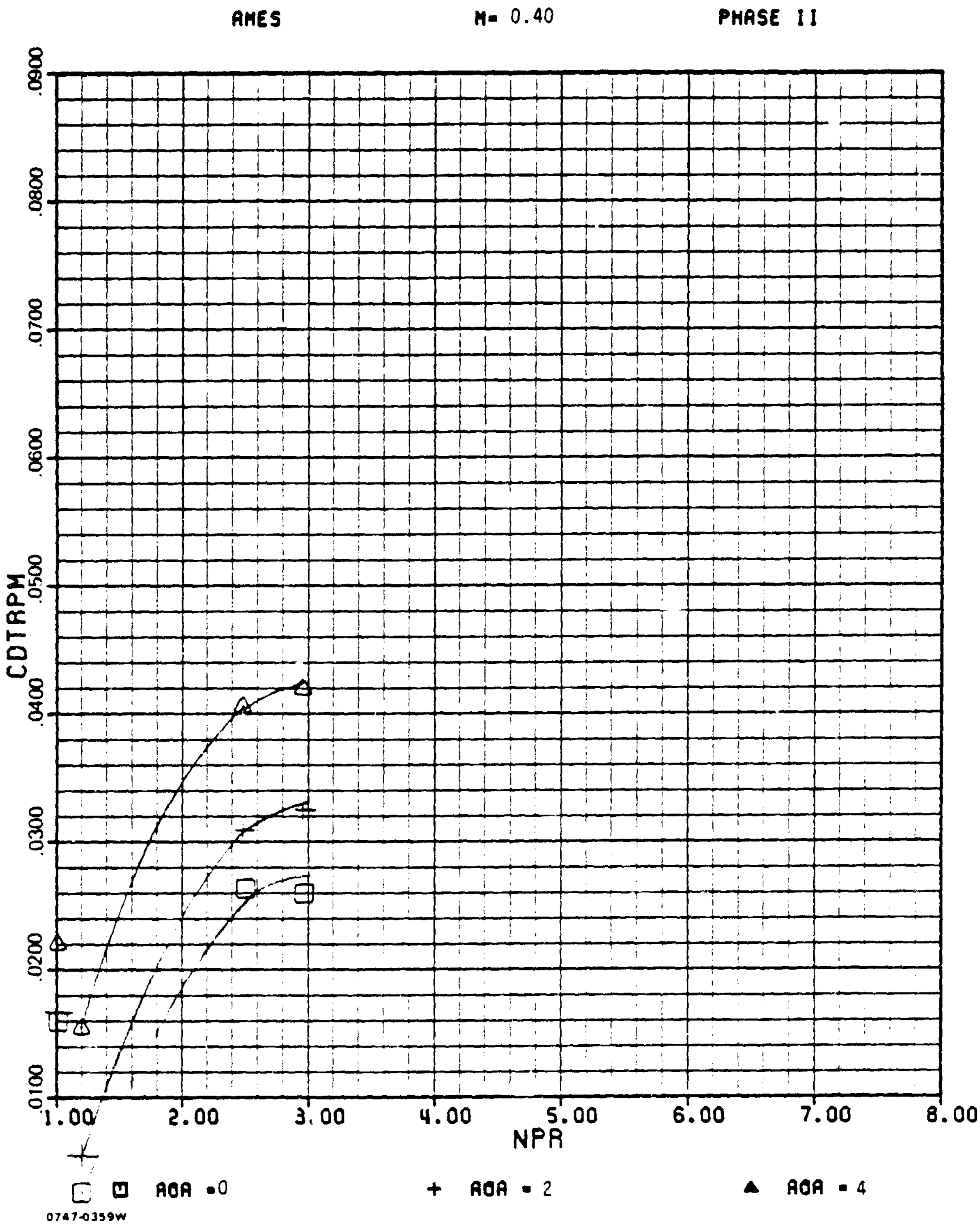
AMES M=0.40 PHASE II



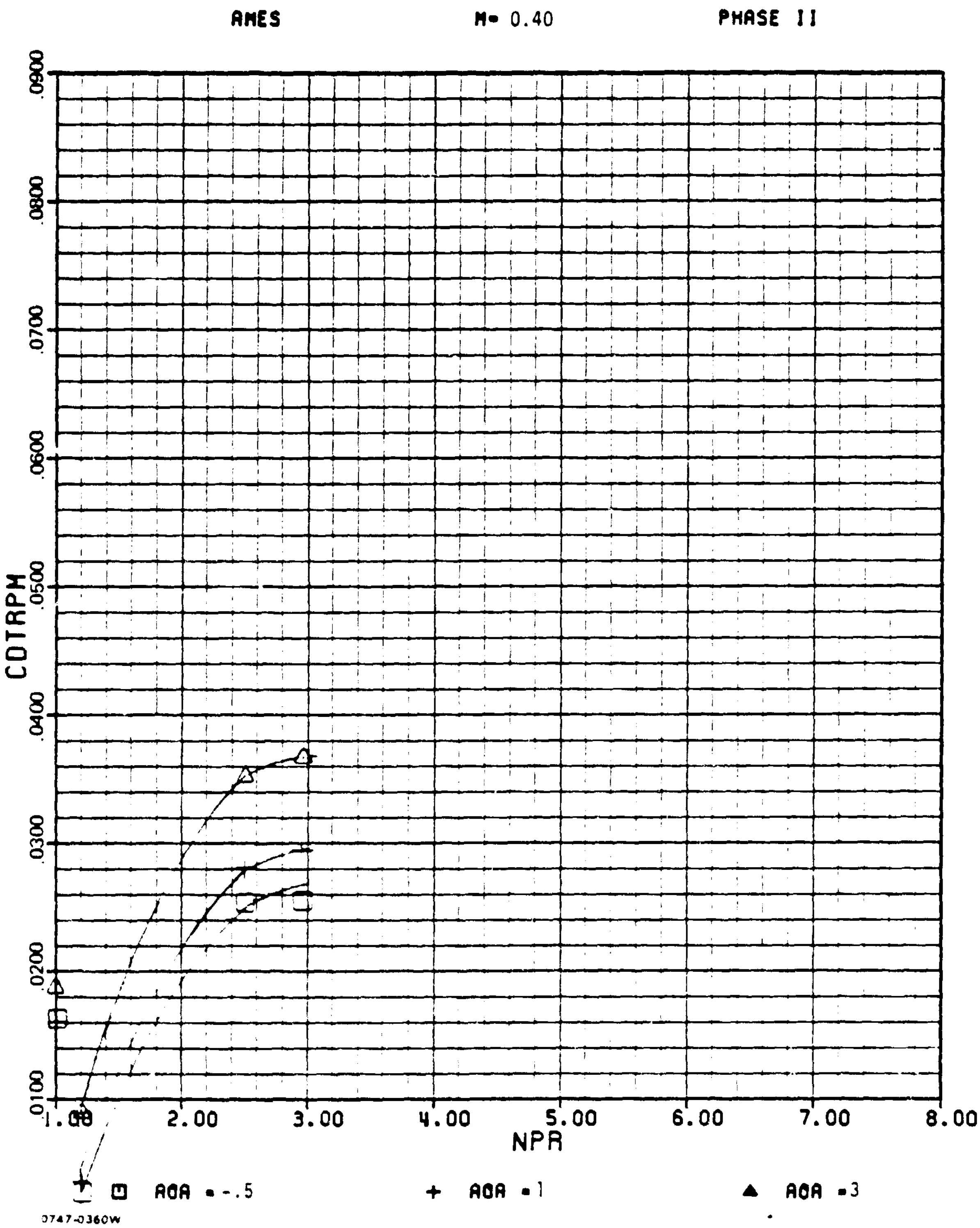

ADEN COMBAT TWENTY DEGREE
AMES
M=0.40
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G8390345
0747-0358W
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

M-1(b) (concl.)

ADEN COMBAT TWENTY DEGREE

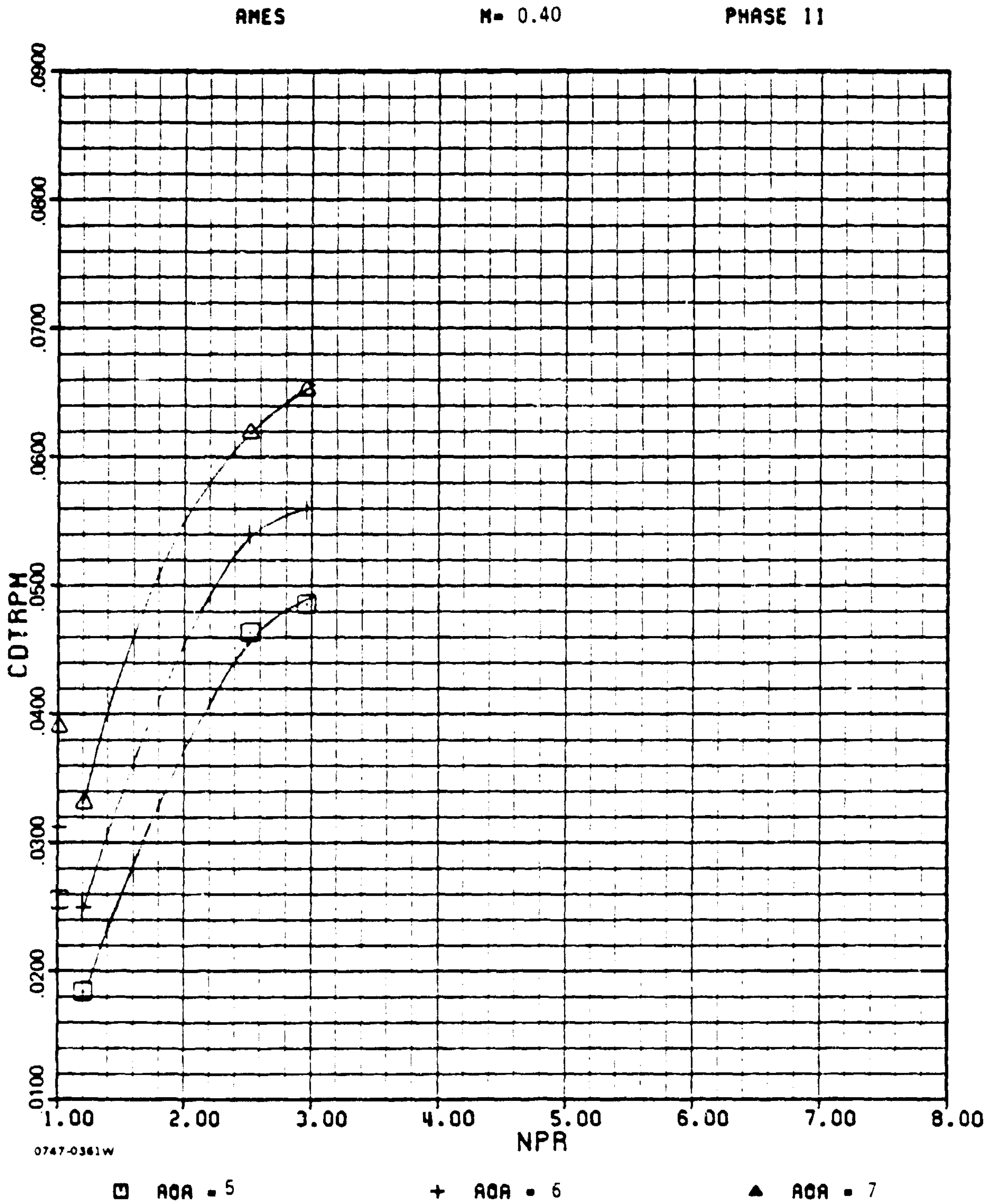


ADEN COMBAT TWENTY DEGREE

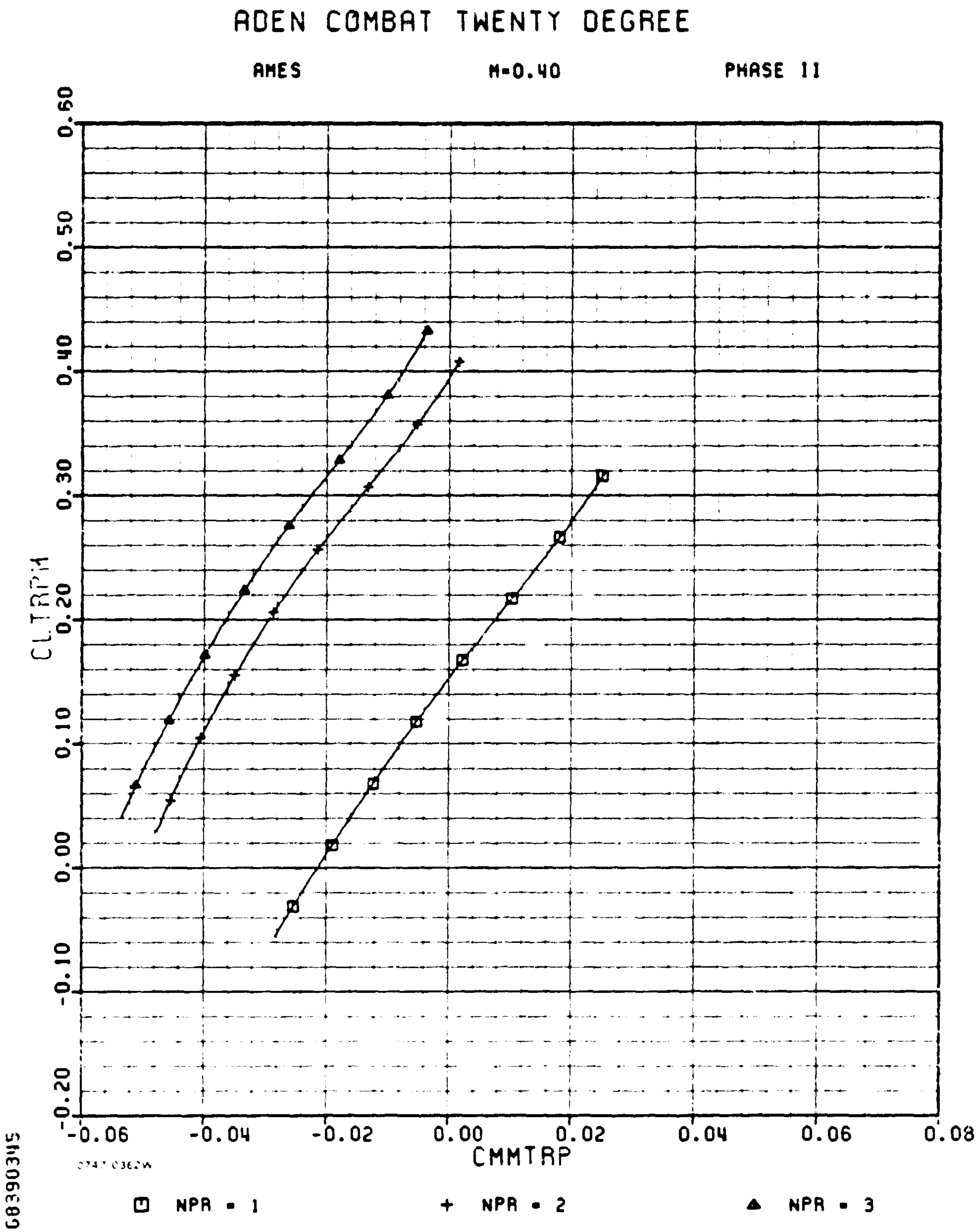


M-1(c) (cont.)

ADEN COMBAT TWENTY DEGREE



M-1(c) (concl.)


ADEN COMBAT TWENTY DEGREE
AMES
M=0.40
PHASE II
CLTRPH
CMMTRP
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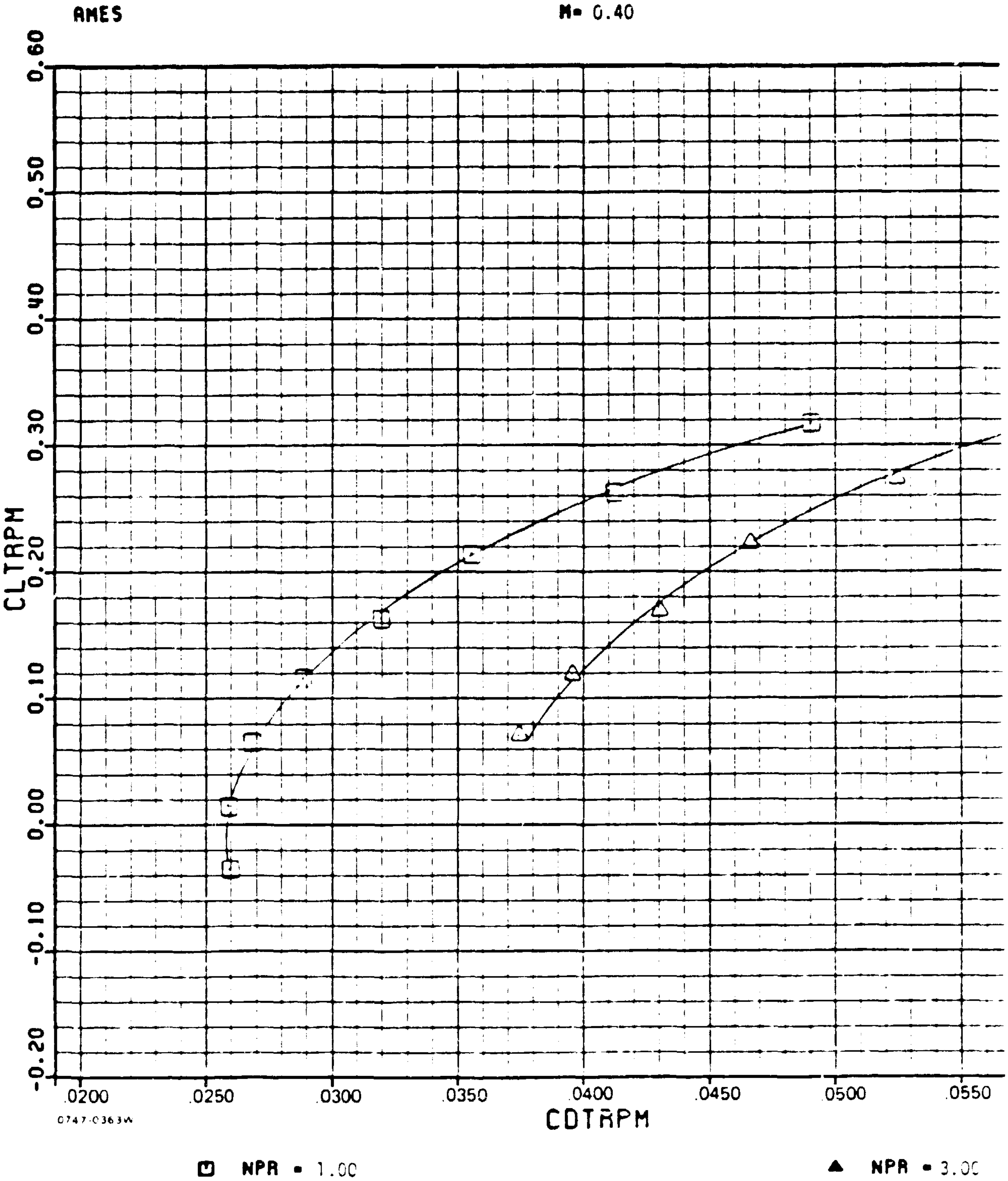
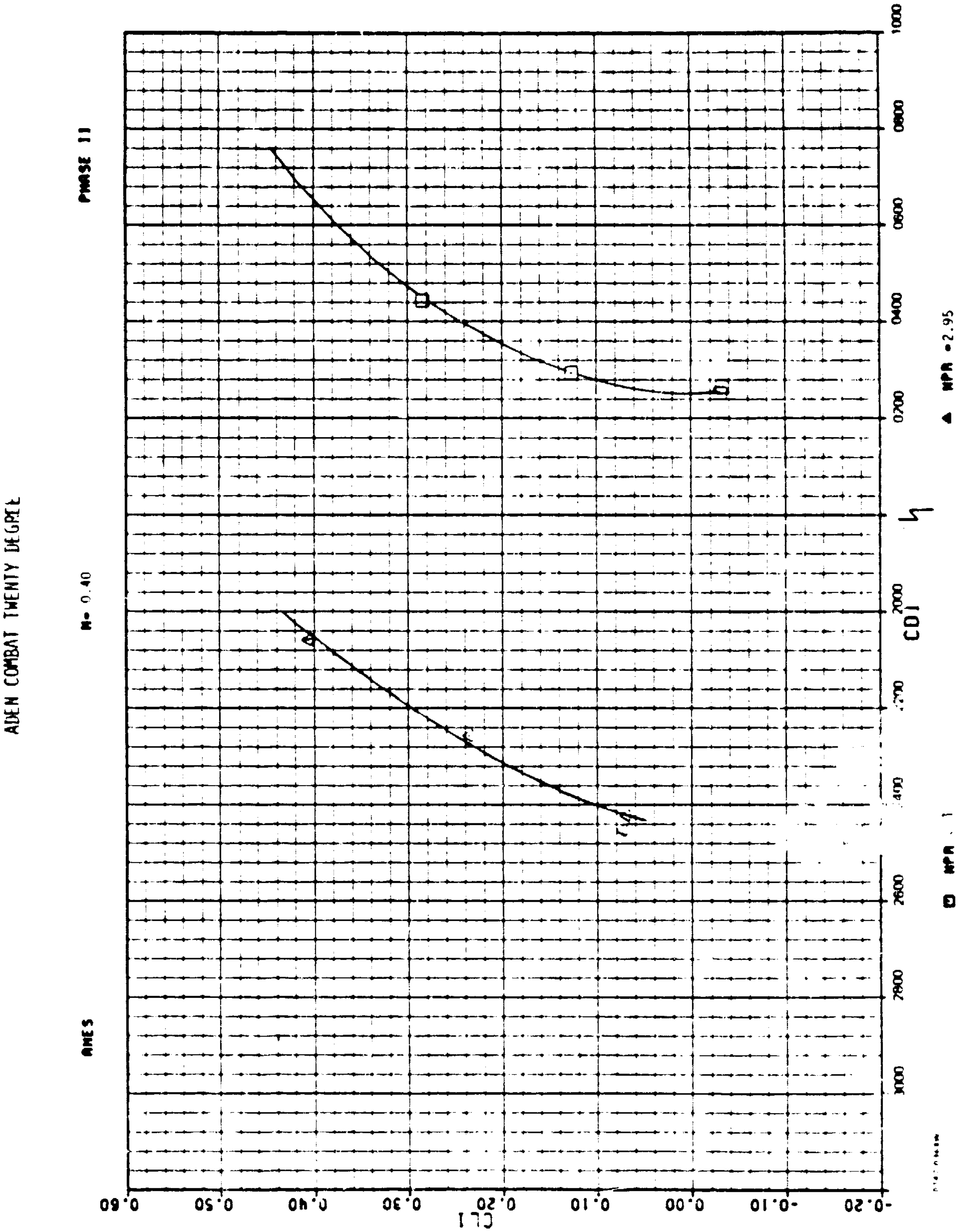
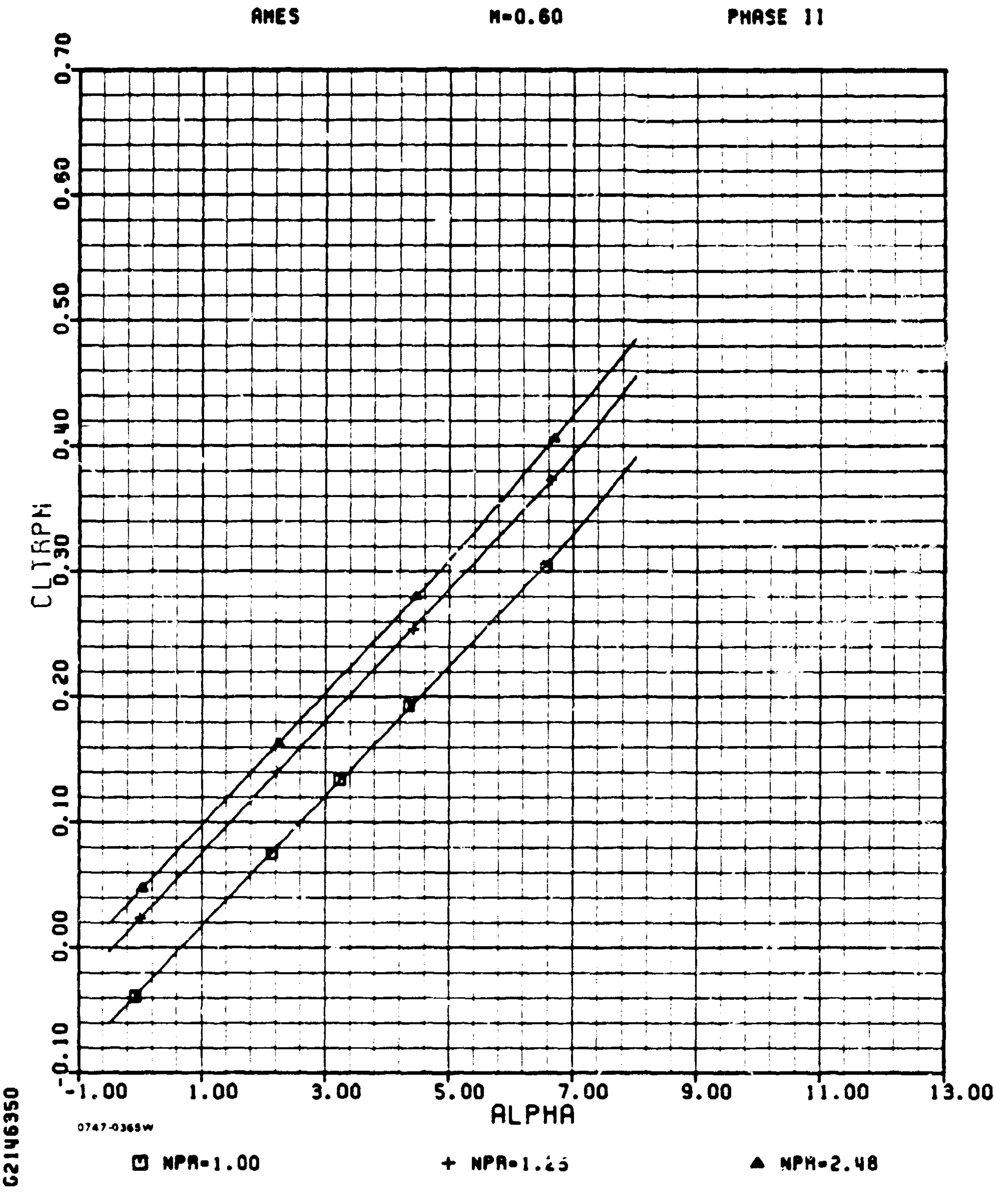
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
-0.06
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
NPR = 1
NPR = 2
NPR = 3
G8390345

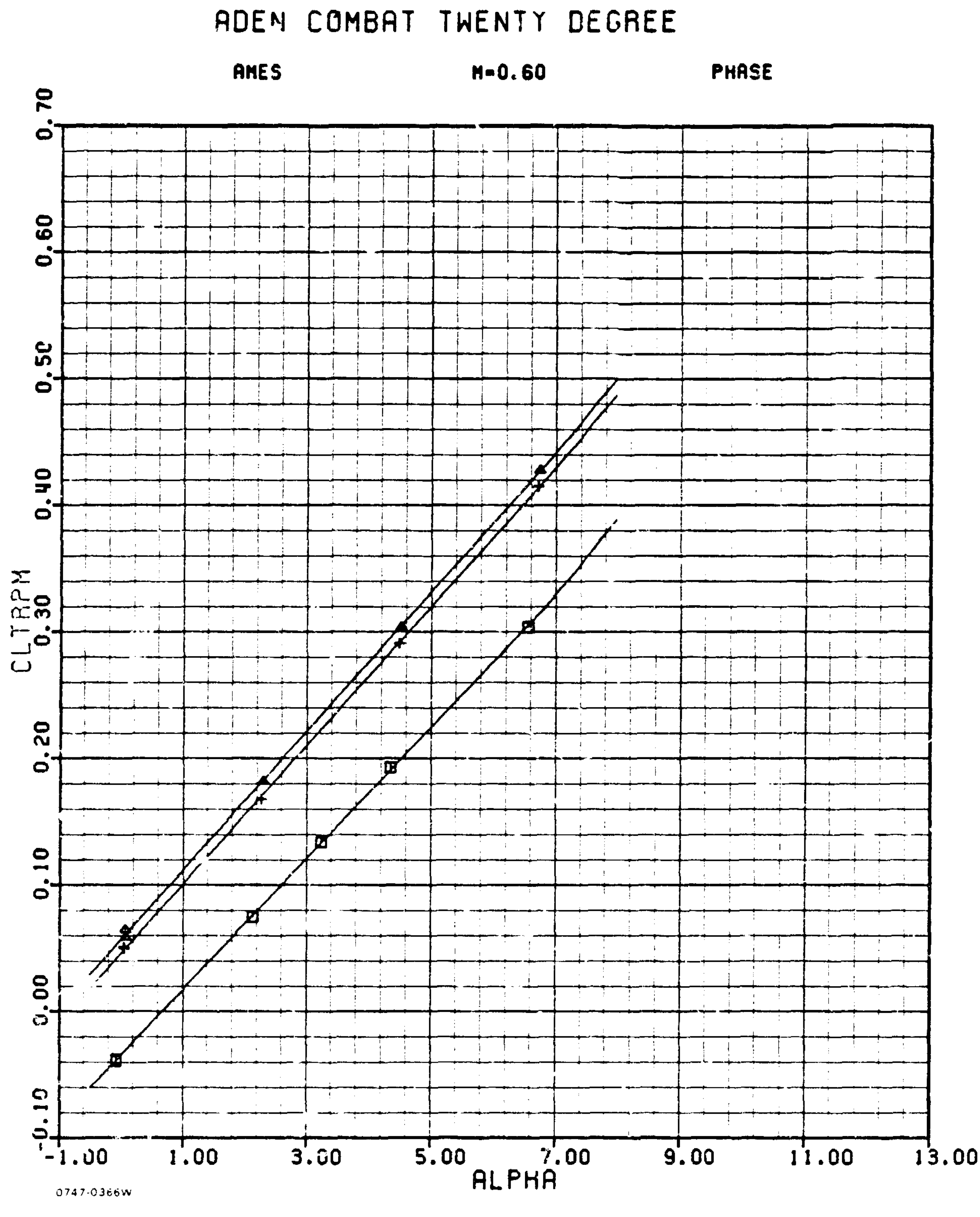
ADEN COMBAT TWENTY DEGREE




ADEN COMBAT TWENTY DEGREE
AMES
M= 0.40
PHASE II
CLI
CDI
NPR =2.95

ADEN COMBAT TWENTY DEGREE




ADEN COMBAT TWENTY DEGREE
AMES
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PHASE
CLTRPM
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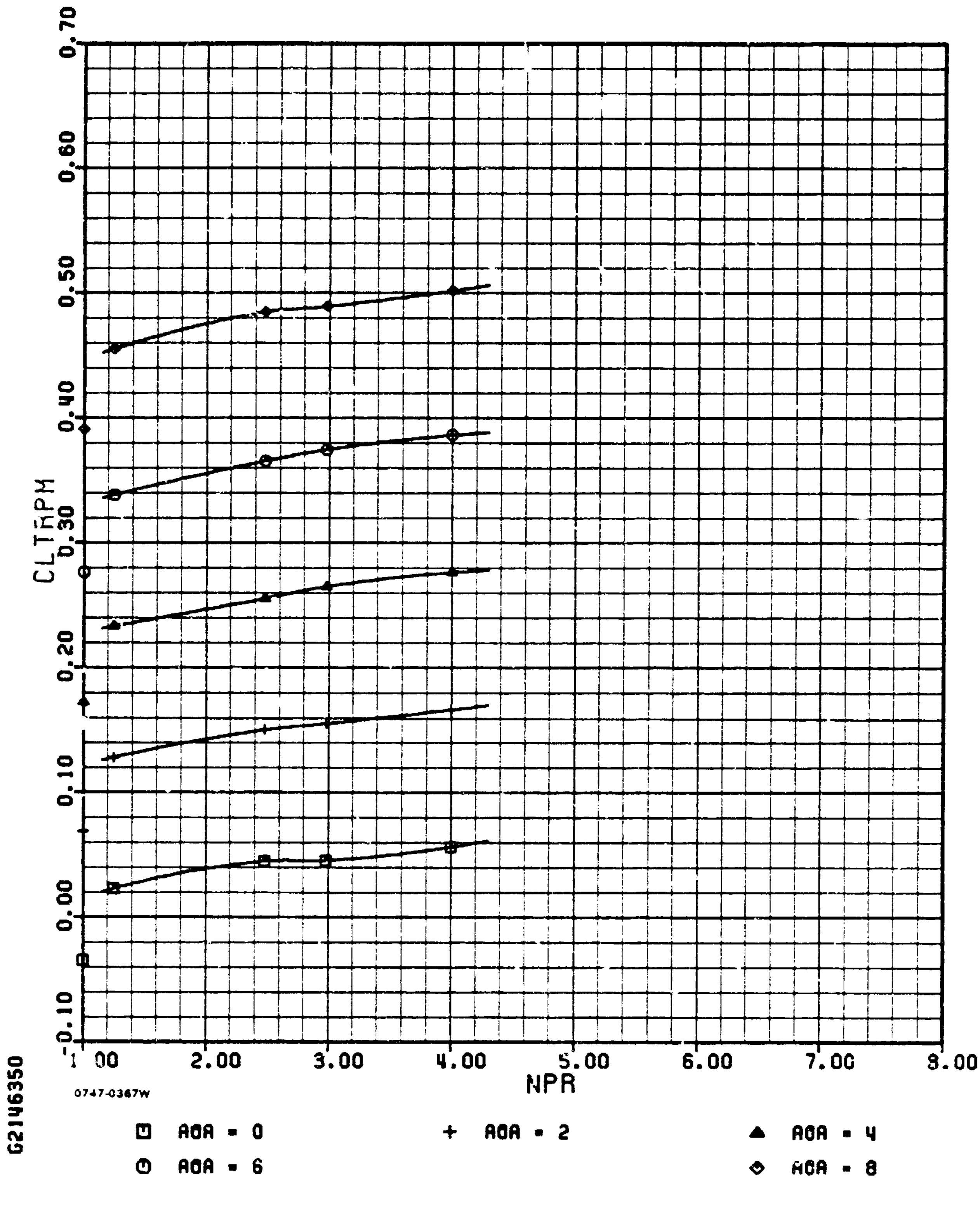
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0366W
NPR=1.00
NPR=2.98
NPR=4.00

82146350

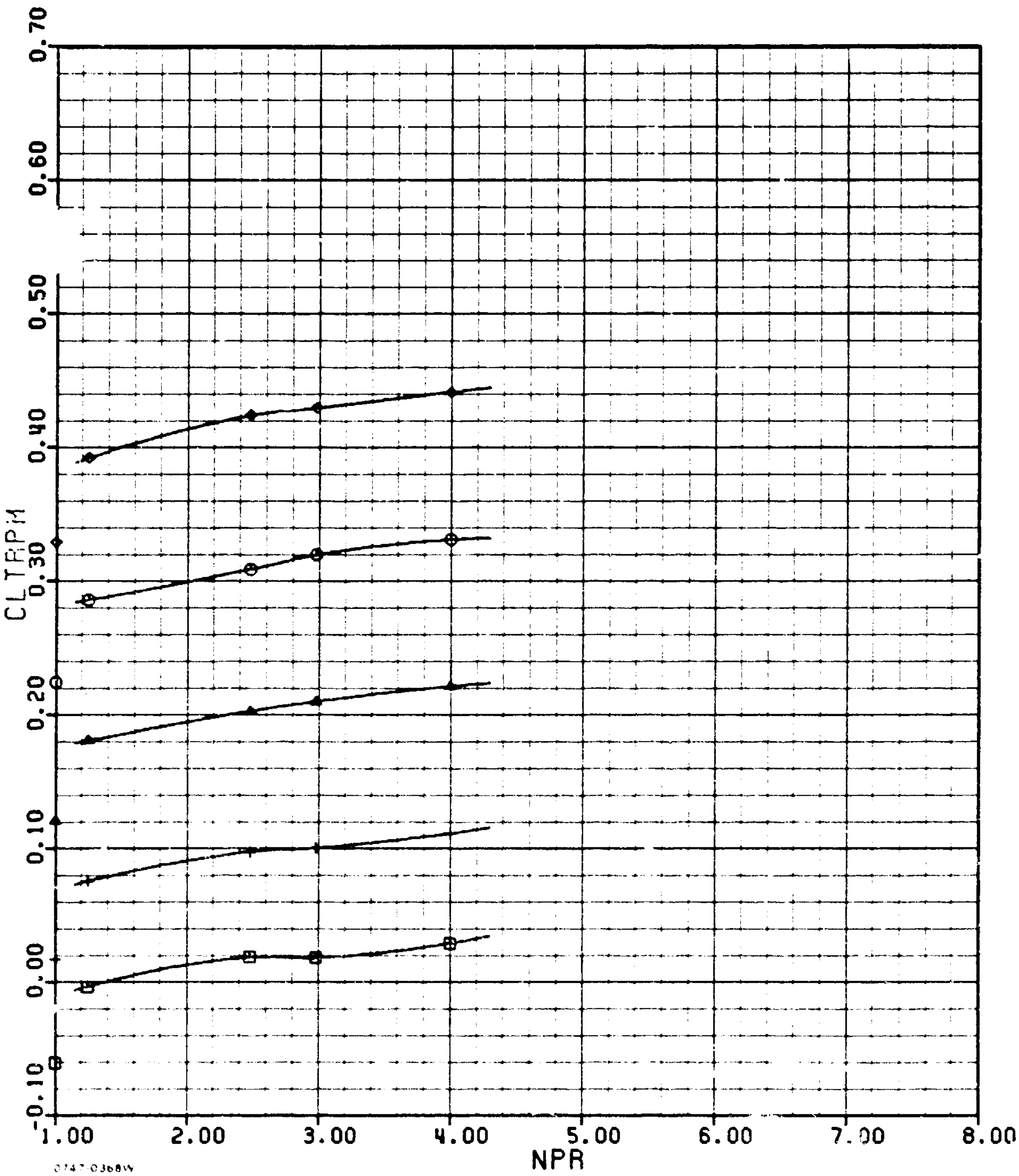
ADEN COMBAT TWENTY DEGREE

AMES M=0.60 PHASE II



ADEN COMBAT TWENTY DEGREE

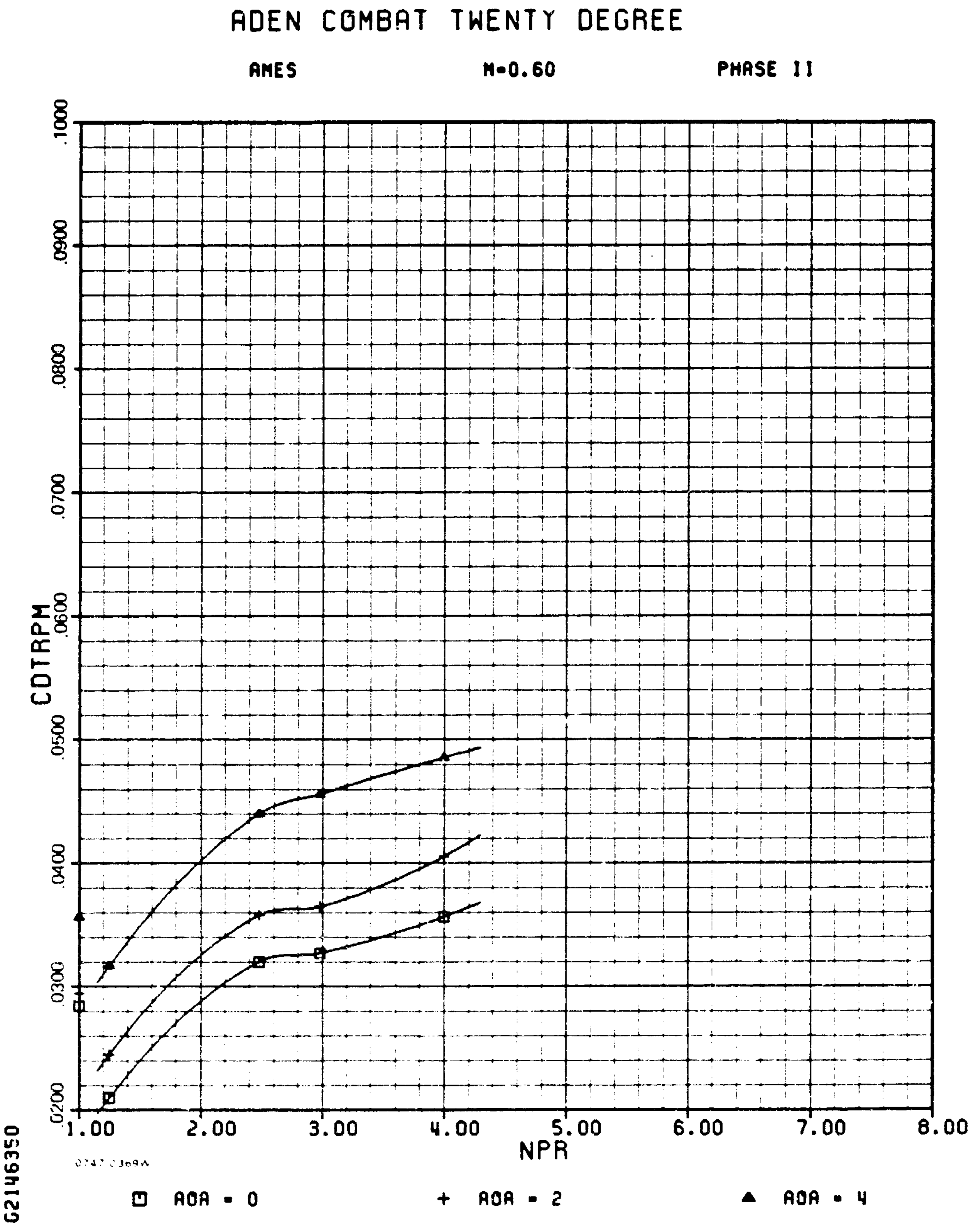
AMES M=0.60 PHASE II



G2146350

AOA=-.5 + AOA = 1 ▲ AOA = 3
AOA = 5 ◇ AOA = 7

M-2(b) (concl.)



ADEN COMBAT TWENTY DEGREE
AMES
M=0.60
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
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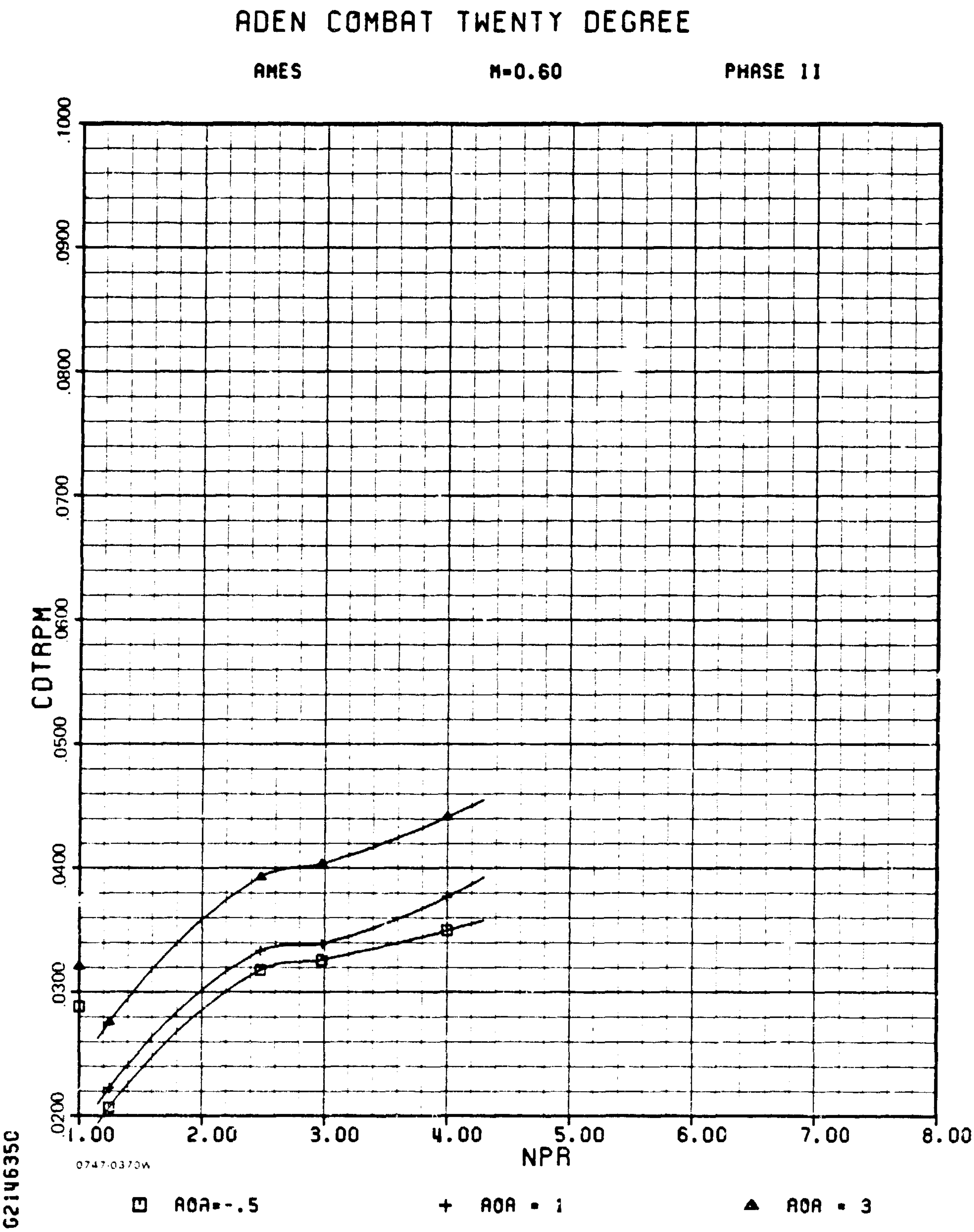
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G2146350
AOA = 0
AOA = 2
AOA = 4



ADEN COMBAT TWENTY DEGREE
AMES
M=0.60
PHASE II
CDTRPM
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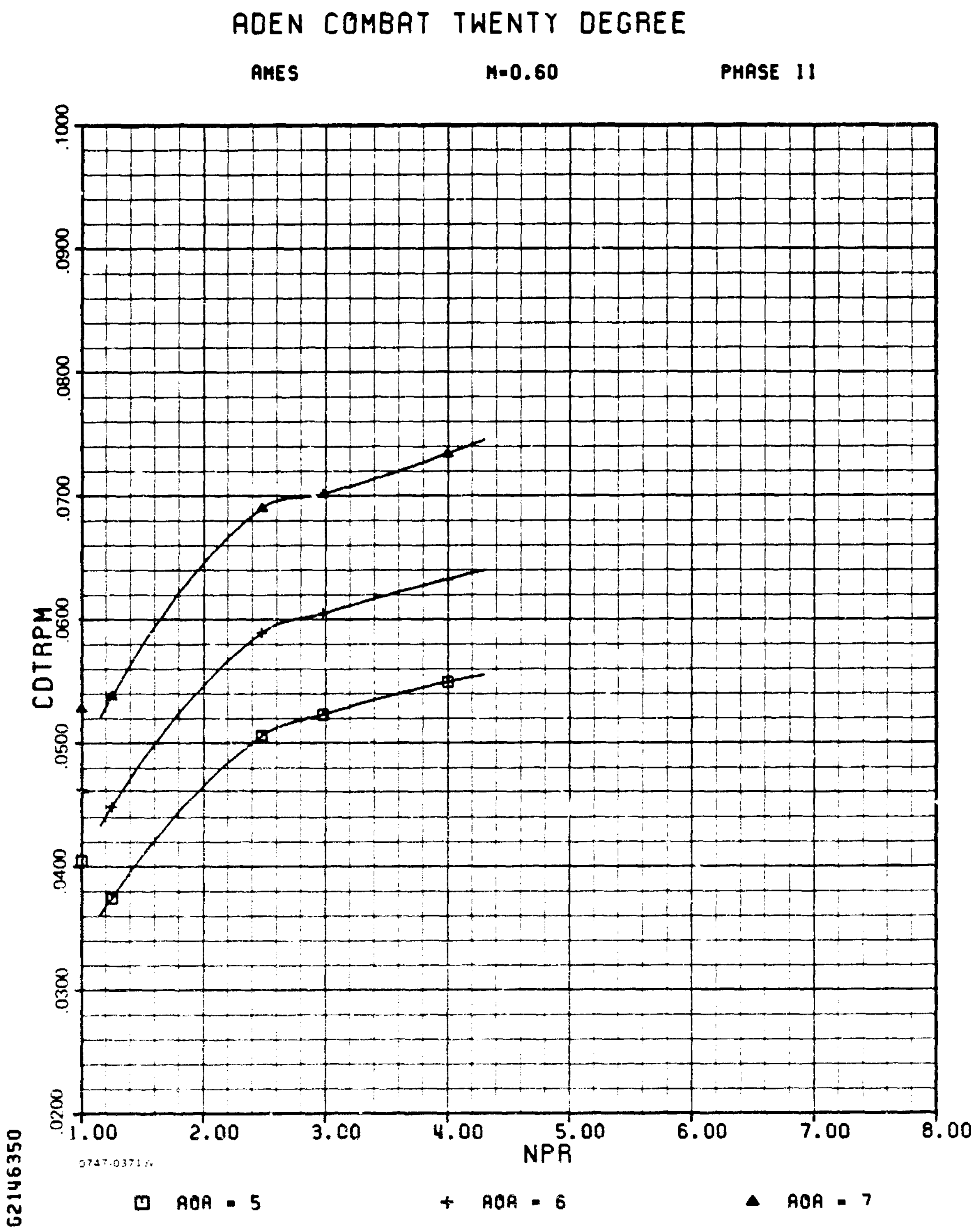
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0370W
G214635C
AOA=-.5
AOA = 1
AOA = 3

M-2(c) (cont.)


ADEN COMBAT TWENTY DEGREE
AMES
M=0.60
PHASE II
CDTRPM
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.0700
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.0300
.0200
1.00
2.00
3.00
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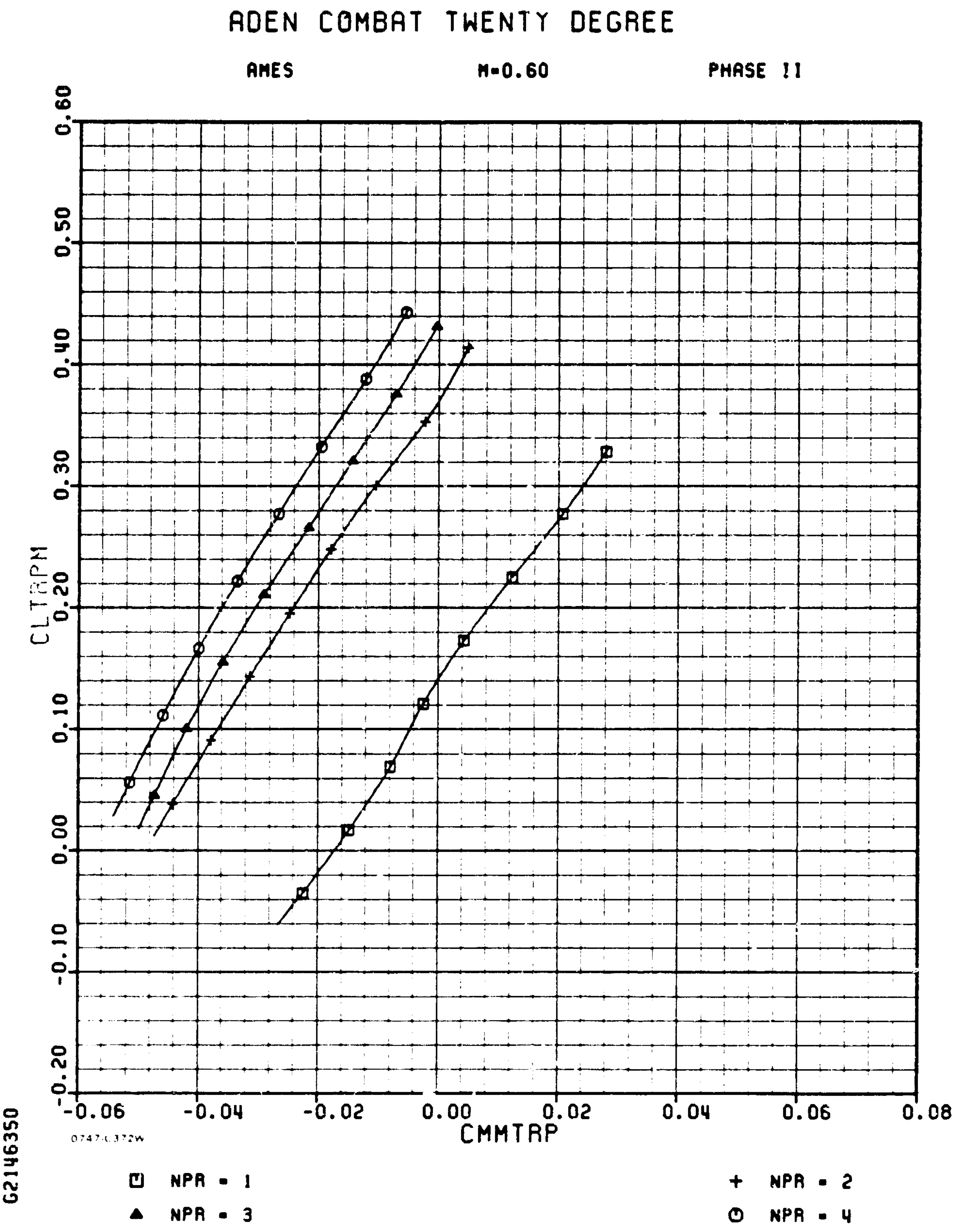
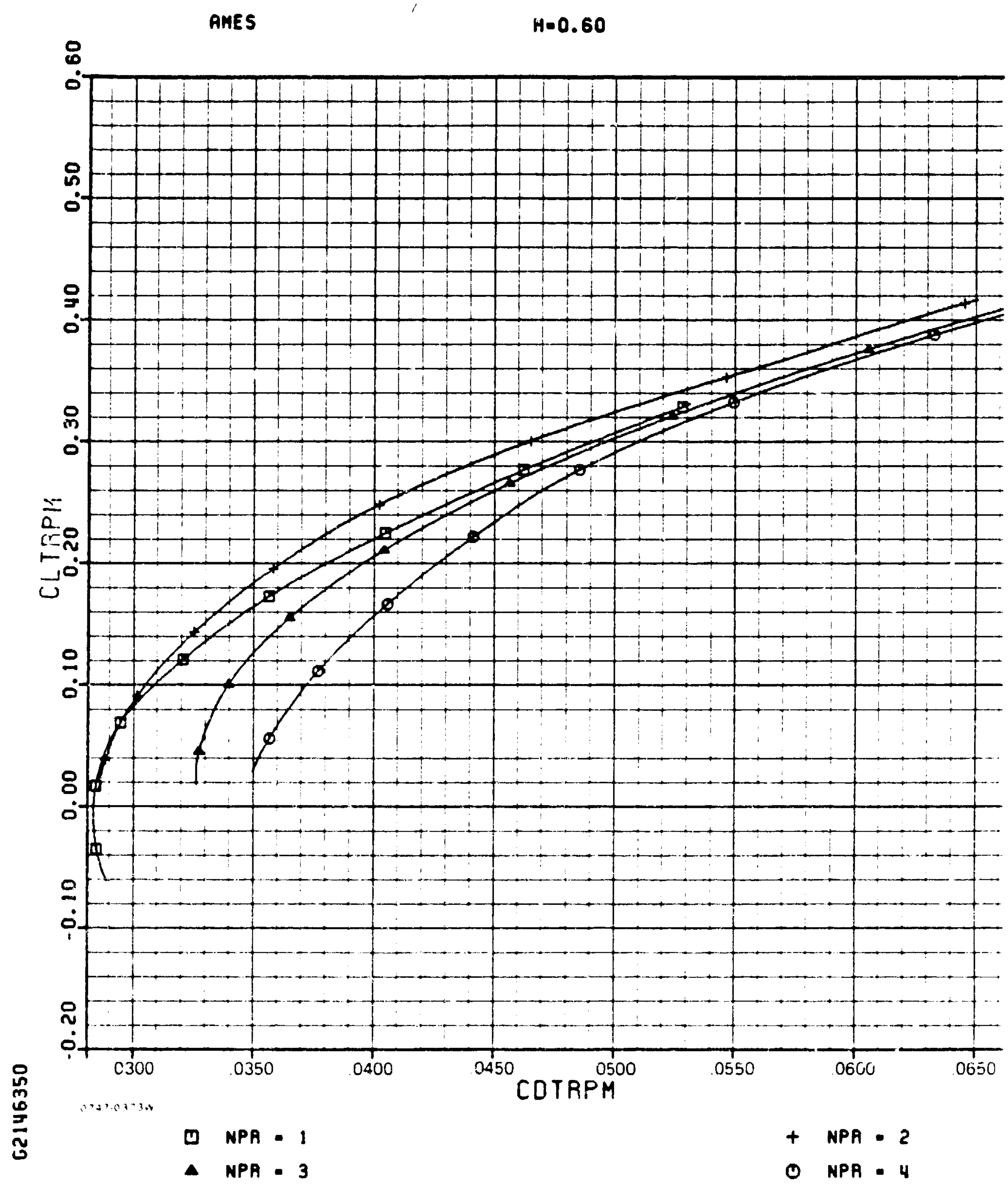
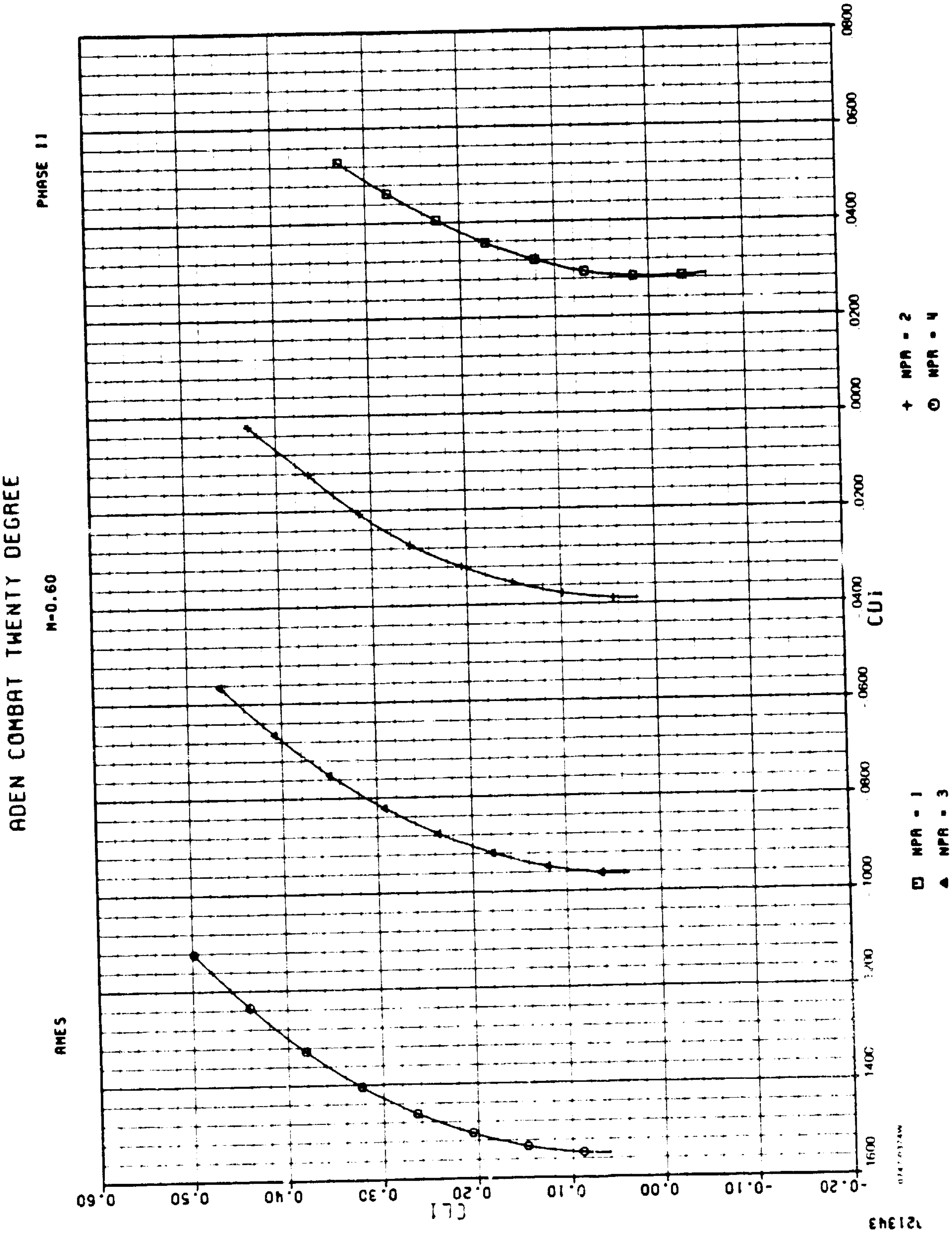
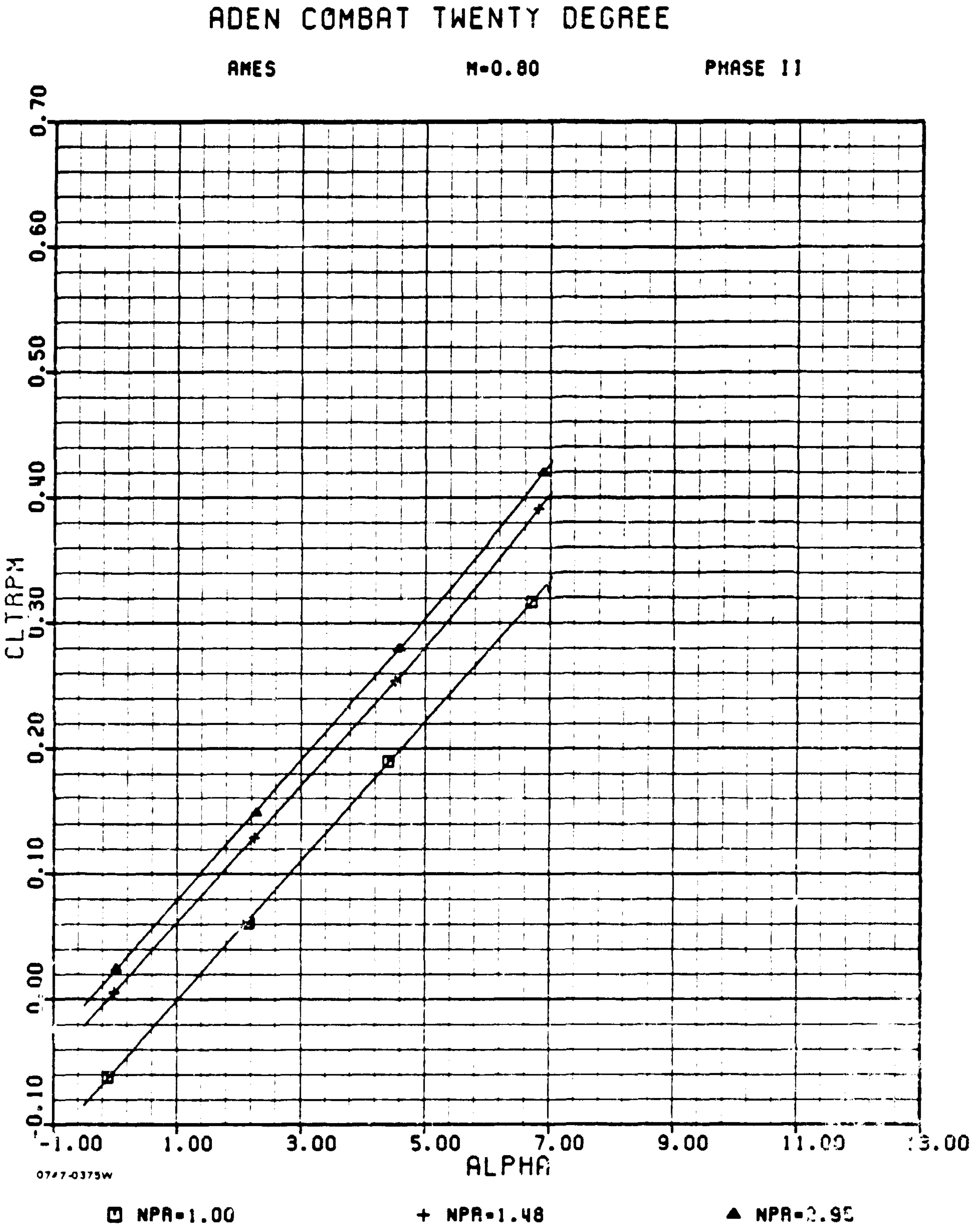
5.00
6.00
7.00
8.00
NPR
G2146350
AOA = 5
AOA = 6
AOA = 7


ADEN COMBAT TWENTY DEGREE
AMES
M=0.60
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.06
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
NPR = 1
NPR = 2
NPR = 3
NPR = 4
G2146350

ADEN COMBAT TWENTY DEGREE




ADEN COMBAT TWENTY DEGREE
M=0.60
AMES
PHASE II
□ NPR = 1
+ NPR = 2
▲ NPR = 3
⊙ NPR = 4
CDi
CLI
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20



ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CLTRPM
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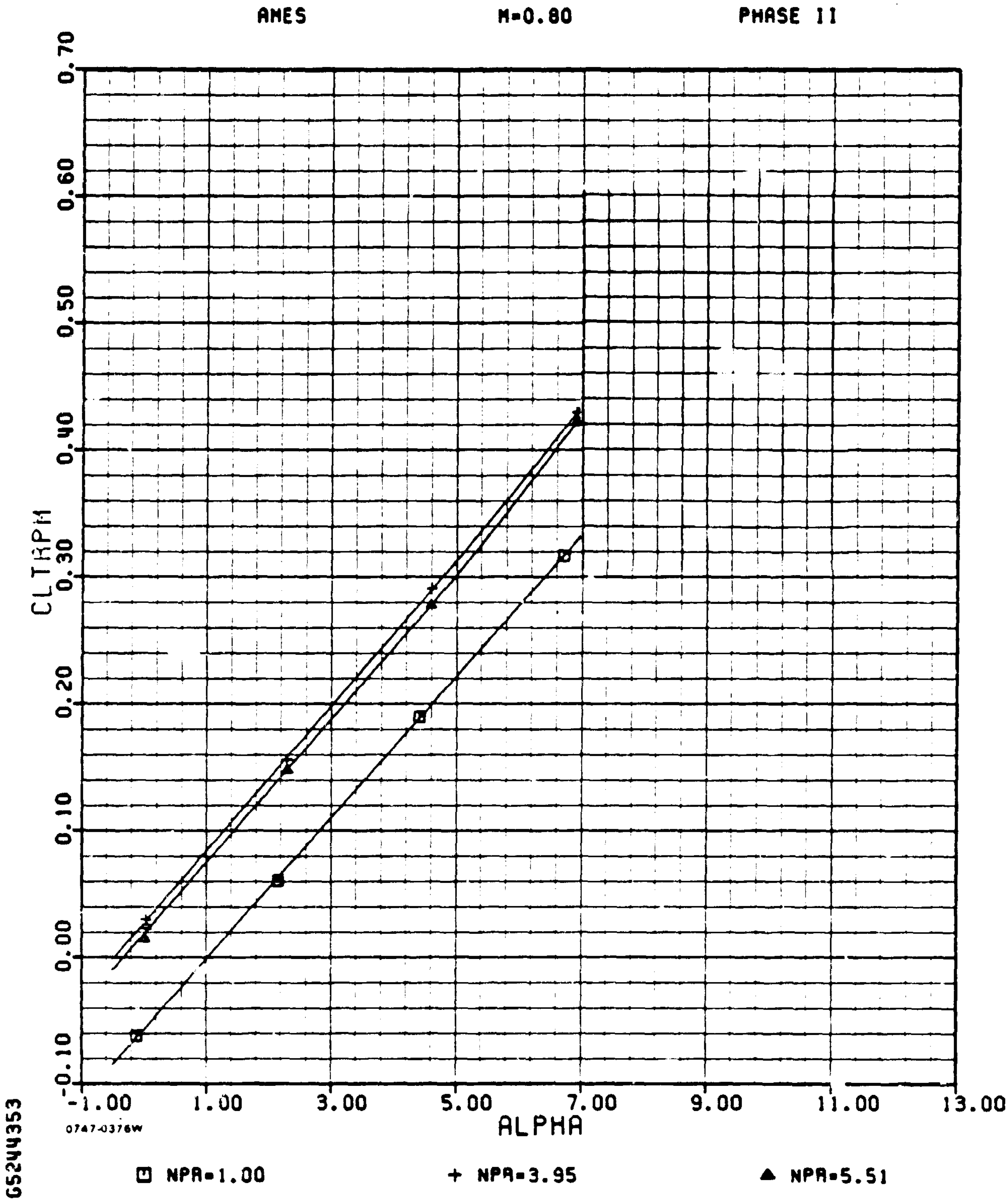
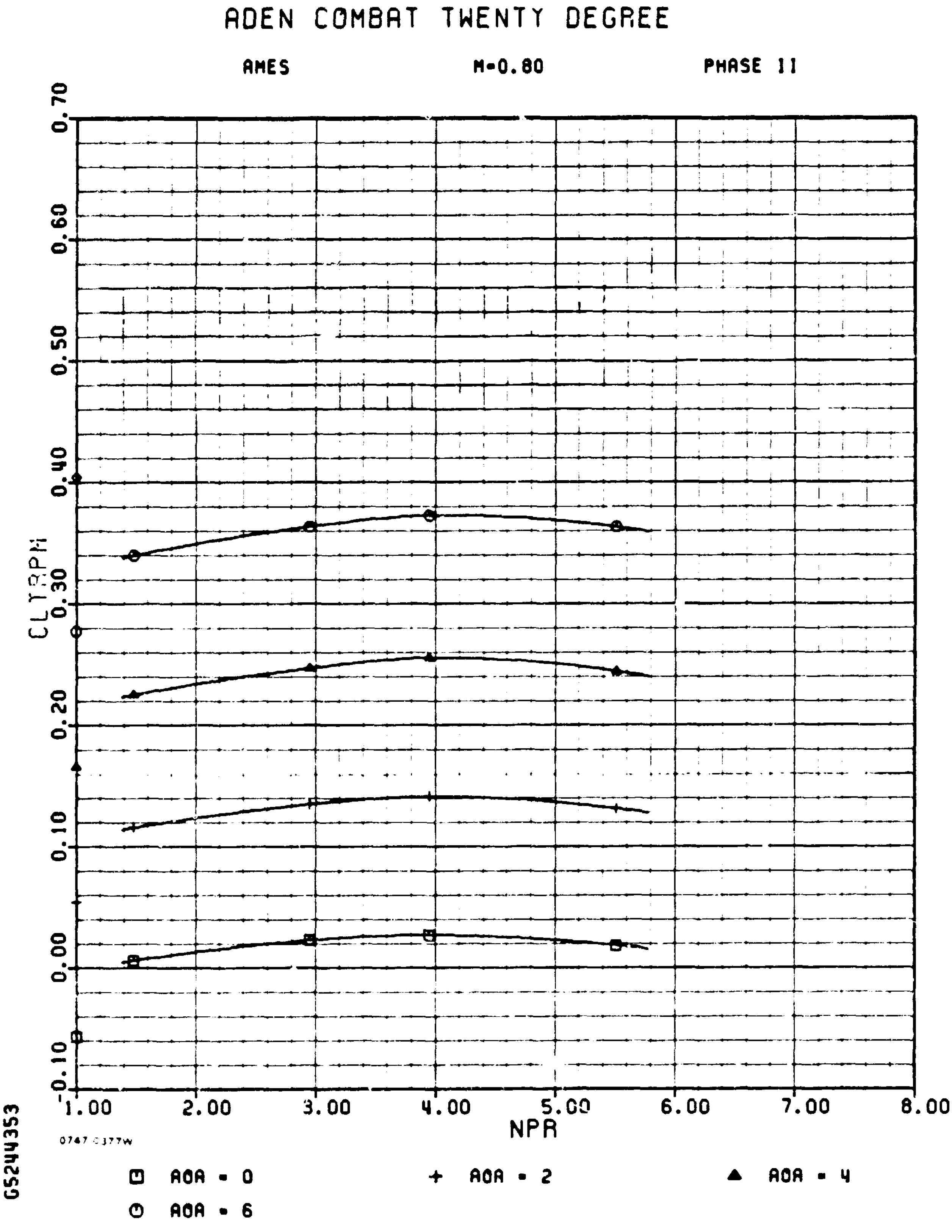
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
ALPHA
0747-0375W
NPA=1.00
NPA=1.48

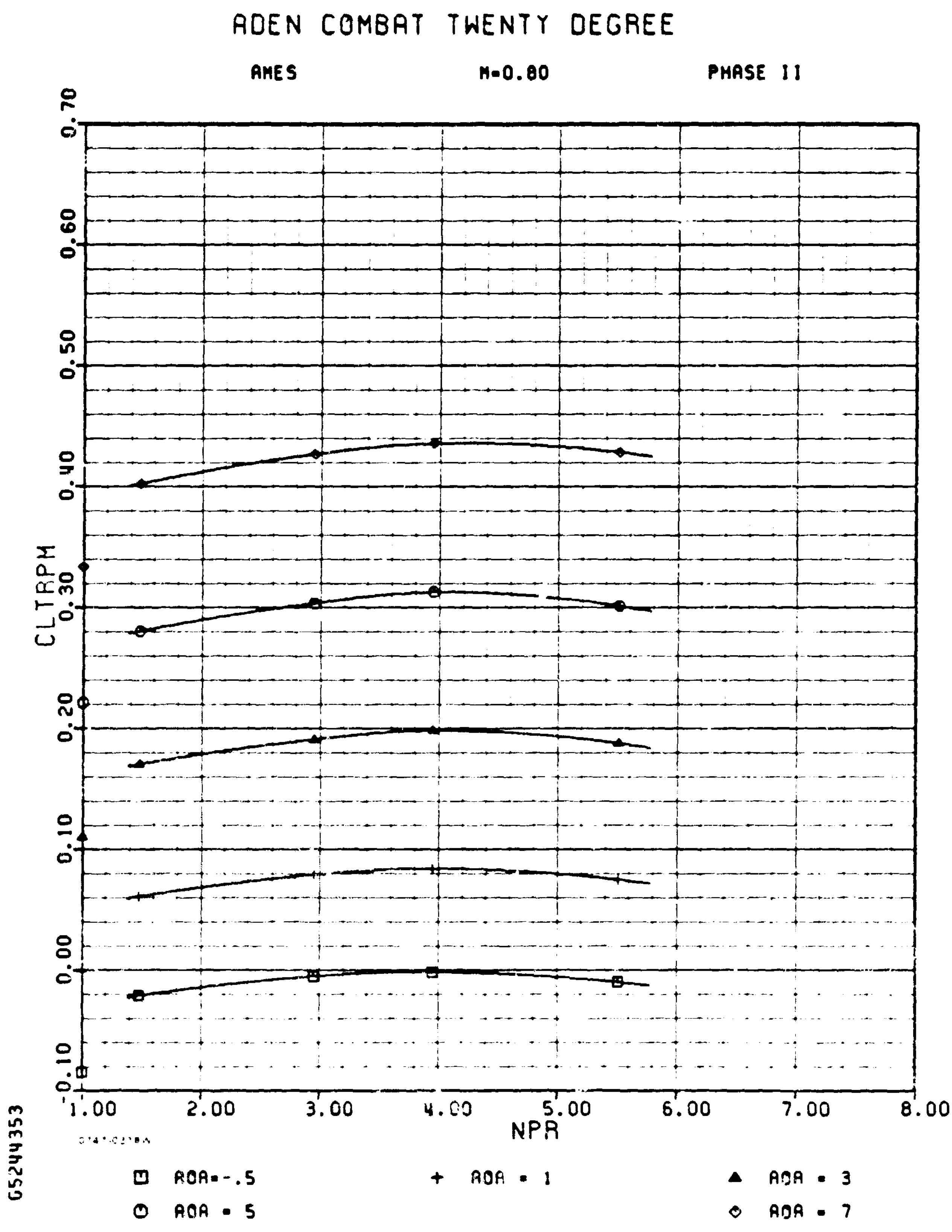
G5244353

ADEN COMBAT TWENTY DEGREE

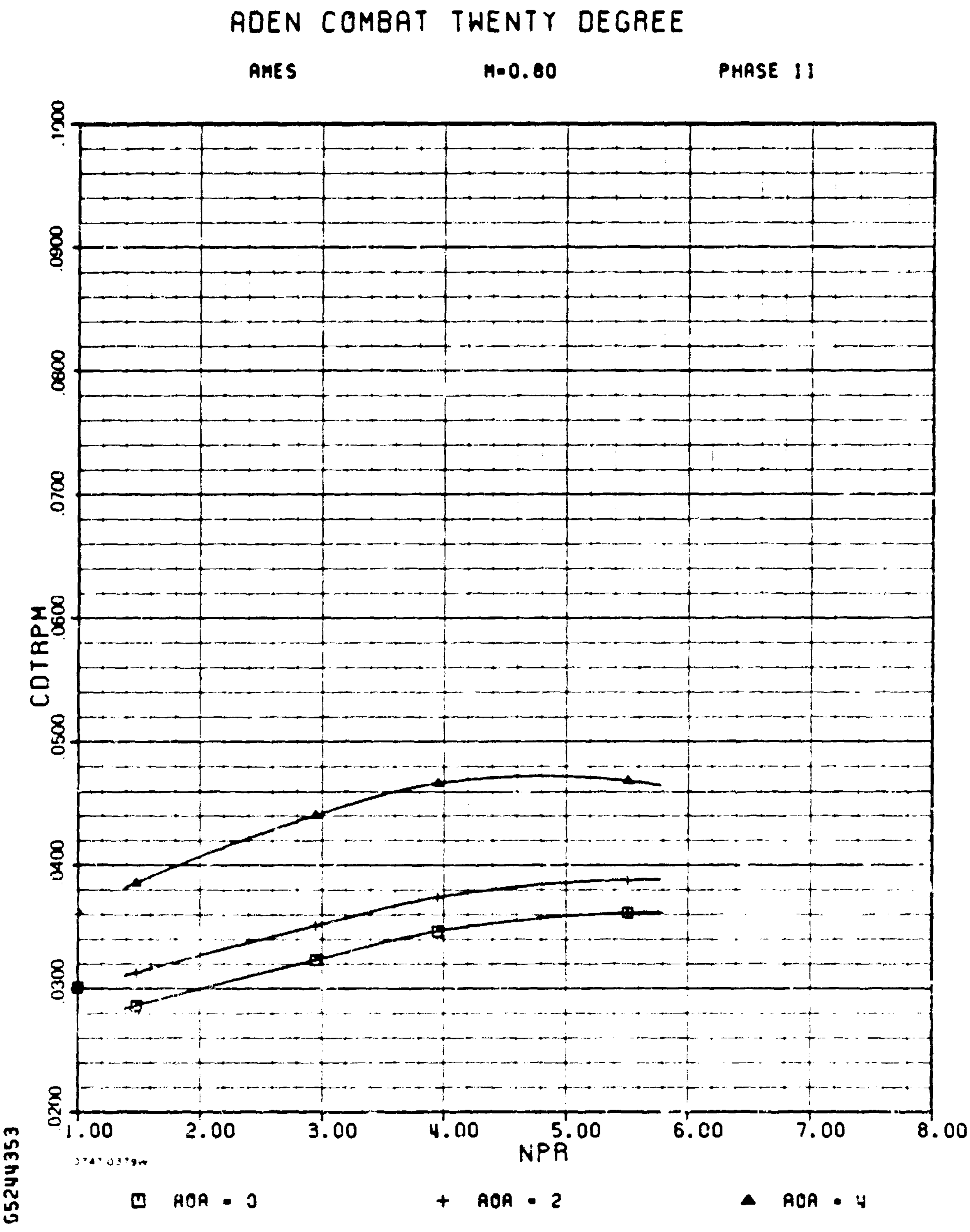


M-3(a) (concl.)

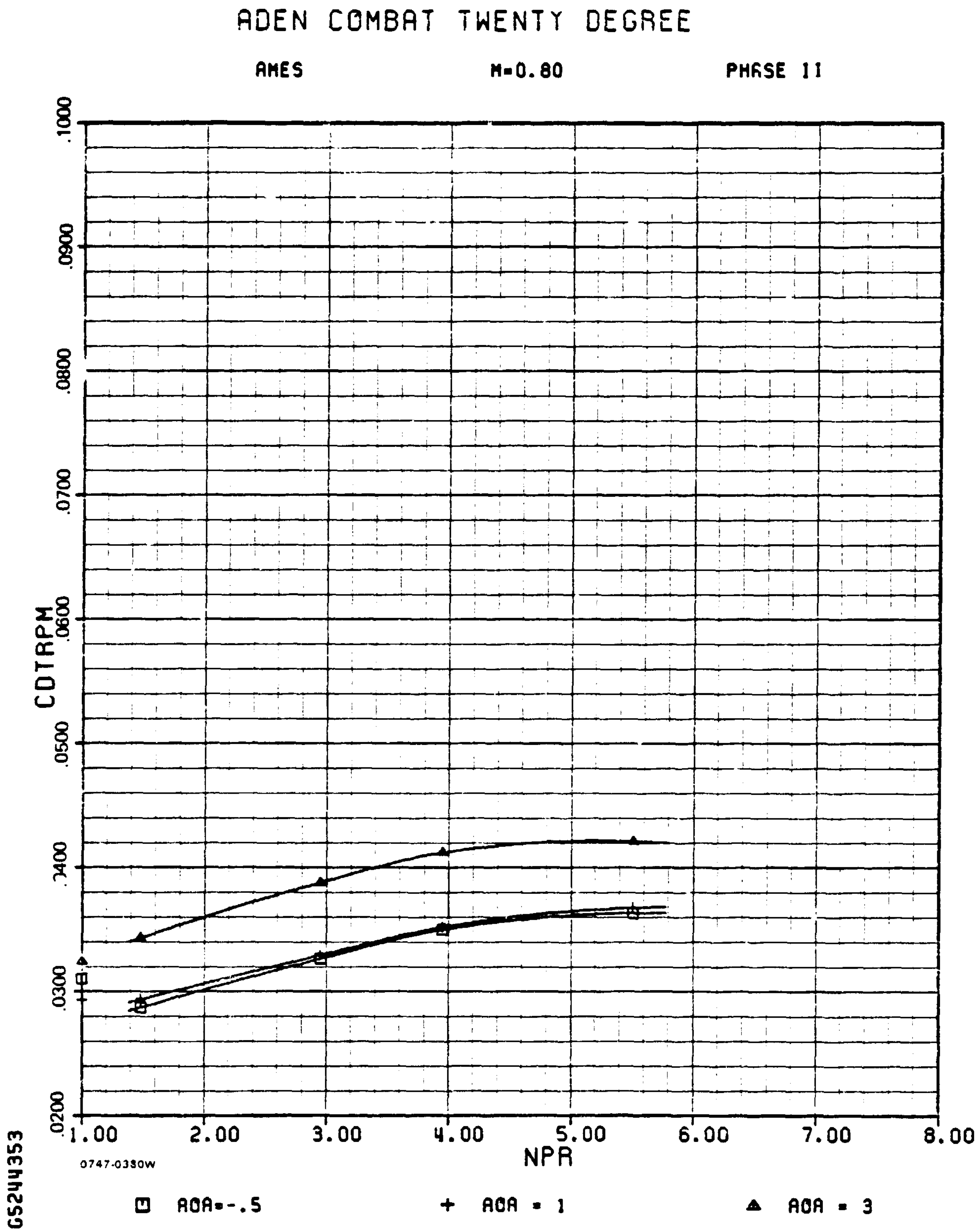

ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
G5244353
AOA = 0
AOA = 2
AOA = 4
AOA = 6


ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CLTRPM
NPR
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7
G5244353

M-3(b) (concl.)

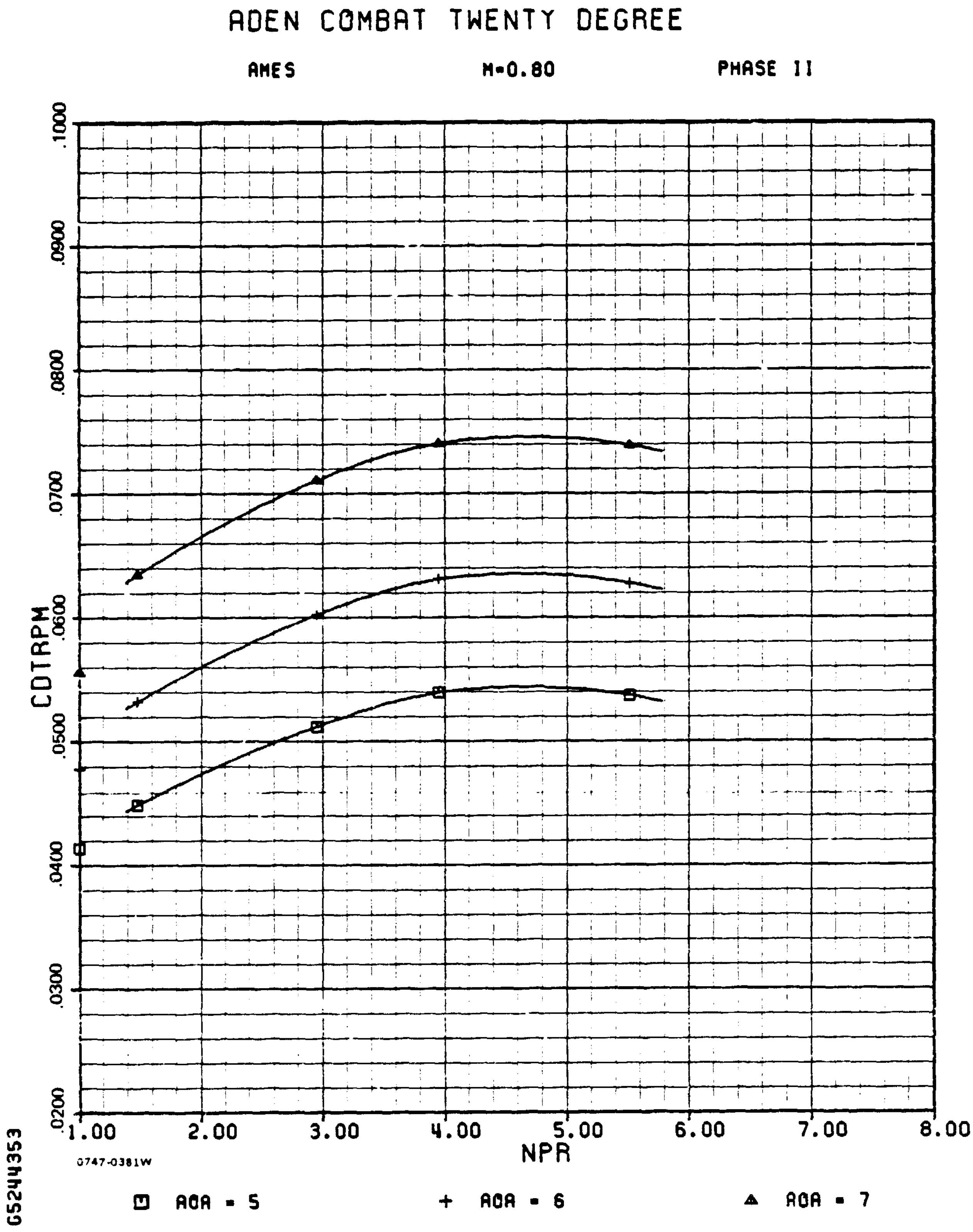

ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
G5244353
AOA = 0
AOA = 2
AOA = 4

M-5(c)


ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0330W
G5244353
AOA=-.5
AOA = 1
AOA = 3

M-3(c) (cont.)

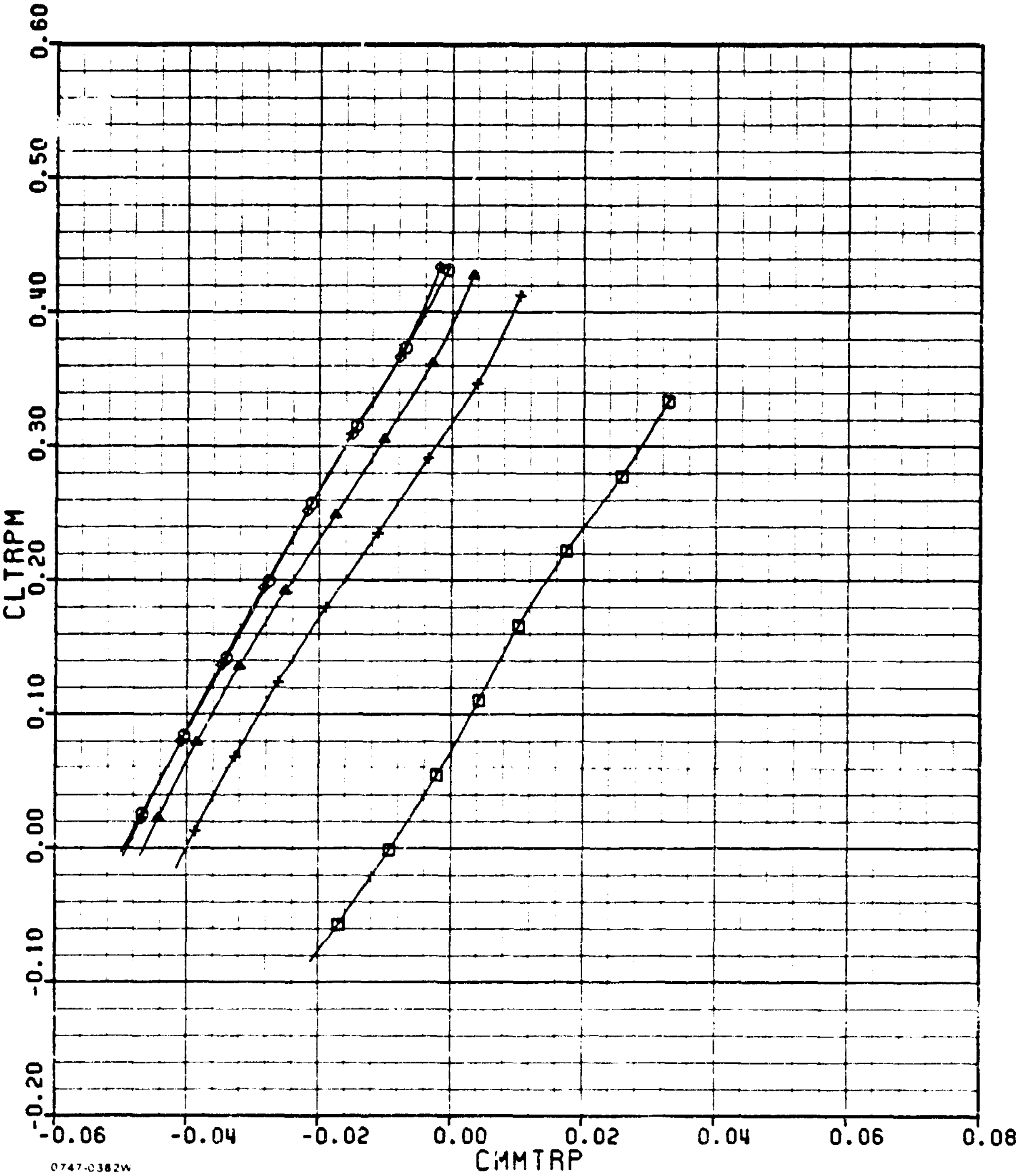
C-6


ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CDTRPM
.1000
.0900
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0381W
G5244353
AOA = 5
AOA = 6
AOA = 7

M-3(c) (concl.)

ADEN COMBAT TWENTY DEGREE

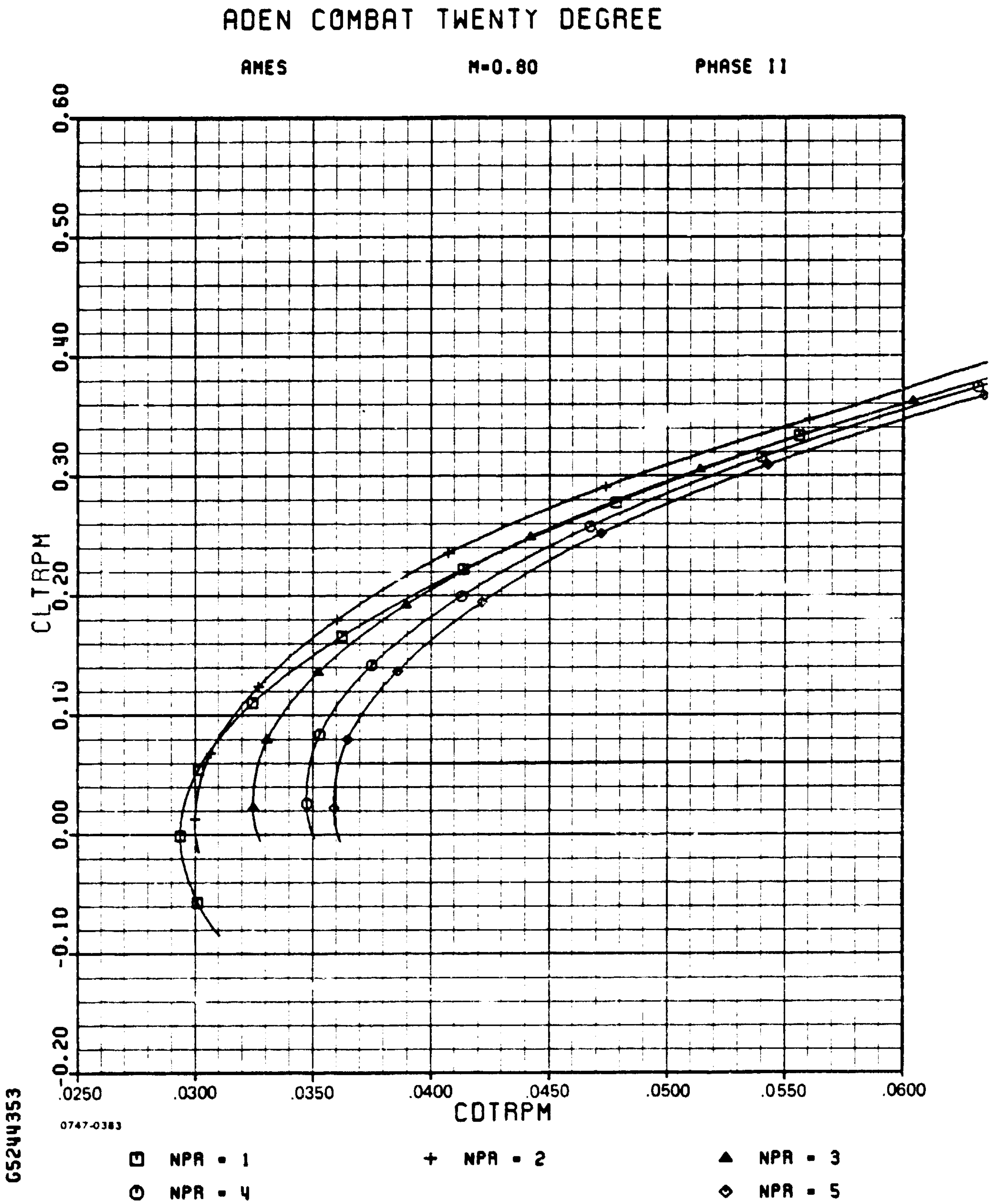
AMES M=0.80 PHASE II

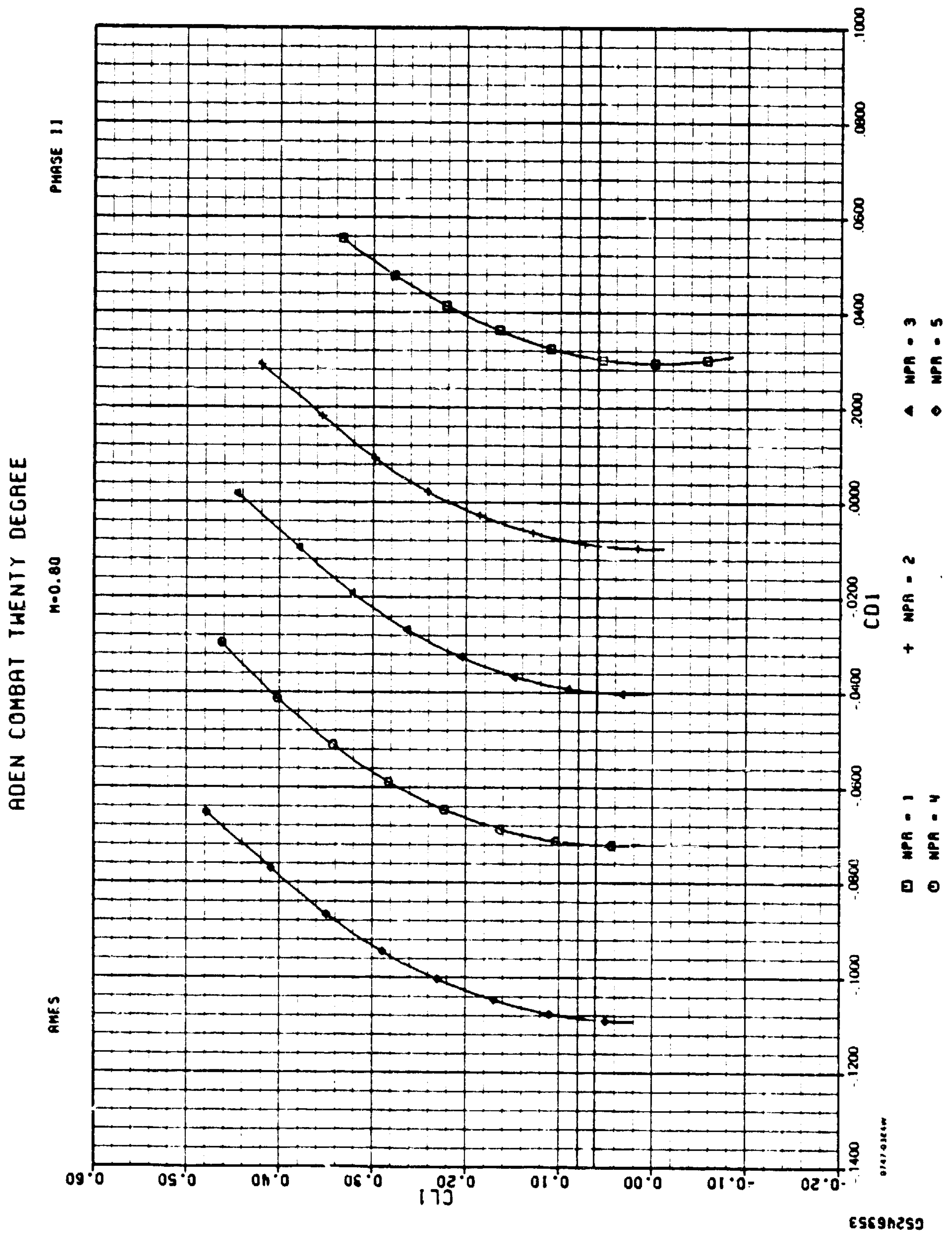


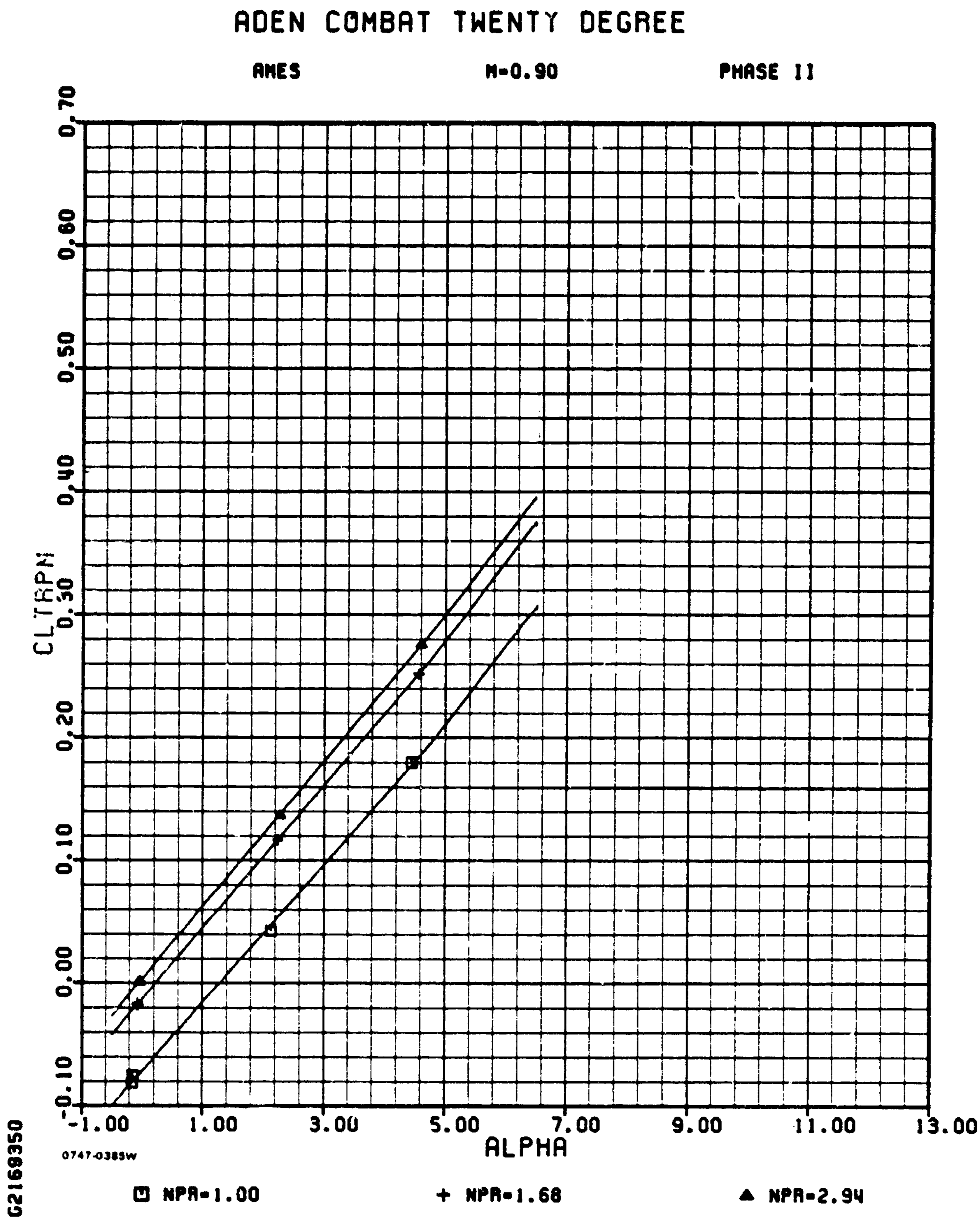
G5244353

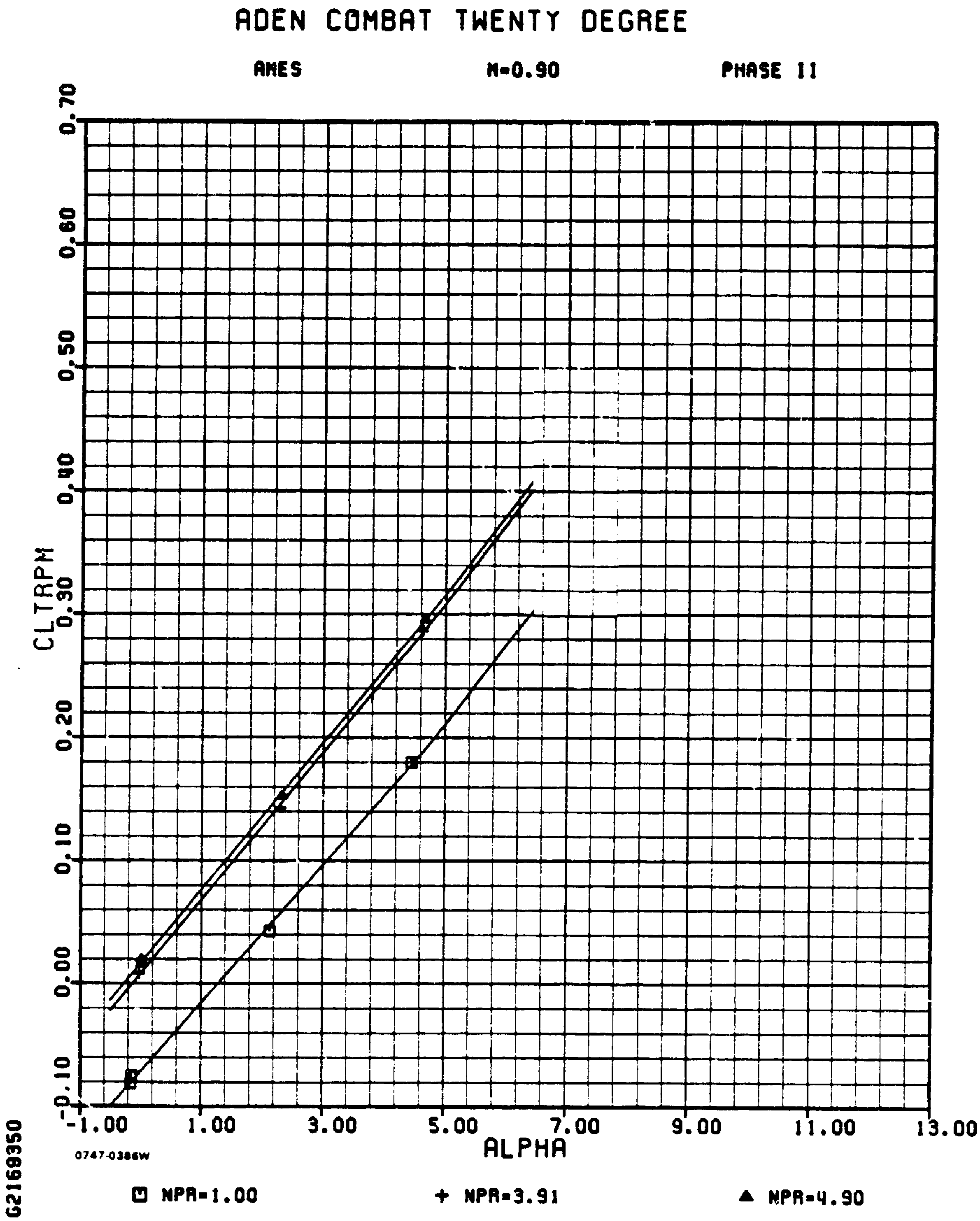
NPR = 1 + NPR = 2 ▲ NPR = 3

NPR = 4 ◇ NPR = 5


ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CLTRPM
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
CDTRPM
.0250
.0300
.0350
.0400
.0450
.0500
.0550
.0600
0747-0383
G5244353
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5

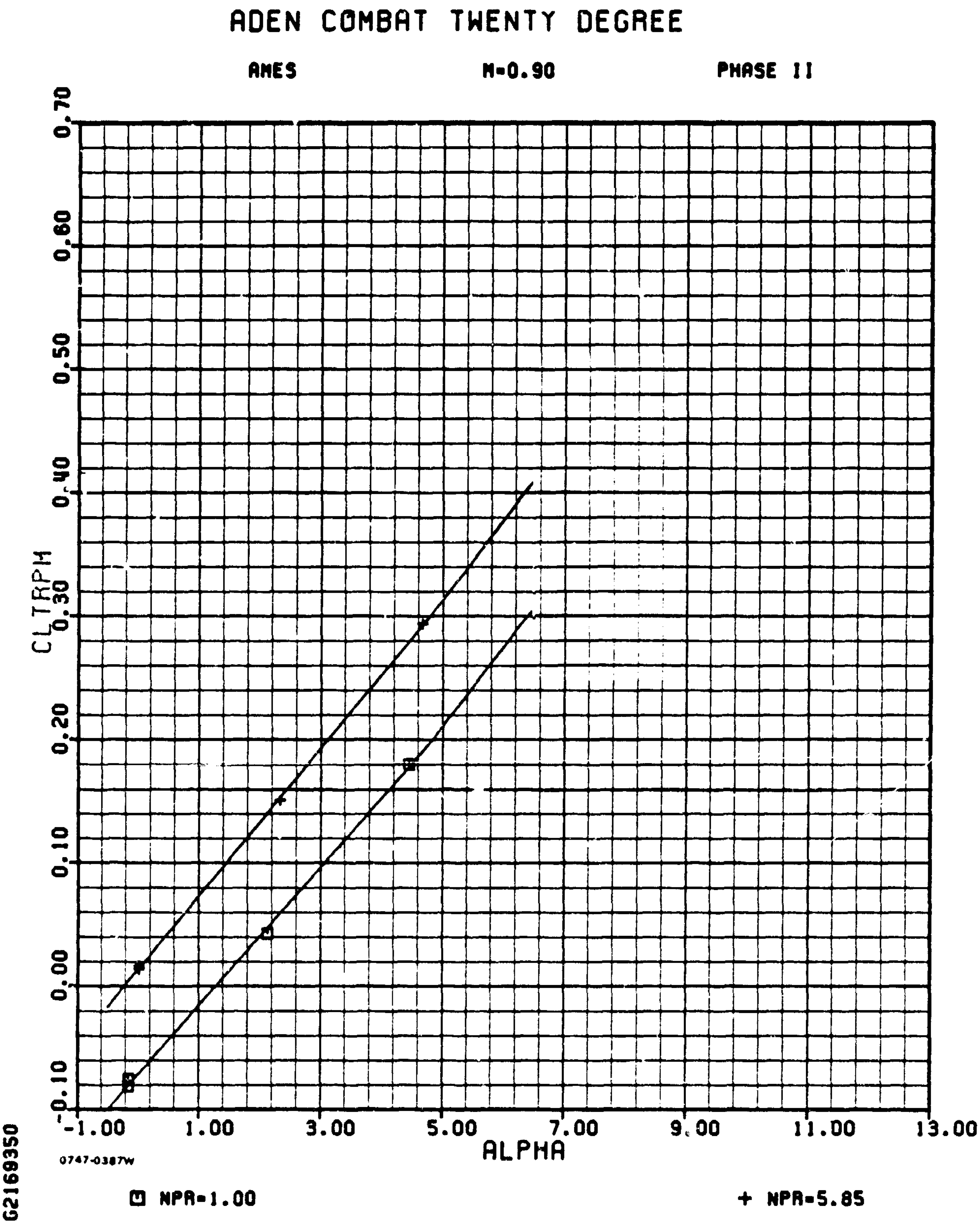

ADEN COMBAT TWENTY DEGREE
AMES
M=0.80
PHASE II
CD1
CL1
□ NPR = 1
+ NPR = 2
△ NPR = 3
⊙ NPR = 4
◇ NPR = 5
CS246353


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPN
ALPHA
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
0747-0385W
G2168350
NPR=1.00
+ NPR=1.68
▲ NPR=2.94



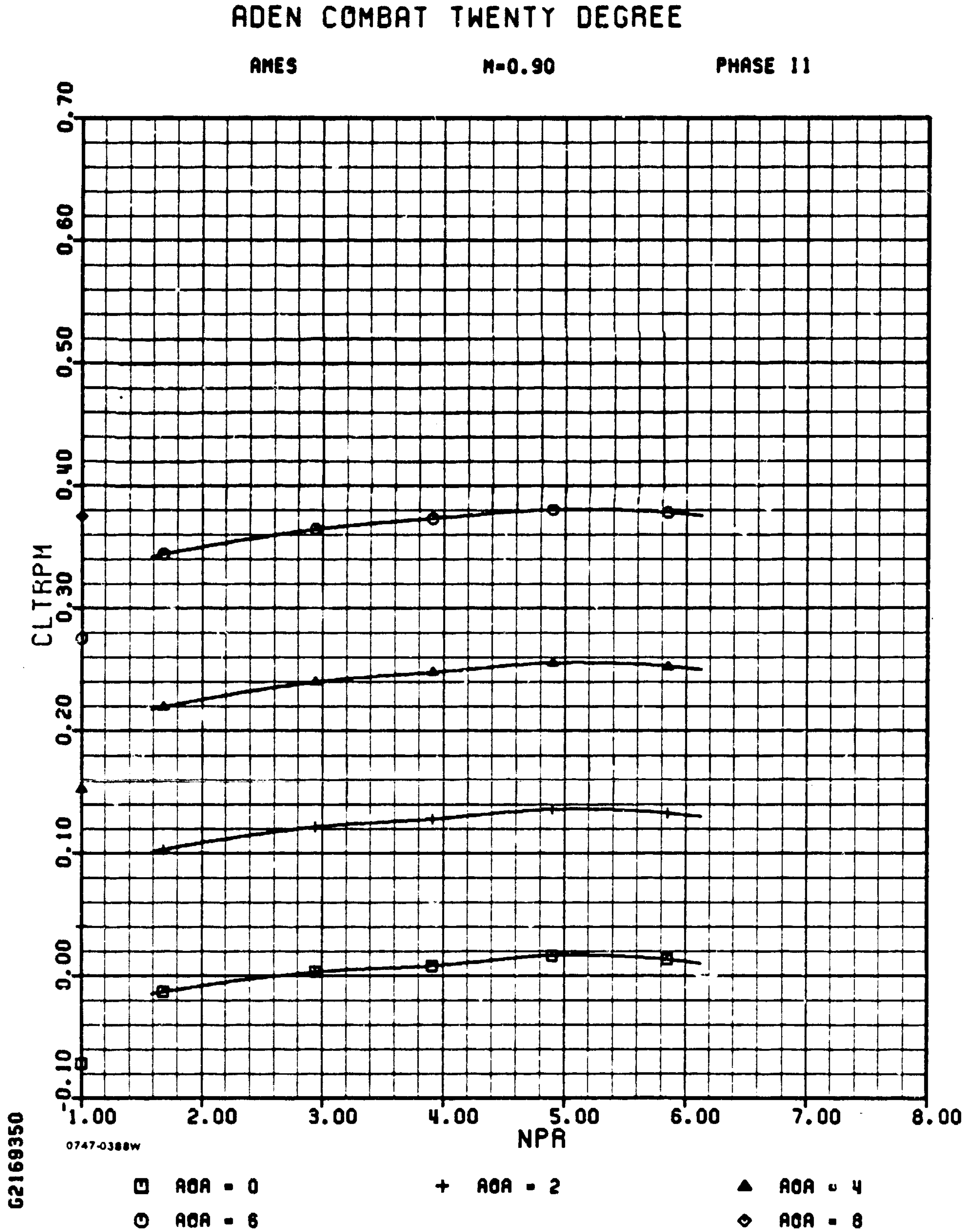
ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0386W
G2169350
NPR=1.00
+ NPR=3.91
▲ NPR=4.90

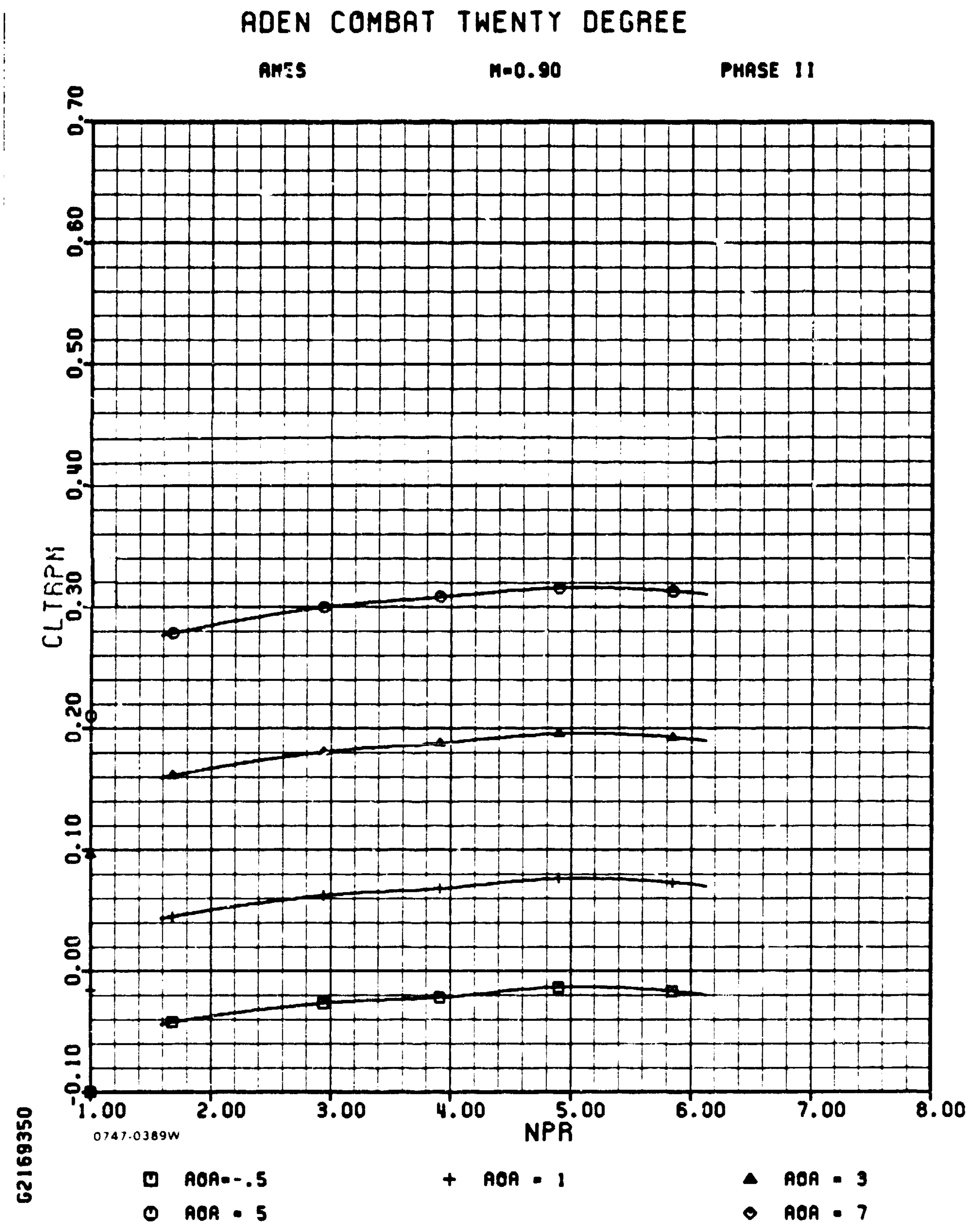
M-4(a) (cont.)



ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
ALPHA
0747-0387W
G2169350
NPR=1.00
+ NPR=5.85

M-4(a) (concl.)


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0388W
G2169350
AOA = 0
AOA = 2
AOA = 4
AOA = 6
AOA = 8

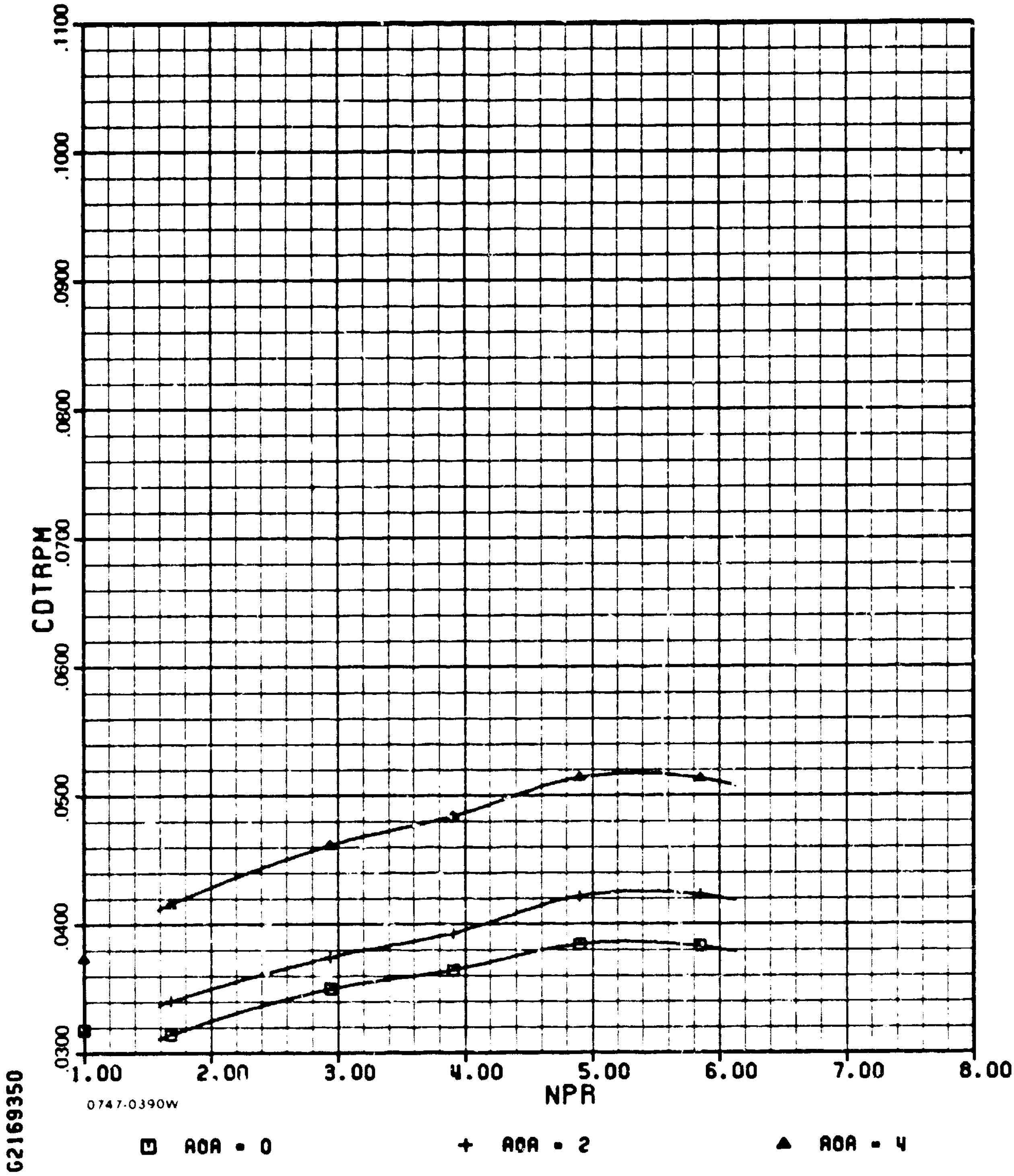


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
NPR
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
0747-0389W
G2169350
AOA=-.5
AOA = 1
AOA = 3
AOA = 5
AOA = 7

M-4(b) (concl.)

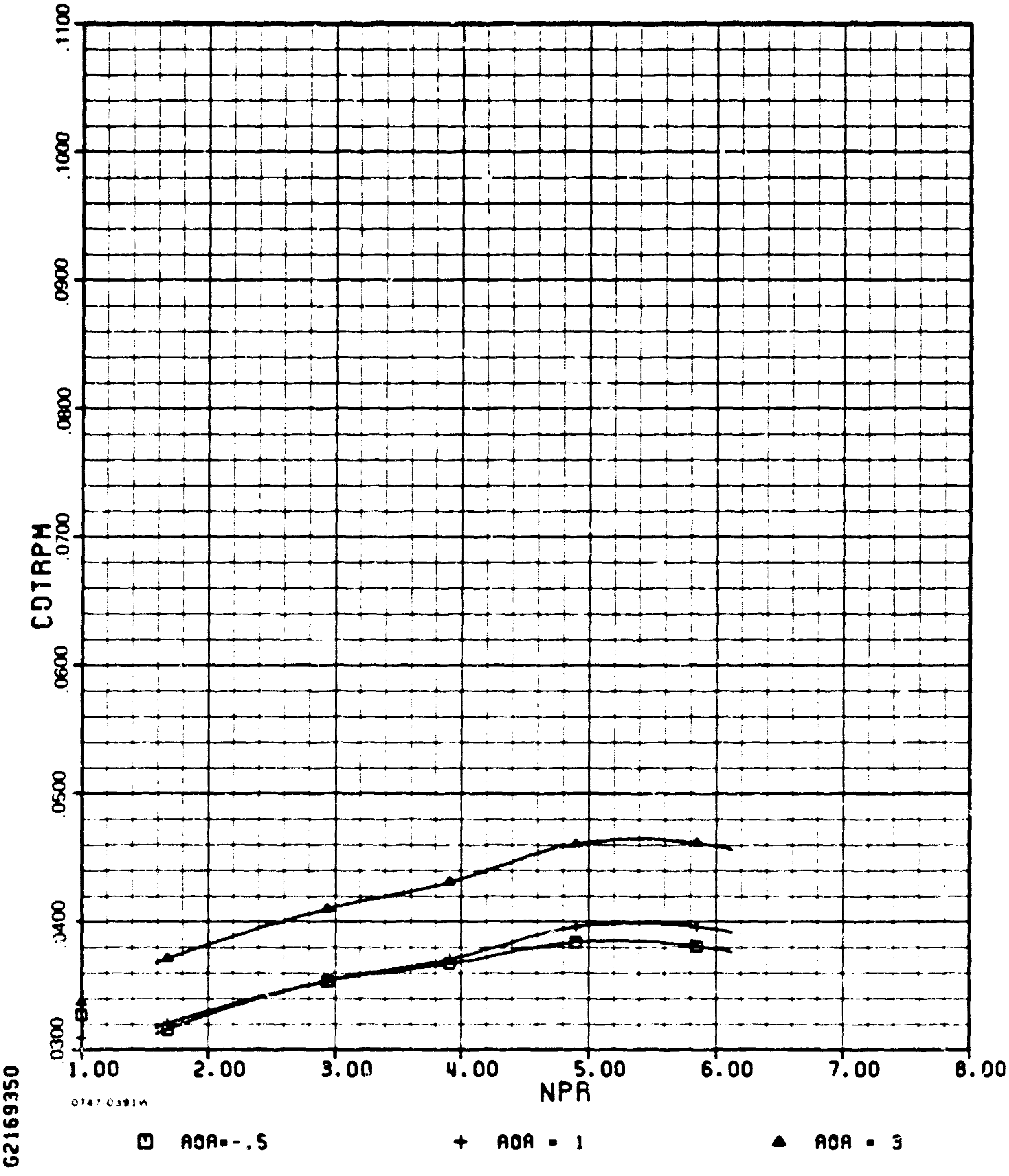
ADEN COMBAT TWENTY DEGREE

AMES M=0.90 PHASE II

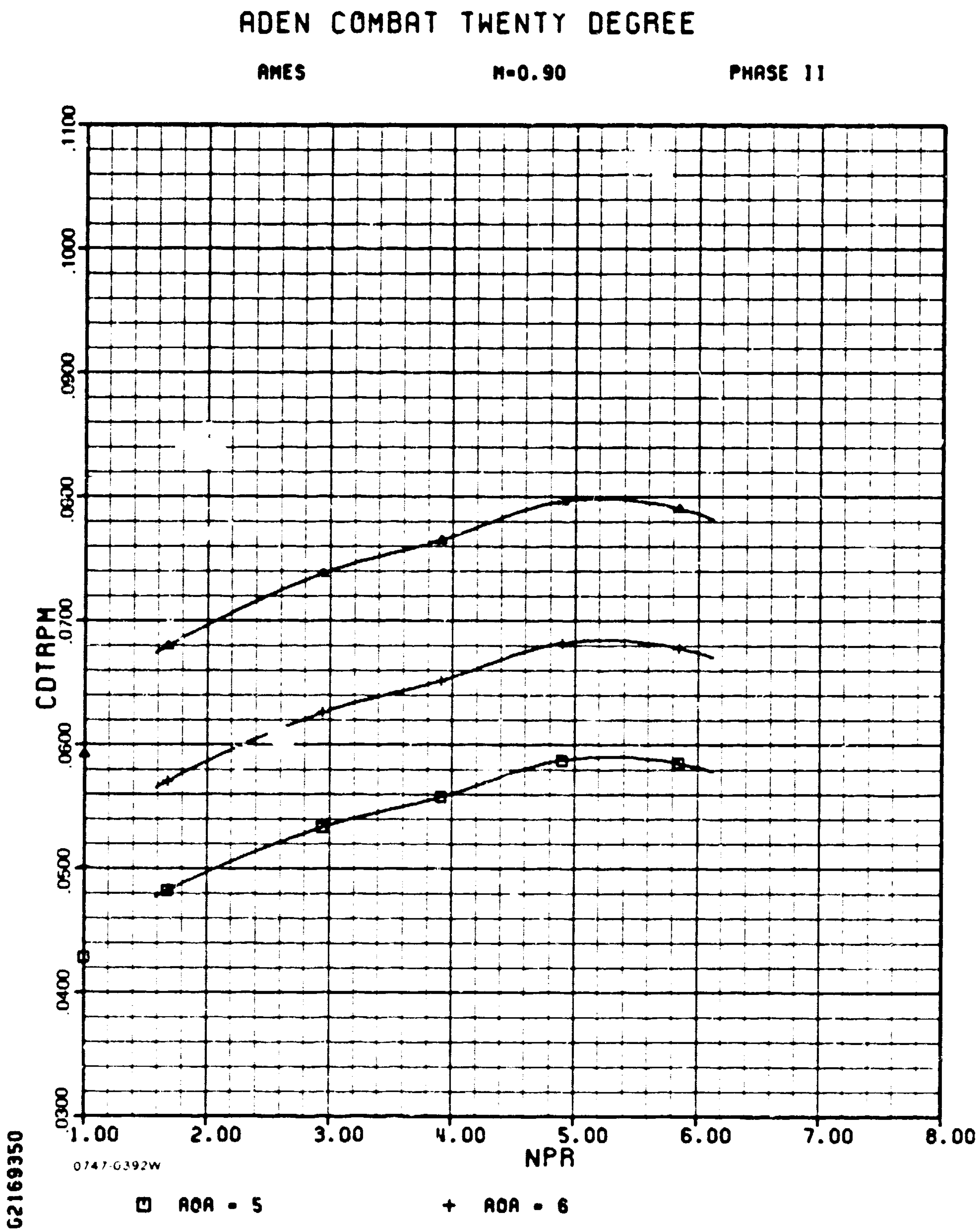


ADEN COMBAT TWENTY DEGREE

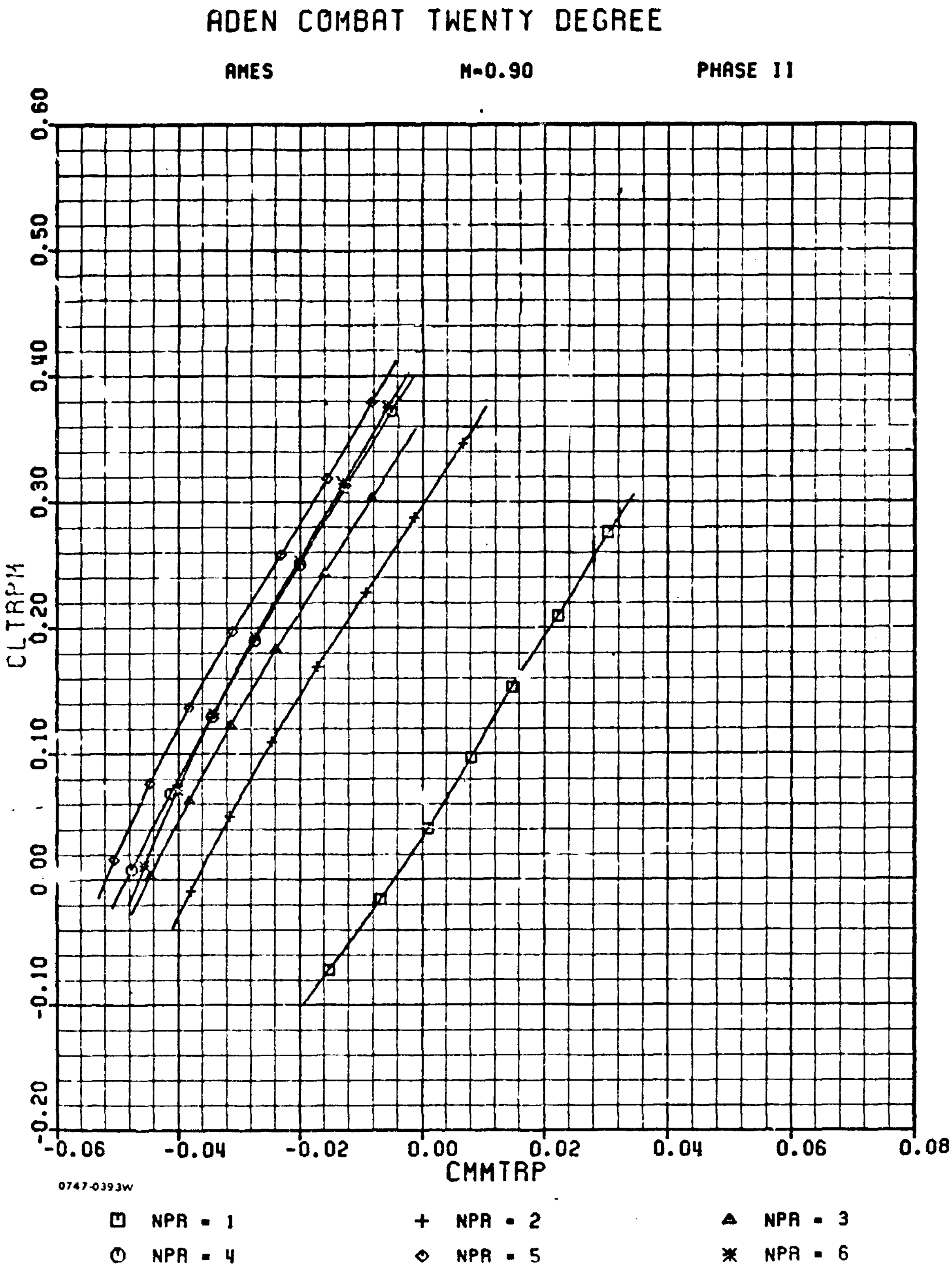
AMES M=0.90 PHASE II

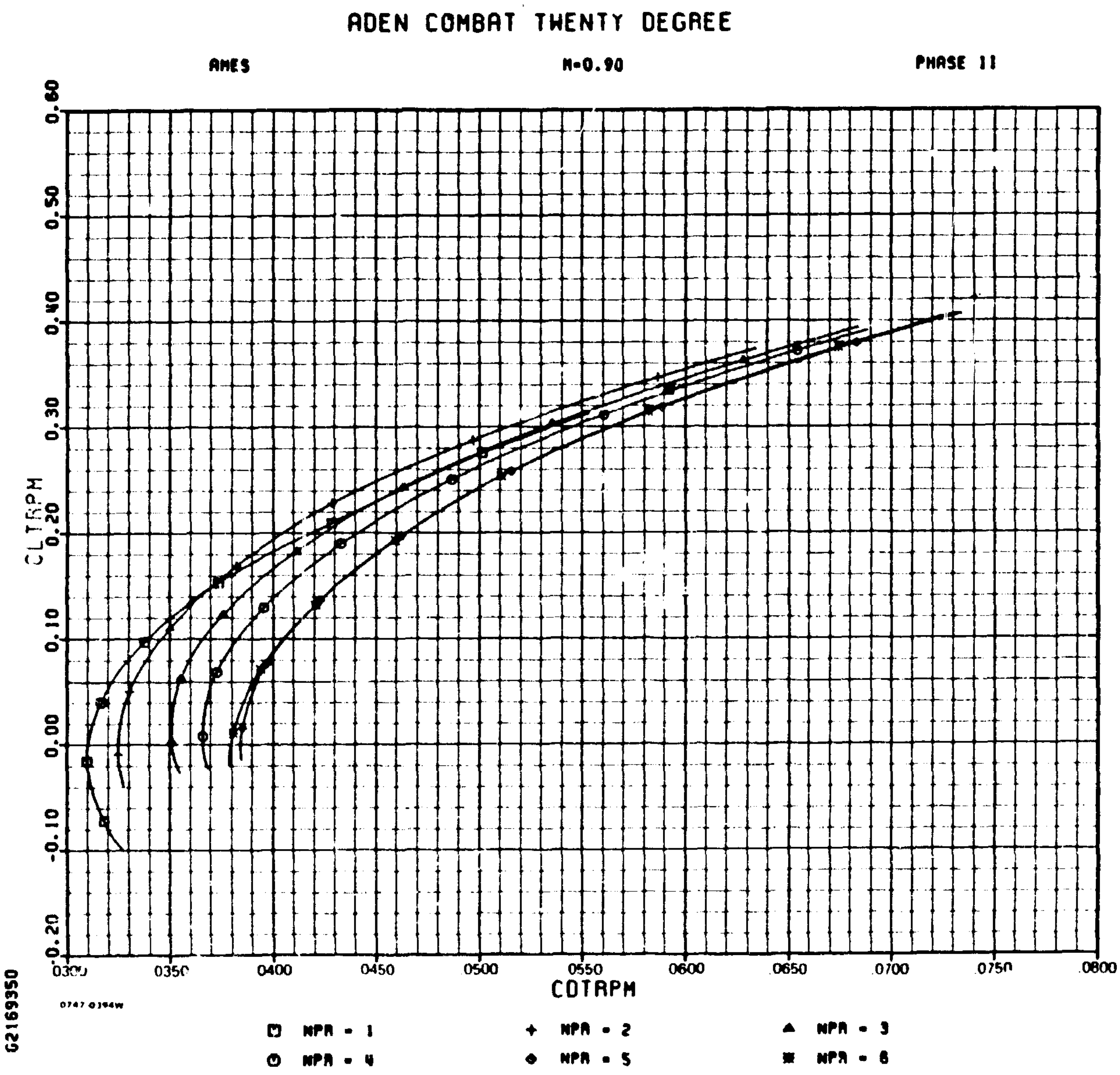


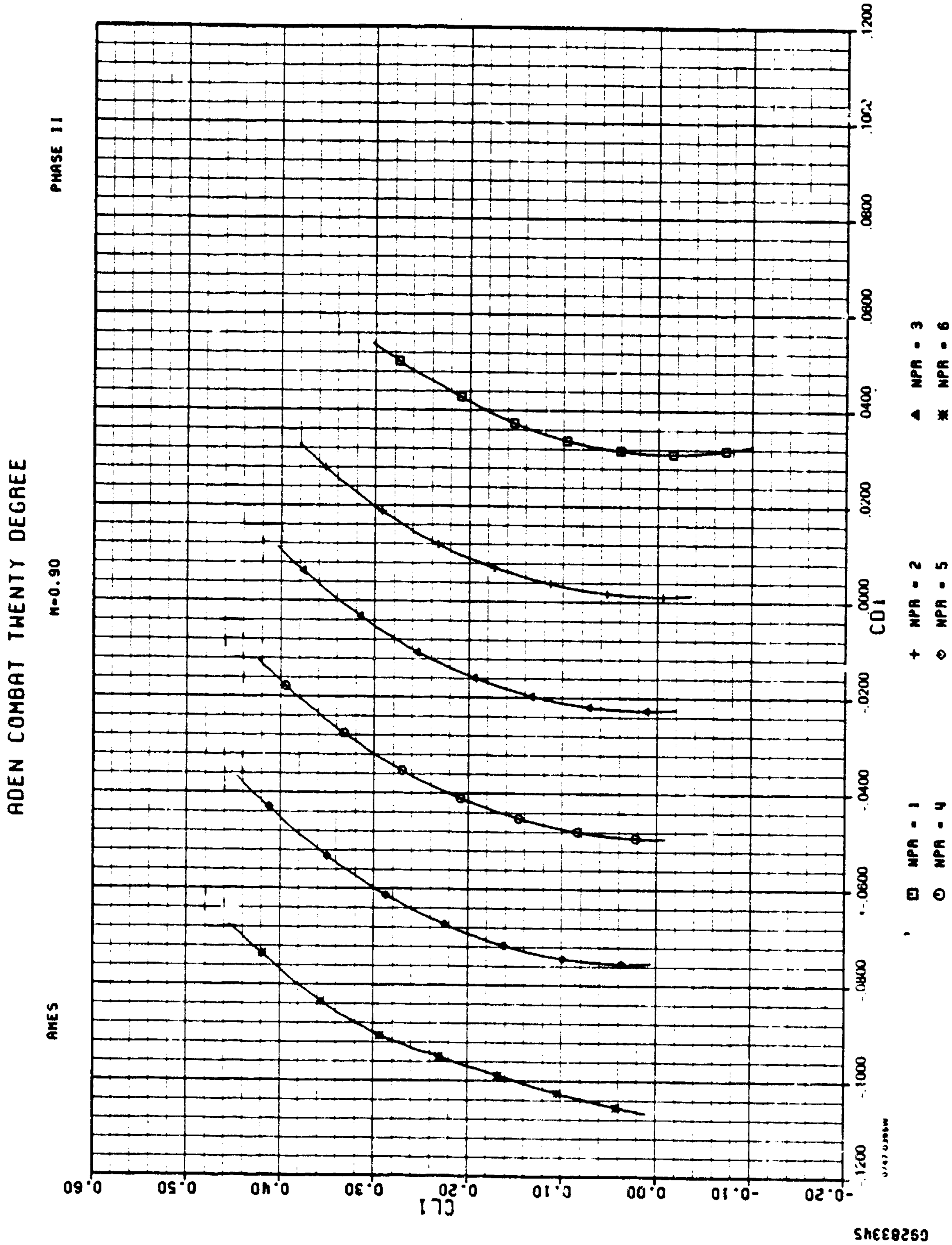
M-4(c) (cont.)


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CDTRPM
.0300
.0400
.0500
.0600
.0700
.0800
.0900
.1000
.1100
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-G392W
AOA = 5
+ AOA = 6
G2169350

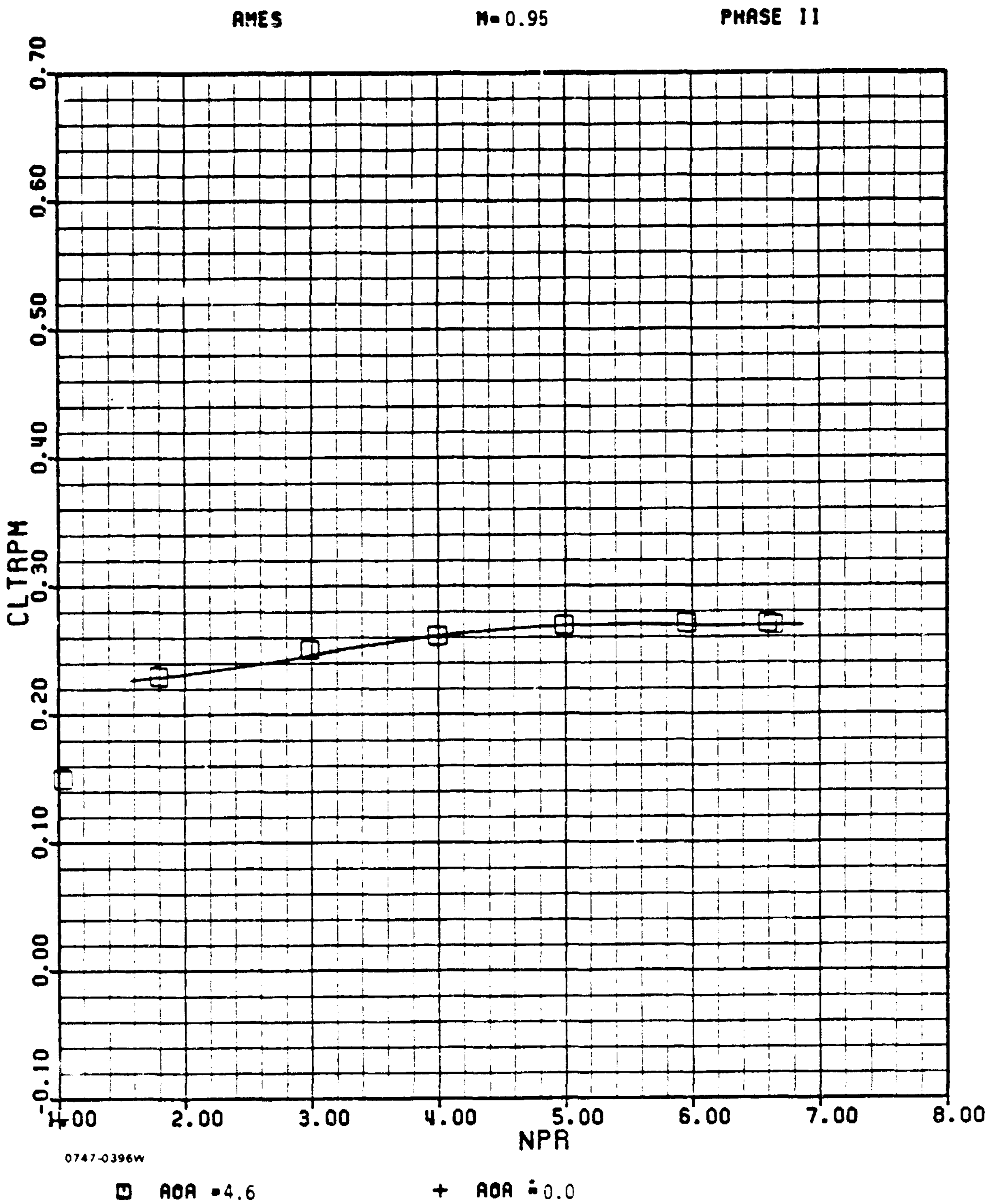
M-4(c) (concl.)

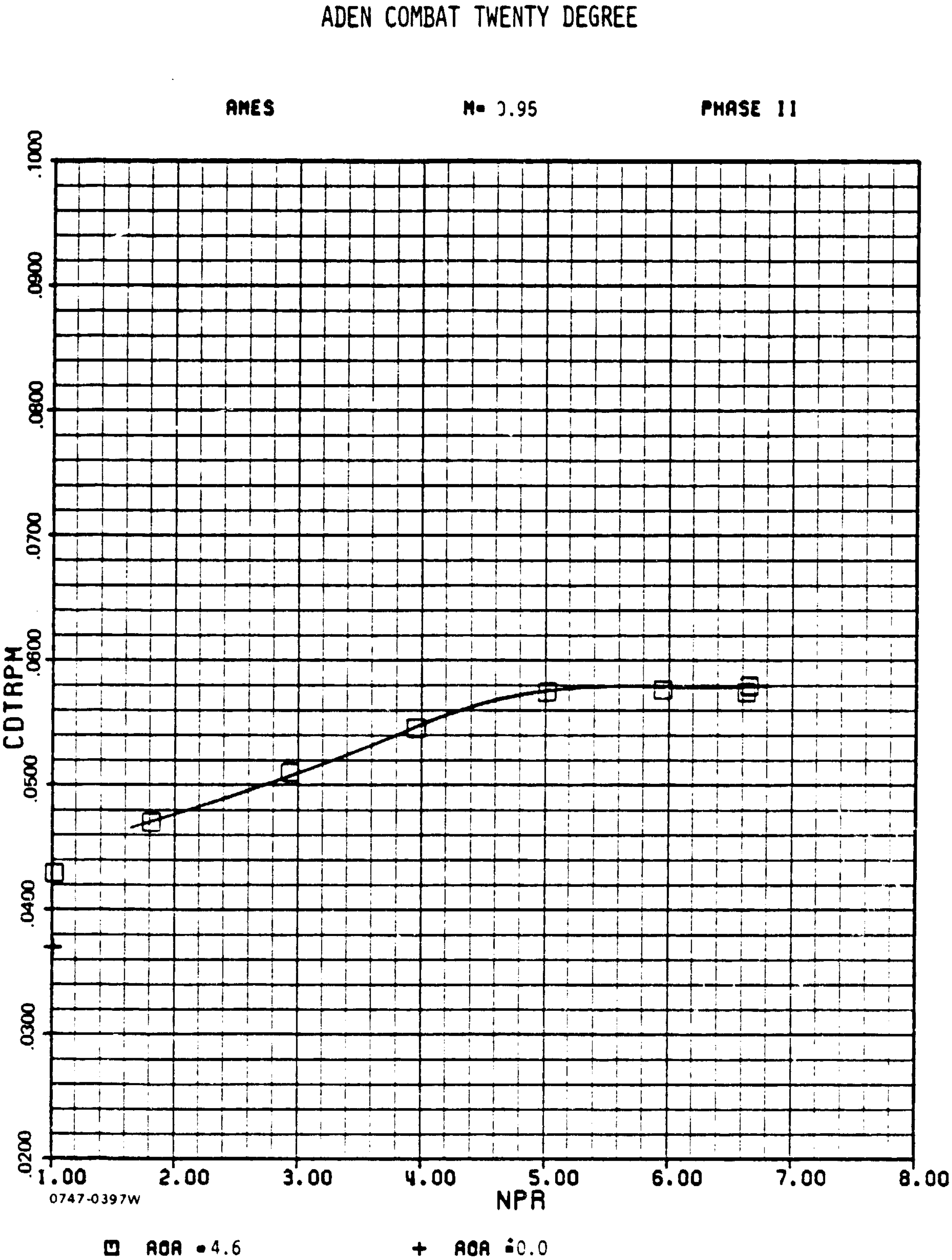

ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
CMMTRP
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.06
-0.04
-0.02
0.00
0.02
0.04
0.06
0.08
0747-0393W
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
G2169350


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
CLTRPM
CDTRPM
G2169350
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6


ADEN COMBAT TWENTY DEGREE
AMES
M=0.90
PHASE II
NPR = 1
NPR = 2
NPR = 3
NPR = 4
NPR = 5
NPR = 6
CD1
CL1
-.1200
-.1000
-.0800
-.0600
-.0400
-.0200
.0000
.0200
.0400
.0600
.0800
.1200
-0.20
-0.10
0.00
0.10
0.20
0.30
0.40
0.50
0.60

ADEN COMBAT TWENTY DEGREE





ADEN COMBAT TWENTY DEGREE
AMES
M= 0.95
PHASE II
CDTRPM
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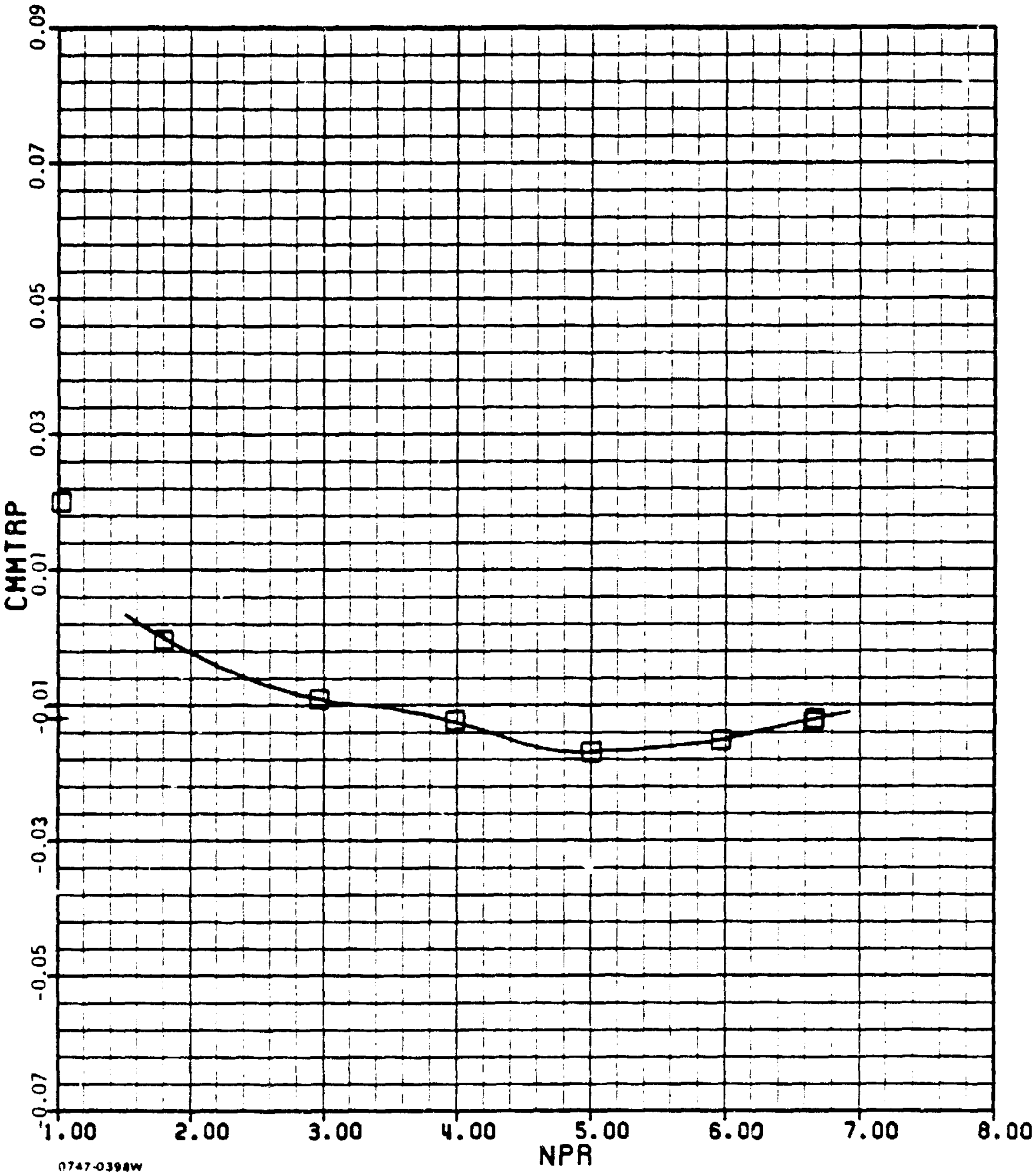
.0800
.0700
.0600
.0500
.0400
.0300
.0200
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
NPR
0747-0397W
AOA =4.6
AOA =0.0

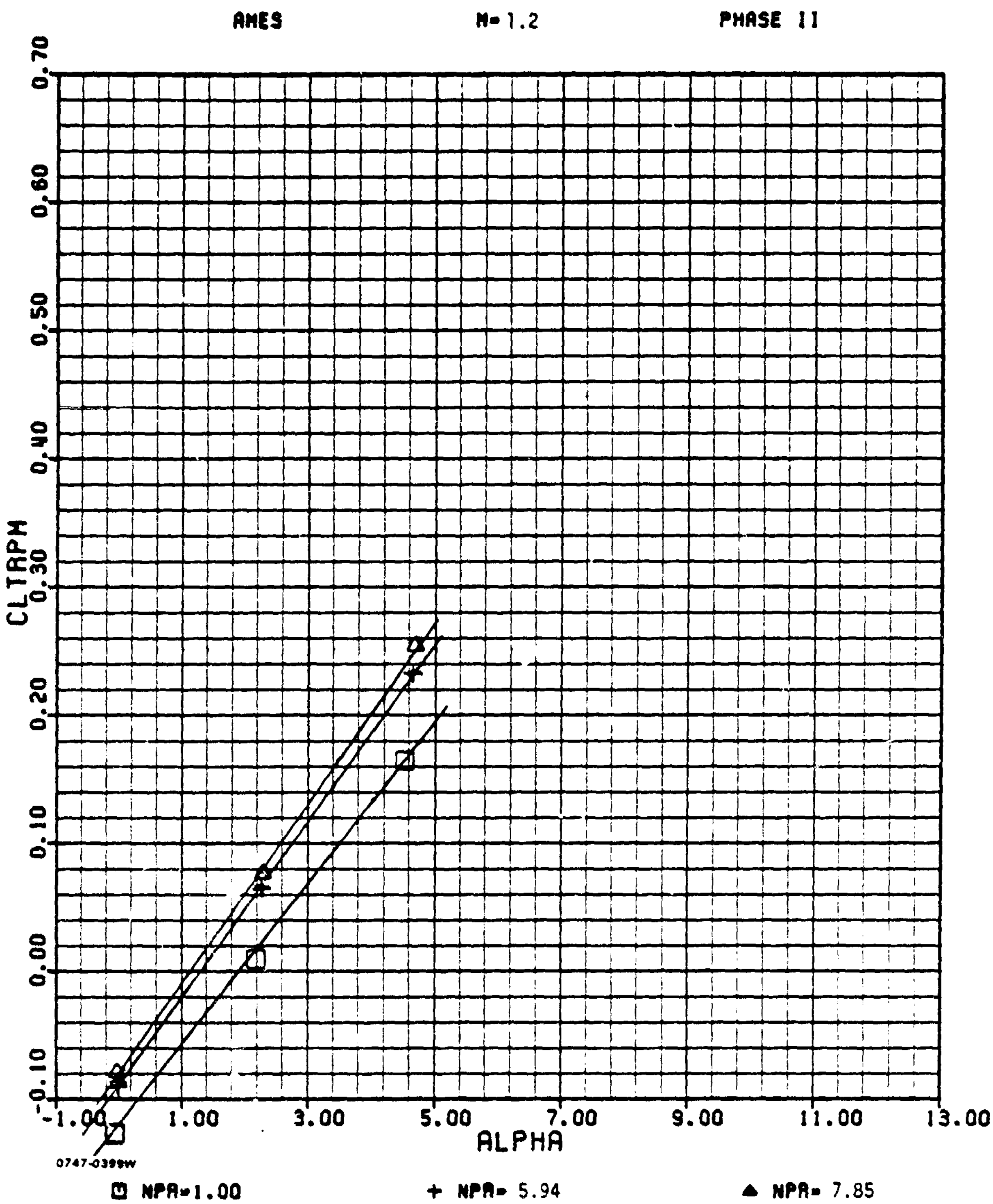
ADEN COMBAT TWENTY DEGREE

AMES M= 0.95 PHASE II

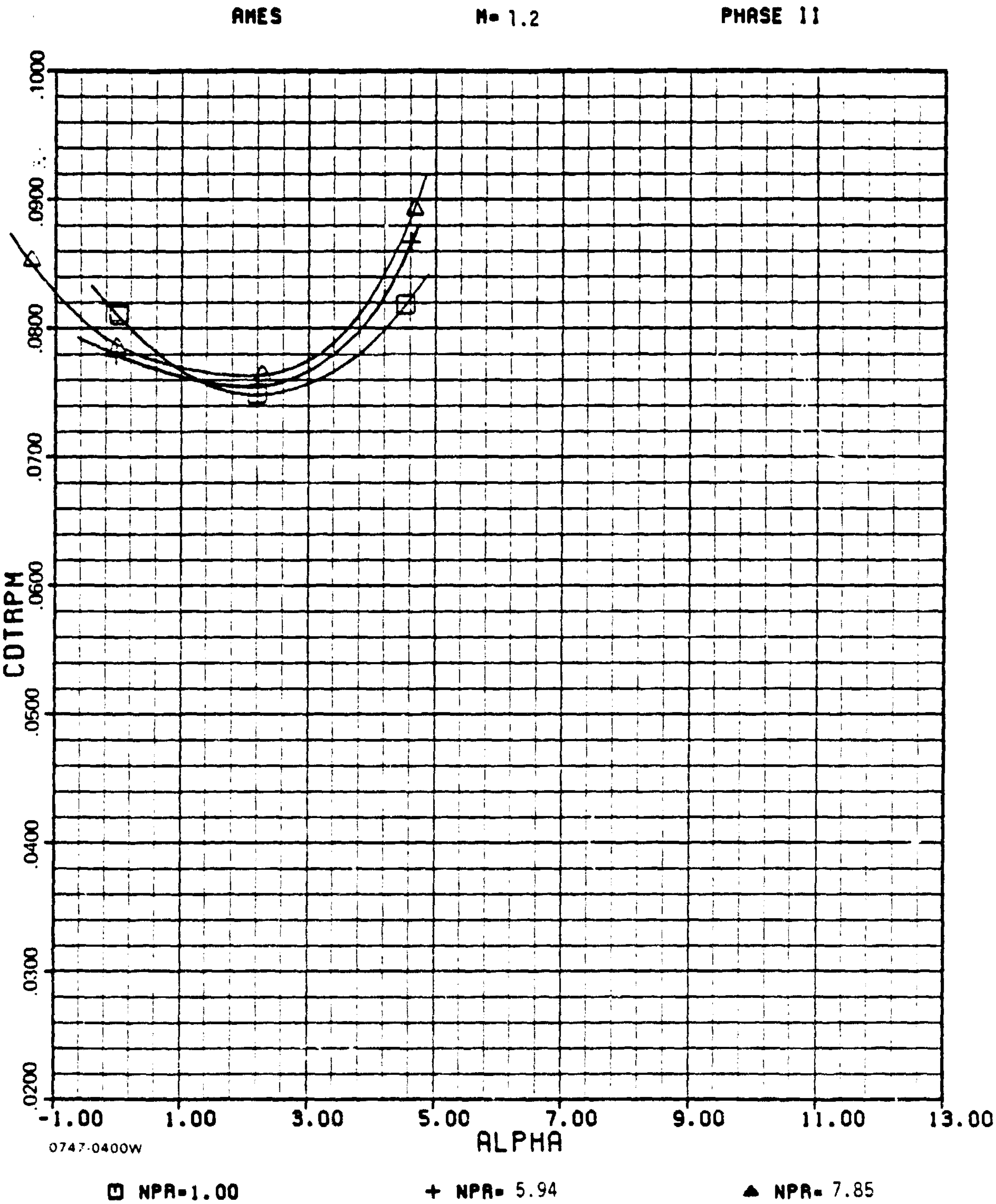


▢ AOA = 4.6 + AOA = 0.0

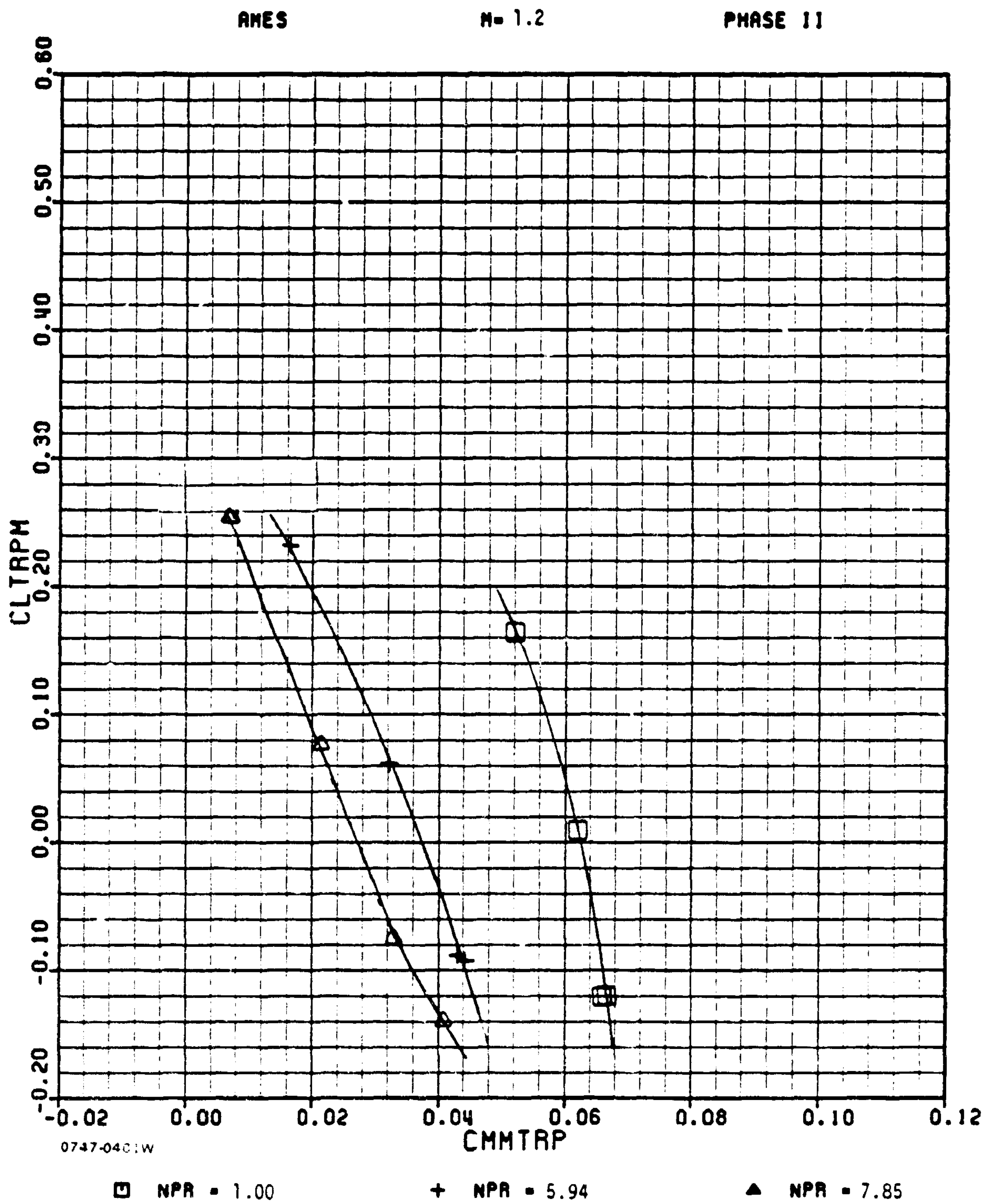
ADEN COMBAT TWENTY DEGREE



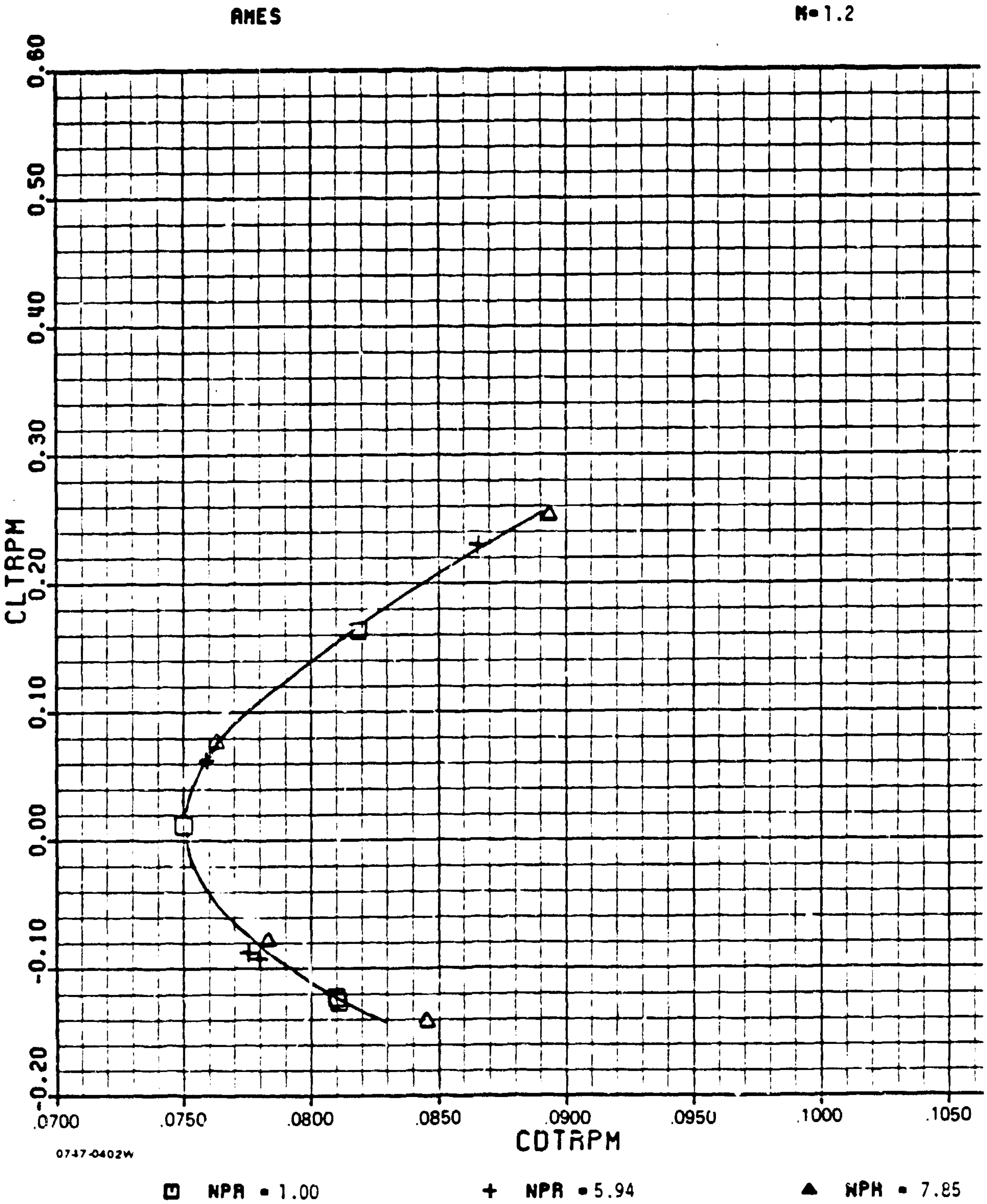
ADEN COMBAT TWENTY DEGREE



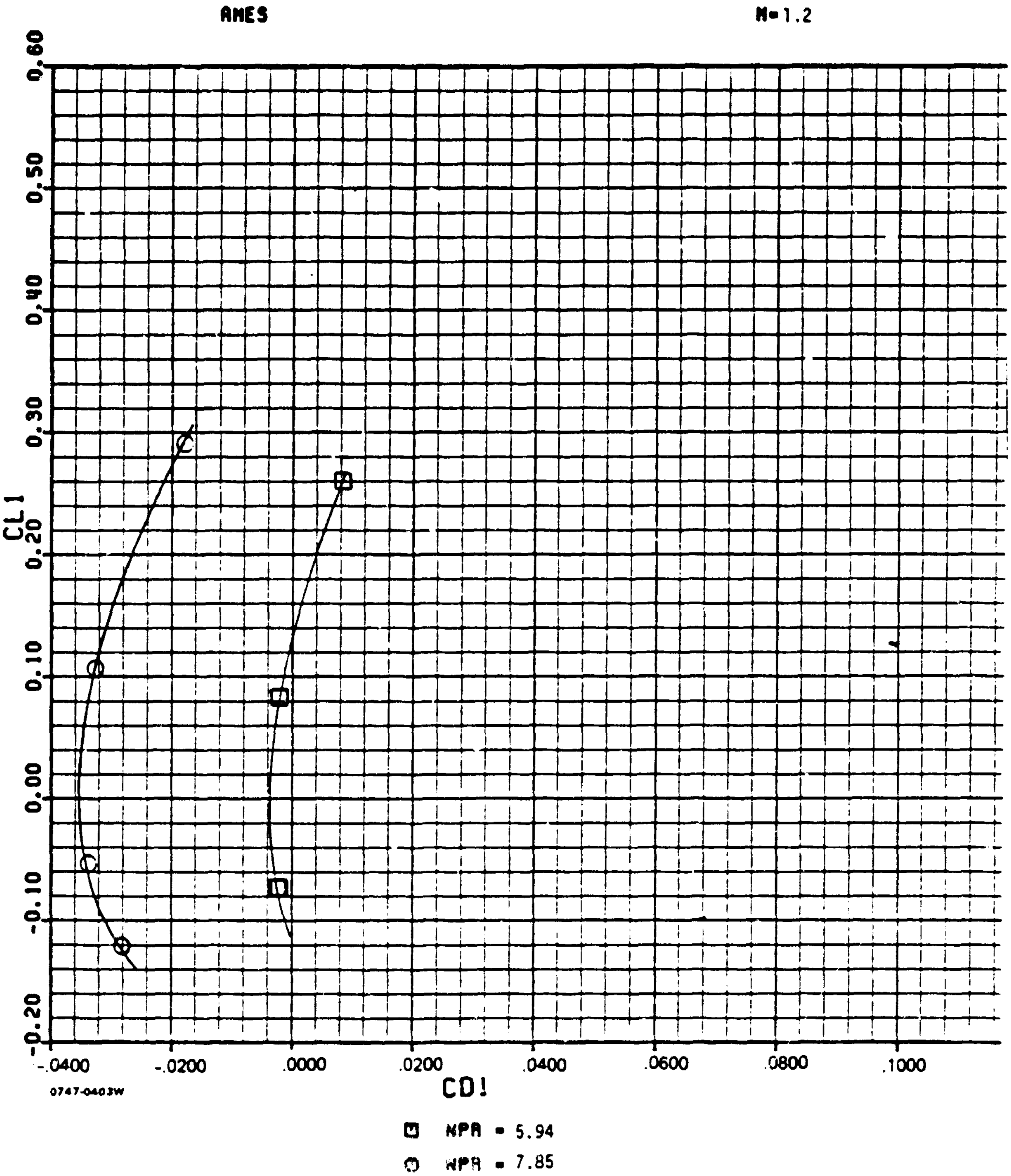
ADEN COMBAT TWENTY DEGREE



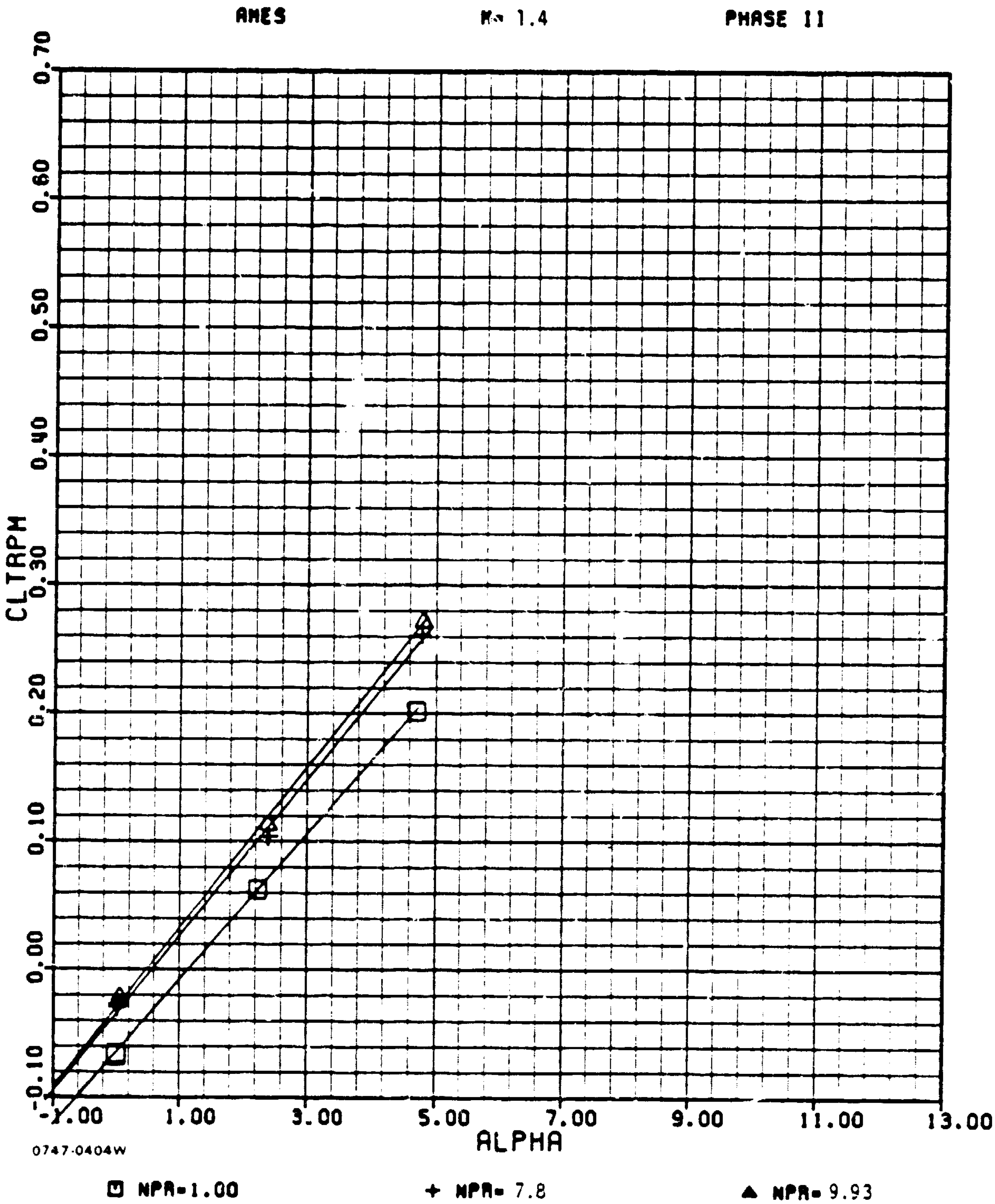
ADEN COMBAT TWENTY DEGREE



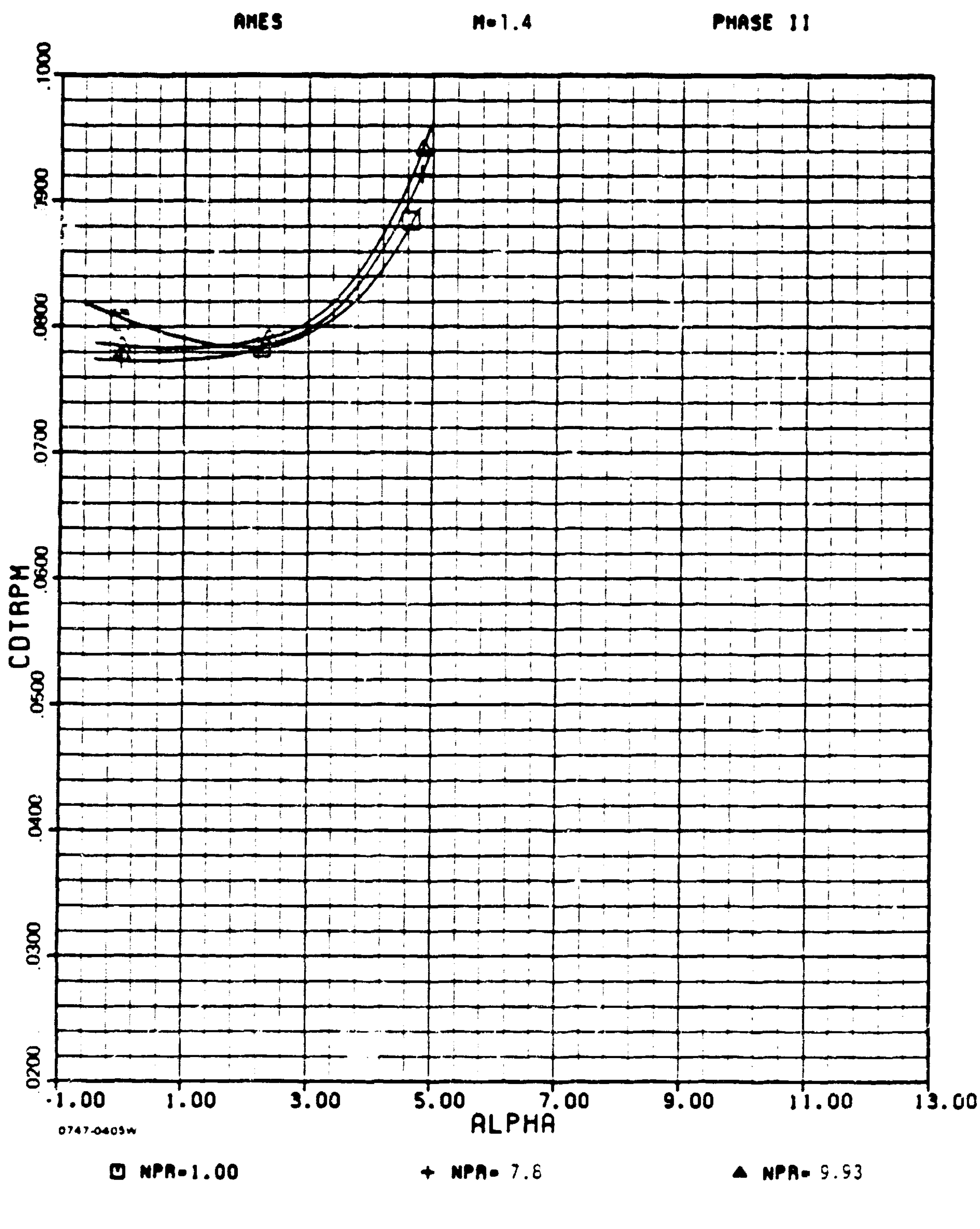
ADEN COMBAT TWENTY DEGREE



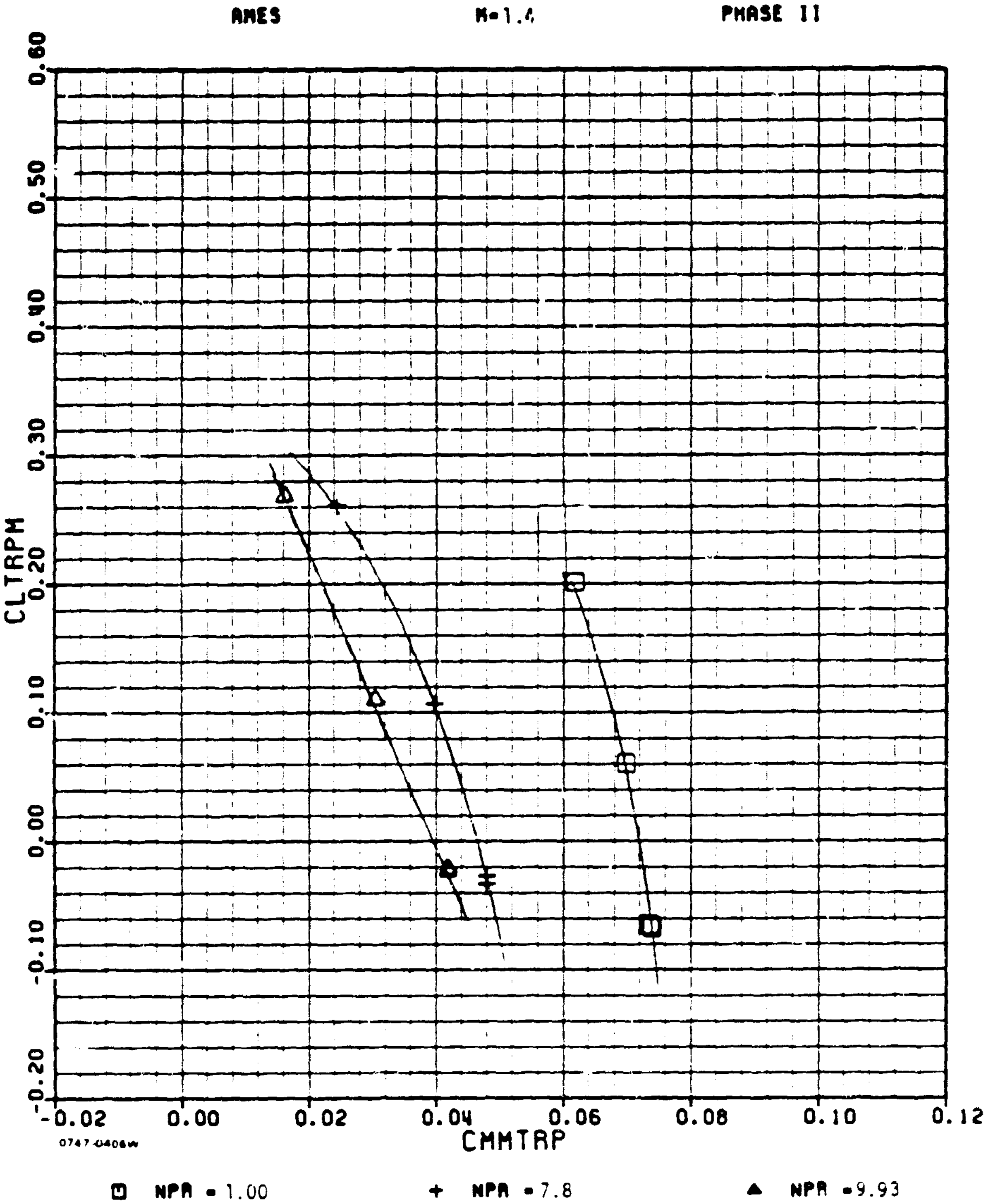
ADEN COMBAT TWENTY DEGREE

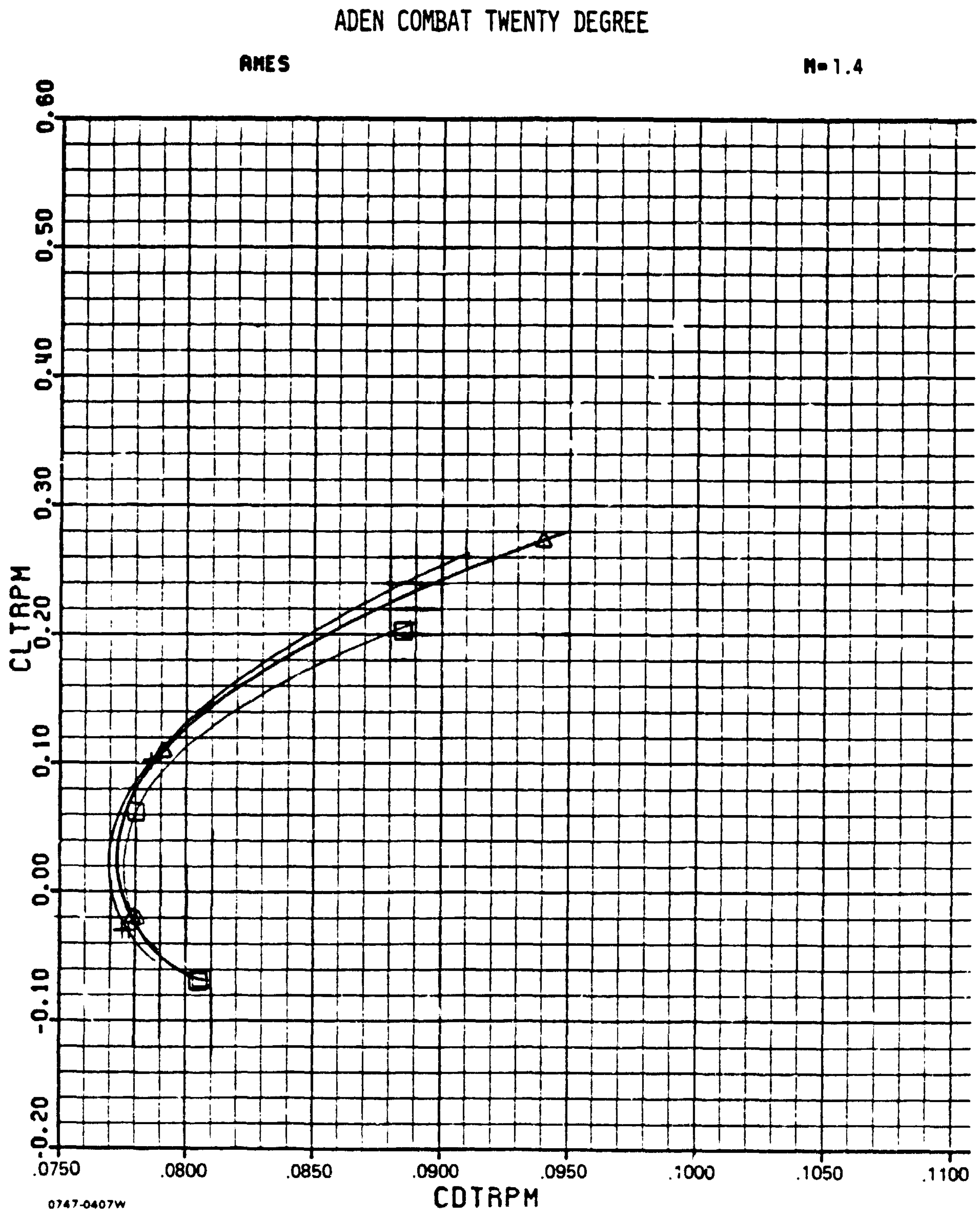


ADEN COMBAT TWENTY DEGREE



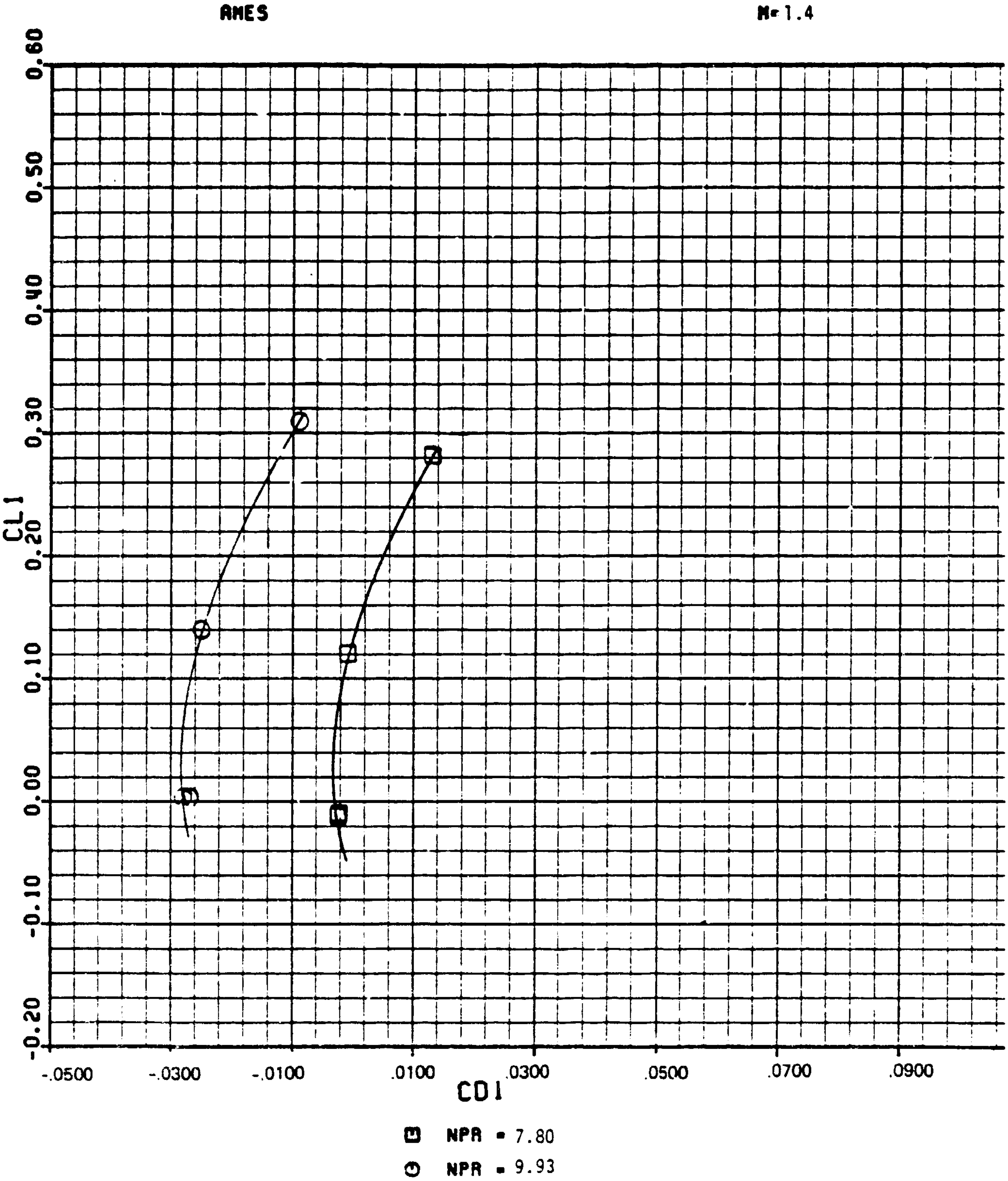
ADEN COMBAT TWENTY DEGREE





ORIGINAL PAGE IS
OF POOR QUALITY

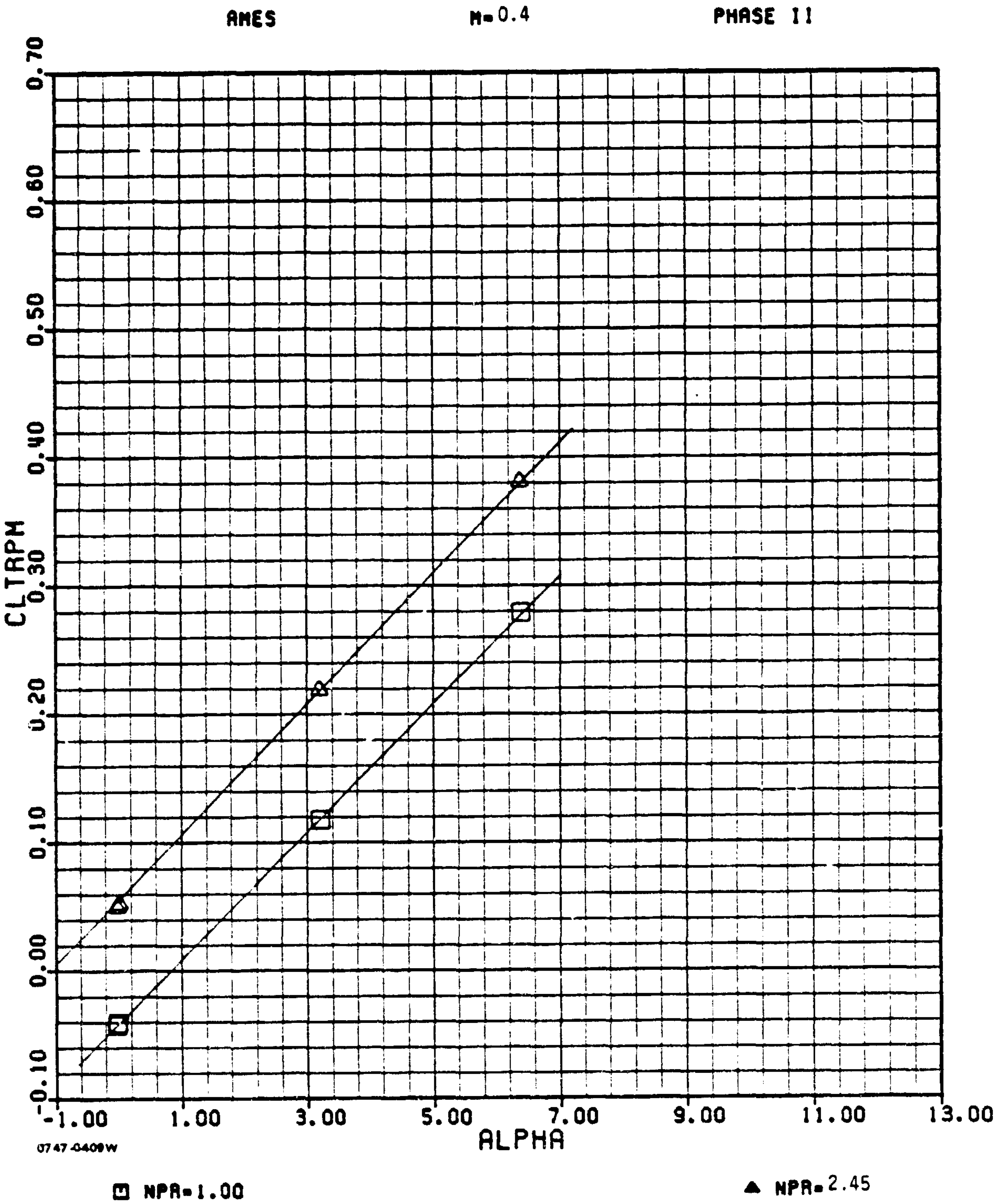
ADEN COMBAT TWENTY DEGREE



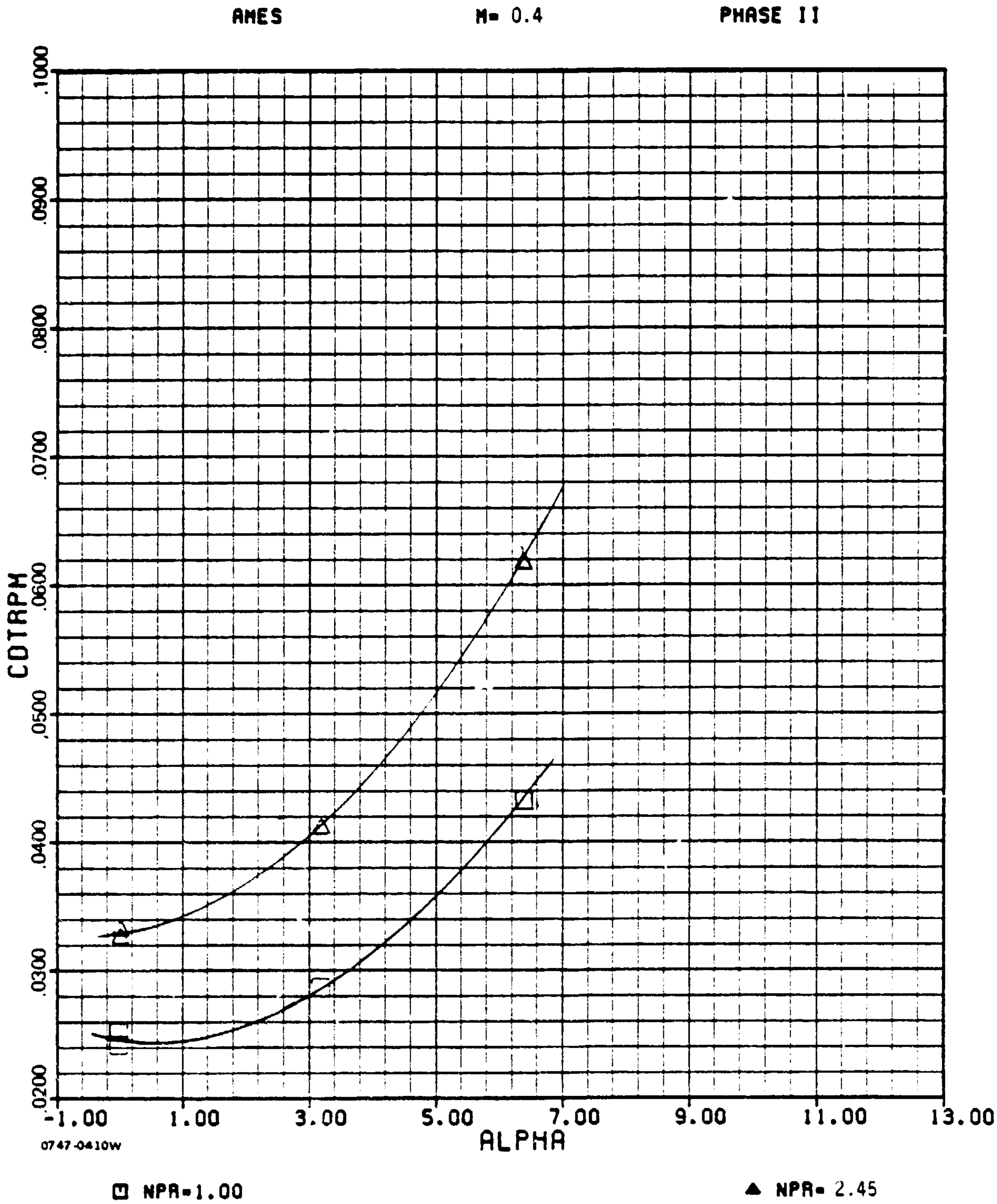
APPENDIX N

ADEN COMBAT 20° ALT WIND-ON DATA

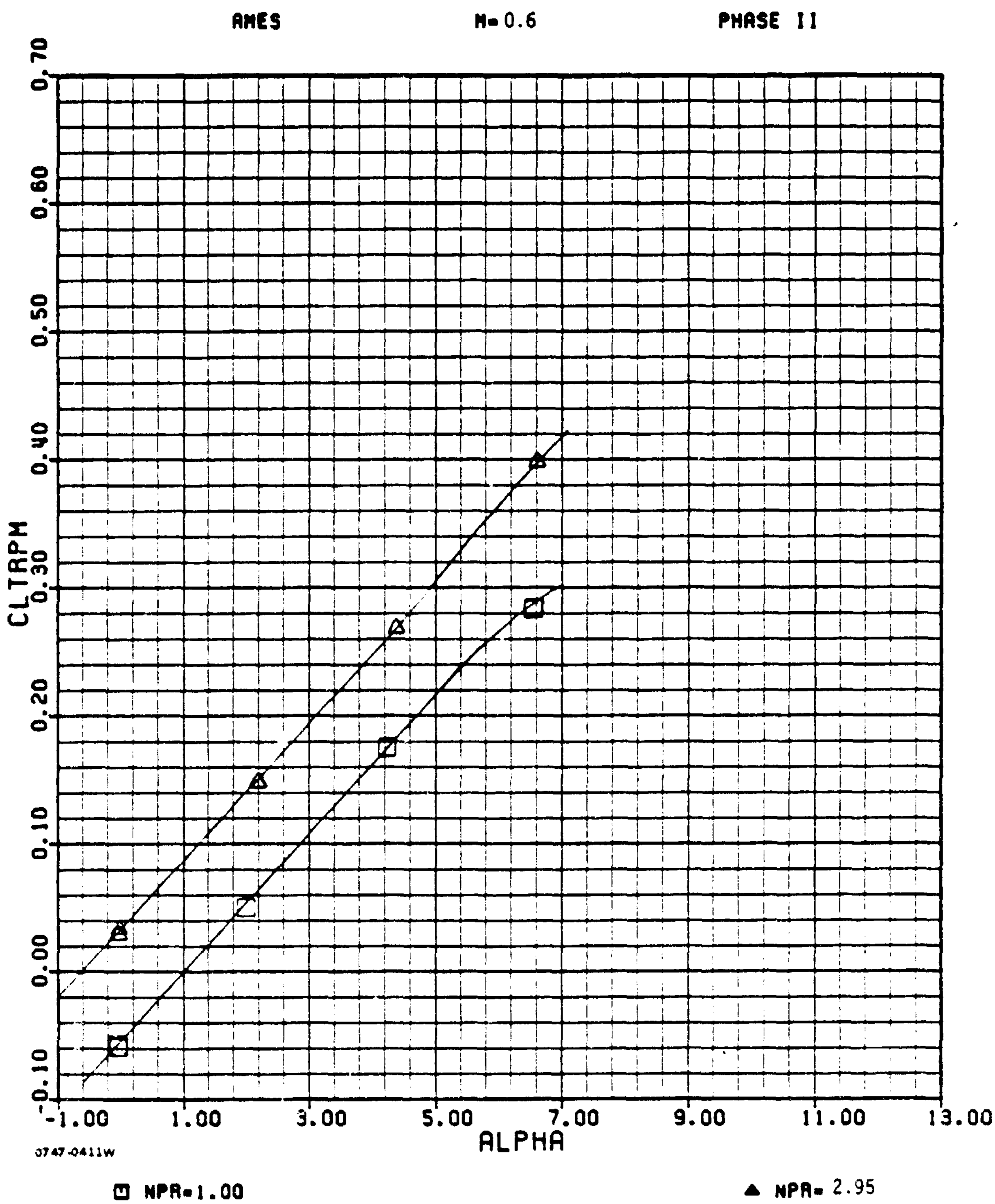
ADEN COMBAT TWENTY DEGREE ALT.



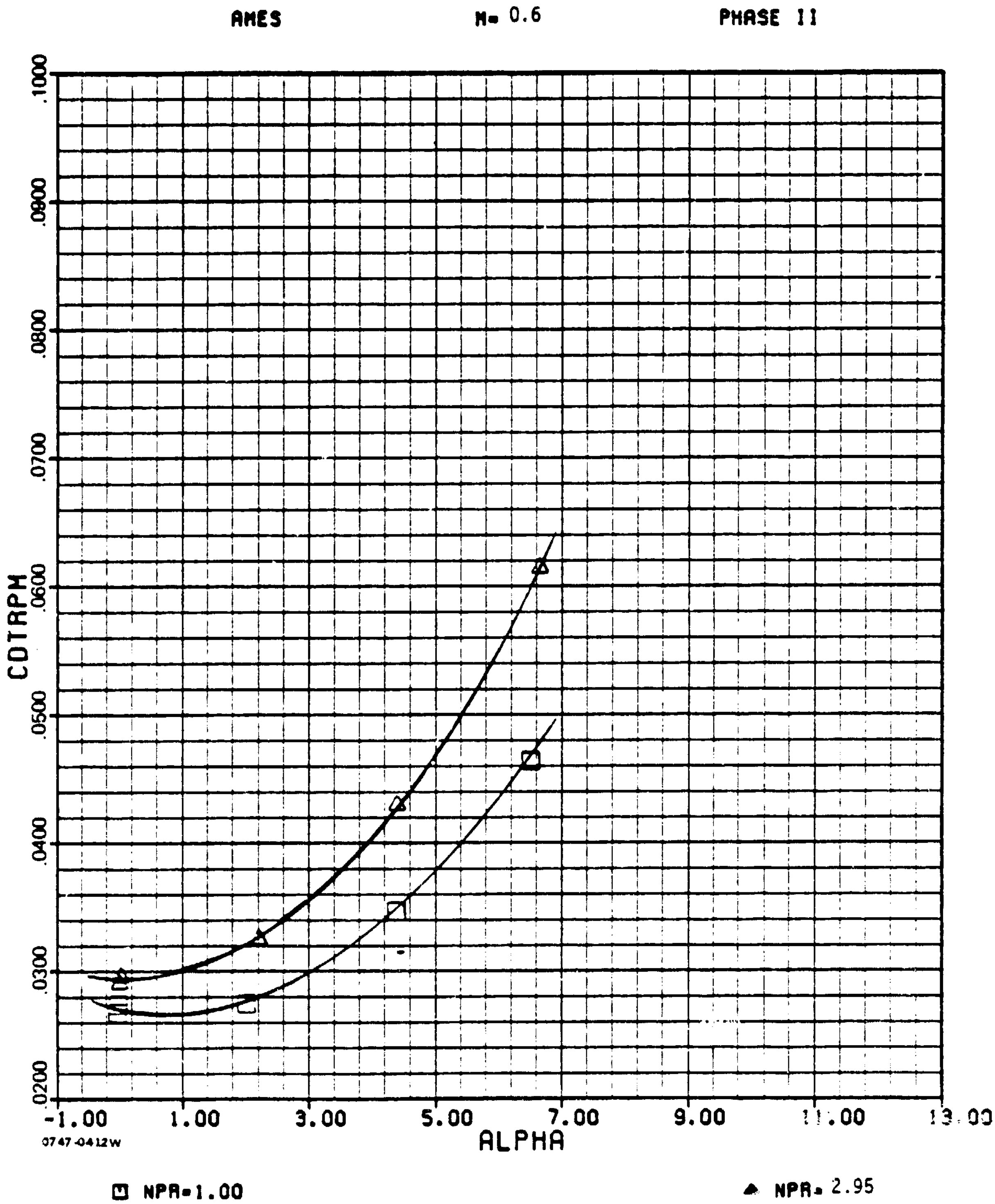
ADEN COMBAT TWENTY DEGREE ALT.



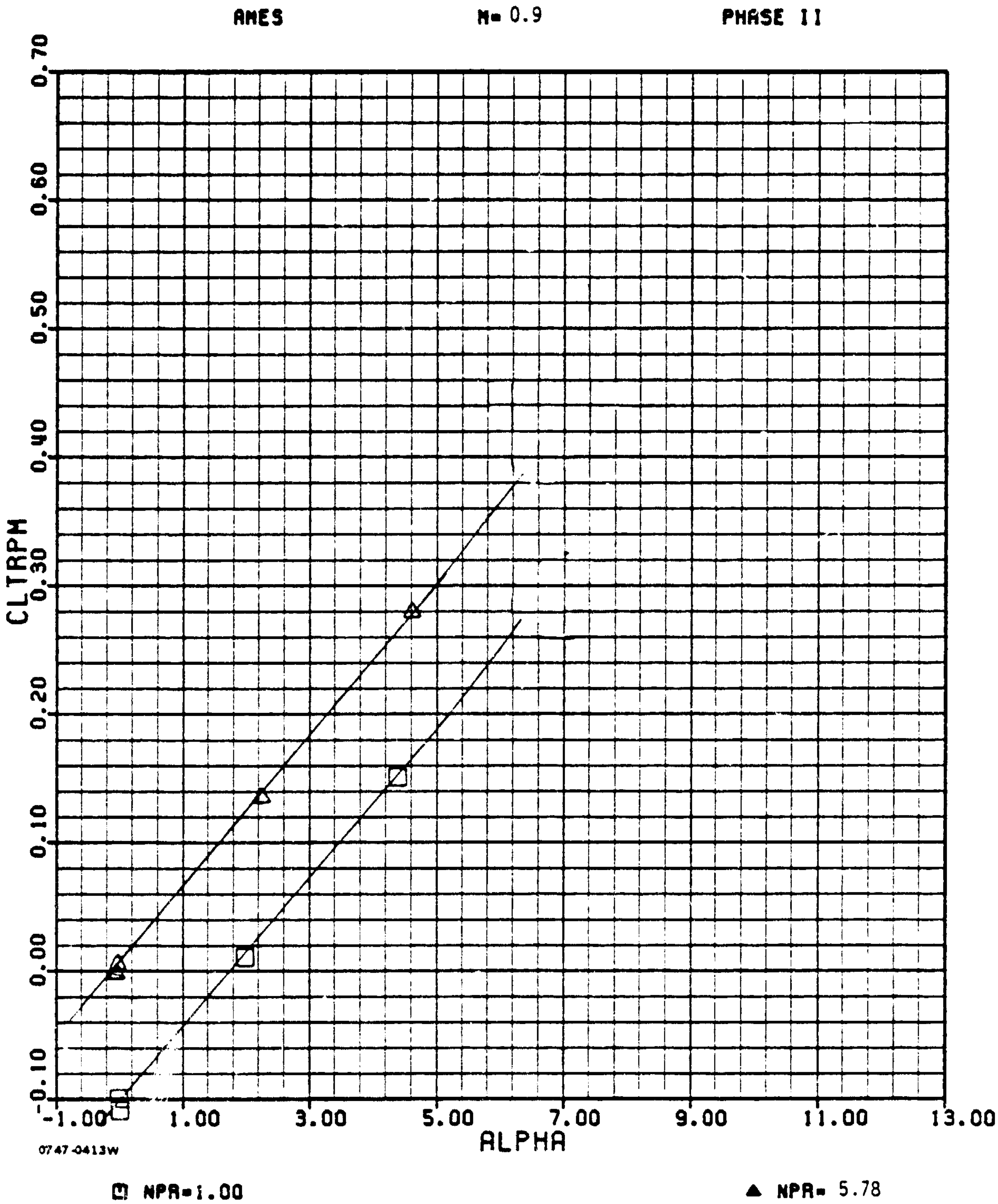
ADEN COMBAT TWENTY DEGREE ALT.



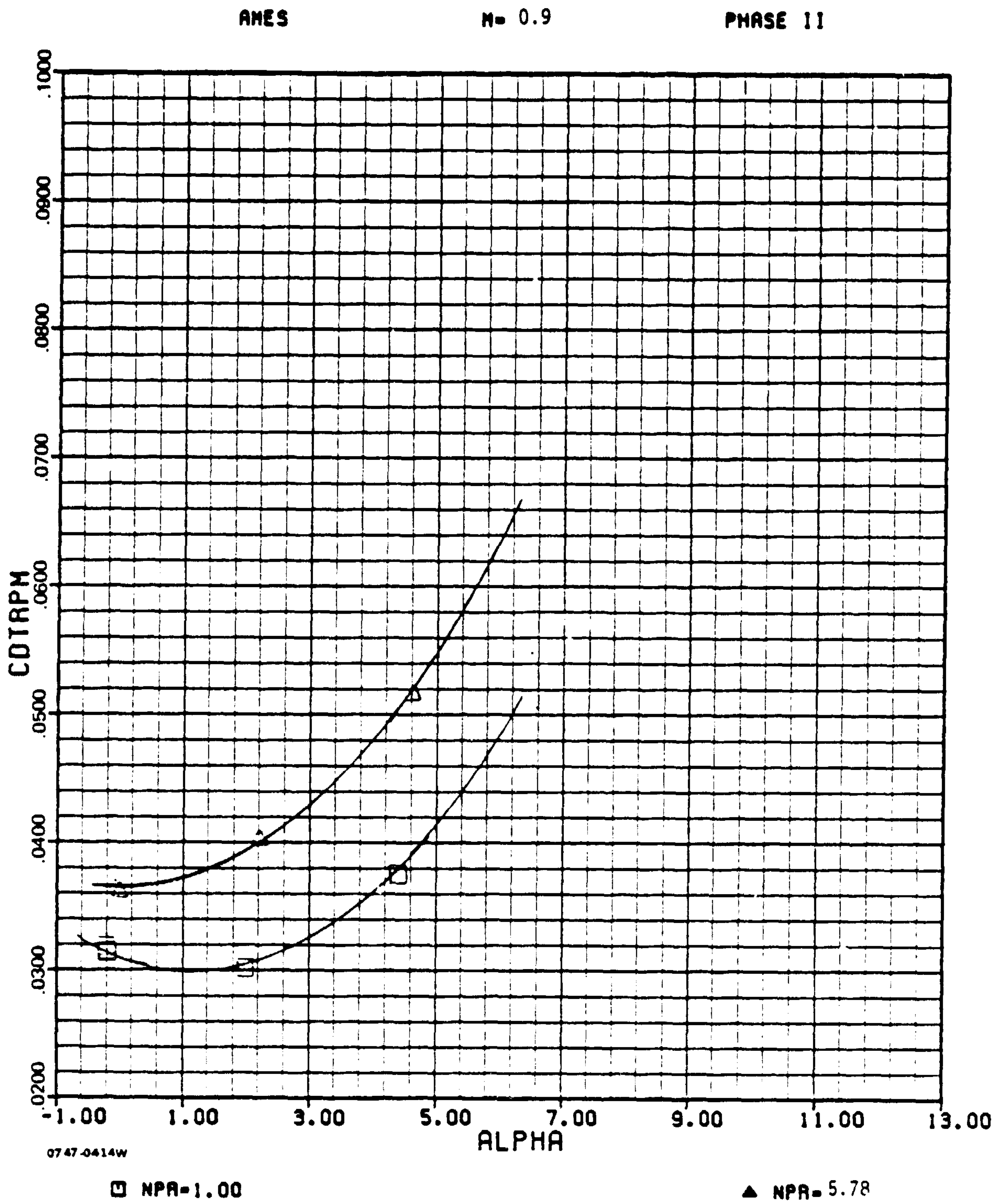
ADEN COMBAT TWENTY DEGREE ALT.



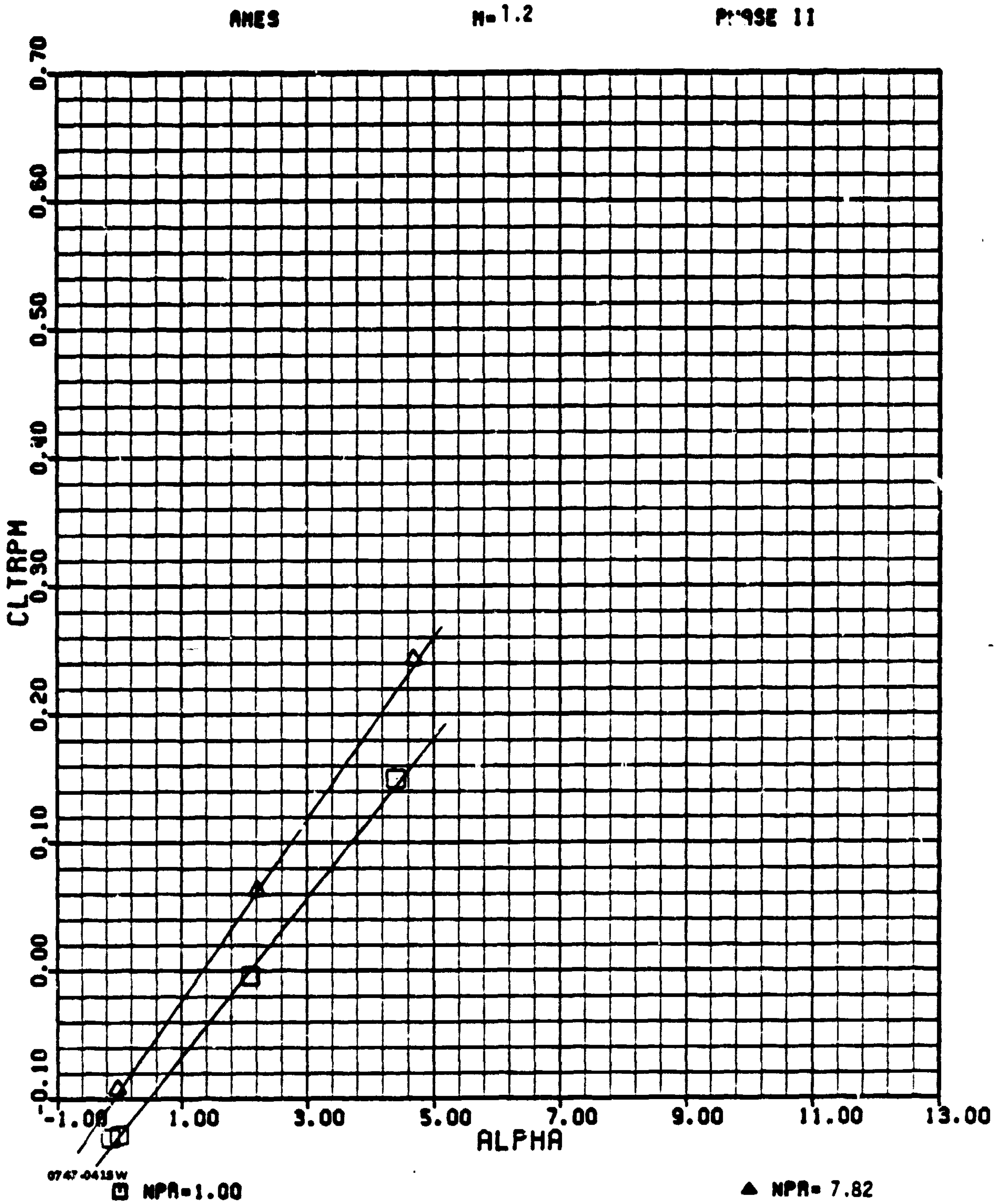
ADEN COMBAT TWENTY DEGREE ALT.



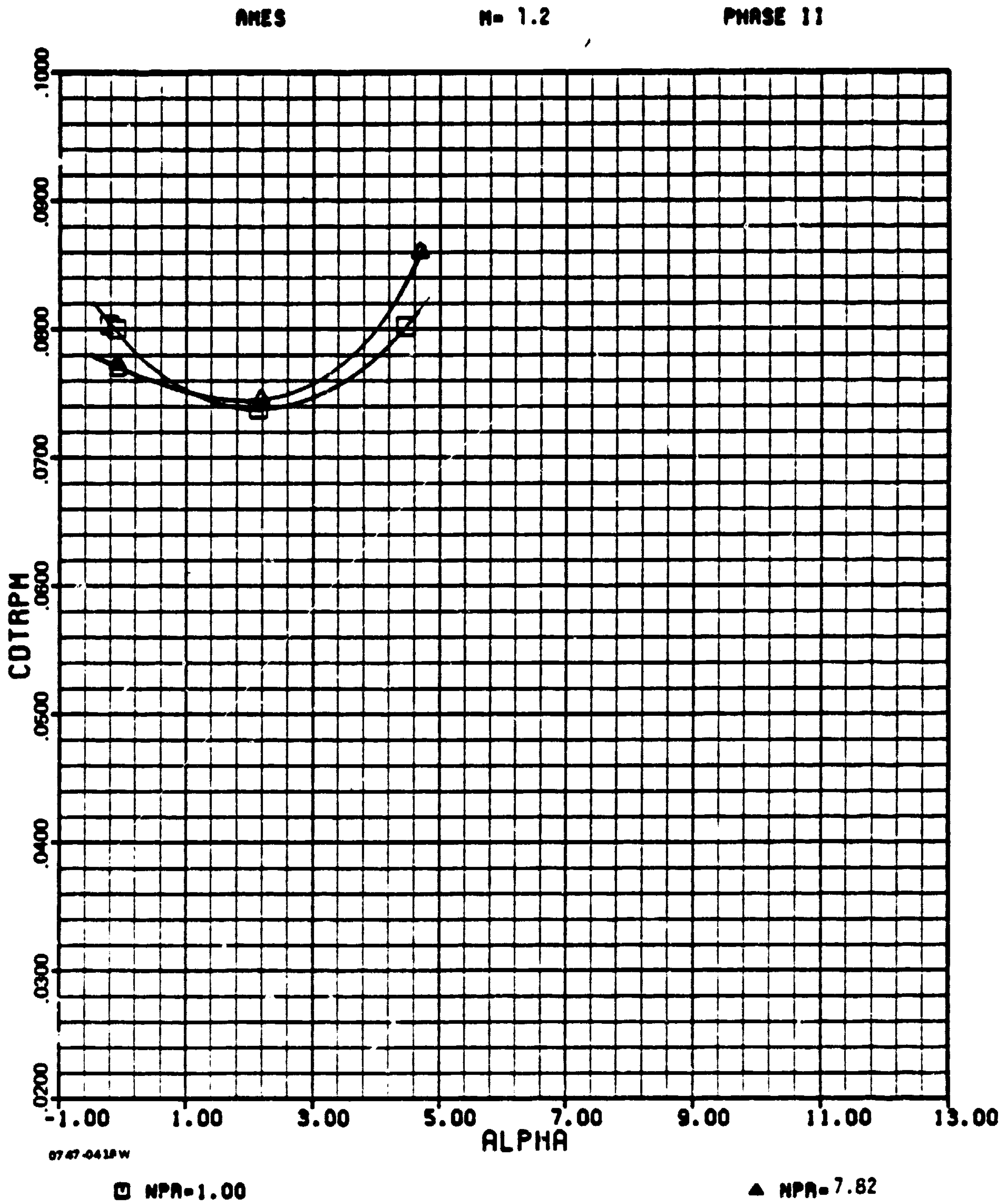
ADEN COMBAT TWENTY DEGREE ALT.



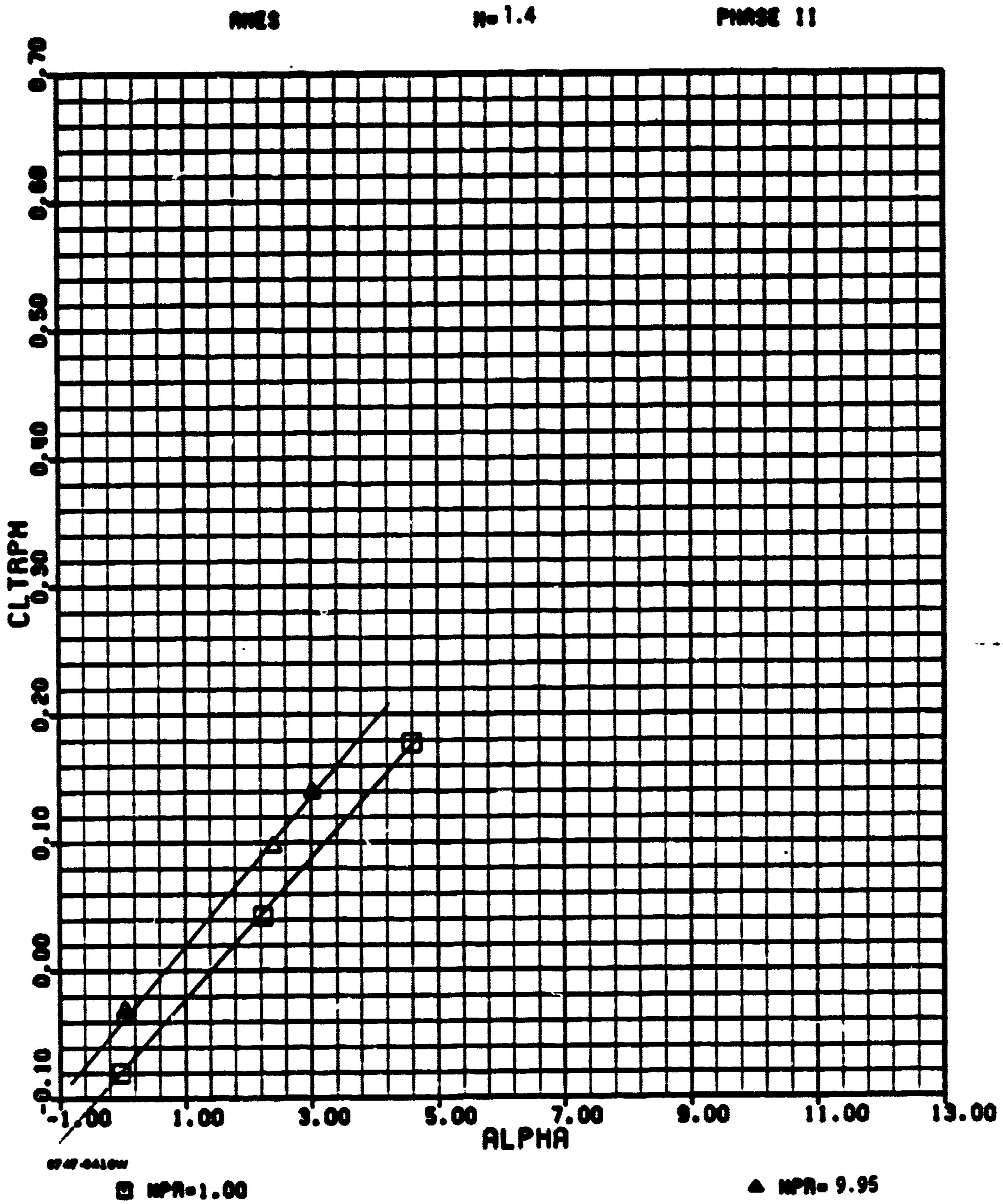
ADEN COMBAT TWENTY DEGREE ALT.



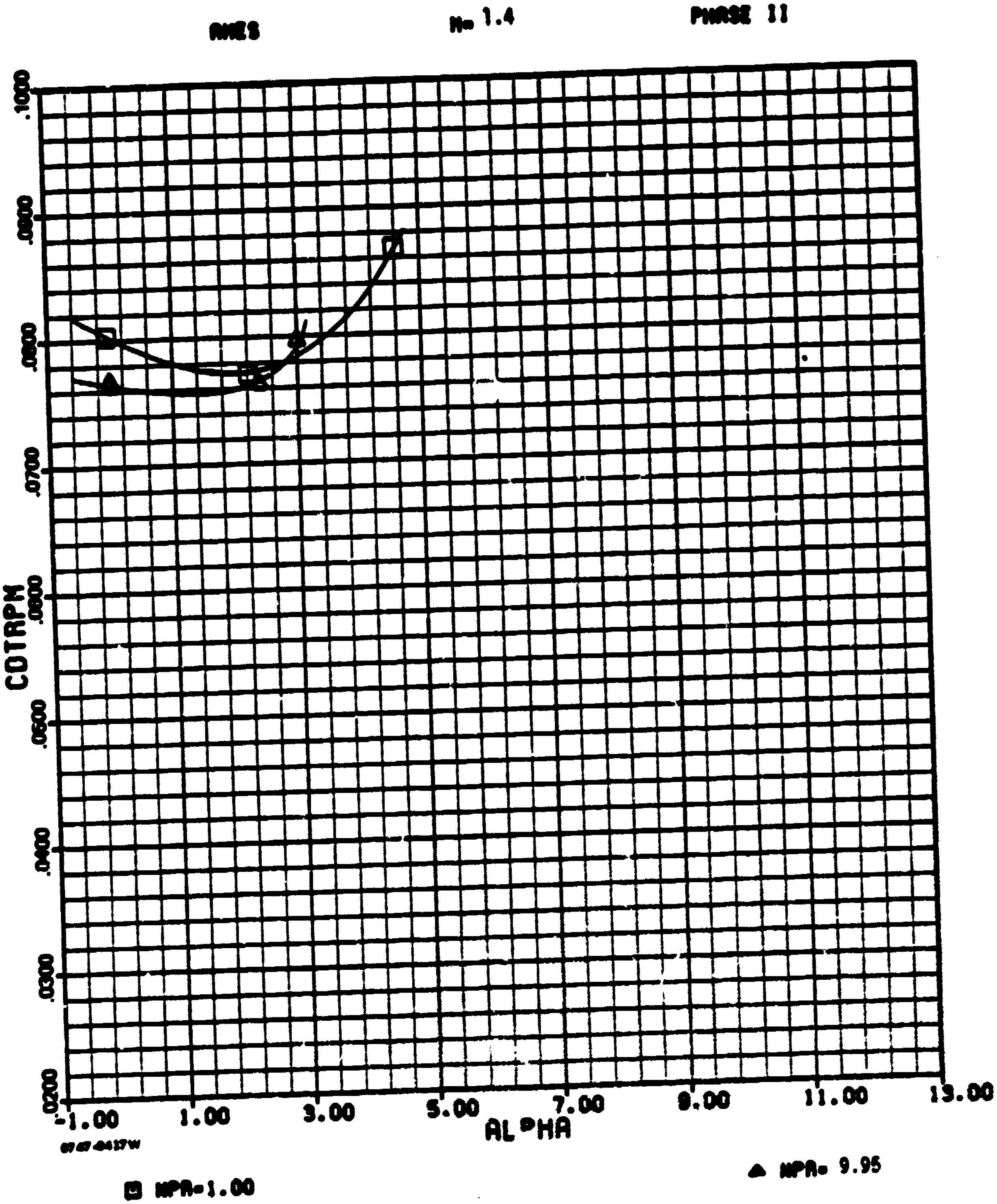
ADEN COMBAT TWENTY DEGREE ALT.



ADEN COMBAT TWENTY DEGREE ALT.



ADEN COMBAT TWENTY DEGREE ALT.



APPENDIX O

PROPOSED DATA ADJUSTMENT

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
CIRCULAR	0.60	-0.13	.0002
		-0.08	.0002
		2.08	.0002
		4.29	.0002
		6.51	.0001
		-0.12	.0002
	0.90	-0.19	.0003
		2.12	.0003
		4.43	.0002
		-0.19	.0003
	0.95	-0.21	.0003
		2.11	.0003
		4.46	.0003
		-0.22	.0003
		2.11	.0003
		4.46	.0003
	1.40	0.07	.0007
		2.40	.0007
		4.76	.0006
		0.05	.0002
		2.40	.0007
		4.76	.0006
		0.06	.0007
		0.06	.0007

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
ALBEN	0.80	-0.12	.0010
		2.08	.0010
		4.35	.0008
		6.64	.0006
		-0.13	.0009
		-0.17	.0009
	0.90	-0.20	.0011
		2.07	.0011
		4.38	.0009
		-0.20	.0011
	1.35	0.01	.0029
		0.02	.0029
		2.31	.0028
		4.67	.0026
		0.01	.0029
CRUISE 5^{0}	0.80	-0.17	.0005
		2.09	.0005
		4.37	.0004
		6.65	.0003
		-0.17	.0005
	0.90	-0.40	.0006
		2.06	.0005
		4.37	.0004
		-0.22	.0005
DASH	0.60	-0.14	.0012
		2.06	.0011
		4.27	.0009
		6.48	.0006

0747-0182W

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
DASH (Cont.)		-0.13	.0012
		-0.13	.0011
	0.90	-0.24	.0014
		2.06	.0014
		4.37	.0012
		-0.24	.0014
		-0.25	.0014
	1.20	-0.18	.0038
		2.17	.0035
		4.54	.0032
		-0.18	.0038
		-0.19	.0038
	1.40	0.04	.0038
		2.32	.0036
		-0.01	.0038
		-0.02	.0038
COM 0^{o} ALT	0.60	-0.14	.0018
		3.16	.0016
		7.61	.0008
		-0.13	.0018
		4.27	.0014
		-0.13	.0018
		-0.13	.0017
	0.90	-0.26	.0021
		4.35	.0018
		-0.24	.0021

0747-0183W

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
COM 0° ALT (cont.)	1.4	-0.02	.0053
		4.67	.0047
		-0.02	.0053
COM 10°	0.60	-0.12	.0027
		2.09	.0026
		4.30	.0021
		6.51	.0013
		-0.11	.0027
		-0.12	.0026
		2.09	.0025
		4.30	.0020
		6.50	.0013
		-0.11	.0026
	0.80	-0.18	.0030
		2.10	.0028
		4.38	.0023
		6.66	.0016
		-0.18	.0029
	0.90	-0.24	.0032
		2.07	.0030
		4.39	.0026
		-0.23	.0031
	0.95	-0.27	.0037
		4.39	.0031
		-0.22	.0032
COM 20°	0.40	-0.03	.0026
		3.17	.0022

0747-0184W

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
COM 20° (Cont.)		6.39	.0012
		-0.04	.0025
		-0.03	.0025
	0.60	-0.07	.0028
		3.24	.0024
		2.14	.0026
		4.35	.0022
		6.56	.0014
		-0.07	.0027
		-0.07	.0026
	0.80	-0.12	.0029
		2.16	.0027
		4.41	.0023
		6.71	.0015
		-0.12	.0029
		-0.15	.0029
	0.90	-0.16	.0031
		2.13	.0029
		2.13	.0029
		4.45	.0025
		-0.15	.0030
		-0.17	.0031
	0.95	-0.27	.0035
		4.40	.0030
	1.20	-0.15	.0078
		2.19	.0072
		4.56	.0066
		-0.15	.0078
		-0.15	.0077

0747-0185W

CONFIG.	MACH	α (DEG.)	CORR. TO JET-OFF POLAR
COM 20^0 (Cont.)	1.4	0.01	.0077
		2.34	.0073
		.01	.0078
COM 20^0 ALT	0.40	-0.02	.0025
		3.16	.0022
		6.38	.0012
		-0.06	.0024
	0.60	-0.12	.0027
		2.09	.0025
		4.31	.0021
		6.53	.0013
		-0.11	.0026
	0.90	-0.24	.0030
		2.06	.0028
		4.39	.0025
		-0.22	.0030
	1.20	-0.13	.0077
		2.15	.0071
		4.53	.0065
		-0.19	.0078
	1.4	-0.04	.0077
		2.28	.0073
		-0.04	.0078