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A 0.15-Scale Study of Configuration Effects on the Aerodynamic Interaction Between Main Rotor and Fuselage.

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LIST OF SYMBOLS

Symbol	Description
AF	Balance axial force, N
a_0, a_1, a_2, a_3	Constants of a Fourier series used to represent fuselage induced velocities in main rotor tip path plane
B	Nomenclature for baseline isolated body of revolution
C_H	Main rotor H-force coefficient, $H/\rho\ \pi R^2(\Omega R)^2$
C_L	Main rotor lift coefficient, $L/\rho\ \pi R^2(\Omega R)^2$
C_T	Main rotor thrust coefficient, $T/\rho\ \pi R^2(\Omega R)^2$
C_W	Aircraft weight coefficient, $W/\rho\ \pi R^2(\Omega\Omega)^2$
C_X	Propulsive force coefficient, $X/\rho\ \pi R^2(\Omega R)^2$
C_P	Main rotor power coefficient, $P/\rho\ \pi R^2(\Omega R)^3$; differential pressure coefficient, $(p_1 - p_\infty)/q$
C_{D_B}	Body drag coefficient, D_B/qS_B
C_{D_W}	Winglet drag coefficient D_W/qS_B
C_{L_B}	Body lift coefficient, L_B/qS_B
C_{L_W}	Winglet lift coefficient L_W/qS_B
$C_{M_{Y_B}}$	Body pitching moment coefficient, PM_B/qS_Bd_B
D	Wind axis drag, N
d_B	Maximum body thickness, m
F2L	Nomenclature for extended nose in lower position
F2U	Nomenclature for extended nose in upper position
FWO	Nomenclature for extended nose in lower position with winglets removed
H	Nomenclature for hub; main rotor H-force, N
HP	Main rotor shaft horsepower

LIST OF SYMBOLS (continued)

Symbol	Description
h	Vertical distance between main rotor hub and body upper surface, m
IGE	Acronym meaning in ground effect
L	Wind axis lift, N
l_B	Body length, m
M	Wind axis pitching moment, N-m
MU	Speed ratio, V/ΩR
NF	Balance normal force, N
OGE	Acronym meaning out of ground effect
P	Main rotor power required, W
PM	Balance pitching moment, N-m
p_l	Local static pressure, N/m^2
p_∞	Free stream static pressure, N/m^2
Q	Main rotor torque, N-m
q	Free stream dynamic pressure, $1/2\ \rho\ V^2$, N/m^2
R	Nomenclature for main rotor; blade radius, m
RM	Balance rolling moment, N-m
r	Main rotor blade radial station, m
SIG	Main rotor solidity
SIGPRM	Density ratio
SF	Balance sideforce, N
S_B	Maximum body cross-sectional area, m^2
T	Main rotor thrust, N
V	Free stream velocity, m/s
W	Aircraft weight, Kg
X	Main rotor propulsive force, N

LIST OF SYMBOLS (continued)

Symbol	Description
x	Nondimensional main rotor blade radial location, r/R; body x-axis coordinate, m
Y	Wind axis sideforce, N
YM	Balance yawing moment, N-m
y	Body y-axis coordinate, m
z	Body z-axis coordinate, m
Z	Distance between main rotor hub and ground, m
α_C	Control axis angle of attack, axis normal to swashplate - positive tilted aft of vertical, deg
α_R	Main rotor induced angle of attack, deg
α_S	Shaft angle of attack - positive tilted aft of vertical, deg
$\Delta\alpha$	Tunnel wall induced angle of attack, deg
Δv	Tunnel wall induced velocity, m/s
θ_B	Geometric body angle of attack - positive up, deg
μ	Speed ratio, $V/\Omega R$
v_i	Main rotor induced velocity, m/s
π	Constant equivalent to 3.14159
ρ	Air density, kg/m^3
Ω	Main rotor rotational speed, rad/s

Subscripts

B	Body
R	Rotor
W	Wing
WA	Wind axis
CWA	Corrected wind axis

SUMMARY

In 1981 NASA Ames released RFP2-30412-(LL) entitled "Investigation(s) to Advance Helicopter Aerodynamics or Dynamics Technology." The purpose of the work reported herein was to advance the technical understanding of mutual main rotor and fuselage aerodynamic interference in response to the RFP. Tests were performed on a 0.15-scale model consisting of a Bell Helicopter Textron Incorporated (BHTI) Model 222 main rotor and a set of fuselage fairings. The fuselage fairings were scaled from fairings NASA is scheduled to test in 1986 during its first full-scale main rotor/fuselage interactional aerodynamics test.

Major test objectives included the effect of fairing shape, main rotor/fuselage separation distance and interactions under IGE hover conditions. A total of four configurations in hover and twelve configurations in forward flight were tested to obtain the required data. Major test parameters included airspeed, main rotor collective pitch, rotor tip path plane and fuselage angle-of-attack.

Data acquisition included main rotor torque, forces and moments, and fuselage forces, moments and pressure distribution. The main rotor and fuselage were mounted on separate balances. Data reduction included correction for wall effects and hub tares. Analysis of rotor performance, fuselage aerodynamics and fuselage pressure was performed.

The data show that the rotors effect on the fuselage may be considerably more important to aircraft performance than the fuselage effect on the main rotor. Recommendations for further work include greater analysis of existing data, tests for rotor effects on hub tares and tests specifically for rotor induced effects on airframe drag.

INTRODUCTION

In recent years the rotary wing industry has been evolving at a rapid pace marked by design trends with increasing impact on configuration aerodynamics. This is due in part to changes in system requirements as well as operational doctrines. In both instances the impact on the aircraft aerodynamics has been significant; especially in the areas of mutual interaction between aircraft components. Consequently, aerodynamic interaction identification, understanding, and application have become areas of significant importance and active technical investigation.

When isolated aerodynamically, aircraft components have their own unique flow field and set of aerodynamic characteristics. However, when the individual components are integrated into an aircraft system a myriad of changes in the aerodynamic environment can and usually do occur. The resultant mutual interaction between the system components may or may not be favorable. It is still difficult today to analyze certain isolated aircraft components to the degree necessary for design application. The added complexity of analyzing components in close proximity becomes a problem which is an order of magnitude greater than that of the individual component. In 1980 Sheridan and Smith, Reference 1, presented an excellent overview of the Interactional Aerodynamics (I/A) state-of-the-art. Figure 1, taken from Reference 1, graphically illustrates the complexity of mutual interactions experienced by a conventional helicopter configuration.

One of the main areas of specific interest to the technical community is the mutual interaction of the main rotor with the fuselage. The resultant interaction of these two components can be manifested in two major ways. First the structural coupling of the main rotor and fuselage requires that the main rotor provide any changes in thrust necessary to trim the aircraft due to fuselage download, upload or drag. Second, a purely aerodynamic interaction occurs between both components when in close proximity to each other. The aerodynamic interaction, or influence, of the fuselage on the main rotor is three fold. First, the fuselage displaces the apparent free stream flow; consequently, altering local angle of attack over the rotor disk. Second, the flow field about the fuselage distorts the main rotor wake, hence the far field wake structure changes with a secondary influence on the time-average induced velocity over the rotor disk. Third, the distorted near wake influences the blade/vortex intersections and local instantaneous angles of attack. The aerodynamic interaction of the main rotor on the fuselage is primarily two fold. First, the main rotor wake emerses the fuselage in a steady downwash field mostly the result of the far wake structure. Second, the near wake creates unsteady airloads

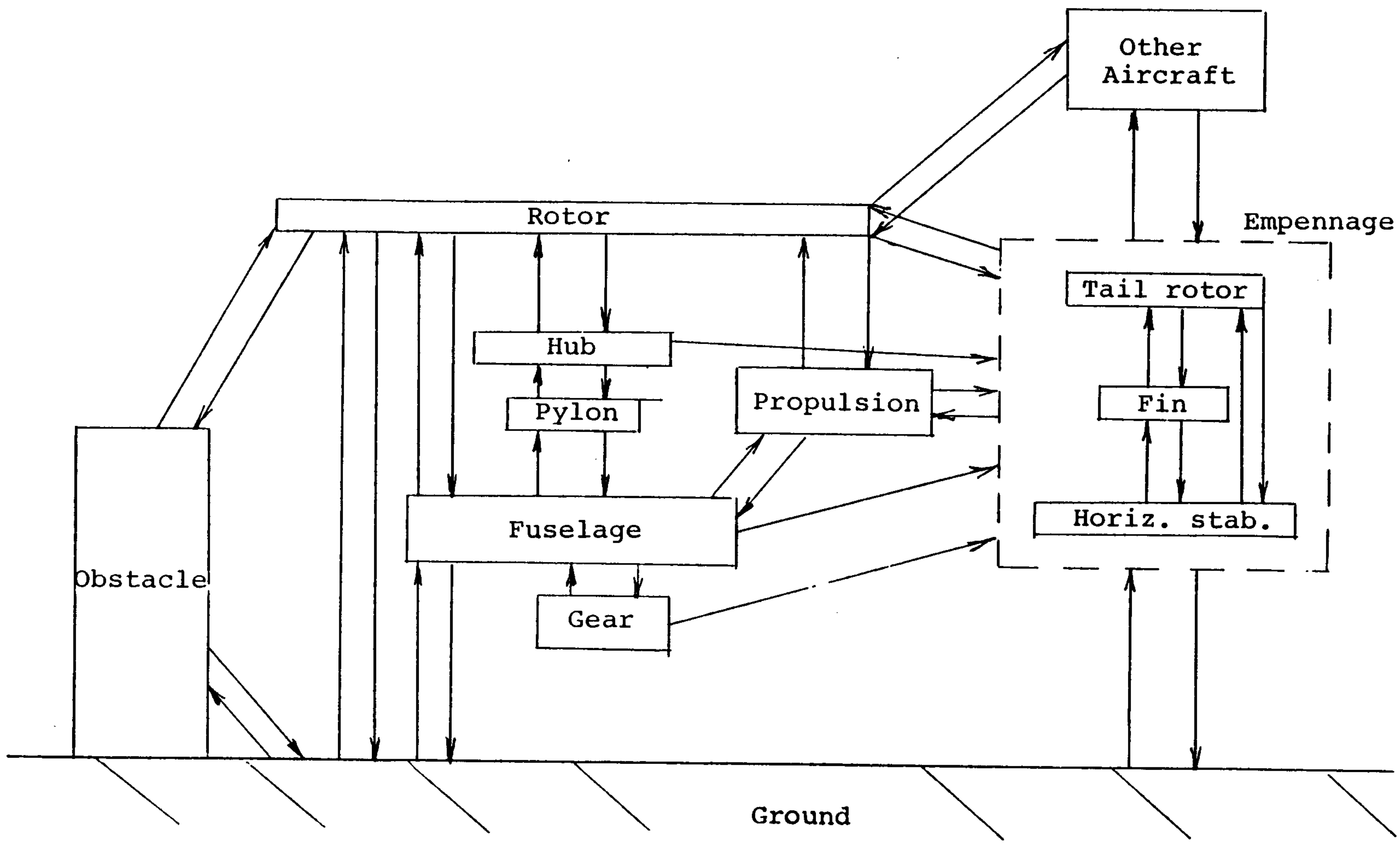

Figure 1. Aerodynamic interactions of the single rotor helicopter configuration.

on the fuselage due to the local blade passage at a frequency of number of blades per revolution and higher harmonics. The interactions discussed above are based on the assumption that only the main rotor and fuselage are present. To be technically correct indirect and potentially strong interactions between fuselage and main rotor occur. For instance the influence of the main rotor on the hub wake will cause the hub wake's effect on the fuselage aerodynamics to change relative to the rotor-off condition.

In 1979 NASA Ames initiated an Interactional Aerodynamics program including full scale as well as model testing. The programs objectives include as a first phase the investigation of mutual rotor/fuselage interaction and its influence on rotor loads and performance as well as fuselage aerodynamic forces, moments and pressures. Specific effects to be studied include rotor/fuselage vertical and longitudinal separation distance, tip path plane angle of attack, and configuration (simulate helicopter nose typical of helicopters in service) on the dynamics of the main rotor as well as the steady state aerodynamics of the main rotor and fuselage. At present the initial full scale test is planned for the BHTI Model 412 rotor on the NASA Ames 1118.6 kw (1500 hp) Model 576 test stand in the Ames (40x80x120-ft) wind tunnel. This test is scheduled to occur in 1986 under Contract NAS2-11090. The subject contract, NAS2-11268, was released to BHTI to conduct a 0.15-scale performance and powered force and moment test of the full scale test configurations defined under Contract NAS2-11090. The model test program included hover testing in the BHTI Hover Test Facility as well as forward flight testing in the Vought Aeronautics Division Low Speed Wind Tunnel Facility.

The remainder of this contractor report discusses the 0.15-scale test program in detail. The literature survey performed under contract will be discussed separately in the next section. The literature survey is followed by two sections, Test Equipment and Test Facilities which describe model/facility capabilities, instrumentation requirements and model installation. The following section defines the test program procedures in detail. The section labeled Test Results discusses data reduction and presents data in a graphical comparative manner most descriptive of the contracts test objectives as opposed to data by individual configuration. The correlation section describes the application of various analytical tools and methodologies utilized to predict the test results. Finally, conclusions and recommendations are presented relative to the application of the results as well as tasks for future work. Reduced test data is presented in tabular format in Appendices A through C for hover, forward flight and pressure data respectively.

LITERATURE SURVEY

The objective of this survey is to review available literature on the subject of the mutual interaction of the main rotor and fuselage of the single rotor helicopter. In addition an assessment of the available information as well as recommendations for further work are made. Recommendations based on the results of this contracted effort and the literature will be summarized together in the Conclusions and Recommendations section.

The literature survey conducted consisted of an on-line literature search using the System Development Corporation (ORBIT), Lockheed (DIALOG), Department of Defense (DROLS), and GIDEP data base systems. In addition, NASA documentation resources and references from subject related reports and papers were reviewed. It is believed that this survey includes the major works on the subject published to date. Several sources are included which specifically address the problem of main rotor/fuselage interaction, even though, limited or no data at all is presented. It was felt that this was necessary in order to establish the state-of-the-art as it has evolved in recent years. Only the references reviewed under this contracted effort will be discussed. However, references discussed by the authors of the documents reviewed which may be of interest to the reader will be noted.

A summary of the literature survey is presented in Table 1 to allow the reader a quick overview of available information. For detailed Reference information see the Reference section. The literature of Table 1 is grouped according to whether rotor-fuselage interaction is a primary or secondary subject of the document. The following information provides a guideline to aid the reader in utilizing Table 1.

Ref	-	Number as listed in the List of References.
Author	-	Last name of first author listed.
Document	-	Report identification. Contracted work will be listed by report number. The letter N designates a NASA report number, U designates an Army report number. For joint NASA/Army contracts the NASA report number will be used. Papers will be identified by year and key name identifier; e.g., '79 AHS Forum.
Contents	-	Document is evaluated as containing information identified by the letter codes defined below.

D	-	Data is presented, D followed by an asterisk indicates the report is primarily a test report including discussion of test parameters, models and procedure.
A	-	The author has provided significant analysis and discussion of the results.
C	-	Data correlation with analysis has been included.
M	-	Methodology has been presented in an analytical form or is being discussed in sufficient detail to be of interest to the reader researching interactional aerodynamics.
CO	-	Calculations only.
Flt Conditions	-	H for hover and FF for forward flight.
Comments	-	Provides key information consisting mostly of scale and model information where applicable.

Table 1. Summary of Literature Survey on Main Rotor/Fuselage Interactional Aerodynamics

Ref	Author	Document	Contents	Flt Conditions	Comments
		Rotor-Fuselage Aerodynamic Interaction as Primary Subject			
2	Freeman	N TM-X-3476	D*	FF	1/4-scale AH-1G rotor-off
3	Freeman	N TM 74033	D*	FF	1/4-scale AH-1G rotor-on
4	Freeman	N TM 80051	D*	H,FF	4-bladed, 3.15m rotor, super elipse body
5	Wilson	N TM-X-3185	D*,A	FF	40% cutout 2-blader, 3 generic bodies
6	Mineck	N TN D-8198	D*,A	FF	1/6-scale RSRA rotor-off
7	Mineck	N TM-X-3489	D*,A	H,FF	1/6-scale RSRA rotor-on
8	Mineck	N TM-X-3548	D*,A	FF	Further analysis of ref 6
9	Sheridan	U TR-78-23A	D*,A	H,FF	1/5-scale YUH-61A
10	Betzina	N TM 84247	D*,A	FF	1/6-scale AH-1G rotor, 1/6-scale RTA body
1	Sheridan	'79 AHS Forum	D,A	H,FF	I/A Overview
11	Wilson	'75 AHS Forum	D,A,C	H,FF	Overview of hover and low speed download
12	Flemming	'82 AHS Forum	D,A,C	H,FF	Full-scale RSRA data
13	Smith,CA	'83 AHS Forum	D,A,C,	FF	1/6-scale AH-1G rotor, 1/6-scale Model 576 body
14	Balch	'83 AHS Forum	D,A,C	H	UTTAS body + several main rotors + tail rotor
15	Wilby	'78 4th ERPLA	D,A,M,C,	FF	Parametric calculations
16	Smith,RV	'79 ARO	D,A,M,C	FF	Fuselage effects on rotor
17	Freeman	'80 AHS Forum	D,A,M,C	H,FF	1 and 3-m model data
18	Bramwell	'65 ARC-R/M-3514	M,D,A,C	H	Mutual body/rotor I/A
19	Soohoo	U TR-78-1A/1B	M,D,A,C	--	Green's function applied to rotor/fuse/flow separ-ation
20	Freeman	N TP 1656	M,D,A,C	--	Rotor/fuse analysis
21	Landgrebe	'76 AHS Mideast	M,D,CO	--	Mainly discussion

Table 1. (Concluded)

Ref	Author	Document	Contents	Flt Conditions	Comments
22	Taylor	'81 7th ERPLA	M,CO	--	Rotor/fuse flow analysis with separation
23	Huber	'82 AGARD	CO	FF	Calculations of fuselage effect on rotor
		Rotor-Fuselage Aerodynamic Interaction as Secondary Subject			
24	Berry	'83 AHS Journal	D	H	1/4-scale UH-1
25	Fradenburgh	'79 AHS Journal	D,A	H,FF	S-76
26	Logan	'80 AHS Forum	D,A	FF	YAH-64
27	Landgrebe	'81 AHS Forum	D,A	H,FF	1/4-scale AH-1G
28	Jepson	N CR-152366	D,A,M,C	FF	-
29	Keys	N CR-3083, Vol. II	M,CO	H,FF	Hypothetical aircraft
30	Harris	'79 AHS Forum	M,CO	FF	-
31	Kocurek	'80 AHS Forum	M,CO	H	AH-1G
32	Cheeseman	'81 7th ERPLA	-	H	Discussion only

The literature of Table 1 is organized by content rather than hover or forward flight because many references address both subjects. For each grouping of contents, e.g., D,A,C the references are listed in chronological order. The number of a reference is determined by the order in which it appears in the text.

References 2 through 4 contain test results only. Reference 2 and 3 contain baseline data for the AH-1G Cobra which when considered together will yield the rotors influence on the fuselage. The model body is not exactly to scale because the body was widened to accommodate the General Rotor Model System (GRMS) test stand; consequently, pitching volume and pitching moment will not be correct. Trends, however, should be characteristic. Reference 4 is a data report on a 3.15 m (10.34 ft) diameter 4-bladed articulated rotor with a body defined by super elipse equations. Only pressure data is presented. The data and body definition lend themselves well for evaluation with panel method analyses.

References 5 through 10 are test reports which include analysis of the results. Reference 5 was a test conducted in the Langley VSTOL tunnel to study the effects of a main rotor on three generic fuselages. The fuselages were representative of attack, utility and observation helicopters of that time frame. Only the utility and attack configurations were tested in the presence of the rotor. The majority of the data was taken in the low speed range with configuration changes resulting from combinations of rotor, fuselage and empennage. Data was taken with variations in pitch and yaw attitude. Tabulated force and moment data as well as graphical force and moment and pressure data is presented. Two factors must be considered in any application of this data. First, the main rotor is a low aspect ratio rotor with 40.2 percent root cutout and no twist. This has a considerable effect on blade loading and may cause a strong vortex at the root cutout. Second, the fuselage was mounted in an inverted position from the ceiling with the main rotor mounted from the floor on its own stand and balance; consequently, hub effects will differ for an actual helicopter. The author concluded from this test that the main rotor has significant influence on fuselage yawing moment for a single rotor helicopter for yaw angles greater than 20 degrees and that Reynolds number has a large effect on the fuselage but in a conservative manner relative to anti-torque requirements.

References 6, 7, and 8 are a series of tests conducted on a 1/6-scale Rotor System Research Aircraft (RSRA) model. Reference 6 contains the rotor-off data including several configuration modifications which must be considered if the data is being compared to the rotor-on data of References 7 and 8. Rotor-on and rotor-off data for the compound as well as helicopter configuration is available in Reference 7. Data are presented over a range of angle of attack, angle of sideslip and main rotor collective pitch at several advance ratios. Test conditions are varied about estimated trim points. Loads data are presented for the airframe, wing, tail and main rotor. Reference 8 is a further analysis of the compound configuration of Reference 7. Care must be taken when considering rotor-fuselage interaction based on the compound configuration because of the additional influence of the jets and wings.

Reference 9 presents 1/5-scale test results for the YUH-61A (Boeing Utility Tactical Transport Aircraft System (UTTAS)). This test investigated several interactions including rotor/fuselage and rotor/fuselage/ground. This report represents an extensive study containing steady and unsteady pressure data as well as wake survey data and analysis. Considerable work was done to investigate the effect of the ground vortex and its impact on fuselage aerodynamics in low speed flight. Because of the magnitude of the effort and its main intent to understand several problems encountered on the full-scale YUH-61A, insufficient data is available for detailed analytical development. This document is probably the single most important piece of work to date in terms of providing design guidance for future work.

Reference 10 is the first piece of work which addresses the rotor/fuselage interactional aerodynamics phenomena from a parametric point of view rather than being configuration or trim centered. It is similar to the work of Reference 5 in that the body is relatively simple and amenable to analysis by potential flow panel methods. It is the first major attempt at establishing fuselage effects on the main rotor. A 1/6-scale AH-1G main rotor was utilized in conjunction with a 1/6-scale model of the Rotor Test Apparatus (RTA) body. The RTA is a 2237.1 kw (3000 hp) test stand used in the Ames 12.2 x 24.4 x 36.6m (40x80x120-foot) wind tunnel for testing full-scale rotors. Consequently, the model results may upon complete evaluation be found to be important in correcting body tares which in turn impact rotor performance. Parameters evaluated included tip path plane angle of attack, body pitch attitude, rotor/fuselage separation distance, nose geometry, speed ratio and rotor thrust. The report concludes that the rotor has a significant impact on the fuselage aerodynamic characteristics. Test results showed that body lift increases when; (1) rotor thrust increases for a constant speed ratio with fixed flapping angle and body pitch attitude and (2) the rotor flaps forward and speed ratio, body pitch attitude and rotor thrust are held constant. Fuselage effects on rotor performance are evaluated using the definition of rotor equivalent L/D which is a measure of the rotors efficiency. The body appears to have a favorable effect on rotor efficiency. Final conclusions on fuselage/rotor interaction will require further study of rotor torque and propulsive force.

Sheridan and Smith in Reference 1 present an excellent discussion on the subject of Interactional Aerodynamics. Interference effects in general are categorized in a well organized manner which allows the reader a good overview of the aircraft I/A problem. Many important points were made in this work related to future I/A studies including; (1) simulation of all main flows, (2) capability for extensive off-the-surface measurements and flow visualization, (3) multidisciplinary support and participation, and (4) more generalized investigation required to establish a technical base for theory development and empirical guidelines.

In Reference 11, Wilson presents an overview of work to that point in time relative to hover download and its importance to overall aircraft performance. He quantifies the cost of download on the performance of a helicopter as; 1 percent loss in thrust results in 1.5 percent figure of merit, 2 percent useful load and 4 percent of payload. This implies a large loss in payload for conventional helicopters and even greater losses for winged configurations. Wilson presented some of the more interesting findings of past investigators. Some of these are presented in the following discussion. Two equations defining download in terms of blocked area and rotor geometry are obtained from references 33 and 34 and presented. It was found in Reference 34 that the greatest vertical drag was experienced when the test panels were within 0.2 rotor radii of the rotor. This was concluded to be the result of two basic mechanisms affecting the panel; (1) the steady component induced by the far wake and (2) the unsteady component due to periodic blade passage close to the body. Wilson discusses some of the early analytical work of references 18, 35 and 36. A review of this work may be useful to the reader in understanding some of the mathematical and numerical related problems associated with more fundamental analyses. As regards the effect of root cutout, Reference 37 presents results showing the loss of rotor lift being somewhat compensated for by a reduction in download. Several fuselage and wing planform combinations were tested with a rotor having a -8 degrees of twist. Wilson reports that the results of this study provide a measure of both airframe download and thrust recovery. Reference 38 is presented in Wilson's paper and an interesting study of the sideloads that are induced by the main rotor. Boatwright in Reference 38 presents three-dimensional velocity measurements in the flow field of a rotor with moderate twist. Wilson suggests that unsymmetrical tailboom shaping may be important in elleviating sideloads with a direct impact on tail rotor yaw control requirements.

Flemming in Reference 12 reports the results of download measurements on the full-scale RSRA aircraft for hover and low speed flight. In hover the data appears to be consistent with model test results which is encouraging in terms of relating model to full-scale aerodynamics. Included in his data presentation are calculations based on the download methodology of Reference 29. The measured download variation with ground effect in hover was approximately twice as great as the calculation. The measured OGE download decreased with airspeed while IGE download increased with airspeed. Care should be taken when evaluating new aircraft in light of these trends since they may be effected by ground vortex, aircraft trim or configuration dependent parameters.

The 1/6-scale test of Reference 13 was quite similar to that of Reference 10. The primary difference was that a body was fabricated to represent the full-scale body used on the Ames 1118.6 kw (1500 hp) Model 576 test stand. This paper presents the effect of the rotor on the fuselage. Body surface pressure data is presented which is very informative concerning the influence of hub location, particularly in the longitudinal direction. Panel method analysis of the isolated body showed good correlation with test data. A more challenging problem would be one of correlation with a conventional hub and control configuration present. The major conclusion from this work which is of interest to the designer and analyst is that the fuselage lift and pitching moment characteristics can be normalized by what would effectively be considered the wake skew angle. This implies that rotor-off wind tunnel data modified by simple momentum theory corrections for angle of attack may work well at high speed forward flight. At this time the test data has not been published.

Some of the results of a recently completed main rotor/fuselage/tail rotor interaction test are reported in Reference 14. Considerable data is presented on the main rotors effect on the fuselage. Because several rotors were tested, some insight into the effect of twist and solidity is provided. Twist was varied from 0 for a model H-34 blade to an equivalent linear twist of -0.2795 rad (-16 degrees) for the UH-60A. Solidity varied from .06155 to .09975. The major conclusions drawn were; (1) the fuselage experiences an upload in ground effect, (2) download is nonlinear with thrust for highly twisted blades and (3) effect of twist is attenuated in ground effect.

In Reference 15 Wilby provides a very interesting piece of work which highlights the effects of key design parameters on rotor performance and loads. Fuselage effects on rotor angle of attack distribution, blade lift and torque variation with azimuth and blade and hub loads is presented. The effects of rotor/fuselage relative position, tip speed, nose shape, and body width. His primary conclusions from the study are; (1) fuselage upwash can provide a perturbation which can lead to significant blade and hub loads, (2) it is possible with some helicopter configurations to initiate stall over the inner part of the blade near 3.14159 rad (180 degrees) azimuth causing large oscillations in blade root torsional loads and (3) fuselage upwash distortion of the wake is important when calculating the rotor induced velocity field and should be modelled correctly. Wilby presented several references which may be of interest to the reader. Reference 39 calculates the fuselage upwash effect on blade flapping. The differences between measured and predicted blade loadings in Reference 40 lead to investigations of the effects of the fuselage upwash field. In Reference 41 the inboard portions of the blades on a Wessex helicopter were roughened to cause earlier stall. This caused stall at approximately 60 percent blade radius at 3.14159 rad (180 degrees) azimuth indicating that the blade angle of attack could be quite high in this region. The calculation of loads in the presence of the fuselage is presented in references 42 and 43. Tests were conducted in Reference 44 which investigated rotor/fuselage proximity effects on loads with results reported in Reference 45.

In Reference 16, Smith presents the results of an investigation of main rotor wake distortion due to the fuselage induced flow field. The mathematical modelling of the problem consisted primarily of vortex rings representing the main rotor wake and a single source in a free stream representing the fuselage. Before modelling the wake distortion, Smith investigated the effect of the fuselage upwash on control loads using a Westland stall flutter program. There was no significant effect. He then simulated the close proximity of a vortex and its effect on the blade loading with encouraging results when compared to test data. One of the major findings was that the degree of interaction was highly dependent upon the rotors elastic and response characteristics.

Freeman in 1980 presented a paper, Reference 17, which analyzed data previously obtained from several bodies tested in the Langley VSTOL tunnel. He discusses the effect of body width and separation distance on download. This is compared to strip theory which seems to do well for the general trends. Data and calculations are also presented for Reynolds number effect on download. His data shows a definite trend of increased nondimensional download with decrease in model scale. A low speed comparison between analysis and measured time-averaged pressures is presented with very good correlation. In addition high speed (speed ratio = 0.3) time-variant pressure data and rotor loads are presented as a function of separation distance. The conclusions drawn from this study are; (1) at a speed ratio of 0.05, fuselage download increases with decreasing rotor fuselage separation, increasing fuselage width, and increasing thrust levels, (2) present theory can calculate download and time-averaged fuselage surface pressures fairly accurately at low speed, (3) unsteady fuselage pressures are significantly affected by separation and (4) chordwise and beam bending moments at the root are significantly effected by separation distance and fuselage width at a blade azimuth of 3.14159 rad (180 degrees).

Reference 18 is one of the earlier works which addressed the problem of rotor/fuselage interactions. Bramwell calculated the pressure distribution on circular and square bodies in the influence of a hovering rotor. Correlation with data measured on a circular body was shown to be quite good. In addition he investigated the change in blade loading due to the passage of the blade close to the body. Significant thrust recovery was demonstrated to occur on the blade. Wilson, Reference 11, noted that it may be questionable whether Bramwell's theory would be applicable to anything other than a circular body.

Soohoo in Reference 19 provides not only a technical manual, Volume A, but also in Volume B a user's guide, test case and fortran listing for program SHAPES (Subsonic Helicopter Aerodynamics Program with Effects of Separation). A Green's function formulation is adapted to the calculation of the flow field of a helicopter configuration including fuselage/pylon/hub and rotor. The main attributes of the program, include; (1) 3-D representation, (2) arbitrary paneling, (3) geometry preprocessor, (4) ability to run all or part of a helicopter configuration, (5) ability to analyze separation effects, (6) automatic generation of rotor and hub wake dynamics and (7) ability to run multibladed rotor configurations. Some correlation data is presented using test data from Reference 5.

Freeman in Reference 20 presents a methodology to calculate time-averaged fuselage pressures in the presence of a main rotor wake. Freeman used a panel method developed by Hess and coupled that with a wake modelled with a modified vortex tube. The vortex tube model allows variation of the spanwise loading. The analysis uses the induced velocities from the wake as onset velocities to the panel method which then solves the potential flow problem. This allows a modification of the flow field about the fuselage but does not allow fuselage effects on the rotor loading. Good correlation was obtained with data from Reference 4 at a speed ratio of 0.05. An analysis of this type can be very useful to the designer if it can adequately identify adverse pressure gradients. Freeman suggests enhancement can be obtained by the inclusion of separated flow techniques and wake distortion.

In Reference 21 Landgrebe provides primarily a discussion for the need for proper rotor/fuselage modelling. He presents a figure of interest which compares the change in blade angle of attack for a coupled (interaction) rotor/fuselage flow field as opposed to a flow field calculated using superposition (interference). The coupled analysis modified the fuselage effect in comparison to the superposition method.

A hover fuselage analysis capable of modelling separation effects is presented by Taylor in Reference 22. A panel method code designated DOWNLOAD is capable of calculating download with separated flow without having to specify the point of separation. The analysis evaluates the boundary layer and automatically repanels the body to provide the proper fluid body dimensions. Stratford's Criterion, Reference 46, is used to predict separation. The author observes that there are some remaining difficulties related to accurately calculating the point of separation. He presents calculations for three different cross-sectional shapes and notes that the analysis appears to somewhat underpredict download.

Reference 23 presents some calculations of fuselage effects on the flow field at the main rotor. Huber discusses the discrepancies between measured and calculated blade root and hub bending moments. He also presents the effect of the fuselage on local lift versus azimuth with a harmonic analysis of the results. The implication is that the fuselage can definitely effect vibration problems because of its impact on the higher harmonics.

Reference 24 compares the measured download on a UH-1 helicopter in the presence of the standard UH-1 rotor with conventional and improved blades. The improved rotor blades increased the fuselage download possibly due to spanwise loading moving inboard; however, the net hover performance did not suffer because the isolated rotor performance had improved.

In Reference 25 Fradenburgh makes two points which are worth considering; (1) fuselage parasite drag increased in forward flight testing of the S-76 with increased rotor thrust and (2) thrust recovery of the rotor in hover due to the presence of the fuselage amounts to only 1 percent of total thrust. IGE and OGE download data are presented for the S-76.

Logan presents some data on the rotor wake effects on fuselage aerodynamics in Reference 26. He concluded that at 61.74 m/s (120 kt) the rotor wake effect on fuselage and pylon lift was equivalent to a change in body angle of attack with the difference comparing closely to that calculated using momentum theory induced velocity. Pressure measurements also showed that the rotor increased suction over the nose relative to the rotor-off pressure distributions.

In Reference 27 Landgrebe discusses the effect of the fuselage on the main rotor wake in low speed flight. He concludes that the fuselage expands the main rotor wake. He presents a figure which shows the influence of the fuselage on the time-averaged velocities along the trajectory of a rocket fired from an AH-1G Cobra.

Although rotor/fuselage interaction is not the main topic of Reference 28, a considerable amount of data is presented and discussed. Jepson discusses in detail the methodology of modelling fuselage effects and the manner in which it is coupled with Sikorsky's elastic rotor analysis. The RTA was used extensively to obtain rotor data and its contours are presented along with the velocities it induces in the plane of the rotor. The effects of the fuselage on loads is presented. Jepson concluded that their "... analysis was able to reasonably predict the increases in vibratory moments consistent in magnitude and phase relation with the test data. However, it was unable to predict absolute values of 1/2 peak to peak moments at all cruise speed and rotor lift conditions."

Examples of classical approaches to treating the fuselage aerodynamics in hover and forward flight can be found in References 29 through 31. Included in References 29 and 31 are the respective results of strip analysis in hover of a hypothetical 6534 kg (15000 lb) helicopter and an AH-1G Cobra. Cheeseman in Reference 32 makes only a brief comment related to rotor/fuselage I/A. He notes that in XH-59A hover tests (Reference 47), the separated flows about the smooth circular body were unstable. The separation points were fixed with strakes.

References 48 through 50 contain information which was not reviewed in this survey but are related to the subject and will be of interest to the reader. This concludes the discussion of the literature search.

TEST EQUIPMENT

The test equipment utilized under this contract included the BHTI Powered Force Model (PFM), the BHTI PFM Data Acquisition System, a 0.15-scale Model 222 main rotor and 0.15-scale fairings representative of the full scale fairings to be tested in the Ames 12.2 x 24.4 x 36.6m (40x80x120-ft) wind tunnel under Contract NAS2-11090.

Powered Force Model Test Stand

Drive System - The PFM is a research tool to investigate helicopter main rotor performance, fuselage aerodynamics and general aircraft aerodynamic characteristics. The PFM will accommodate rotors from 1.22 to 3.05m (4 to 10 ft) in diameter with a maximum RPM of 3000. A photograph of the PFM is shown in Figure 2. An assembly drawing of the Model 576 fairing mounted to the PFM is shown in Figure 3.

The PFM consists of a 55.9 kw (75 hp) variable RPM electric motor, a speed reducer, tilting and yawing pylon assembly, rotor controls, and a five-component rotor balance. The speed reduction gearbox is designed to accommodate two 55.9 kw (75 hp) motors at a future date. The output shaft drives the model mast through a flexible disk coupling in the rotor balance. The rotor

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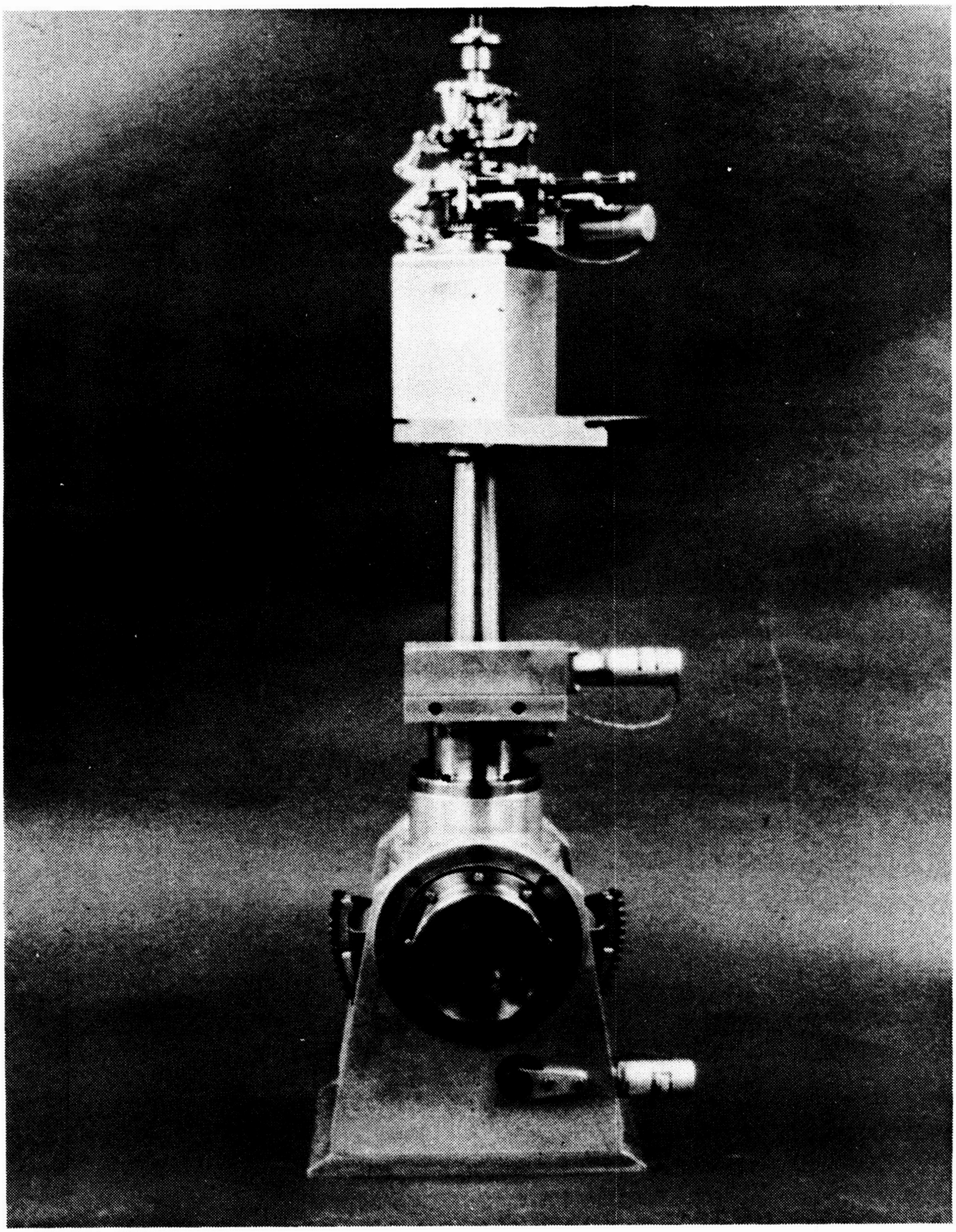

Figure 2. BHTI powered force model test stand.

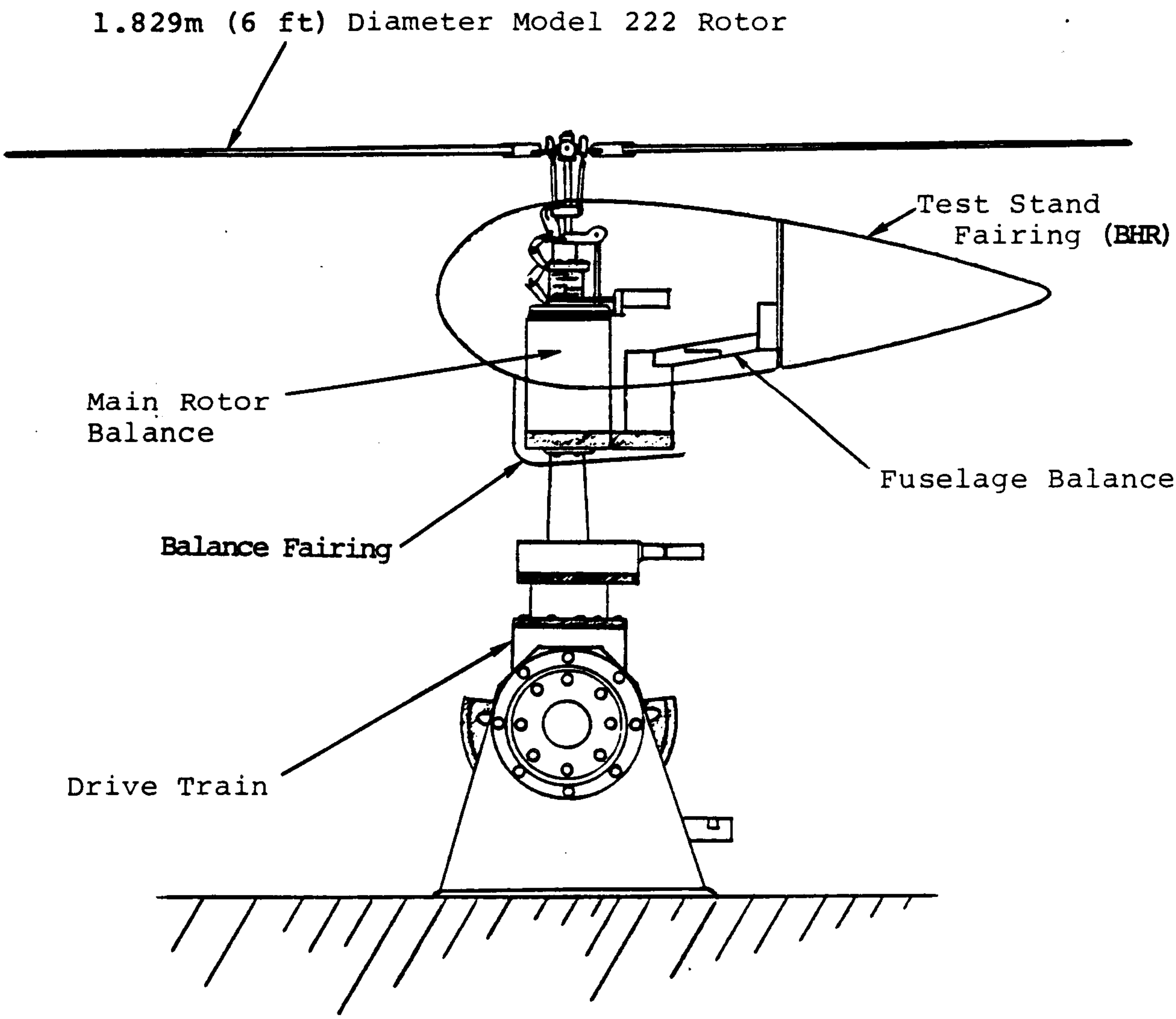

Figure 3. BHTI powered force model with 0.15-scale model 576 test stand fairing.

balance measures all rotor loads except drive torque which is measured by mast torsion strain gages. The balance measures five components with strain gaged flexures. The capabilities are: normal force, 6671 N (1500 lb); pitching-moment, 706 N-m (6250 in-lb); side force, 2500 N (562 lb); rolling moment, 706 N-m (6250 in-lb); and axial force, 2500 N (562 lb). The balance was designed and built by the Vought Corporation to BHTI specifications.

Above the rotor balance is the collective control actuator that can raise and lower the swashplate 3.81 cm (1.5 in). The cyclic actuators ride on the collective slider assembly to provide longitudinal and lateral swashplate tilt of .4189 rad (24 deg). Just below the balance, a yaw actuator can rotate the entire model ±1.309 rad (±75 deg). The PFM has a 40 slip ring assembly package located below the spiral bevel gearbox. The data acquisition system can monitor up to 18 channels of instrumentation in the rotating system.

Fuselage and Drive Train Interface - When a fuselage is mounted on the drive train for interaction studies, it is isolated from the rotor and its balance by a six-component fuselage balance. This balance is of one-piece construction and was manufactured for BHTI by the Vought Corporation. The force and moment capacities are: normal force, 3558 N (800 lb); pitching moment, 226 N-m (2000 in-lb); side force, 1957 N (440 lb); yawing-moment, 124 N-m (1100 in-lb); rolling moment, 68 N-m (600 in-lb); and axial force, 556 N (125 lb).

Powered Force Model Data Acquisition System

To allow maximum utilization and productivity of the BHTI PFM, a dedicated data system consisting of three sections was designed. Section one is the model operator's control console. The control console contains the switching necessary to control model pitch, yaw, collective, and two cyclic actuators. This system provides three switch-selectable actuator rates. The console contains twelve panel meters consisting of digital and analog types. These meters display control actuator position and any additional information required.

Section two is a tape data system that records test data on one inch magnetic tape. The tape system contains signal conditioning modules. This system has an IRIG-B time code generator for time and event synchronization.

The system contains a logic card that provides a control of the tape system automatic calibrate sequence and also produces a level code to provide interrupt signals for use by the BHTI Ground Data Center computer system. Tape data can be recorded in either single-carrier FM or FM multiplex. Single-carrier FM uses one tape track per channel and provides DC to 5 KHz frequency response. FM multiplex allows one track to contain 13 channels. BHTI uses a multiple constant bandwidth multiplex that provides 4 channels with DC to 50 Hz response, 6 channels with DC to 200 Hz response, and 2 channels with DC to 400 Hz response.

Section three is a microcomputer-based data acquisition system. Computing power for this system is provided by a Hewlett-Packard 9835A computer with 128K of read-write memory and a 20-line CRT. The computer is connected via an IEEE 488 Buss to a highspeed scanner capable of scanning channels at 1000 channels per second. Analog-to-digital conversion is performed with a high speed DVM capable of 5000 samples per second.

The PFM data system is also able to read rotor and fuselage balance data, convert these data to engineering units, correct the data for cross-axis loading, and correct for tare loading. Another function performed by the data system is to monitor the model status to ensure that the model is functioning properly. This is done by either reading critical items with the computer system at regular intervals, or by using visual displays such as X-Y monitor scopes or panel meters.

Figure 4 shows the BHTI Data Acquisition System installed and in use in the Vought Corporation Low Speed Wind Tunnel. Figure 5 provides a flow chart of the PFM data system.

Model 222 0.15-Scale Test Rotor

The Model 222 0.15-scale main rotor is a two-bladed teetering rotor. The blade construction consists of a solid graphite leading edge bonded to a balsa afterbody with aluminum web. The blade has a linear twist rate of -0.1778 rad (-10.19 degrees) and a constant chord of 0.11m (.36 ft) from 28 percent radius to the tip. An FX-080 airfoil is utilized along the entire blade. The hub is approximately fifth scale. An illustration of the hub and blades is provided in Figure 6. Rotor properties of interest are listed in Table 2.

Test Stand Fairings

The test program required the use of three basic configurations based on the full scale fairings designed under contract NAS2-11090. Fabrication of ten individual shells out of balsa and fiberglass was required in order to model the full scale fairings. Figure 7 presents sketches of the assembled shells for the three major configurations tested. Split lines defining individual components and major dimensions are provided. The body contours are defined in Appendix C.

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Figure 4. BHTI powered force model data acquisition system installed in LTV low speed wind tunnel.

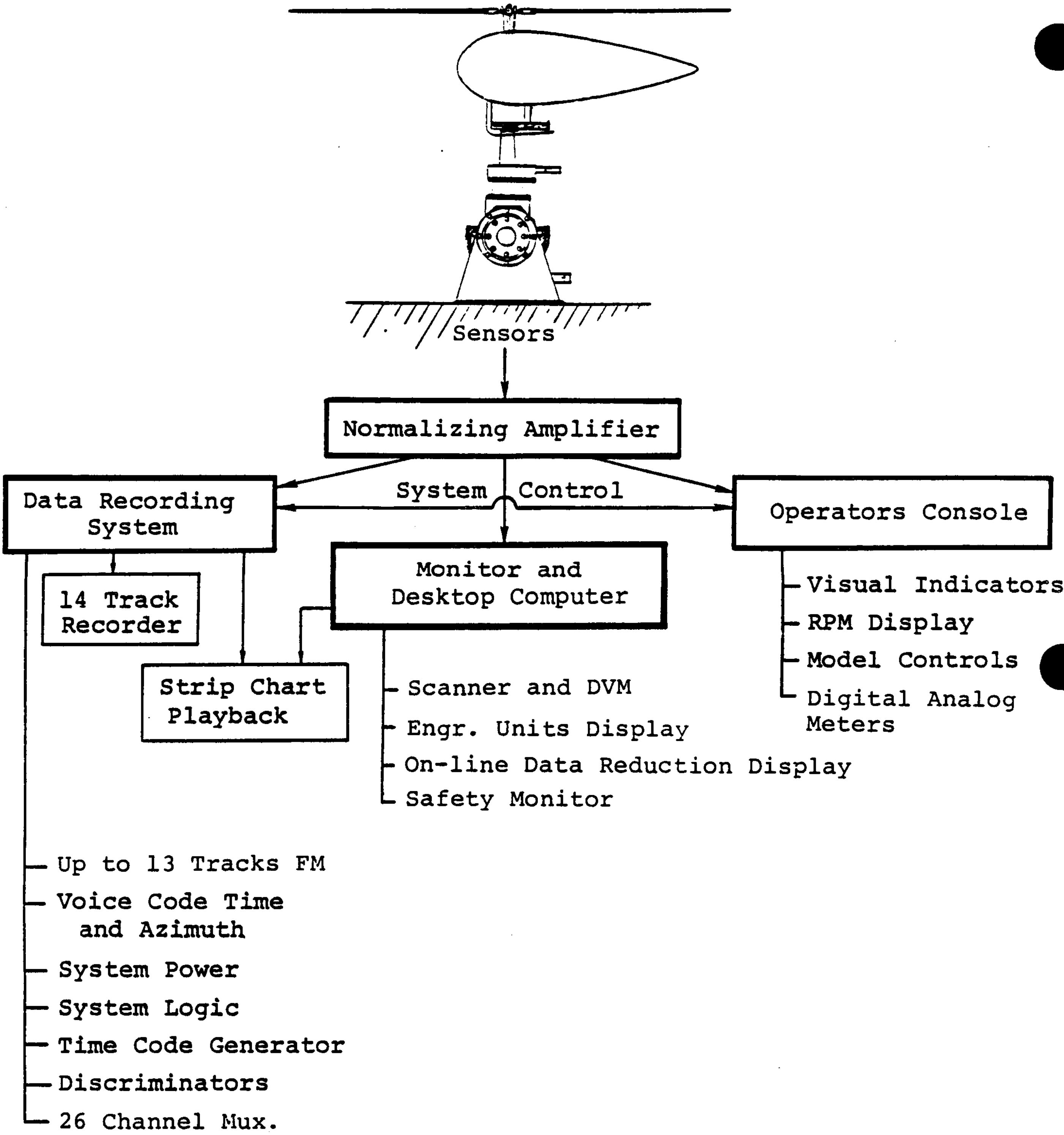


Figure 5. BHTI powered force model data acquisition system flow chart.

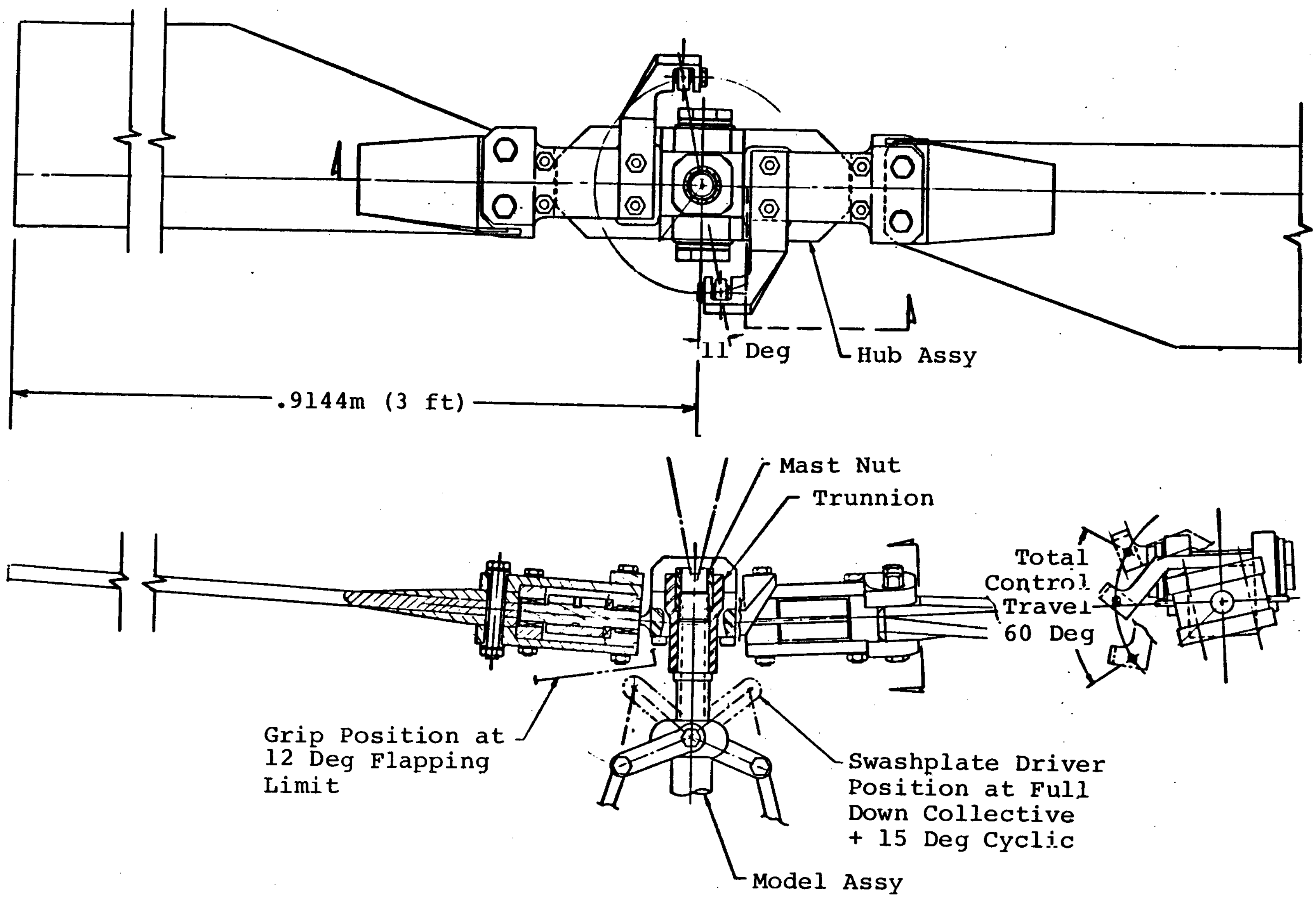
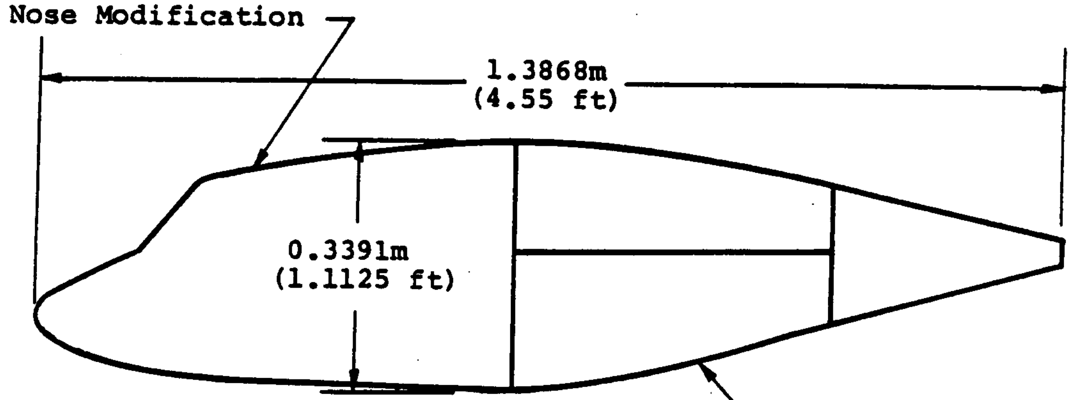


Figure 6. Model 222 0.15-scale test rotor.

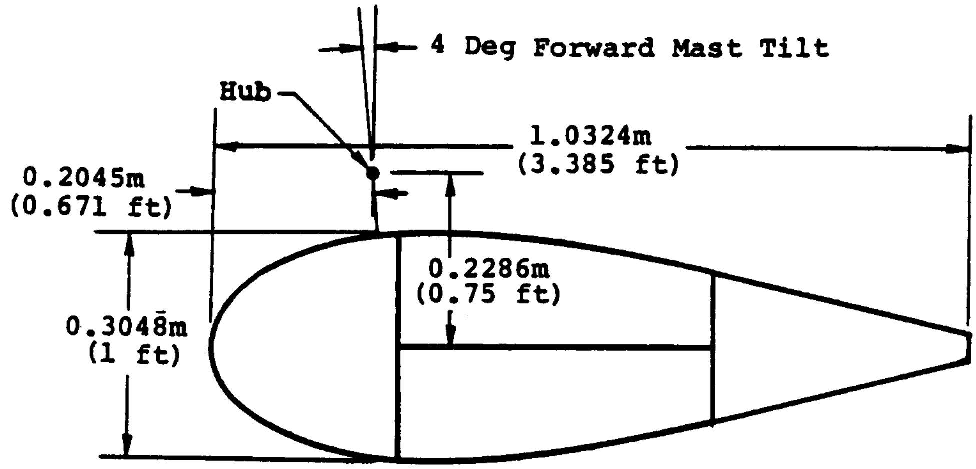
Table 2. Properties of 0.15-scale Model 222 Rotor

Description	Quantity	
Number of blades	2	
Blade radius, m	.9144	(3 ft)
Blade chord (constant), m	.110	(.36 ft)
Root cutout (bolt hole), m	.110	(.36 ft)
Blade twist (linear), rad	-.178	(-10.19 deg)
Weight (per blade), kg	.430	(.948 lb)
Weight moment (per blade), N-m	1.660	(1.22446 ft-lb)
Flapping inertia (per blade), kg-m^2	.10184	(.075134 slug-ft^2)
Geometric pitch/flap coupling, rad	.192	(11 deg)
Rotor precone, rad	.0611	(3.5 deg)
Tip speed (full scale), m/s	220.68	(724 fps)
(test speed, SLS), m/s	158.50	(520 fps)
Rotor test speed (rpm)	1655.2	
Direction of rotation	(counterclockwise looking down)	

NOTE: BF2U geometry is identical to BF2L except that the transition fairing is on the top. The transition fairing coordinates are provided in Appendix C.



a.) Configuration BF2L

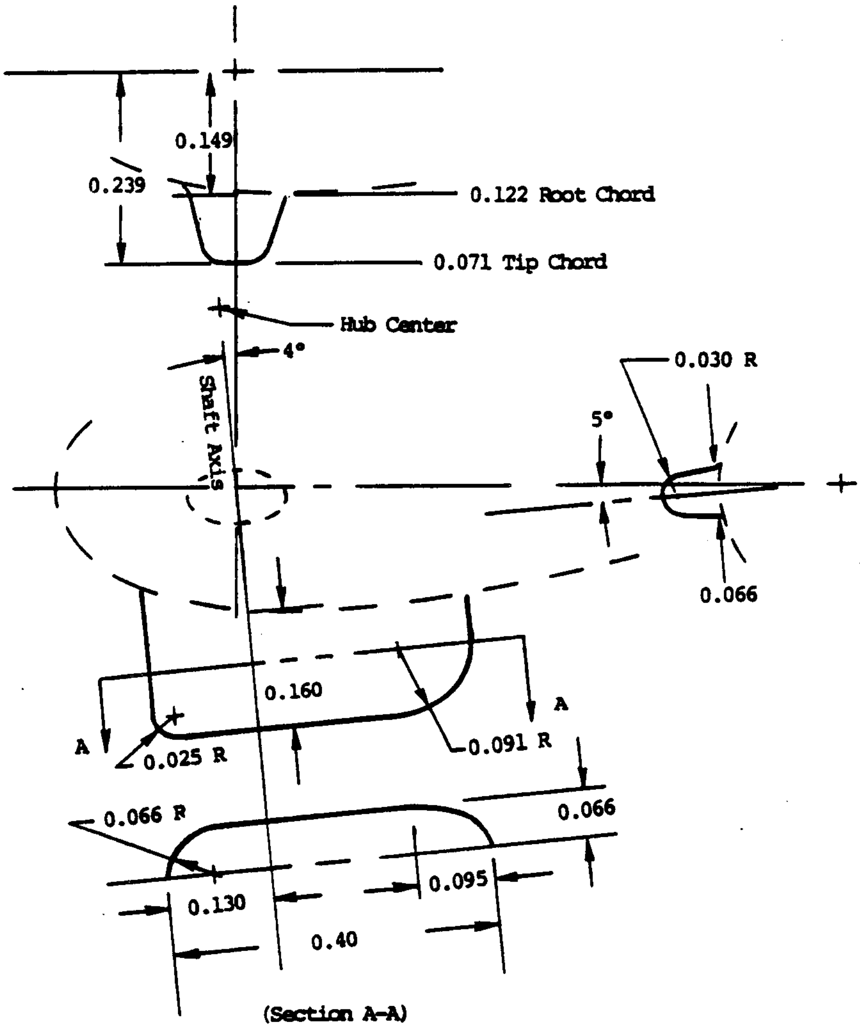


b.) Configuration B (Baseline Fairing)

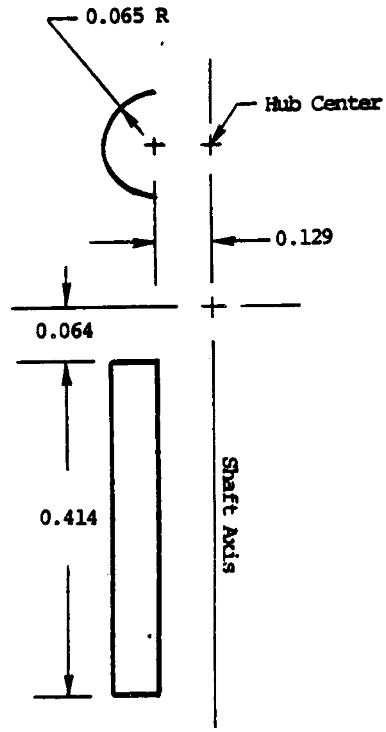
Model and Fairing Geometry

Configuration	L_B (m)	d_B (m)	S_B (m^2)	h/R (-)
B	1.0324	0.3048	0.07297	0.0833
BF2L	1.3868	0.3391	0.08342	0.0833
BF2U	1.3868	0.3391	0.08342	0.0458

Figure 7. Sketches of the 0.15-scale model fairing components.



c.) Main Rotor Balance Fairing and Winglet Geometry



All dimensions are in meters.

d.) Isolated Rotor Fairing Geometry

Figure 7. (continued)

The baseline configuration is the 0.15-scale model of the NASA Ames Model 576 test stand fairing constructed under joint NASA/Army venture by BHTI in 1966. The geometry is essentially a body of revolution with the exception of a protuberance (winglet) at each lift strut attachment point. The coordinates of a NACA 0030-74 airfoil were used to define the test stand fairing to 69.87 percent of chord. The remainder of the fairing was linearly tapered aft of 69.87 percent chord. The full scale maximum diameter and length are 2.03m (6.66 ft) and 6.7m (22 ft) respectively.

The two extended nose configurations only differ in afterbody shape. They represent modifications to the baseline fairing by the extension of the nose to simulate a typical helicopter nose and windscreen. In addition a transition fairing on the afterbody is provided to assure a smooth transition from the nose geometry into the baseline afterbody. The extended nose configurations evolved as a direct result of constraints on the full scale NASA Model 576 test stand. Because of structural interference the full scale fairing could not be moved vertically to simulate separation distance. Consequently, the extended nose was developed to move vertically relative to the baseline afterbody with a transition fairing placed either on the upper or lower surface depending on which separation distance was desired. The result was a configuration which had the same maximum thickness. There is a slight difference in afterbody shapes depending on the location of the transition fairing.

Two additional fairings were used during this test. For isolated rotor performance a shield was placed in front of the main rotor balance to reduce wind blast. Enclosure of the test stand with a symmetrical fairing was considered; however, not used because of the size required relative to the rotor diameter. In addition changes in pitch attitude would possibly have resulted in, (1) flow redirection equivalent to that induced by the fairings to be tested, or (2) a vortex beneath the rotor resulting from a fairing sideload. Since the fuselages were built to the same scale as the main rotor, a portion of the lower main rotor balance protruded below the fuselage. This was covered with a fairing. Care was taken to assure that this fairing did not ground the fuselage. These two fairings are also shown in Figure 7.

Instrumentation

The following section provides a brief description of the instrumentation utilized for data acquisition and safety monitoring. Table 3 summarizes the instrumentation requirements by identifying the type of instrumentation, location and the data to be obtained. Table 4 defines the instrumentation setup for this test.

Table 3. Instrumentation requirements.

Item Code	Instrumentation	Location	Data Measured
1	Strain gage	Red blade, .255 radius	Beam bending
2	Strain gage	Red blade, .30 radius	Torsion
3	Strain gage	Hub, .036 radius	Beam bending
4	Strain gage	Hub, .036 radius	Chord bending
5	Strain gage	Red pitch horn	Pitch horn bending
6	Potentiometer	Hub	Flapping
7	Potentiometer	Longitudinal cyclic actuator	F/A cyclic
8	Potentiometer	Lateral cyclic actuator	Lateral cyclic
9	Potentiometer	Fixed swashplate	Collective
10	Potentiometer	Hub	Red blade feathering
11	Magnetic pickup	At slip ring	M/R rpm
12	Magnetic pickup	At slip ring	M/R azimuth
13	Strain gage	Mast	M/R torque
14	Thermocouple	Main Rotor	Temperature
15	Thermocouple	Upper balance	Temperature
16	Thermocouple	Lower balance	Temperature
17	Pressure gage	Lub oil pump	Lub oil pressure

Table 3. (Concluded)

Item Code	Instrumentation	Location	Data Measured
18	Pressure gage	Transmission	Accessory cooling water pressure
19	Buzzer & light	LTV balance room	Cooling water "no flow"
20	Main rotor balance	PFM	Main rotor forces and moments
21	Fuselage balance	PFM	Fuselage forces and moments
22	Scanivalve	Inside fuselage	Body surface differential pressures
23	Scanivalve	Wake rake	Total pressure
24	Potentiometer	PFM pitch actuator	Pitch
25	Potentiometer	PFM yaw actuator	Yaw
26*	Intervelometer	Outside of system	---
27**	Intervelometer	Outisde of system	---

* Scanivalve scan pulse
** Scanivalve home pulse

Table 4. PFM 0.15-scale rotor/fuselage I/A test instrumentation.

Item[1] Code	Tape	HP 9835	Output Device										Other
						CRT'S		Scopes					
			Printer	Control Console	Osc.	1[2]	2	1	2	3	4	5	
1	X												
2	X												
3	X				X			X					
4	X				X			X					
5	X				X				X				
6	X				X					X			
7	X	X	X	X	X	X	X						
8	X	X	X	X	X	X	X						
9	X	X	X	X	X	X	X						
10	X												
11	X		X[7]	X		X	X						
12	X				X					X			
13	X	X	X	X	X	X	X						
14													
15													
16													

Table 4. (Concluded)

Item[1] Code	Tape	HP 9835	Output Device										Other
			Printer	Control Console	Osc.	CRT'S		Scopes					
						1[2]	2	1	2	3	4	5	
17													X
18													X
19													X
20	X	X	X	X[3]	X	X	X				X[4]		
21	X	X	X		X[6]	X	X					X[5]	
22	X				X								
23	X				X								
24	X	X	X	X		X	X						
25													
26													X
27													X

[1]Corresponds to item code in Table 3.
[2]CRT #2 is computer display.
[3]Main rotor thurst only.
[4]Main rotor rolling and pitching moment only.
[5]Fuselage pitching moment only.
[6]Fuselage lift and pitching moment only.
[7]Required rpm as calculated by computer.

Rotor, hub, mast and pitch link loads were monitored primarily for safety. Blade beam and torsion were monitored at 25.6 and 30.0 percent blade radius respectively. Hub beam and chord loads were monitored at 3.6 percent blade radius. In addition all balance components were being monitored.

The test fairings were instrumented with static pressure taps. A total of 69 pressure taps were installed. The majority of pressure taps correspond to locations chosen for the full scale test. Pressure tap locations are defined in Appendix C. Some had to be moved because of physical restrictions. Pressure data was read with two 48-port scani-valves. Each scani-valve used a 17238 N/m^2 (2.5 psi) range Kulite transducer.

A wake rake was mounted behind the test stand fairing to measure total pressure. Seven Kiel tubes were utilized because of their accuracy over a wide range of angle of attack. The Kiel tubes were placed at a vertical height that aligned them with the center of the model tail cone when the body was at zero angle of attack. The Kiel tubes were located 1.29m (4.23 ft) behind the hub with the shaft axis at zero angle of attack.

TEST FACILITIES

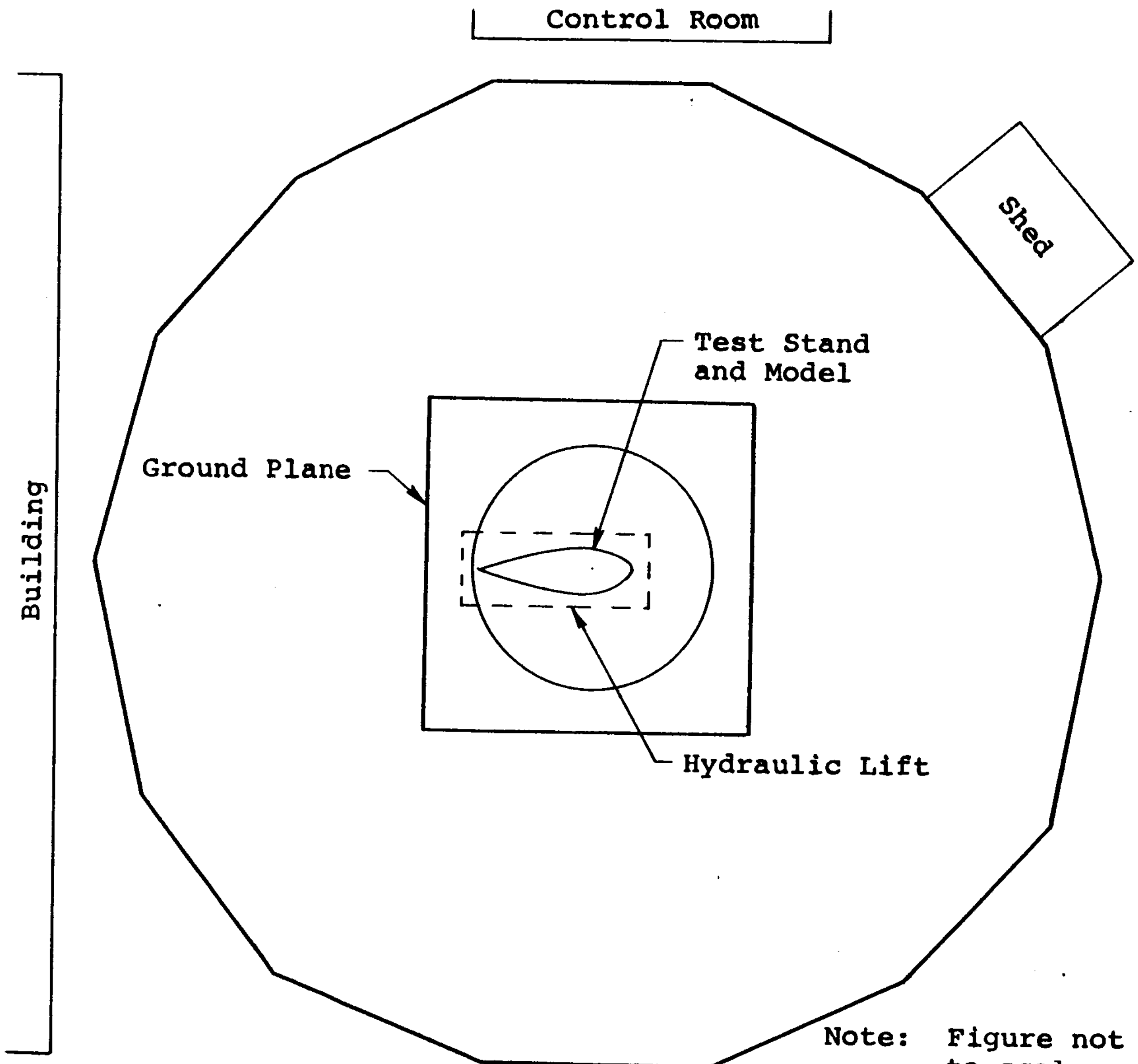
BHTI Hover Test Facility

The model was situated in the center of a 16m diameter covered whirlcage test facility, see Figure 8. The cage consists of a concrete floor, wire mesh walls, and a conical wooden roof 5.4m high at the wall and 8m high at the center. Canvas curtains are available to cover the walls to control outside winds. A hydraulic lift is available in the center of the cage for vertical movement of the model. Instrumentation cables connect the test stand to the PFM data acquisition system and control console located inside a concrete blockhouse adjacent to the cage. A 55.9 kw (75 hp) source and model buildup area are available in a building adjacent to the cage.

Vought Corporation Low Speed Wind Tunnel Facililty

This facility is a horizontal single-return, tandem test section, closed circuit facility with overall circuit length of 135m (443 ft) as shown in Figure 9. The 2.1 x 3.05m (7x10-ft) test section is 4.9m (16 ft) long and operates at atmospheric pressure. This section operates through a speed range of 12.2 to 106.7 m/s (40 to 350 ft/sec). Table 5 presents the 2.1 x 3.05m section flow calibration as obtained from Reference 51.

The rectangular 4.6 x 6.1m (15x20 ft) VSTOL test section is 11.9m (39 ft) long and is located upstream of the 2.1 x 3.05m test section in a tandem arrangement. This section operates at a slightly positive static pressure and has a speed range of 2.7 to 23.5 m/s (9 to 77 ft/sec).



Note: Figure not drawn to scale.

Figure 8. Whirl cage floor plan.

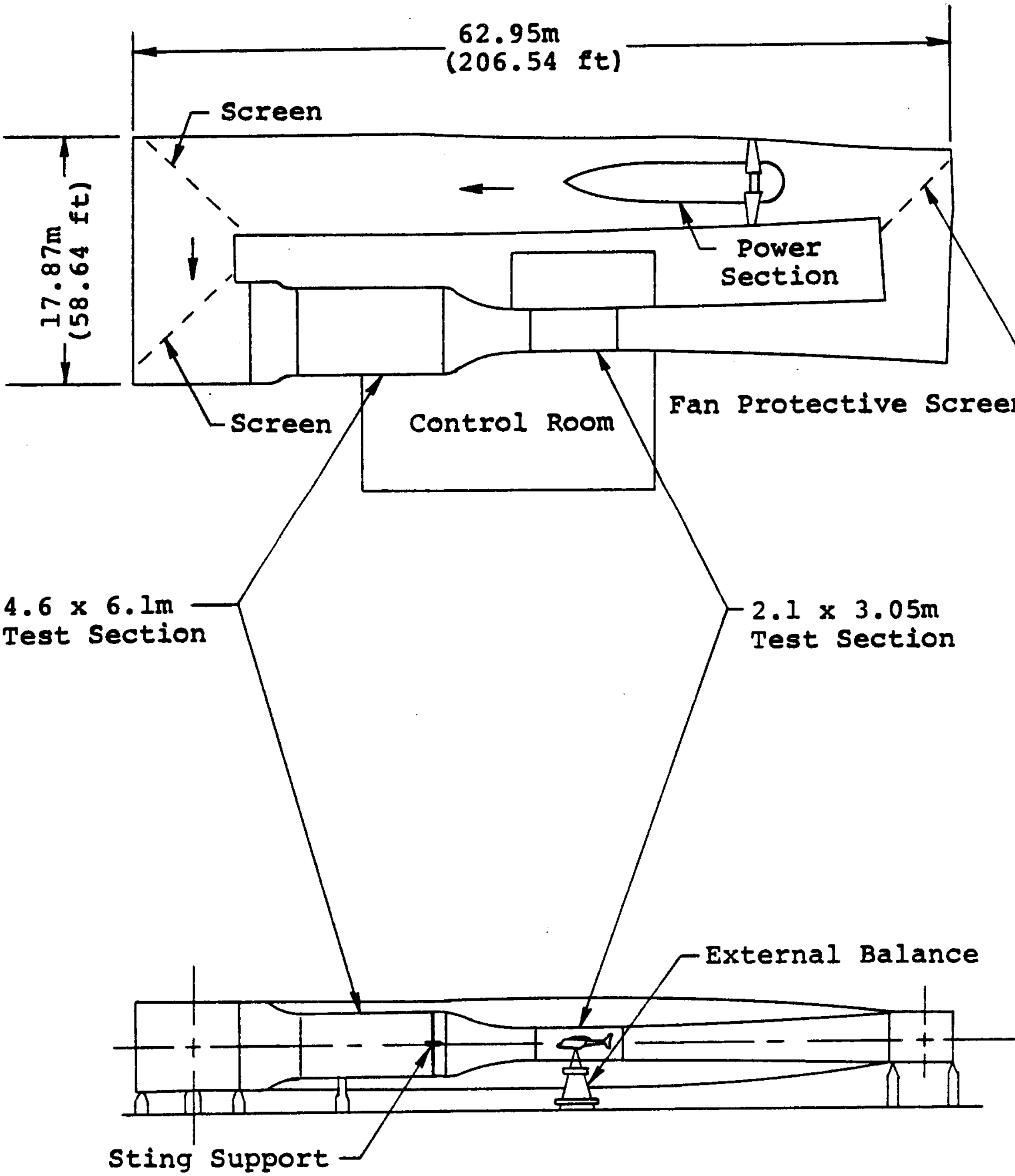


Figure 9. Vought low speed wind tunnel circuit arrangement.

Table 5. Vought Corporation Low Speed Wind Tunnel test section calibration.

Test section calibration results are as follows:	2.1 x 3.05 m (7 x 10-ft) Test Section	4.6 x 6.1 m (15 x 20-ft) Test Section
Dynamic pressure variation	±0.75%	±1.50%
Flow angle variation (relative)	±0.0984 red (±0.25 deg)	±0.0984 rad (±0.25 deg)
Static pressure gradient	0.0000276($\Delta P/q$) per cm (0.00007 per in)	0
Turbulence factor (average)(1)	1.01	1.40
Boundary layer thickness at entrance	10.16 cm (4 in)	7.62 cm (3 in)
Boundary layer thickness at exit	12.7 cm (5 in)	12.7 cm (5 in)
Energy ratio (clear tunnel, 386.2 km/hr, 240 mph)	6	

(1) Based upon Reference 53 definition.

A 1118.6 kw (1500 hp) electric motor furnishes power for the tunnel fan. Remote controls for the tunnel fan are provided to each control room. Detailed information pertaining to this facility may be found in Reference 51.

Only the high speed section was utilized for this test. Figure 10 shows the test stand and model installed in the high speed section. Figure 10 defines the relative tunnel/rotor/fuselage/balance/wake rake geometry.

TEST PROCEDURES

Before testing began all instrumentation was allowed to warm-up sufficiently to a stable condition. All instrumentation was checked for drift and range. A mechanical inspection of the rotor and test stand was performed including checks for balance grounding. Functional checks of the model, test stand and data acquisition system were performed before initiating any testing. This included check calibrations for sign as well as magnitude. Check calibrations were performed on the main rotor and fuselage balances, torque, hub and blade loads, controls and model pitch. Procedures unique to hover and forward flight are reported in the following sections.

Hover Test Procedure

For all hover testing the whirl cage curtains were lowered to cover the walls with only a .3m (1 ft) clearance at the bottom to minimize recirculation. Recirculation did occur; however, it did not appear to be a factor in testing for configuration effects.

A 3.7 x 3.7m (12 x 12 ft) ground plane was used for in-ground-effect (IGE) testing. An insert was made to cover the opening through which the test stand was raised and lowered.

The test procedure was as follows:

1. Place model at desired height.

2. Secure hydraulic lift to prevent slippage.

3. Position ground plane around model (IGE only).

4. Place ground plane insert around test stand.

5. Place model in zero condition (zero collective, zero flapping, place red blade over tail, and zero mast angle).

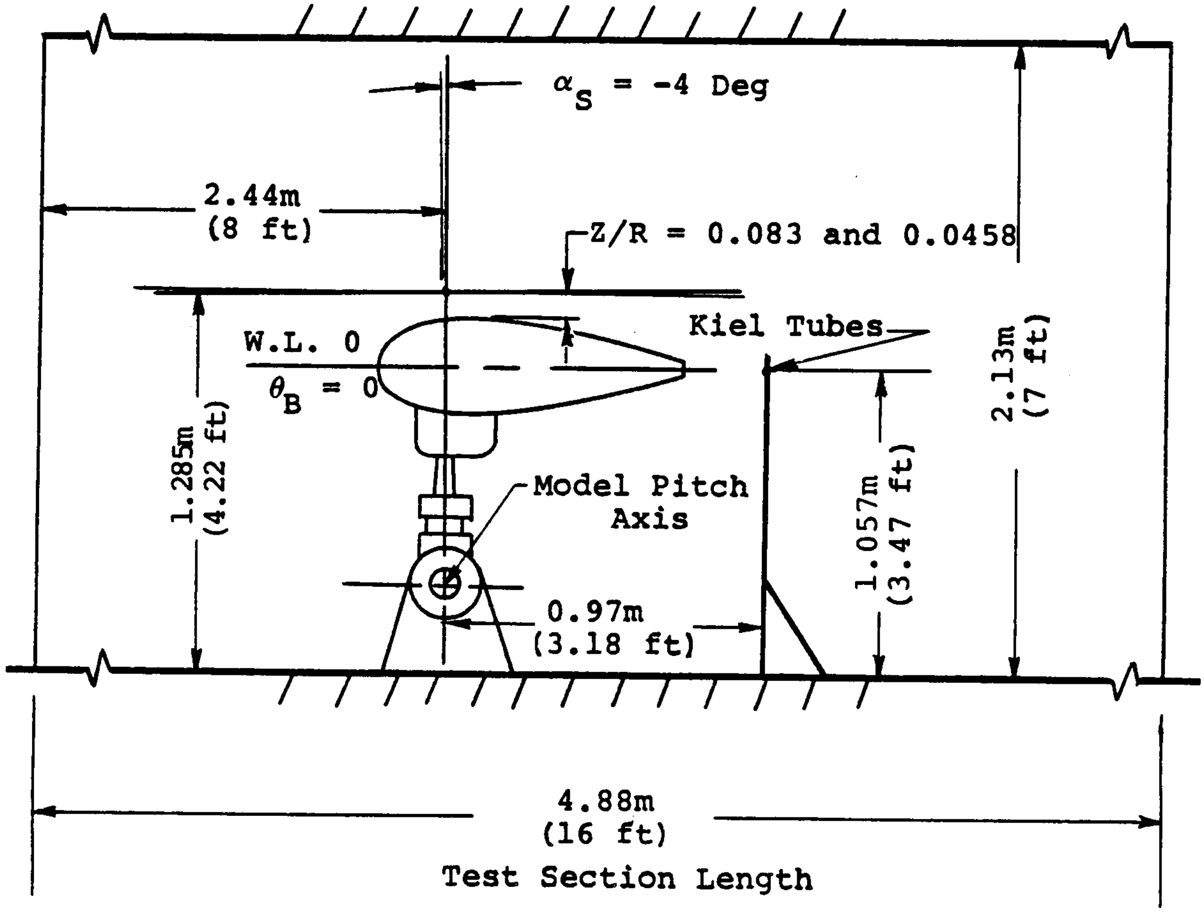


Figure 10. PFM and Model 576 installed in LTV tunnel.

6. Clear and secure test area.

7. Read wind-off zeroes.

8. Take rotor to operational RPM at nominal thrust of 50 lbs.

9. Monitor computer and control console for drift and repeatability.

10. Set rotor collective pitch at value below first desired pitch setting and increase rotor pitch to desired setting in order to maintain a positive loading on the system.

11. Sweep collective in one degree increments to approximately 1.34 design thrust coefficient for the rotor system tested.

12. Repeat the first data point.

13. Read wind-off zeroes.

Forward Flight Test Procedure

Several tasks were performed before data acquisition could begin. Number 80 carborundum grit was placed on several fairings to assure that the flow would transition and remain attached. Each nose shell had grit applied at a location equivalent to 5 percent of the bodies length from the nose. The winglets had grit applied at 5 percent chord on both upper and lower surfaces. In addition the extended nose had grit applied to the upper windscreen line.

Before testing began scanivalve data was taken on a strip chart recorder to determine an appropriate sampling rate for the pressure data. Settling rates were extremely fast, on the order of 10 milliseconds. Consequently, the sampling rate was set to 4 ports per second. This provided a settled sample of approximately 6 revolutions.

For rotor-on testing the test procedure was as follows:

1. Place nets in the tunnel (advance ratio = 0.1 only).

2. Place model in zero condition (zero collective, zero flapping, place red blade over tail, and zero mast angle).

3. Clear and secure test area.

4. Read wind-off zeroes.

5. Take wind-off tares.

6. Take rotor to operational RPM at nominal thrust of 50 lbs.

7. Bring tunnel speed up to idle and allow rotor to stabilize.

8. Set model to desired shaft angle.

9. Enter atmospheric conditions, model pitch attitude and collective pitch into data system. System responds with tunnel dynamic pressure and rotor tip speed required to maintain desired tip Mach number and speed ratio.

10. Set tunnel speed and rotor tip speed maintaining zero flapping with cyclic controls.

11. Monitor data system and control console for drift and repeatability.

12. Take prime data record (approximately 17 seconds).

13. Sweep collective in one degree increments to approximately 1.34 design thrust coefficient or unitl control/ load limit is reached.

14. Repeat the first data point.

15. Repeat 8 through 12 if shaft angle sweep is not completed.

16. Increase tunnel speed and repeat 8 through 15.

17. Read wind-off zeroes.

In order to maintain full-scale tip speeds on the 0.15-scale rotor, an operational rpm of 2305 was originally specified. However, due to loads problems the rotor was operated at 1655 rpm. This change in operational tip speed reduced the tunnel dynamic pressure required to maintain the test values of speed ratio. Consequently, drift in the tunnel dynamic pressure became a problem at a speed ratio of 0.10.

For rotor-off testing the blades were removed and the grips were blocked to close the gap left by the blades. The hub was operated at 1000 rpm. An rpm sweep was made which showed no significant changes in rotor or fuselage loads. The test procedure was the same as the rotor-on testing without the collective pitch sweep.

For the isolated body testing the main rotor balance was removed and the opening for the mast and rotating controls was covered. The test procedure was similar to the blades-off testing mentioned above. With the hub and rotating controls removed, only model pitch was activated from the control console.

Flow Visualization Procedure

Flow visualization runs were made in both hover and forward flight. In hover this included only a videotape of tufts on configuration BHRF2L under IGE and OGE conditions.

During the forward flight phase tuft and smoke flow visualization work was conducted. After each performance run was completed, the pressure taps were sealed with tape and tufts were placed on the model shells. All tuft work was performed at the correct tip speeds and tunnel speeds. Some still photographs were taken of the tuft work; however, the primary record was taken on videotape.

Smoke work was performed with a system developed by LTV in conjunction with Dr. S. Shindo of the University of Washington, Reference 52. The fluid from which smoke is produced is commonly referred to as "fog juice". The probe used produces two streams of smoke. In order to optimize tunnel time only one stream was used which allowed approximately 10 minutes of tunnel operation before the tunnel had to be vented. The tunnel nets were installed and the tunnel was operated at approximately 50 fps. Changes in speed ratio were obtained by changing tip speed. All shop lights and tunnel lights were turned off with only control room lights left on. A strobe flood light was provided by LTV which enabled a wide angle view of the smoke filament; however, this did provide some difficulty in obtaining a uniform light intensity throughout the test section. The strobe was operated at a flash rate of twice per revolution. Changing the strobe frequency worked quite well in simulating a slow motion time history of events.

TEST SCHEDULE

The following section provides a summary of the hover and forward flight test schedules. Detail test conditions for hover and forward flight are presented in Appendices A and B respectively.

HOVER

Figure 11 presents sketches of the configurations tested in hover. Photographs of configurations HR and BHRF2L installed in the BHTI Hover Test Facility under IGE and OGE conditions are

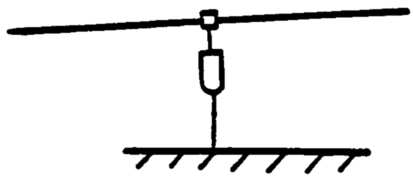
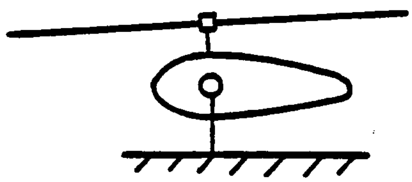
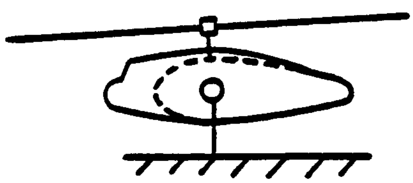
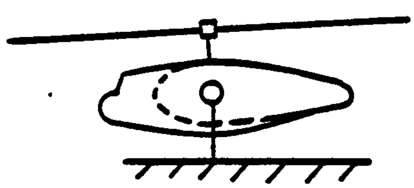
Configuration		Test Sequence
HR		Test Stand With Rotor Only
BHR		Add Fairing
BHRF2U		Add Nose Modification in High Position
BHRF2L		Lower Nose Modification

Figure 11. Hover test configurations.

presented in Figure 12. Table 6 provides a summary of configuration designation, run number, tip speed and height above ground in terms of rotor radii. Figure 11 and Table 6 are repeated in Appendix A for the convenience of the reader.

FORWARD FLIGHT

Figure 13 presents sketches of the configurations tested in forward flight. A photograph of configuration BHR installed in the Vought Low Speed 7x10-ft Wind Tunnel Facility is shown in Figure 14. Table 7 provides configuration designation, run mumber, shaft angle and speed ratio. Figure 13 and Table 7 are repeated in Appendix B for the convenience of the reader.

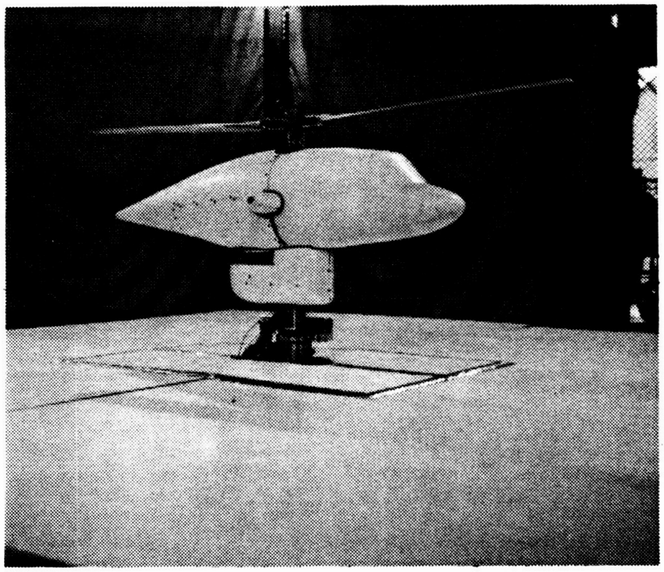
TEST RESULTS

The results of this test program will be presented in three sections; 1) hover, 2) forward flight and 3) flow visualization. Before proceeding with the final results, data acquisition and reduction will be discussed.

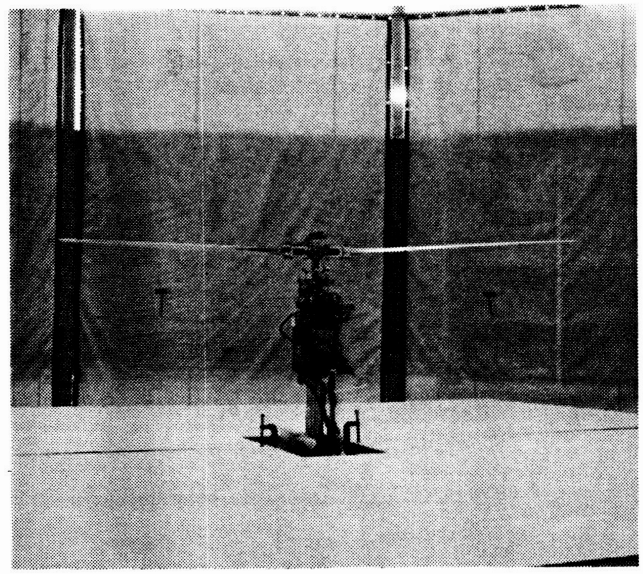
Data Acquisition and Reduction

Initially test data was to be recorded by three separate systems; the PFM data system, a 14 track tape system, and the Vought Corporation Data System. The Vought Corporation measures balance as well as pressure data and reduces it as part of its entry fee; consequently, the plan was to utilize their system for taking and reducing pressure data. Because of mechanical problems with the BHTI PFM, the test schedule slipped and the Vought system was lost to another program. The pressure data was then taken on the BHTI 14 track tape system. Because of the magnitude of the data acquired during this test, it was not possible for the PFM data system to digitize the pressure data.

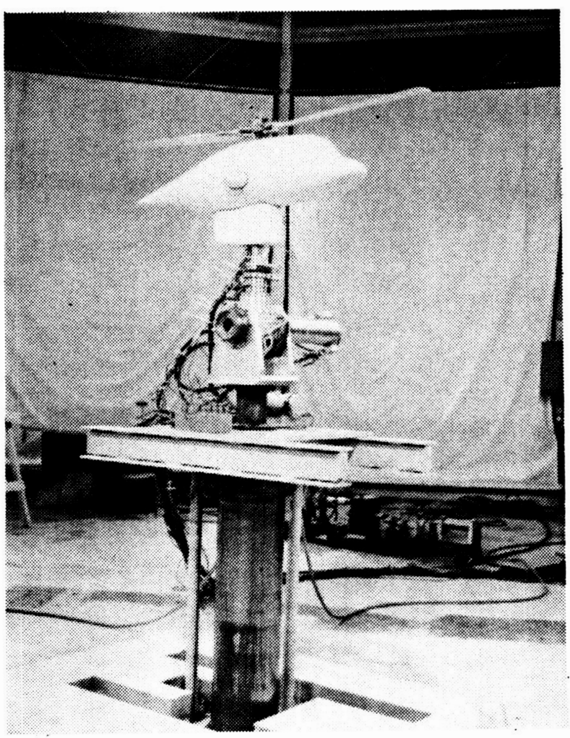
A single output signal was branched to both the PFM computer and the 14 track tape; consequently, the data from each device should be compatible. The 14 track tape system recorded the analog data with care taken not to exceed 60 percent of bandwidth. The tape data has not been digitized, however, a strip chart recorder was used extensively to play back tape data to check its integrity and reduce a limited amount of pressure data (fuselage only, Kiel tube data was not reduced). In addition the signal recorded on tape was being continually monitored by the data package through which the signal was being conditioned and recorded. The PFM computer received those channels required for monitoring, analysis and presentation. All PFM computer data was filtered at 2 Hz and printed as required. All channels on the PFM computer were scanned at 1000 channels per second for a total of 30 samples per channel. It should be noted that the data presented in this report has not been smoothed.



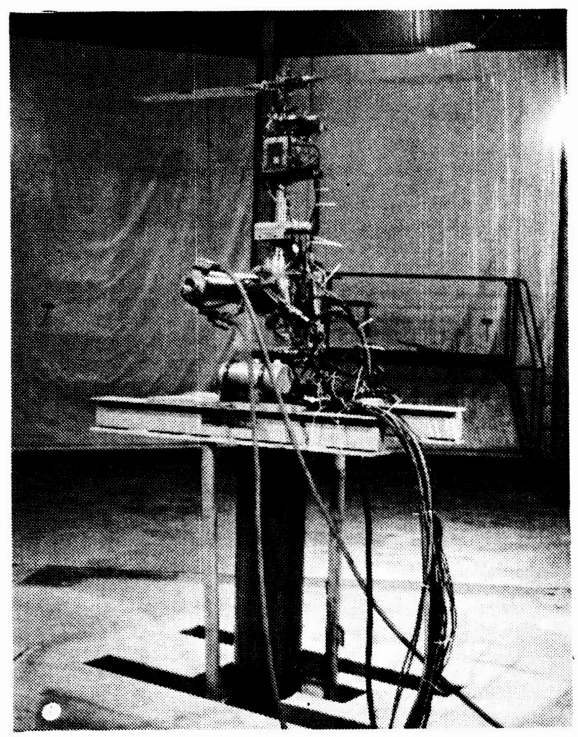
a.) Configuration BHRF2U IGE



b.) Configuration HR IGE



c.) Configuration BHRF2U OGE



d.) Configuration HR OGE

Figure 12. Photographs of several hover test configurations.

Table 6. Summary of hover test conditions.

Configuration	Run No.	TP(1)	Z/R
BHRF2L	108	520	0.50
	109		0.75
	110		0.8681
	111	724	0.50
	112	520	3.00
	113	724	3.00
BHRF2U	114	520	0.50
	115		0.75
	116		0.8681
	117		3.00
BHR	120		0.50
	121		0.75
	122		0.8681
	123		3.0
HR	124		0.50
	125	724	0.50
	126	520	0.75
	127		0.8681
	128	Sweep	0.50
	129	520	3.00
	130	724	3.00
	131	Sweep	3.00
BHRF2L	133	520	2.00
	135		1.625
	136		1.2639
	139	724	0.8681

(1)Tip speed indicated is the reference tip speed at sea level standard day conditions.

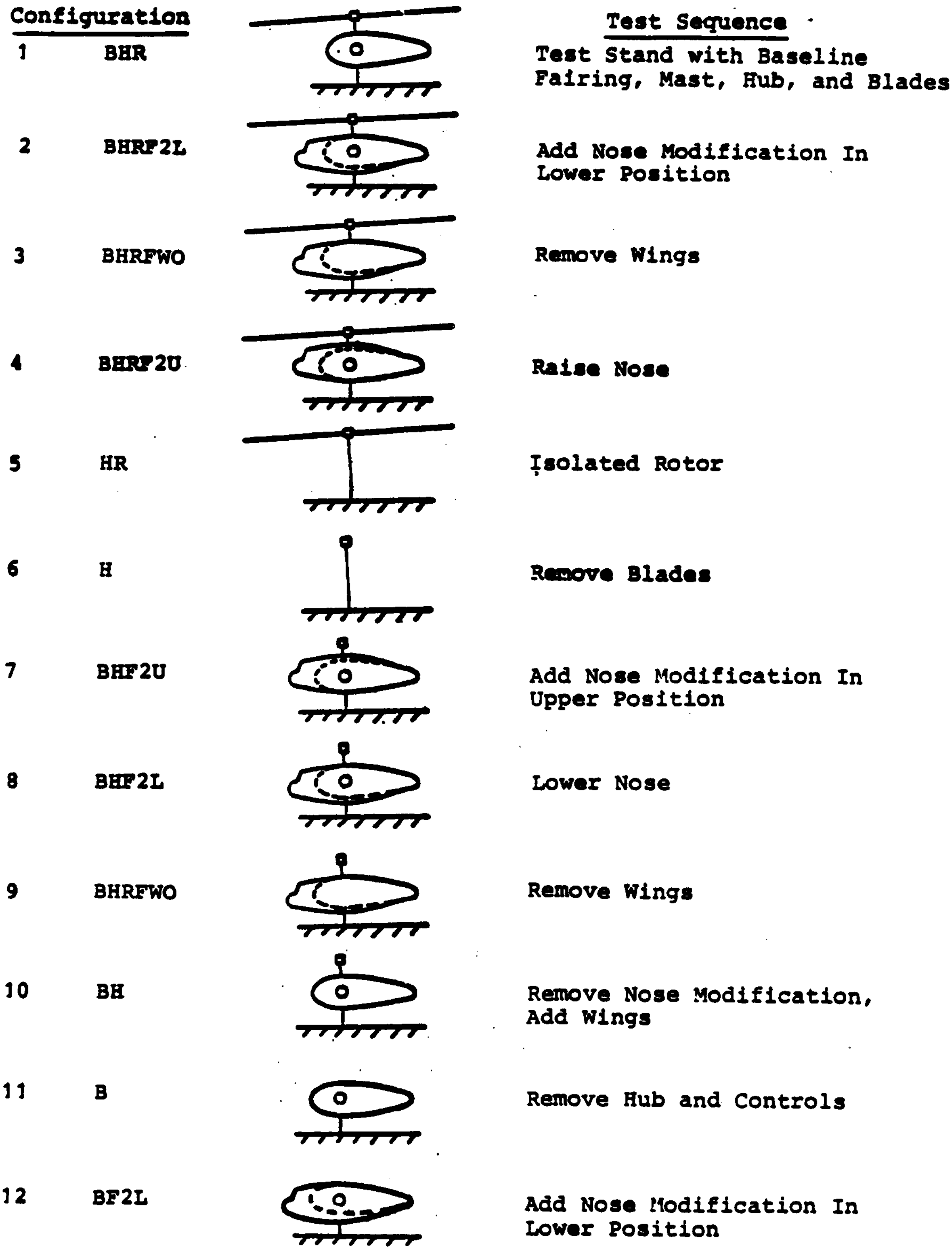


Figure 13. Forward flight test configurations.

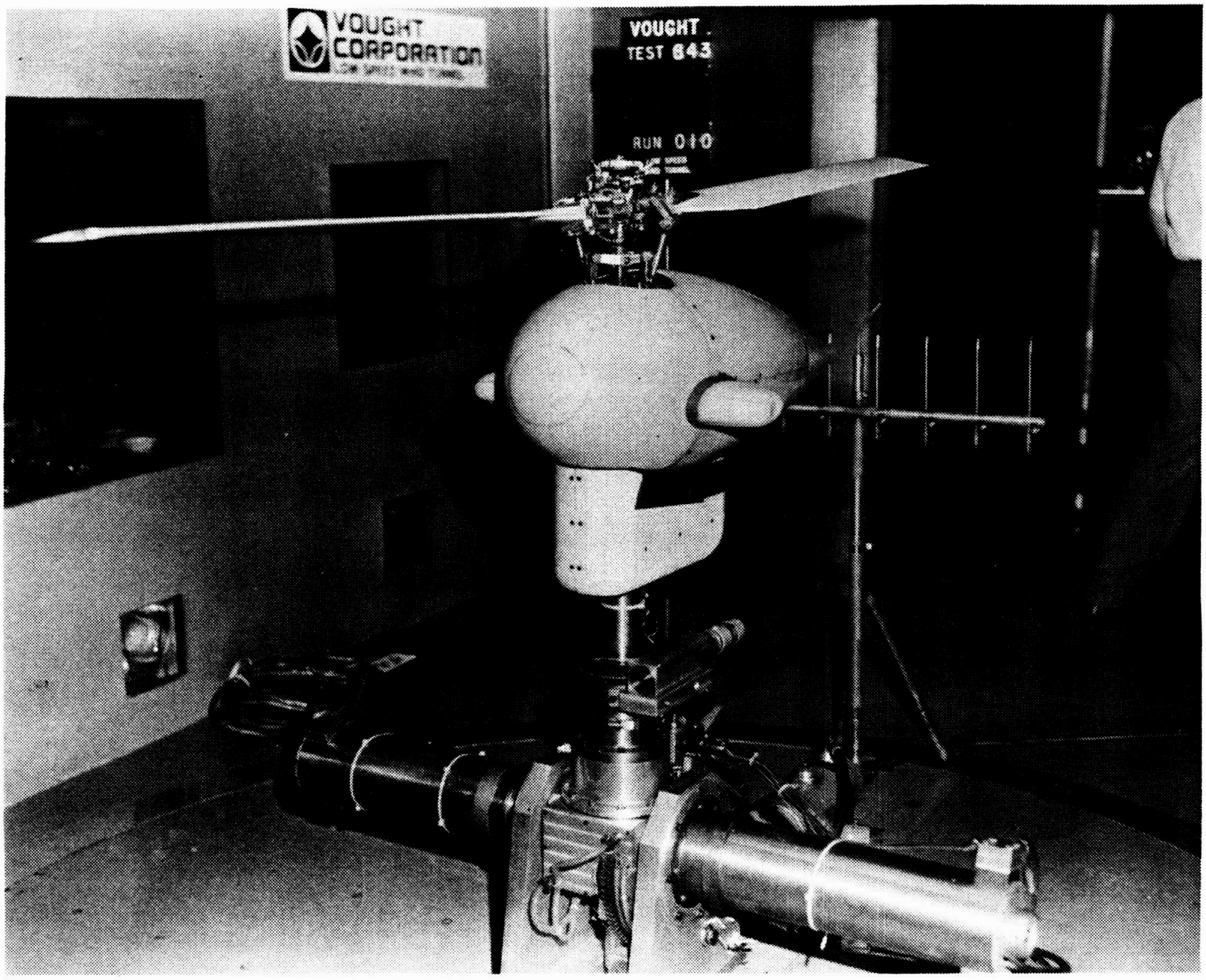


Figure 14. Configuration BHR installed in the LTV 7x10-foot Low Speed Wind Tunnel.

Table 7. Summary of forward flight test conditions.

Configuration	Run No.	Shaft Angle	Speed Ratio
BHR	14*(1)	4,0,-4,-8	0.10
	15	4,0,-4,-8	0.20
	16	4,0,-4,-8,-12	0.30
	17	-4	0.25
	18	-4	0.15
BHRF2L	19*	4,0,-4,-8	0.10
	20	-4	0.15
	21	4,0,-4,-8	0.20
	22	-4	0.25
	23	4,0,-4,-8,12	0.30
BHRFWO	24*	-4	0.10
	25	-0,-4,-8	0.20
	26*	-4	0.30
BHRF2U	27*	4,0,-4,-8	0.15
	28	-4	0.15
	29	4,0,-4,-8	0.20
	30	4,0,-4,-8,-12	0.30
HR	31*	4,0,-4,-8,-12	0.10
	32	4,-4,-12	0.15
	33	4,0,-4,-8,-12	0.20
	34	4,-4,-12	0.25
	35	4,-0,-4,-8,-12	0.30
H	40*	4 to -12	0.10
	41*		0.15
	42*		0.20
	45*		0.30
BHF2U	46	8 to -16	0.10
	47		0.15
	48		0.20
	49		0.25
	50		0.30
BHF2L	51	8 to -16	0.10
	52		0.15
	53		0.20
	54		0.25
	55		0.30

Table 7. (Concluded)

Configuration	Run No.	Shaft Angle	Speed Ratio
BHFWO	56	4 to -12	0.10
	57		0.20
	58		0.30
BH	59	8 to -16	0.10
	60		0.15
	61		0.20
	62		0.25
	63		0.30
B(2)	64	4 to -12	0.10
	65		0.20
	66		0.30
BF2L(2)	67	4 to -12	0.10
	68		0.20
	69		0.30

(1) An asterisk indicates that graphical data is not presented

(2) Although the rotor shaft was removed, test stand pitch attitude was calibrated to the shaft axis. The shaft is titled forward 4 degrees relative to the body waterline; consequently, the shaft angles of (4 to -12 listed correspond to (8 to -8) degrees body pitch attitude.

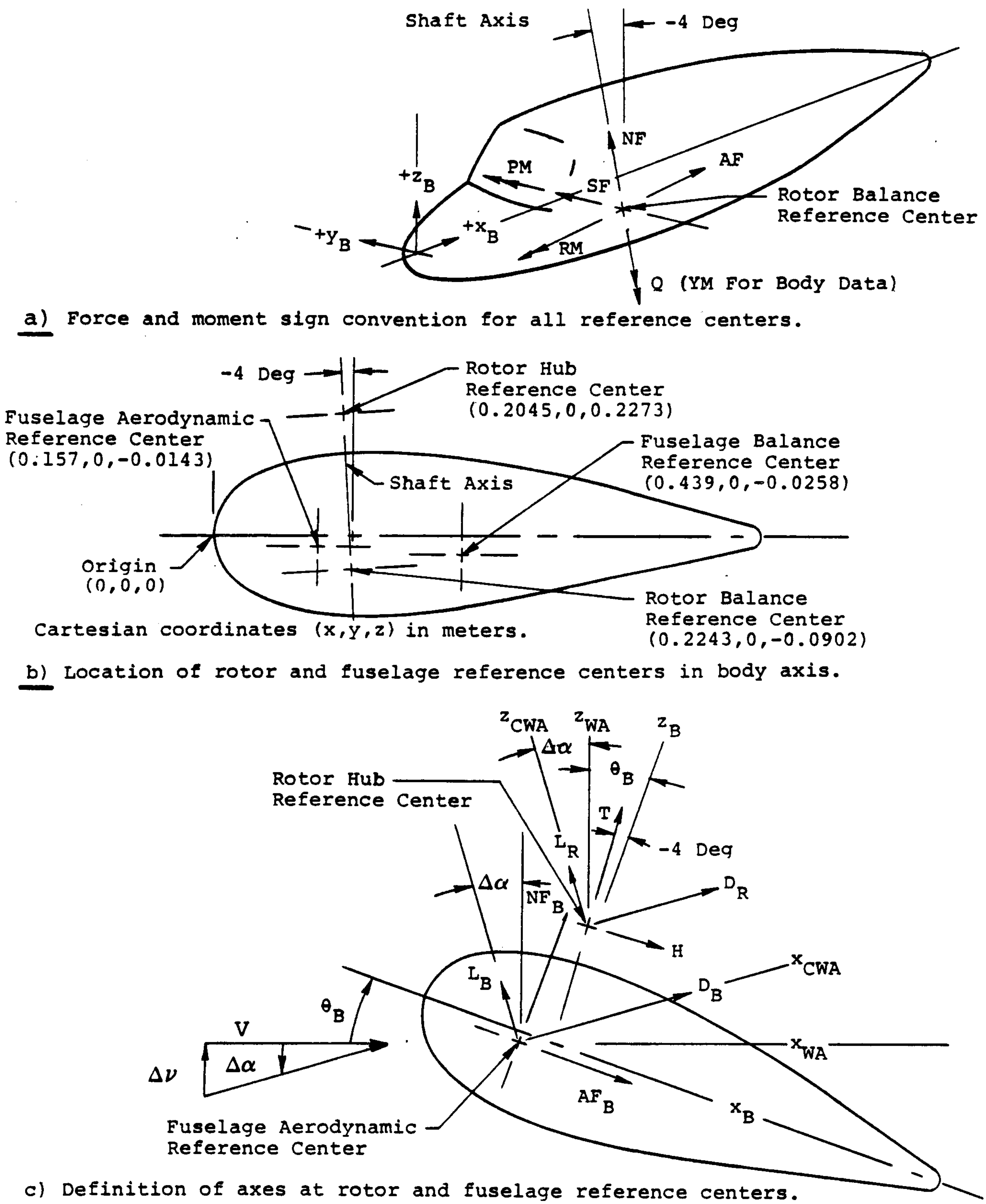
In hover, the balance data was resolved at the hub and fuselage aerodynamic reference centers for rotor and body data respectively. The fuselage aerodynamic reference center corresponds to that defined under the full-scale effort discussed in the Introduction.

The forward flight data reduction procedure is somewhat more complex. Main rotor balance data was corrected for wind-off tares and wind-off zeroes before being resolved into desired axis systems. Rotor data was resolved at the hub in the shaft axis and wind axis system. Fuselage data was resolved in the body axis and wind axis systems at the fuselage aerodynamic reference center. Corrections for wall effects are based on fixed wing analogy and consistent with that which will be used for reduction of the full scale data. The rotor was vertically off-centerline in the tunnel which was corrected for using data from Reference 53 and an image system analysis of the Vought Corporation low speed wind tunnel. The boundary correction factor was determined to be .123. Tabular reduced data is presented in Appendices A through C for hover, forward flight, and pressure data respectively. Figure 15 defines the balance locations, reference centers and force and moment sign conventions.

Hover Test Results

Two sweeps of rpm at zero rotor thrust were performed for the purpose of establishing the mean profile drag coefficient of the main rotor for analytical performance studies. At the beginning of this program the blades had been refurbished; consequently, previously determined values of mean profile drag coefficient were no longer applicable. The rpm sweeps were conducted under IGE and OGE conditions to determine whether there were any differences. Figure 16 shows the results of this test. Main rotor horsepower referred to density ratio is plotted versus rpm cubed. Plotted in this manner the data should fall on a straight line whose slope is directly proportional to the mean profile drag coefficeint. Normally an rpm range exists which is sufficiently removed from Reynolds and Mach effects to provide a good measurement of mean rotor drag. Linear curvefits were applied to the data of Figure 16 with a good resultant fit. Utilizing the slope of the curves in Figure 16, mean profile drag coefficients were calculated. For IGE the value was .009367 and for OGE .009052. This represents approximately a 4 percent difference in profile power. The difference falls within the accuracy of the data system at normal thrust levels.

<u>Fuselage Data</u> - Fuselage aerodynamic forces and moments were measured at several heights above the ground for configurations BHR, BHRF2L and BHRF2U. The objective was to determine the influence of configuration and rotor-body separation distance on fuselage aerodynamic loads under IGE and OGE conditions.



a) Force and moment sign convention for all reference centers.

b) Location of rotor and fuselage reference centers in body axis.

c) Definition of axes at rotor and fuselage reference centers.

Figure 15. Definition of sign conventions and reference systems.

CONFIGURATION HR AT Z/R = 0.5 (RUN 128) = 3.0 (RUN 131)

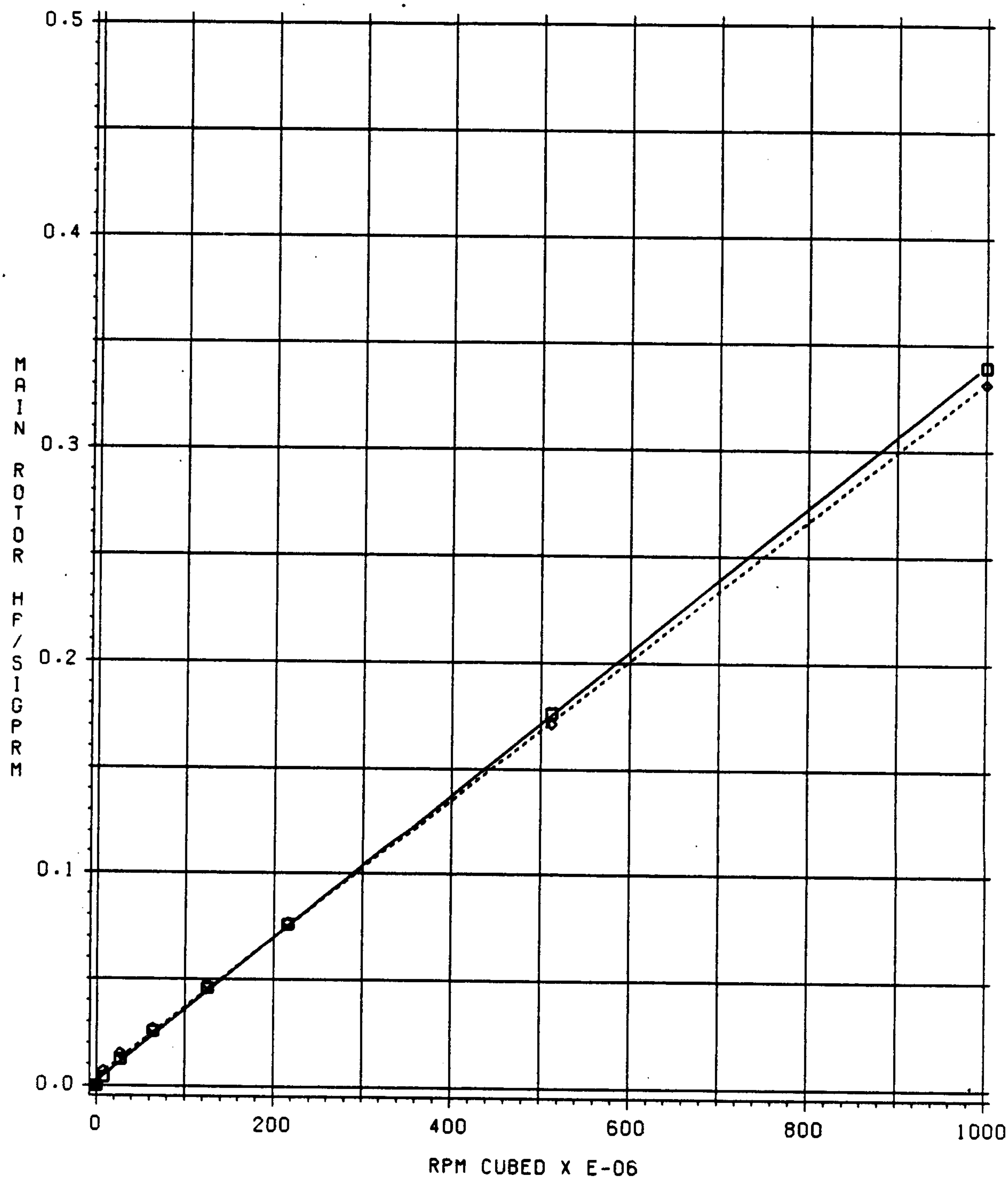


Figure 16. Flat pitch runup for 0.15-scale Model 222 main rotor.

Configurations BHR and BHRF2L have equal separation distances (h/R = 0.0833) with respect to the rotor. However, BHR has a planform area 34 percent less than BHRF2L as well as a different nose shape. Figure 17 compares the IGE and OGE download of the two configurations. BHRF2L with the larger planform area experiences the greater download and a larger rate of change with main rotor thrust coefficient. In ground effect both bodies experience an upload which appears independent of main rotor thrust coefficeint. The trends noted above are consistent with those published in References 14 and 25.

Configuration BHRF2U has a slightly different afterbody shape than BHRF2L (see Figure 7); however, the primary difference is that BHRF2U has a rotor-body separation distance of h/R = .0458. Figure 18 compares the two configurations under IGE (Z/R = 0.50) and OGE (Z/R = 3.0) conditions. Both configurations show trends in download/rotor thrust with increased thrust coefficient similar to those reported in References 14 and 25.

The differences are quite small and no consistent trend can be developed. This may be due to the tradeoff between steady and unsteady loads as noted in Reference 11 and discussed in the Literature Survey section. Configurations BHRF2L and BHRF2U both have a rather flat and broad upper surface in front of the mast. This is the result of the configuration constraints encountered during the full-scale geometry definition under contract NAS2-11090; consequently, a considerable area is less than 0.2 rotor radius from the main rotor and may be very sensitive to the effect of the impulsive load on the steady download.

To provide a better definition of ground effect on fuselage loads, configuration BHRF2L was tested at several intermediate heights. The results are shown in Figure 19 for download. The data in Figure 19 were curvefit with a second order polynomial in order to develop the data of Figure 20. Figure 20 shows the ground effect on download at constant thrust coefficients of .004, .005, and .006. The Figure 20 data was purposely fit with a spline to show the flat nature of the curves near Z/R = 0.5 and 3.0.

One measure of the influence of fuselage pitching moment is to determine the amount of change in pitch attitude it can cause. Assuming that the aerodynamic pitching moment is reacted only by weight moment and weight is equal to thrust, the static pitching moment equation can be solved for a pitch attitude as a function of the ratio of pitching moment to thrust. Figure 21 presents the results for BHRF2L as a function of height above ground and thrust coefficient. No significant or clear trends are shown and the maximum excursion of pitch attitude is only ±0.00436 rad (±0.25 deg).

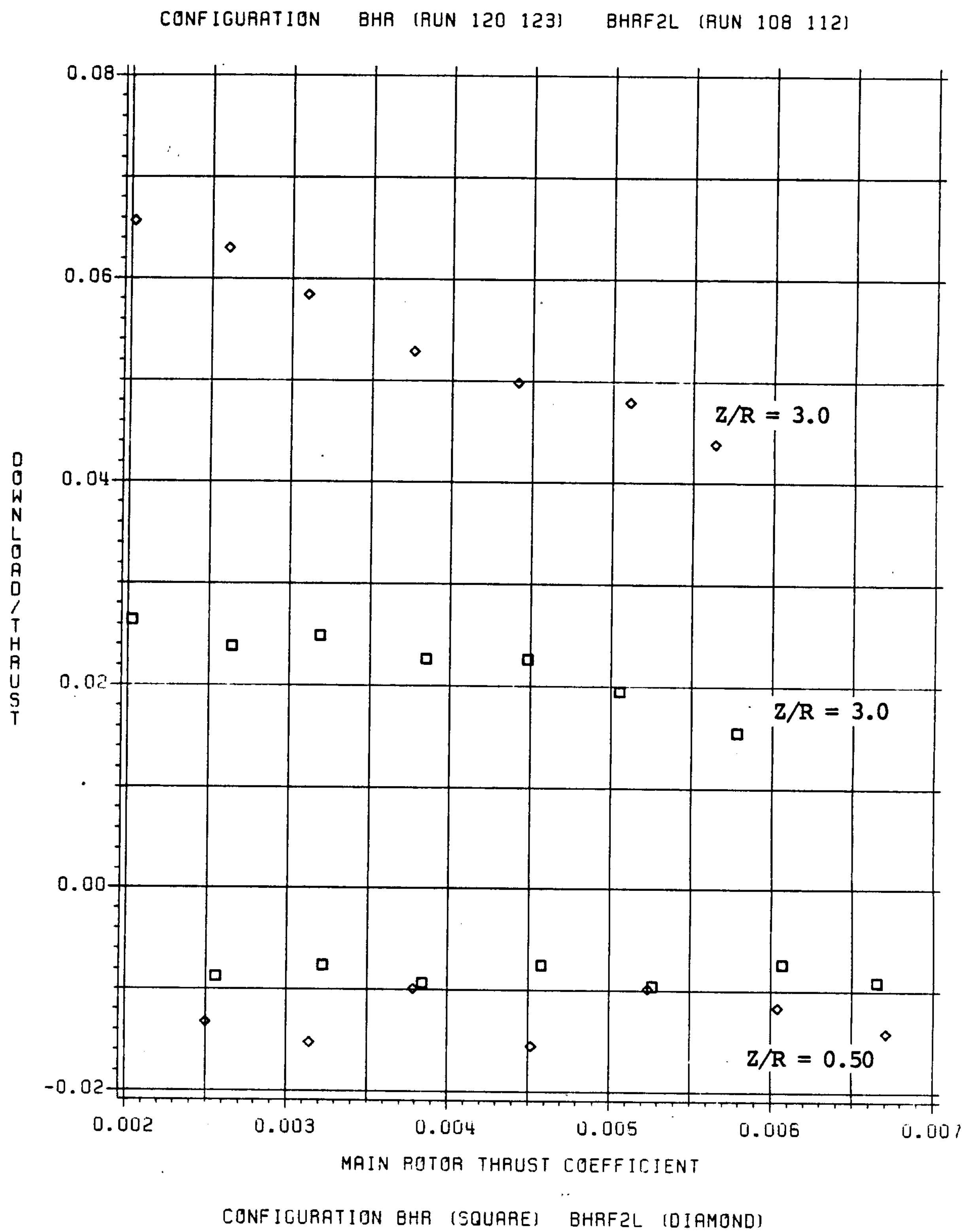


Figure 17. Effect of configuration on fuselage download.

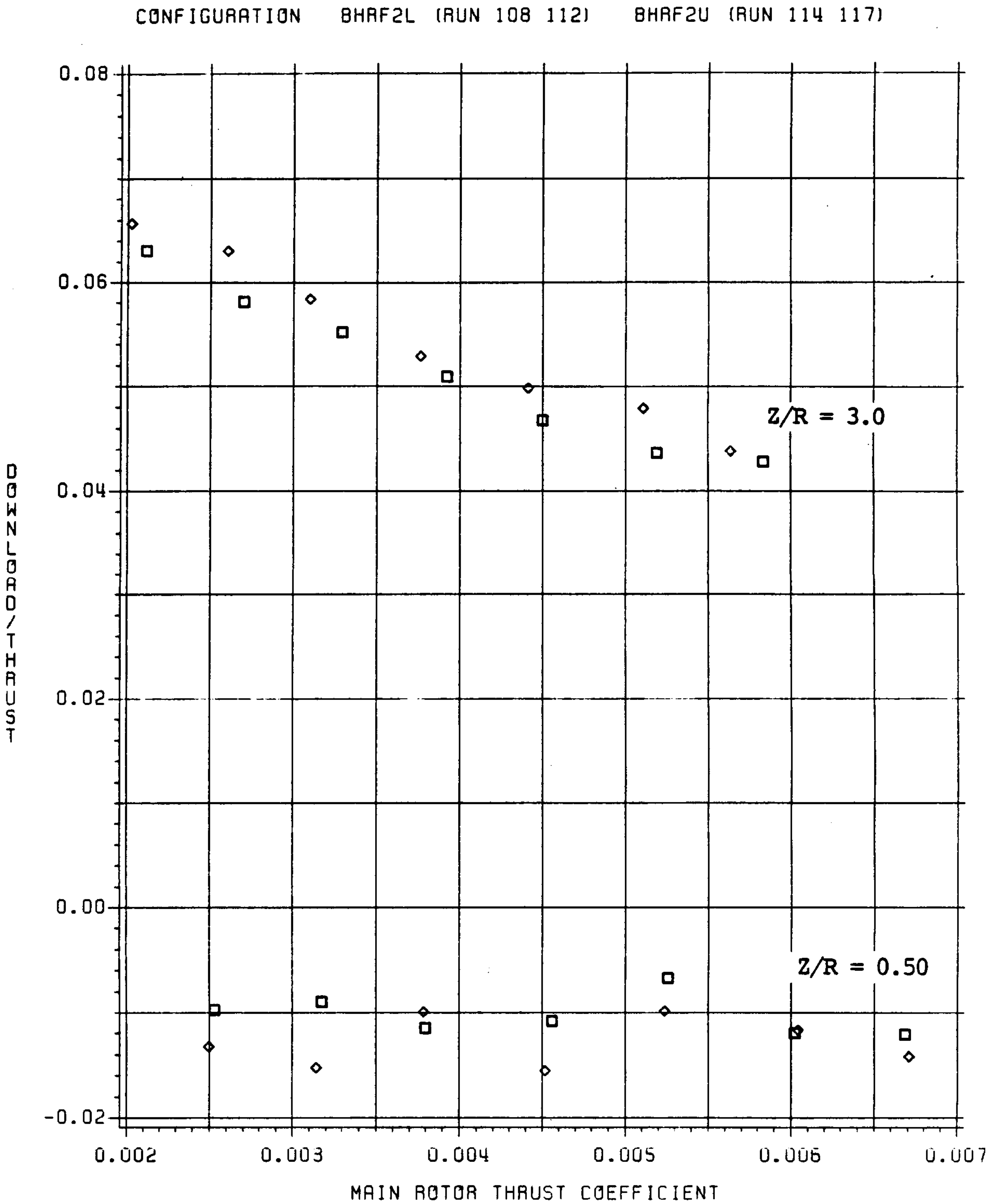


Figure 18. Effect of main rotor - fuselage separation distance on fuselage download.

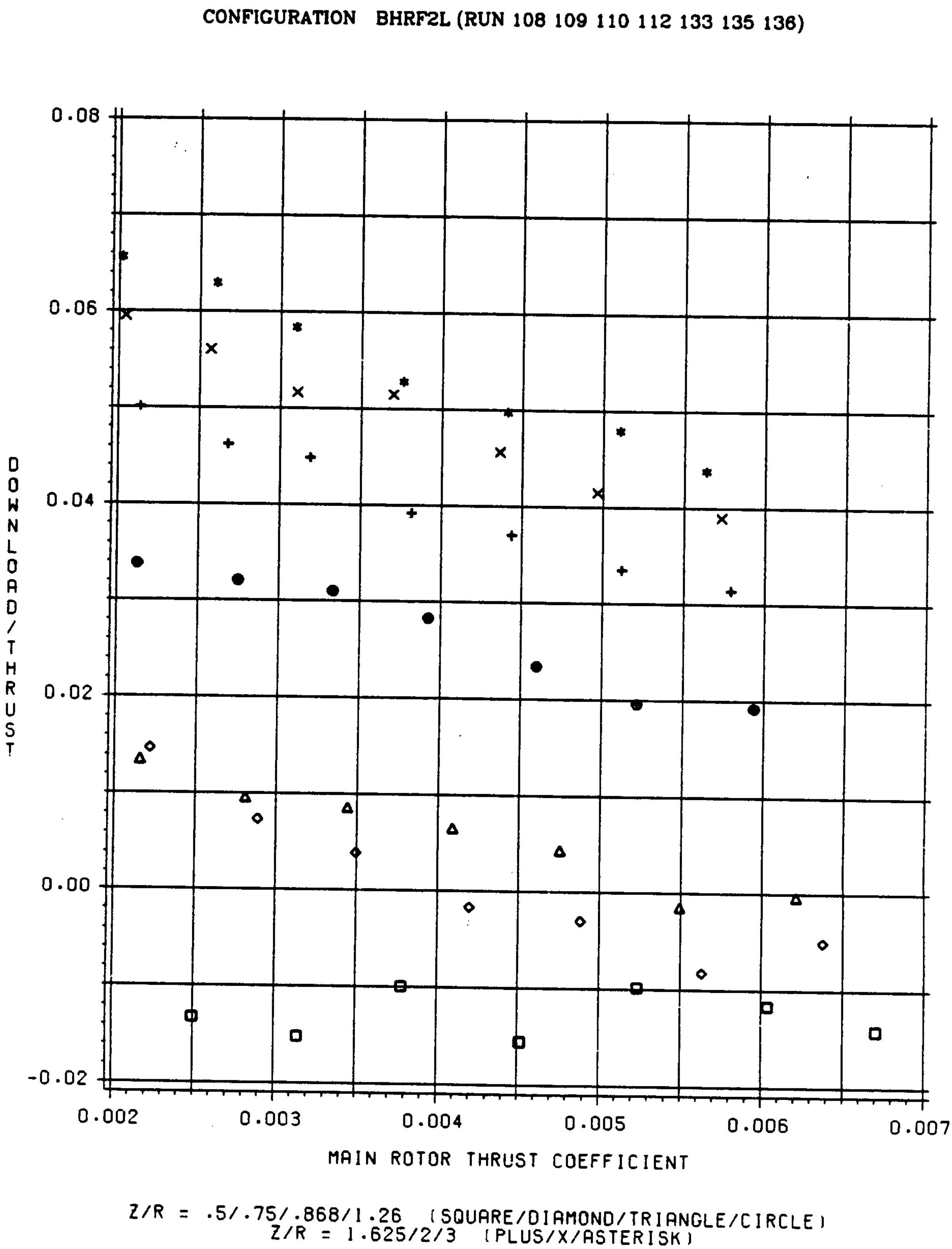


Figure 19. Effect of main rotor thrust coefficient on BHRF2L IGE and OGE download.

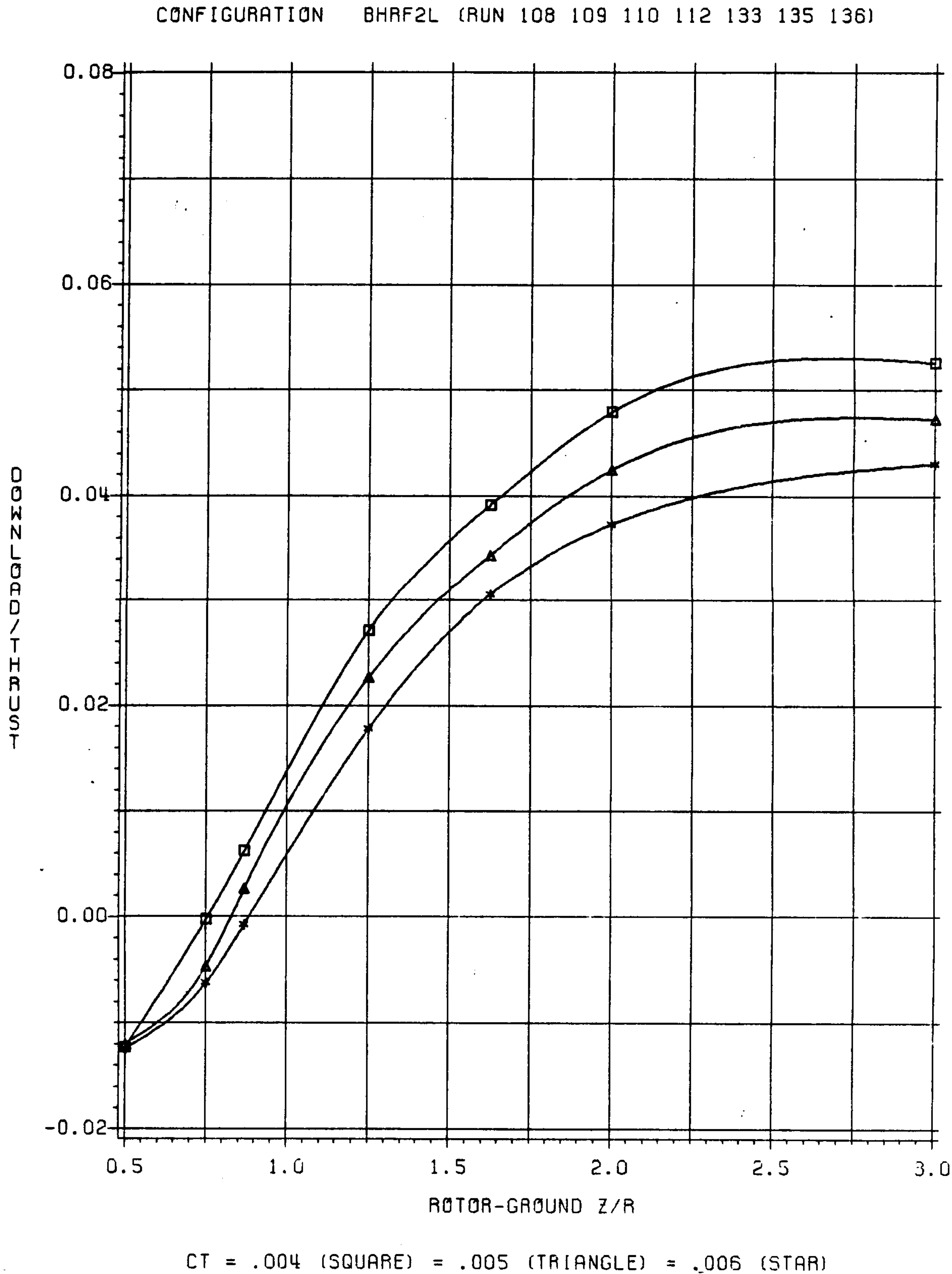


Figure 20. Ground effect on configuration BHRF2L download.

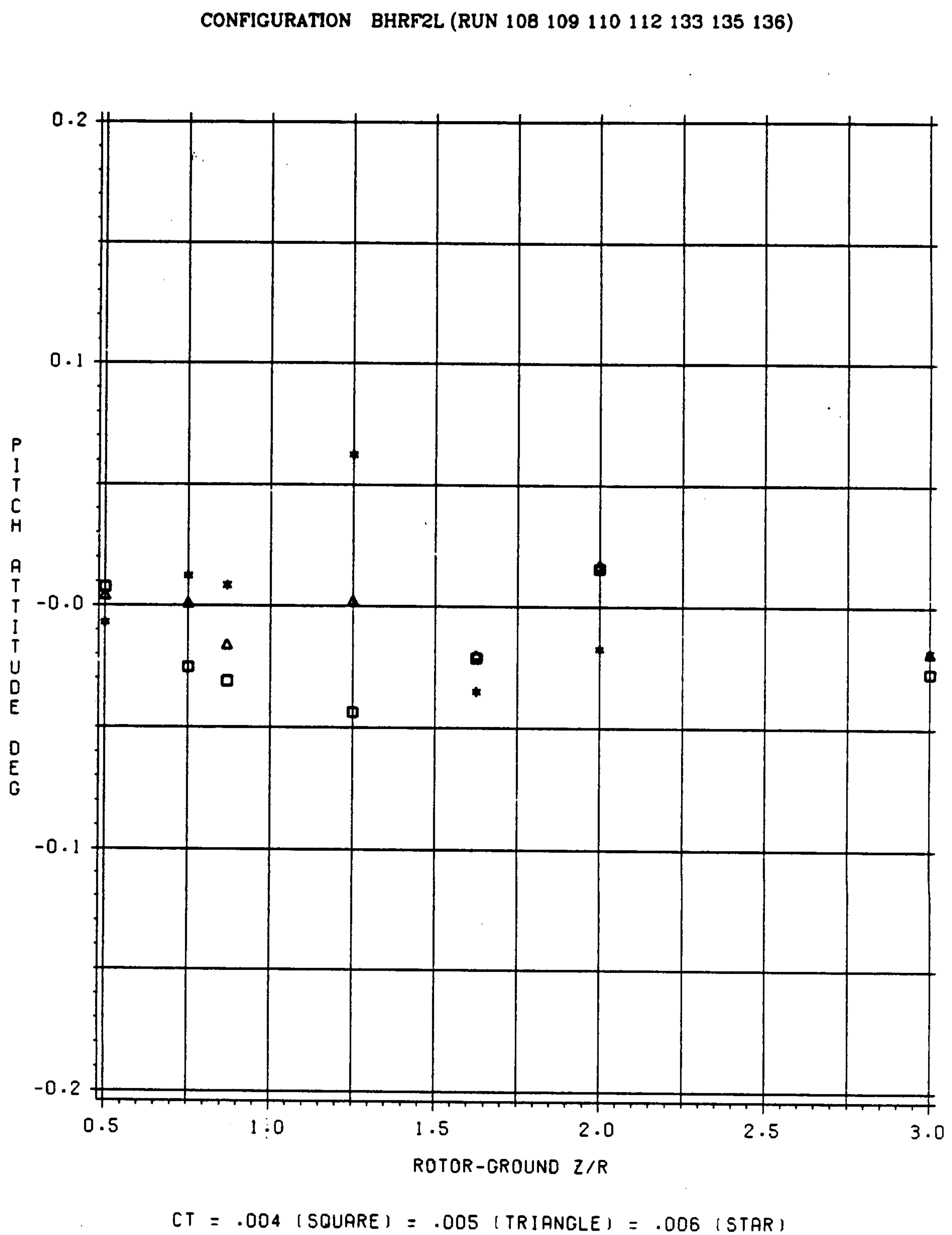


Figure 21. Ground effect on fuselage pitching moment.

Yawing moment for configuration BHRF2L is shown in Figure 22 as a function of height above the ground. Note the very definite change in the data between Z/R = 0.5 and 0.75. This was noted for all configurations tested and at full-scale tip speeds as well. The yawing moment is primarily due to swirl associated with viscous and induced flow effects. The predominant effect should be due to wake skew angle, and between Z/R = 3.0 and Z/R = 0.75, this appears to be the case as the ground distorts the wake. However, the wake must take on a considerable change in character to cause the sudden reversal between Z/R = 0.75 and Z/R = 0.50. A sample of 26 aircraft shows that the average aircraft Z/R while sitting on the ground is .578 with a range from .502 to .67. Figure 22 suggests a possible excursion in yawing moment of 10 percent of main rotor torque which might be of importance in simulation programs.

It should be noted that considerable fuselage data scatter was encountered near the ground. This may very well have been the result of an unstable separated flow around the smooth circular afterbody as noted in Reference 47.

The majority of the data was taken at a tip speed of 520 fps to remain consistent with the forward flight data; however, a full-scale tip speed of 724 fps was tested for its effect. Figure 23 shows the effect on fuselage download. The higher tip speed results in a lower download for a constant thrust coefficient which is most pronounced under OGE conditions (Z/R = 3.0).

Main Rotor Data - Measured rotor hover performance will be presented as power coefficient versus thrust coefficient. To quantify the effects of configuration and separation distance a curvefit was applied to the performance data and then used to ratio measured powers at constant values of thrust. The power coefficient was assumed to be a function of thrust coefficient to the 3/2 power and thrust coefficient squared. This functional relationship provided a very good fit of the data with a coefficient of variation less than 1.0 for all cases.

The effect of configuration on hover performance under IGE and OGE conditions is shown in Figures 24 through 27. Several trends are indicated by the data. First, at Z/R = 0.5 (Figure 24) the baseline body, configuration BHR, reduces rotor thrust at constant power levels over the thrust range tested. Configuration BHRF2L reduces the thrust even further. As height above the ground increases to Z/R = 3.0 (OGE) the effects noted above diminish.

The effect of separation distance was measured and is presented in Figures 28 through 31. Configurations BHRF2L and

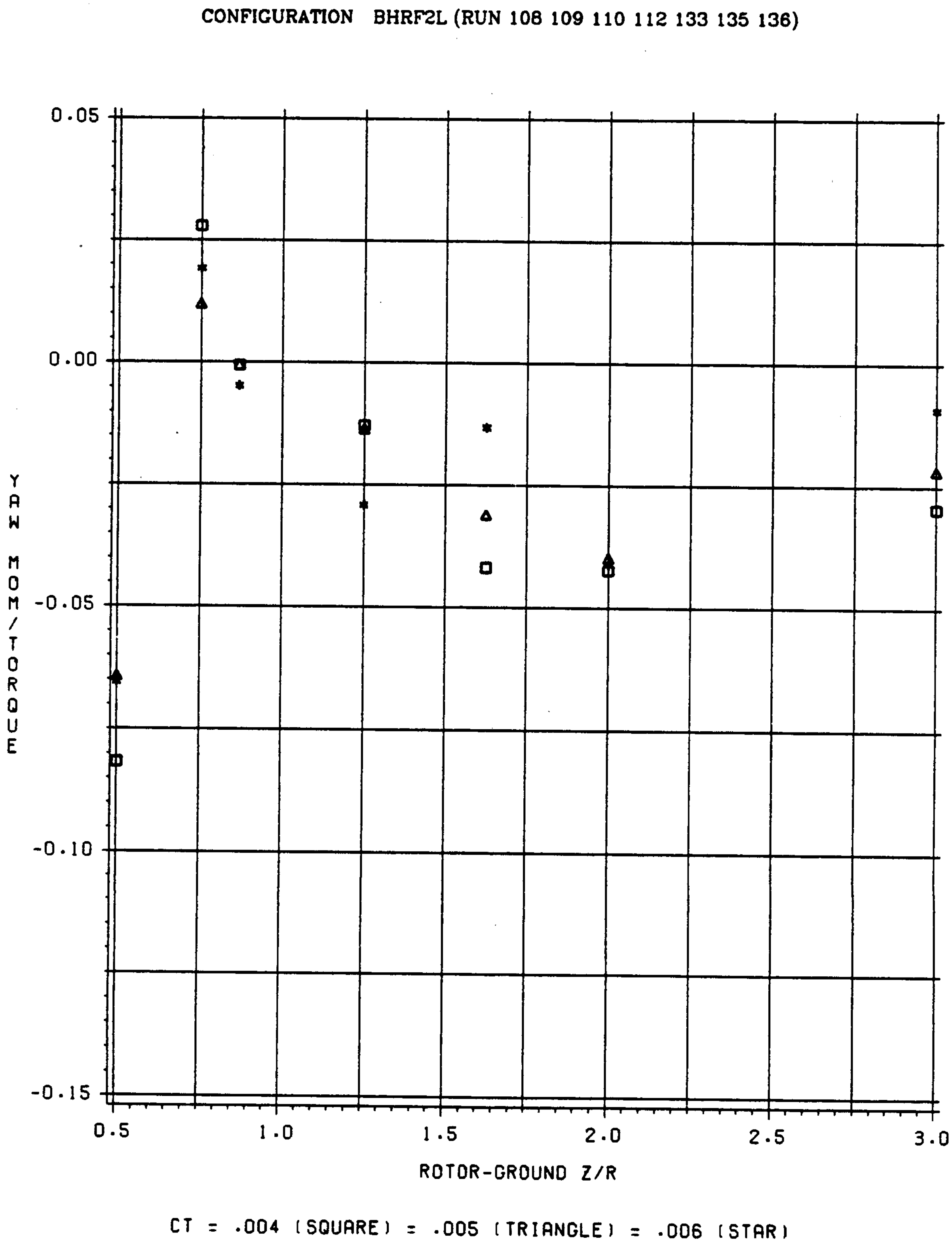


Figure 22. Ground effect on fuselage yawing moment.

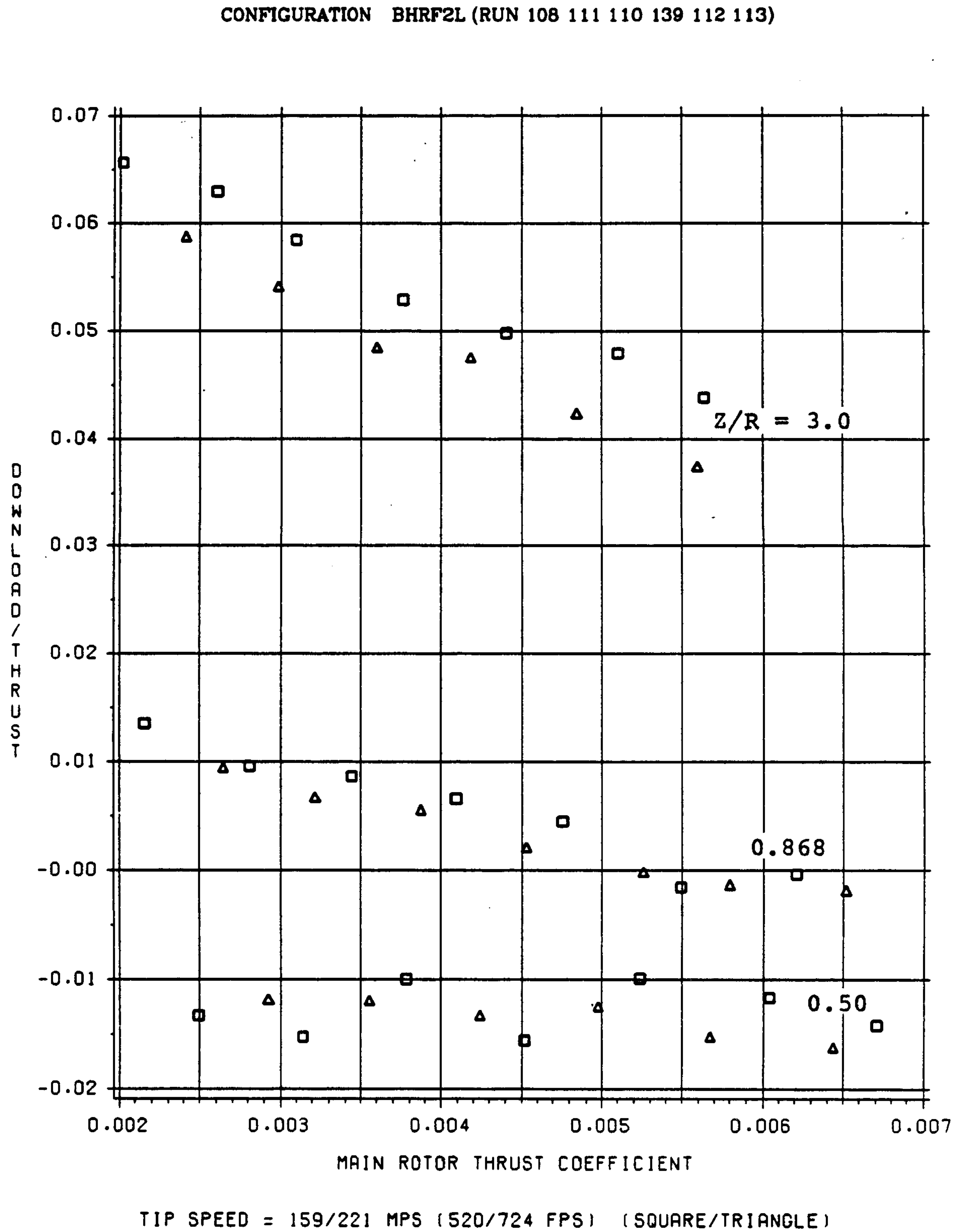


Figure 23. Effect of tip speed on fuselage download.

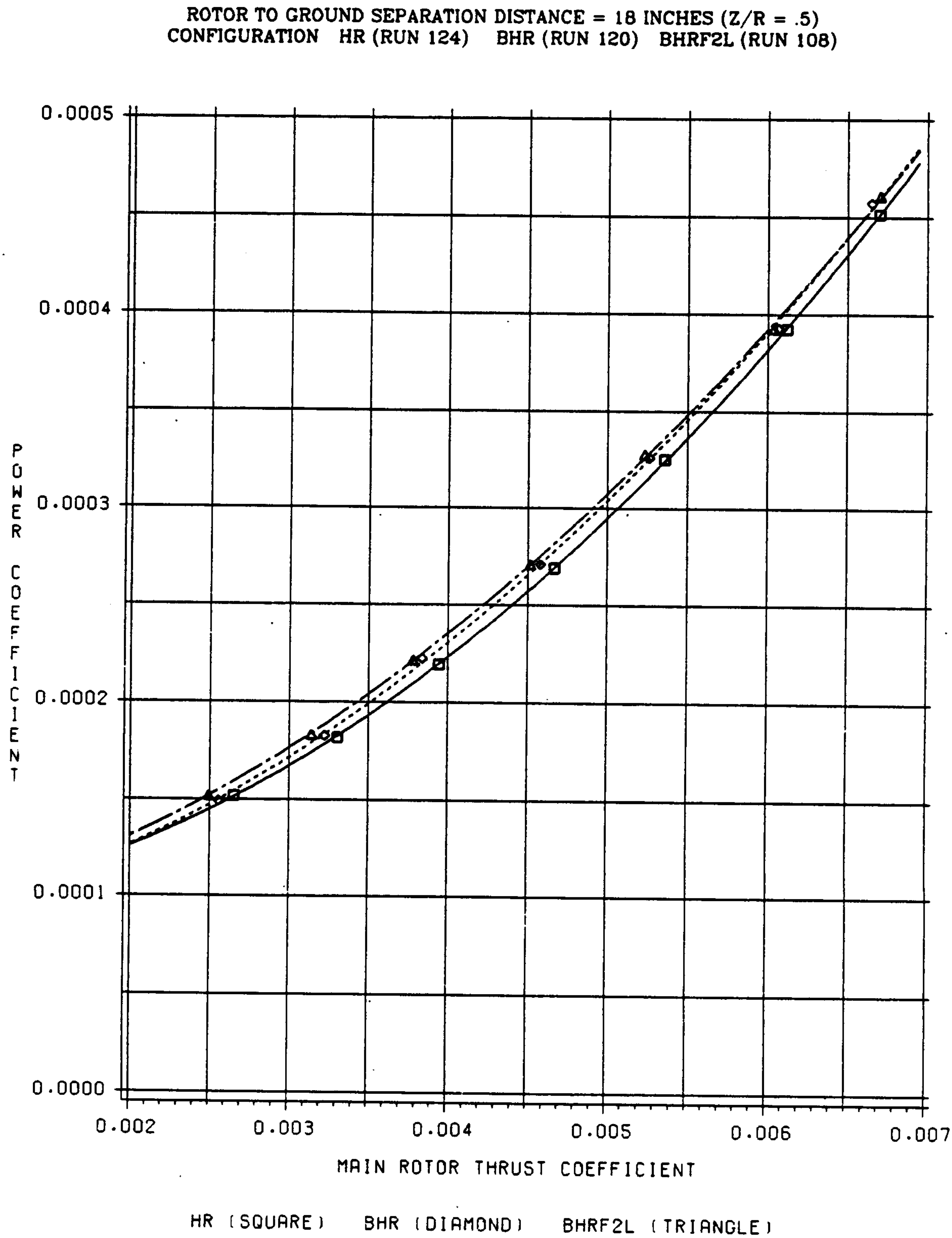


Figure 24. Effect of configuration on IGE hover performance, Z/R=0.5.

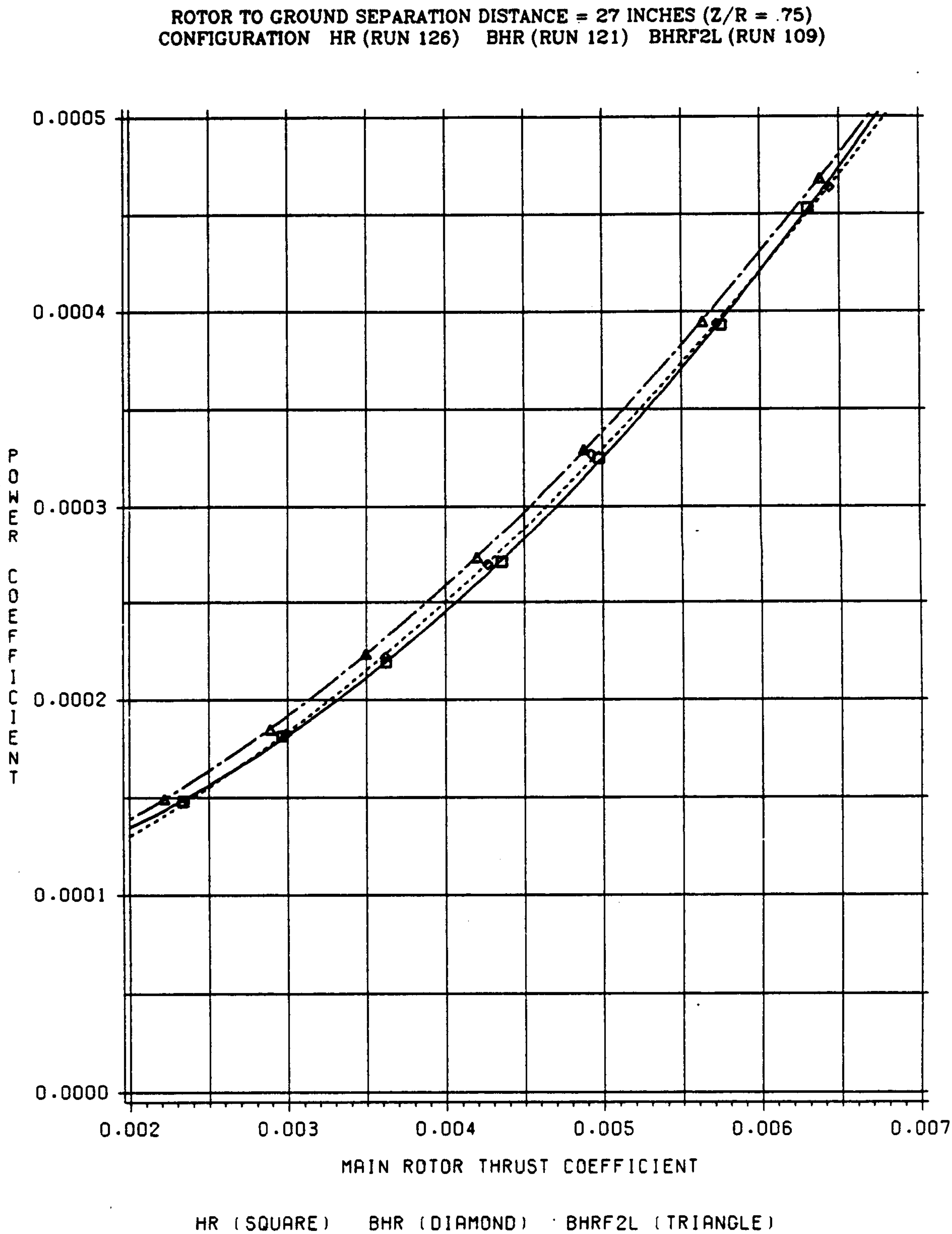


Figure 25. Effect of configuration on IGE hover performance, Z/R=0.75.

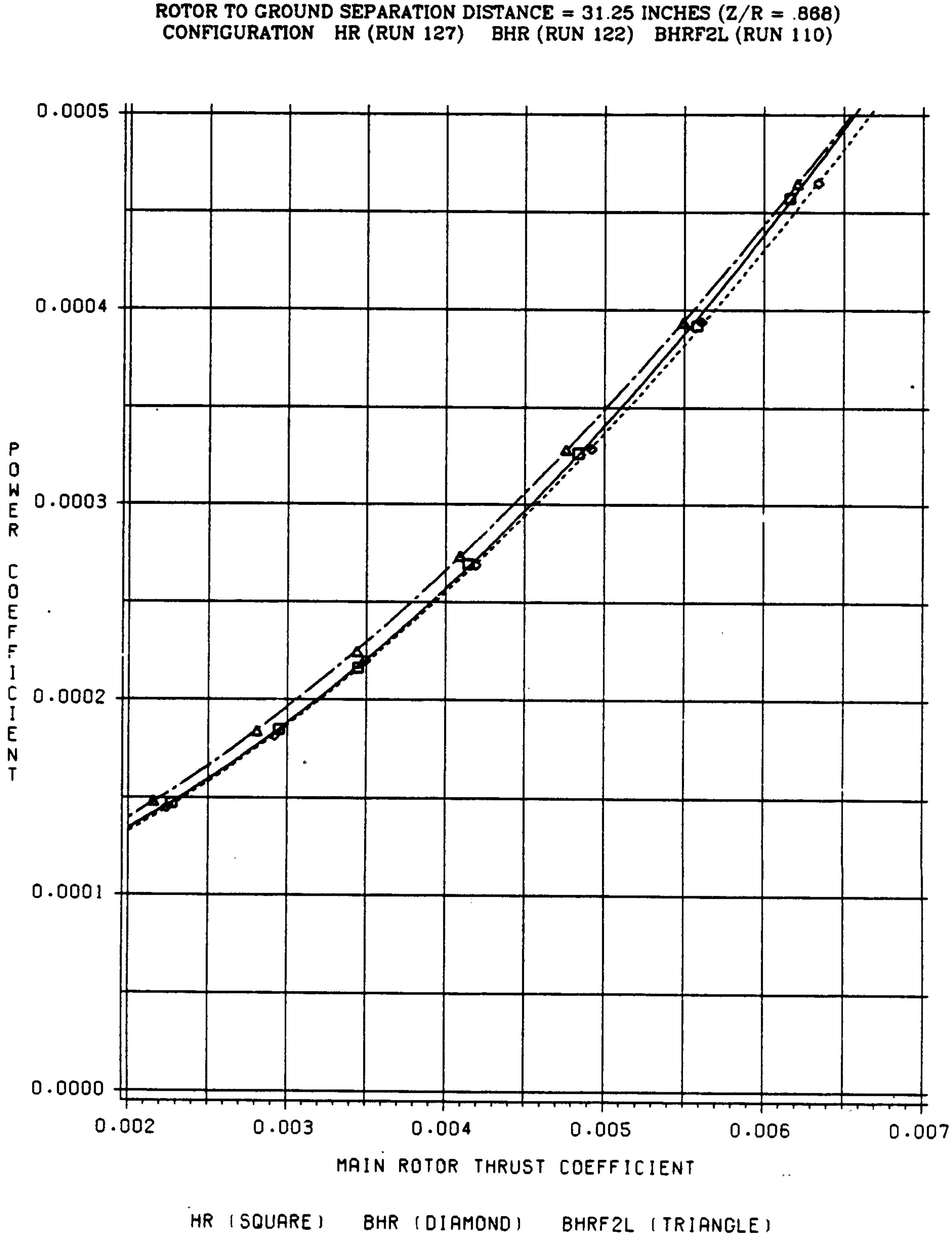


Figure 26. Effect of configuration on IGE hover performance, Z/R=0.868.

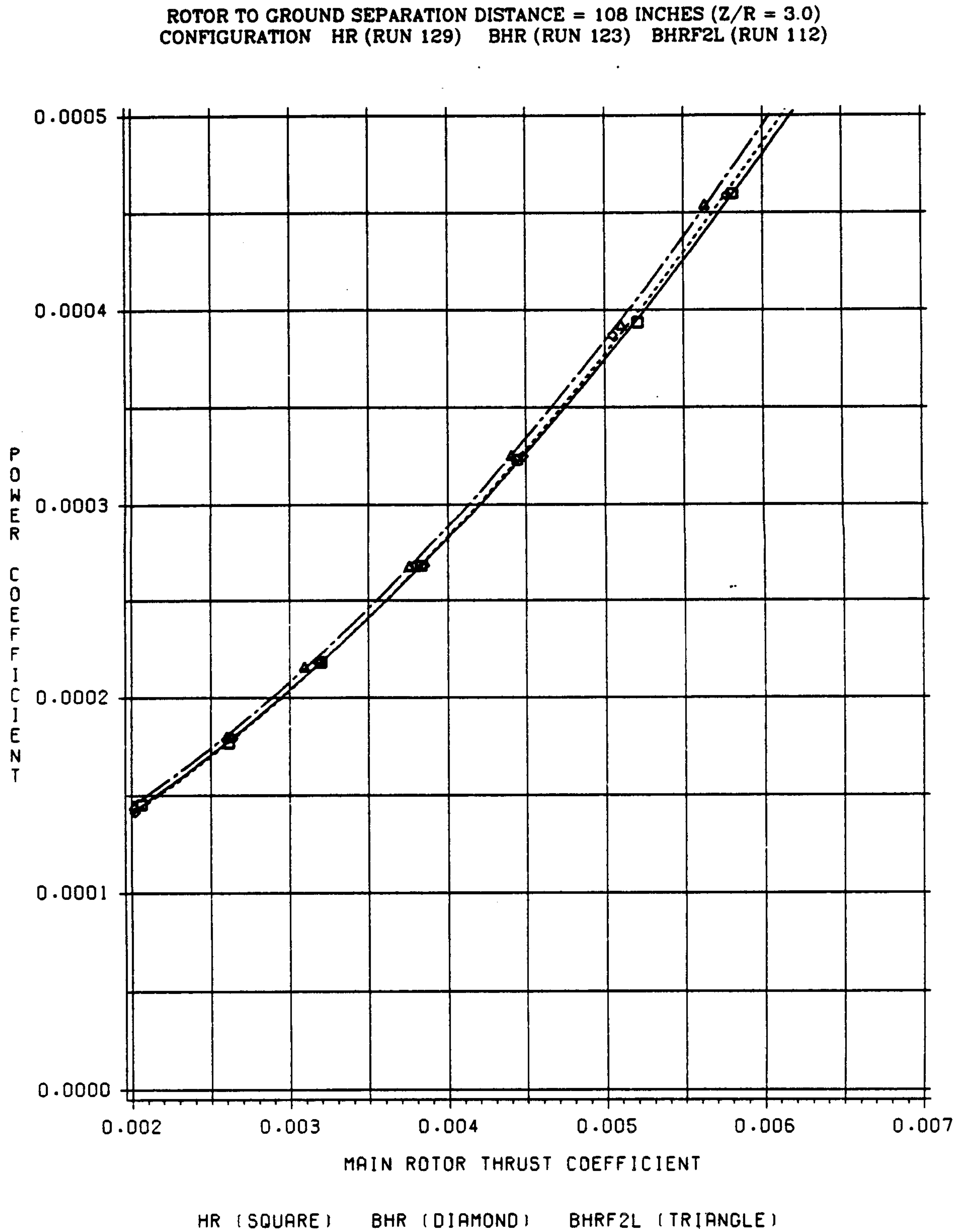


Figure 27. Effect of configuration on OGE hover performance, Z/R=3.0.

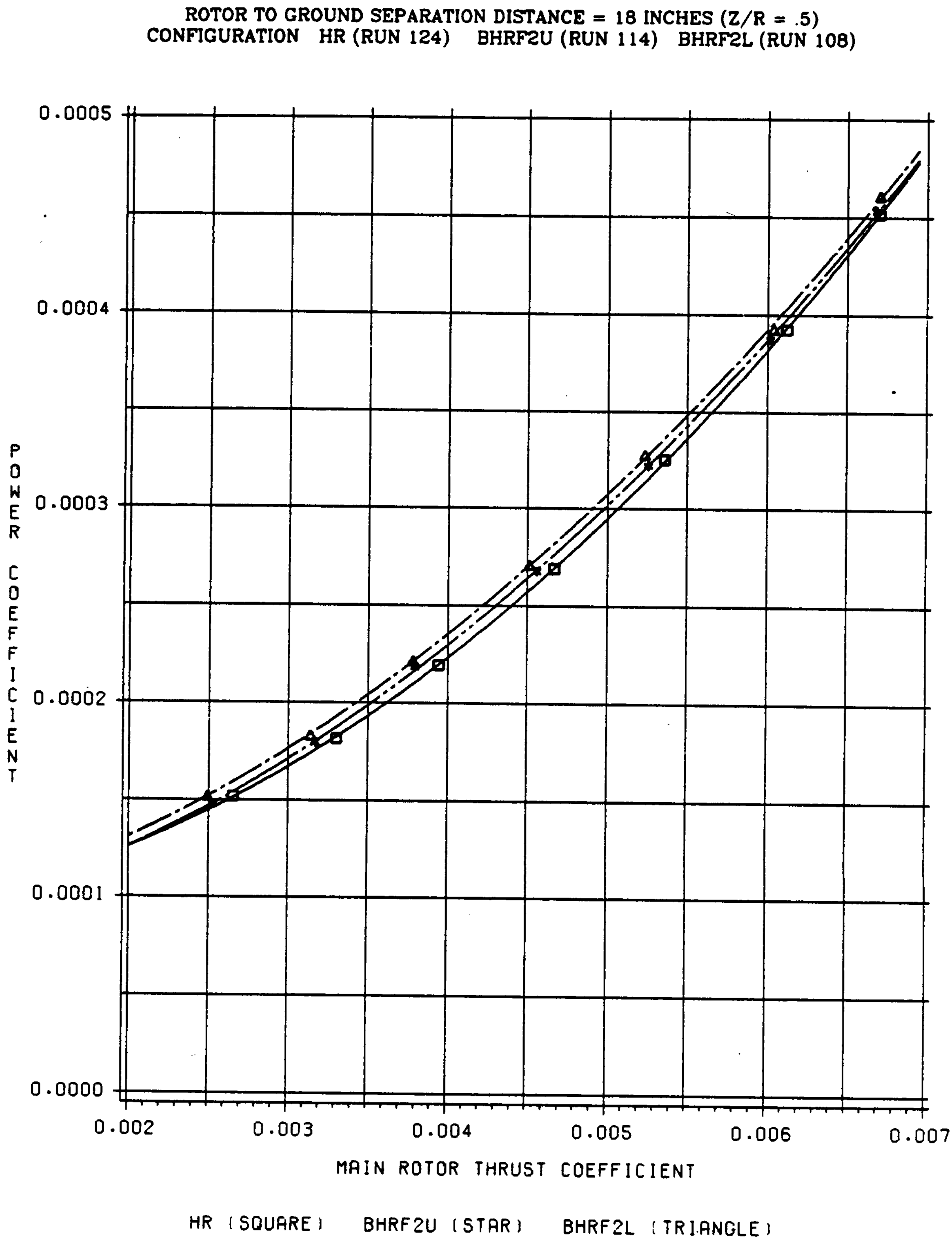


Figure 28. Effect of rotor-fuselage separation distance on IGE hover performance, Z/R=0.5.

ROTOR TO GROUND SEPARATION DISTANCE = 27 INCHES (Z/R = .75)
CONFIGURATION HR (RUN 126) BHRF2U (RUN 115) BHRF2L (RUN 109)

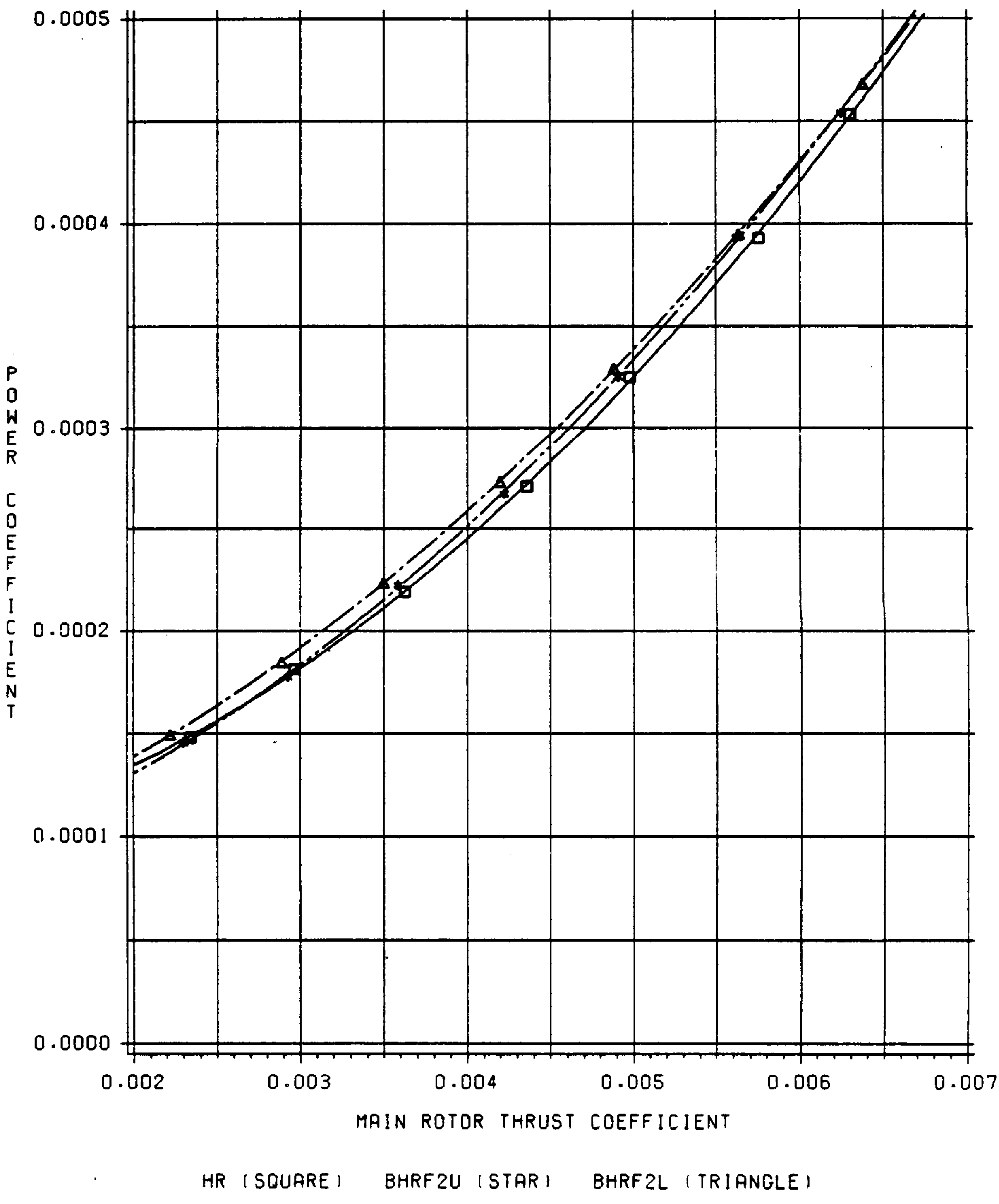


Figure 29. Effect of rotor-fuselage separation distance on IGE hover performance, Z/R=0.75.

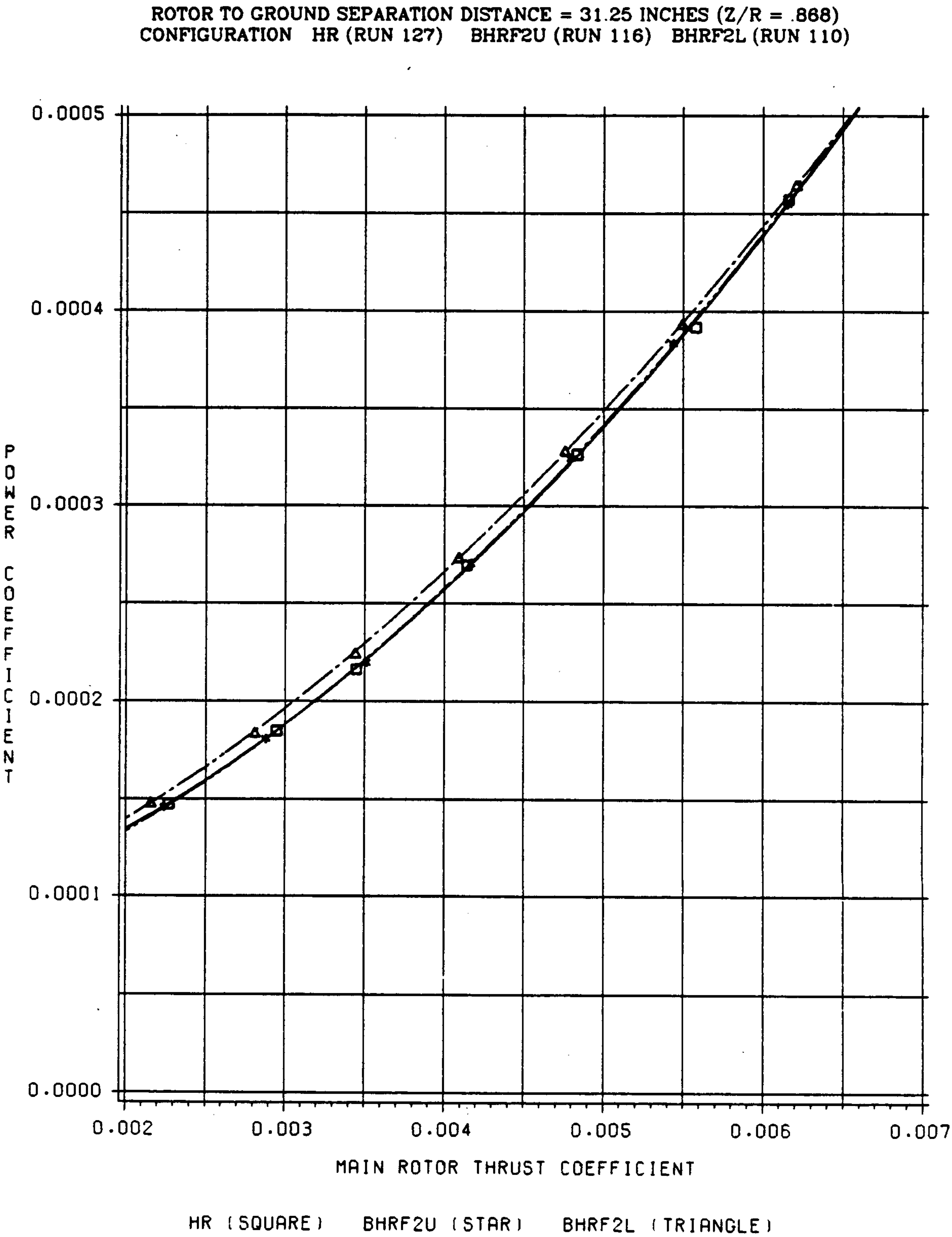


Figure 30. Effect of rotor-fuselage separation distance on IGE hover performance, Z/R=0.868.

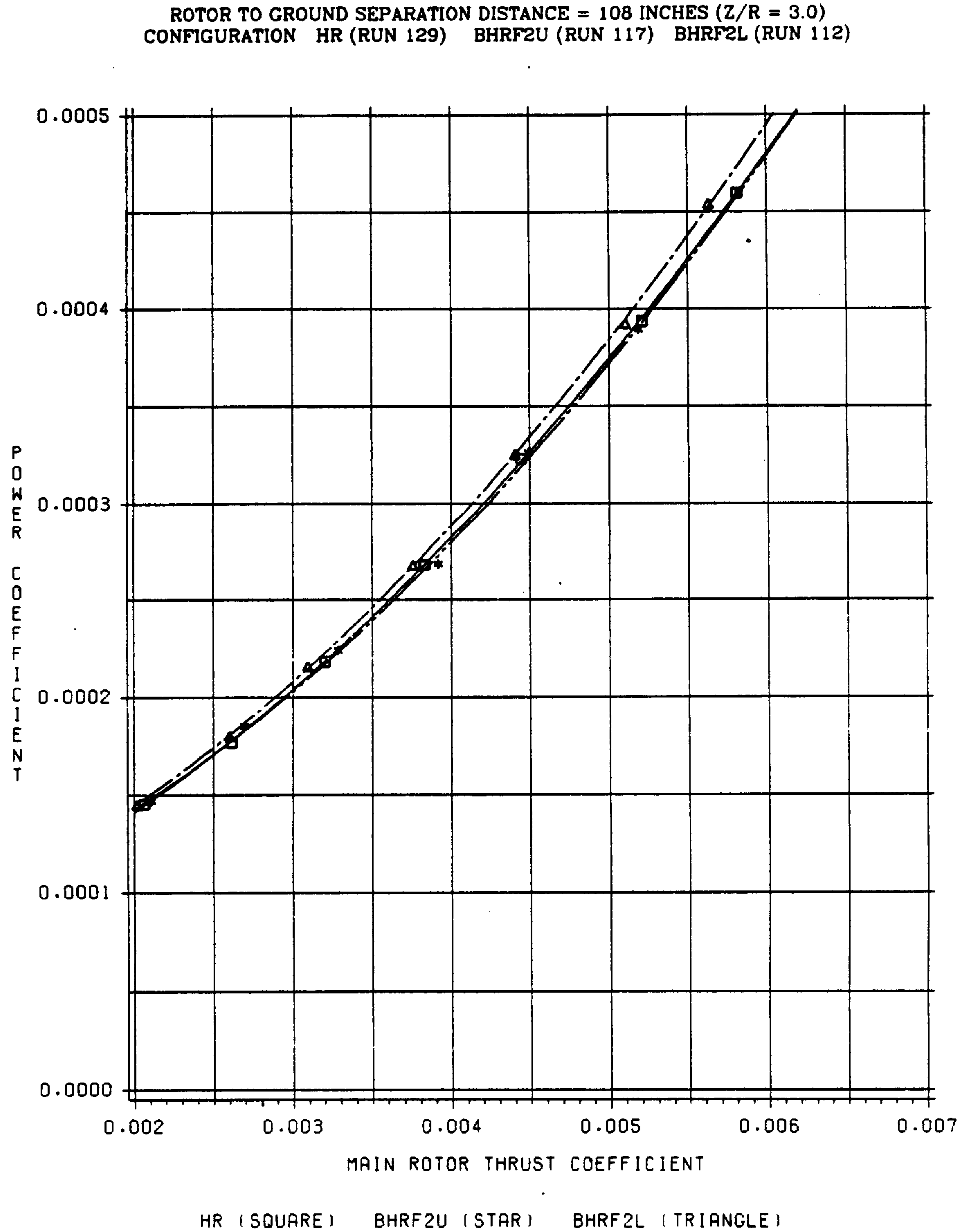


Figure 31. Effect of rotor-fuselage separation distance on OGE hover performance, Z/R=3.0.

BHRF2U have the same planform area with a slight afterbody difference as the result of simulating separation distance, which is discussed in the Test Equipment section. Configuration BHRF2U was tested at a rotor/fuselage separation distance of h/R = 0.0458 as opposed to .0833 for BHRF2L. Decreasing the separation distance caused thrust to increase at constant power coefficient.

The separation distance effect is consistent with thrust recovery theory; however, the presence of the bodies tested especially in ground effect appears to contradict it. It is worth noting that in Reference 25 Balch halved the separation distance of the UH-60A with mixed results for the range of rotors tested indicating that thrust recovery may not always be an obvious benefit. The separation distance and rotor blockage area of BHRF2U is almost equivalent to the Reference 25 test. The BHRF2U body was even closer to the rotor in an equivalent sense. The major difference lies in the upper surface curvature. Consequently, in a weighted sense the mean separation distance of configuration BHRF2U based on body depth would be considerably less than that of the Black Hawk configuration possibly resulting in a more pronounced effect.

Figure 32 shows BHR, BHRF2L and BHRF2U IGE power ratioed to isolated rotor power for Z/R = 0.5. OGE power ratios are presented in Figure 33. The Figure 32 results indicate a sizable effect in terms of percent. The magnitude of the fuselage effect in the Figure 32 hover performance is of concern. It is inconsistent with published data and does represent a sizeable impact on payload. Data accuracy alone could halve the results. However, other factors should be considered including fuselage shaping, blade planform and twist before the results are completely dismissed. The geometric factors are beyond the scope of this program and may warrant a separate parametric study.

Another approach to addressing the question of configuration and separation distance effects would be to compare the IGE/OGE power required ratio for each configuration. Figures 34 through 37 show the IGE/OGE data. Each configuration shows that the ground effect benefit increases with thrust except for the isolated rotor at high thrust levels where a slight reversal is shown. All configurations are compared in Figure 38 at a thrust coefficient of .005 which is approximately the design thrust for the Model 222. Some scatter exists in Figure 38 but most of the data shows that the power ratio for the rotor-fuselage configurations is greater than for the isolated rotor. This indicates that the ground effect is not as great for the rotor-fuselage configuration as for the isolated rotor.

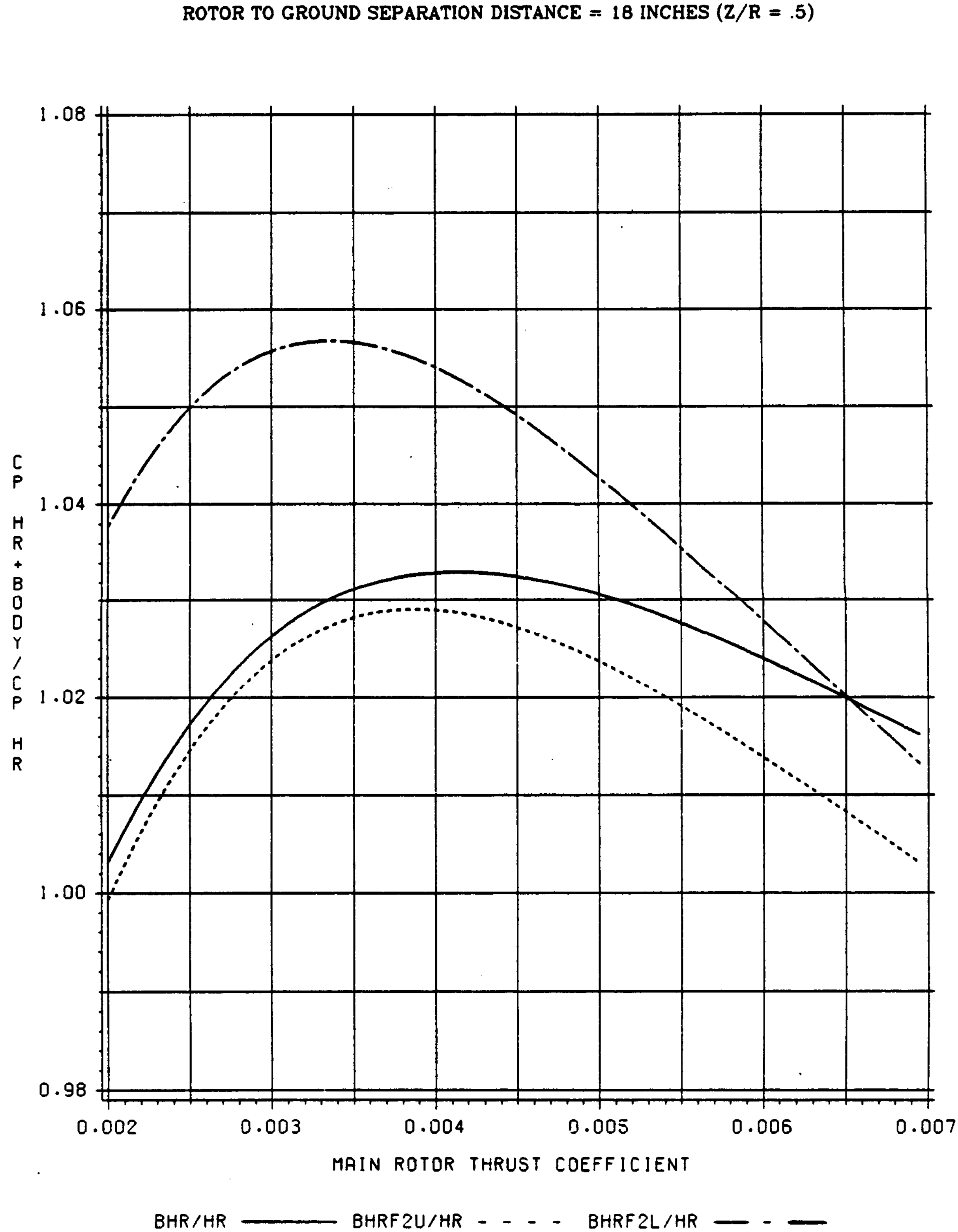


Figure 32. IGE rotor-fuselage configuration power required/ isolated rotor power required, Z/R=0.5.

ROTOR TO GROUND SEPARATION DISTANCE = 108 INCHES (Z/R = 3.0)

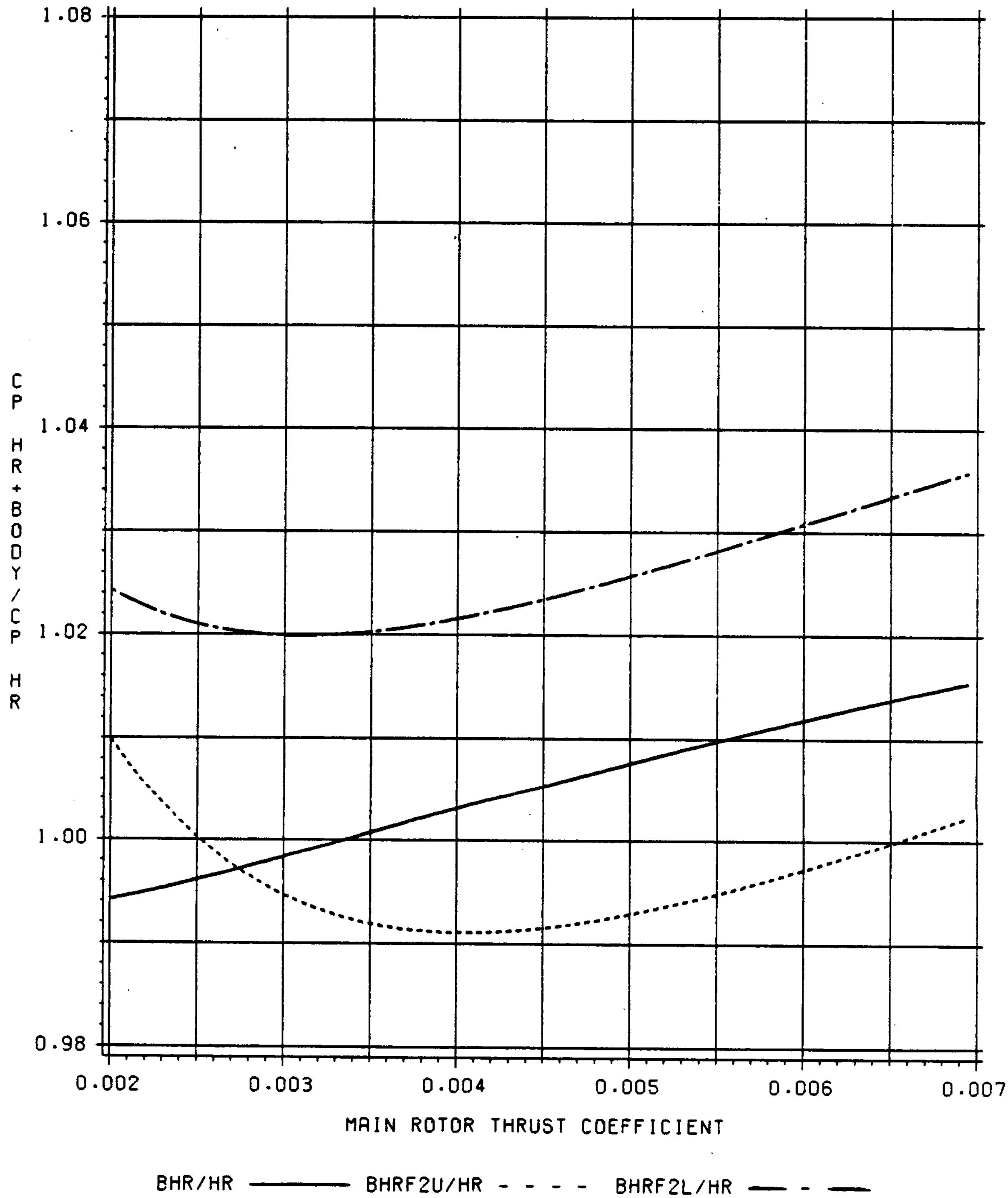


Figure 33. OGE rotor-fuselage configuration power required/ isolated rotor power required, Z/R=3.0.

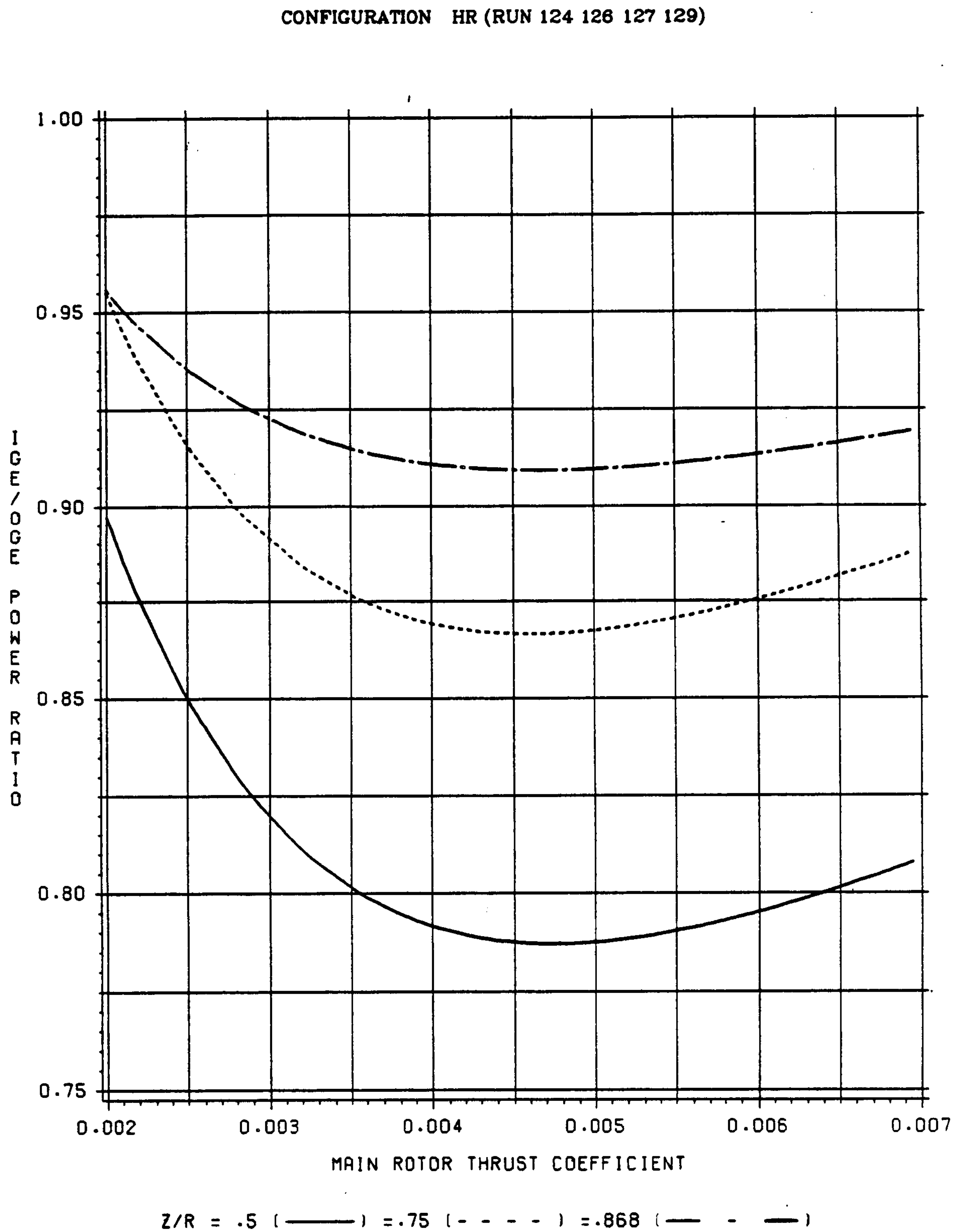


Figure 34. Configuration HR IGE/OGE hover power required.

CONFIGURATION BHR (RUN 120 121 122 123)

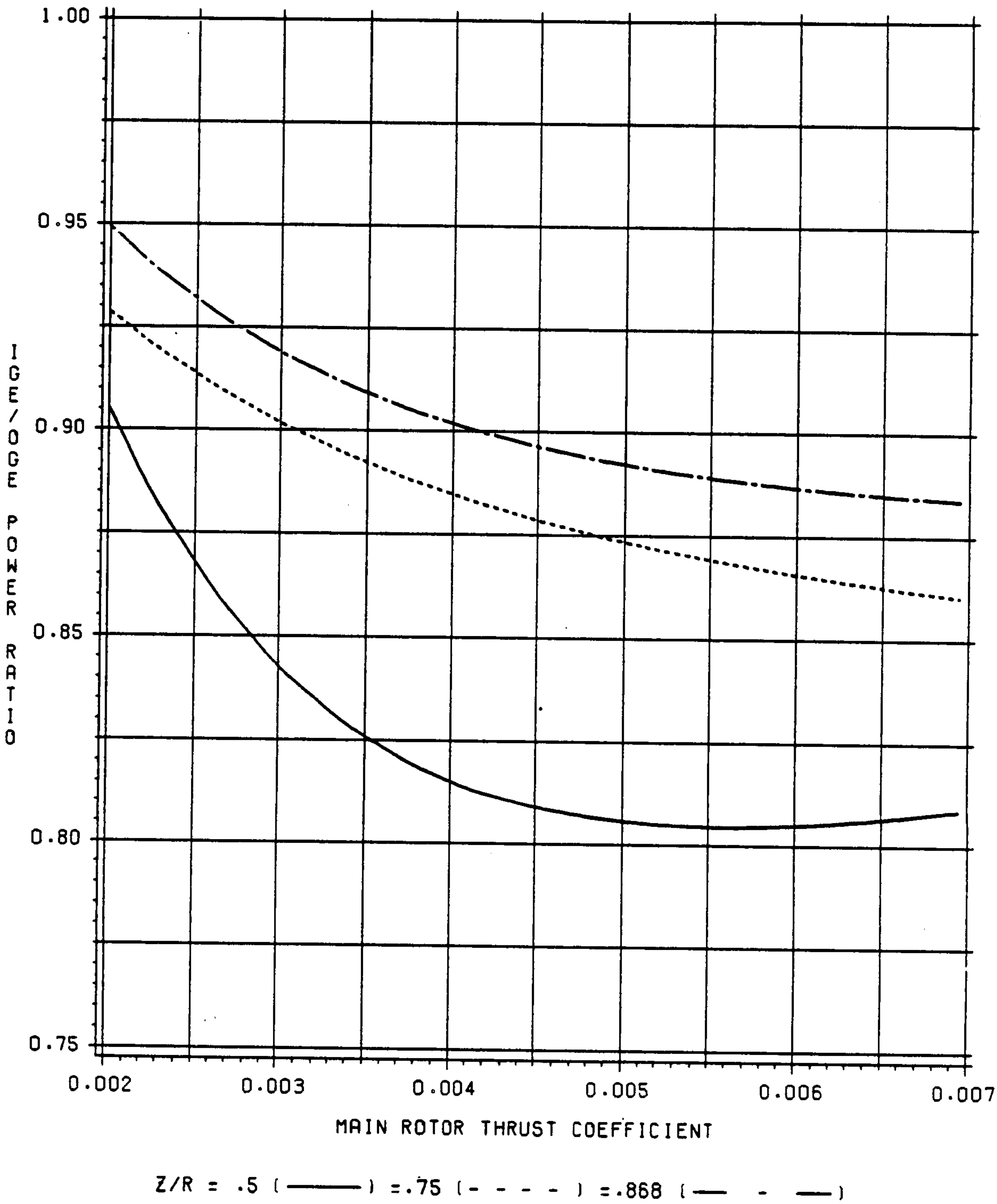


Figure 35. Configuration BHR IGE/OGE hover power required.

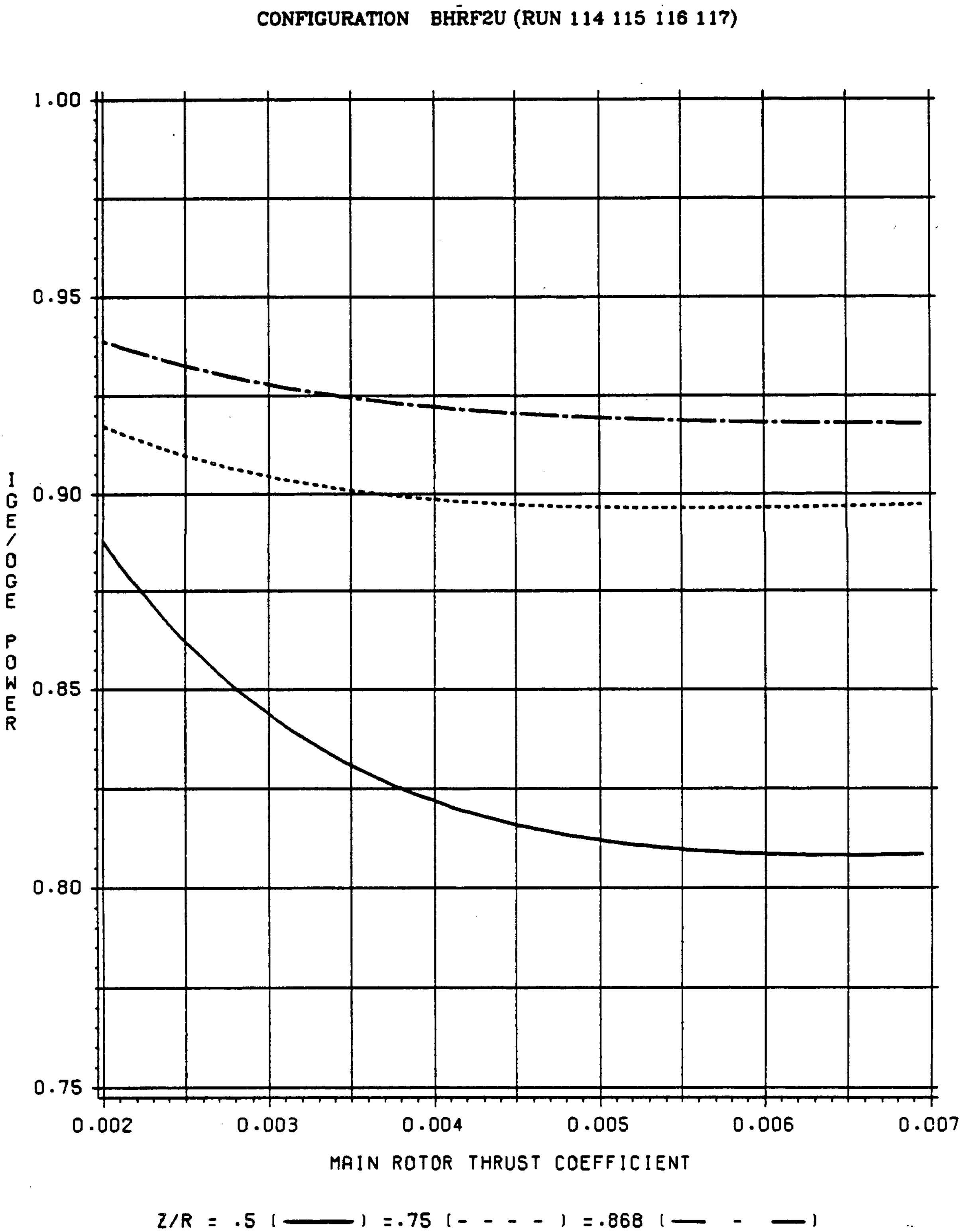


Figure 36. Configuration BHRF2U IGE/OGE hover power required.

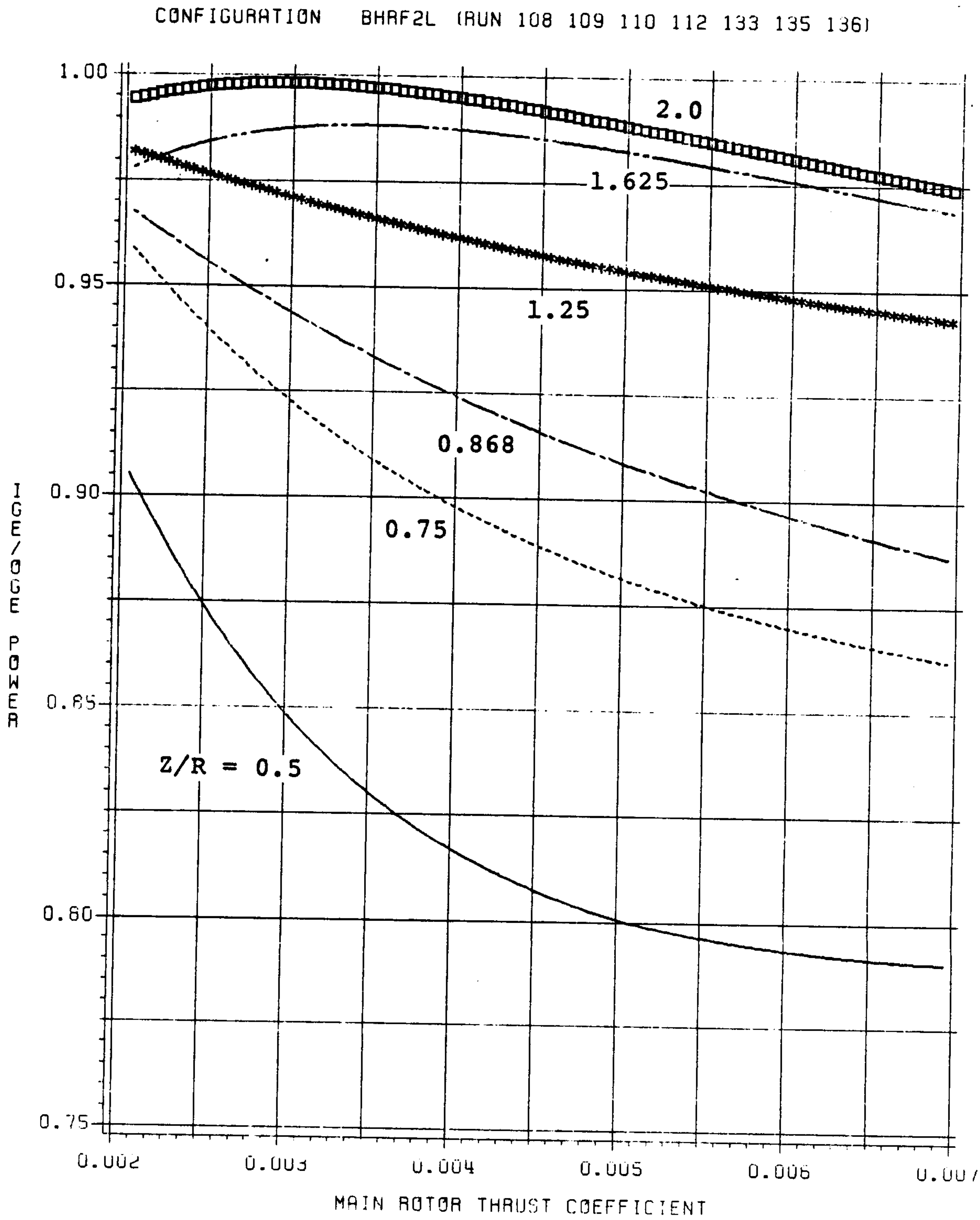


Figure 37. Configuration BHRF2L IGE/OGE hover power required.

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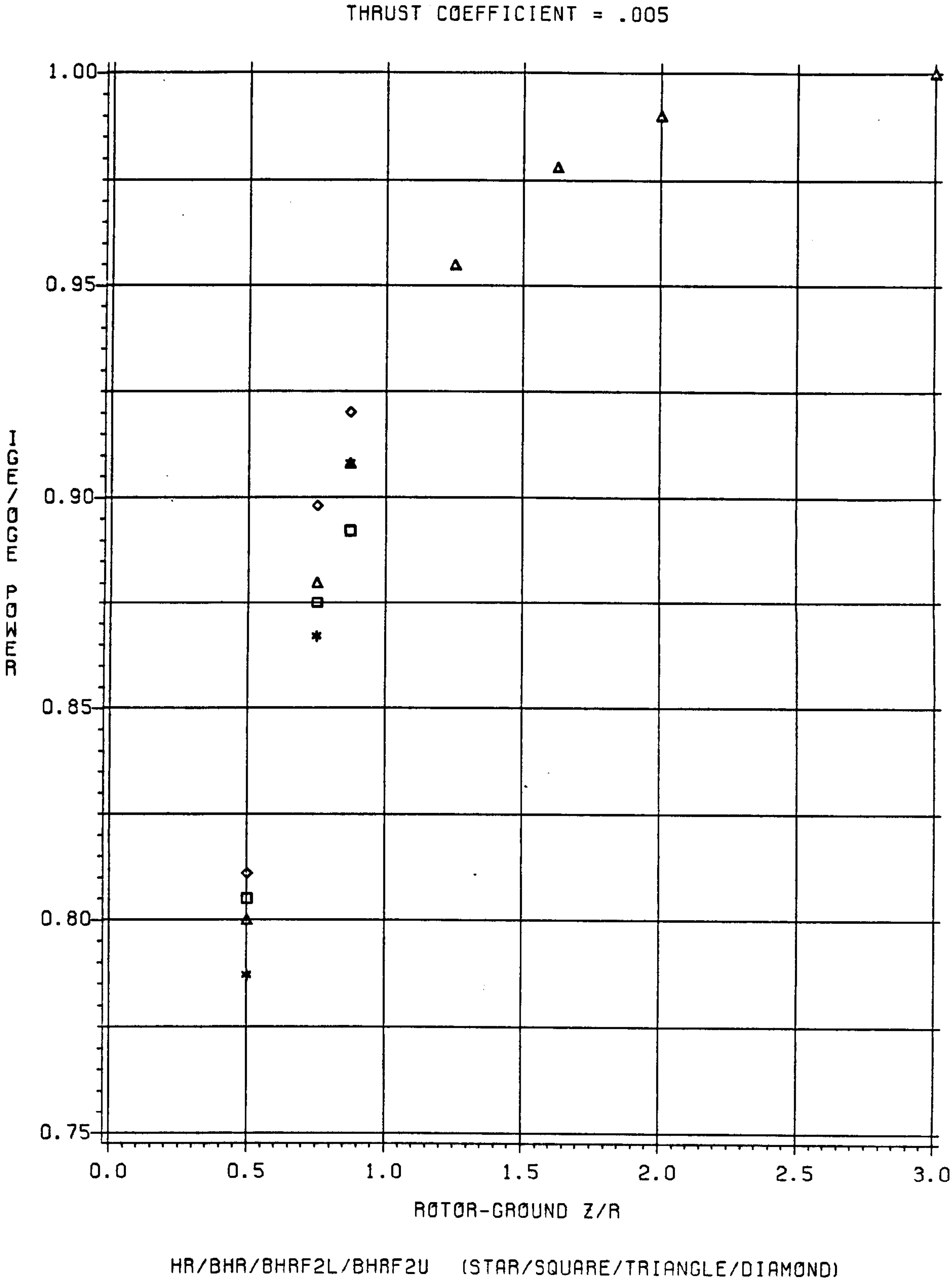


Figure 38. Ground effect on IGE/OGE hover power required.

As discussed in the fuselage section, tests were conducted at tip speeds of 158.5 m/s (520 fps) and 220.7 m/s (724 fps). Figures 39 through 42 present main rotor performance at these two tip speeds for configurations HR and BHRF2L under IGE and OGE conditions. Increasing tip speed caused a slight increase in power coefficient at constant thrust coefficient for most conditions. The only exception is the OGE high thrust coefficient data of configuration BHRF2L. Consequently, trends observed would not have been significantly altered by testing at the higher tip speeds.

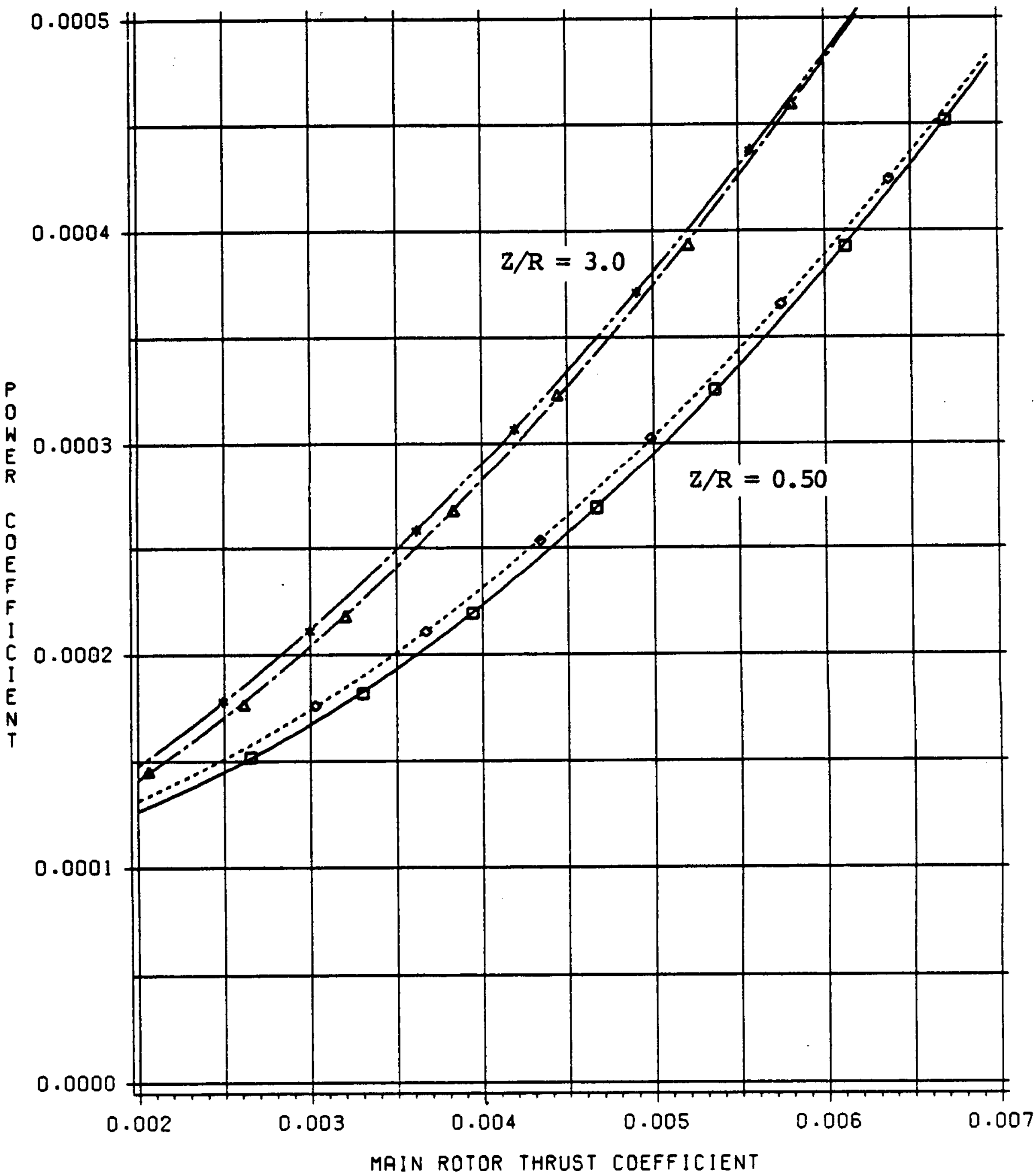
To this point in the discussion fuselage and rotor performance have been treated separately. However, it is worthwhile evaluating the effect of mutual rotor/fuselage interaction on the main rotor performance. Data from Figures 17, 18, 27, and 31 were utilized to calculate the rotor performance of configurations BHR, BHRF2L, and BHRF2U, with the assumption that each configuration is operating at an aircraft weight coefficient. Given a weight coefficient, download was obtained and added to the weight coefficient to determine thrust coefficient. The results of this test indicate that under OGE conditions this becomes an iterative process since download is a function of thrust. This effect tends to reduce the download by 0.1 percent when comparing download at the required thrust coefficient as opposed to weight coefficient. Once the thrust coefficient is calculated, the power coefficient is obtained from Figures 27 and 31. The results are compared to isolated rotor performance (HR) and shown in Figure 43. The net result at a weight coefficient of .005 is that configuration BHRF2L and BHR respectively required 9.9 and 3.1 percent more power than the isolated rotor. Configuration BHRF2U increases the power required over the isolated rotor by 4.5. percent.

Forward Flight Test Results

The results of the LTV low speed tunnel test are presented in three sections, 1) fuselage data, 2) rotor data, and 3) pressure data.

<u>Fuselage Force and Moment Data</u> - The following fuselage data is presented in nondimensional form. Only the longitudinal aerodynamic characteristics lift, drag and pitching moment will be presented for discussion. Due to the quantity of data taken during this test, a limited number of graphical comparisons considered to be characteristic of the test results will be presented.

CONFIGURATION HR, Z/R = .5 (RUNS 124 & 125) = 3.0 (RUNS 129 & 130)



TIP SPEED = 221/159 MPS (724/520 FPS) (DIAMOND & STAR/TRIANGLE & SQUARE)

Figure 39. Effect of tip speed on configuration HR IGE and OGE hover performance.

C - 2

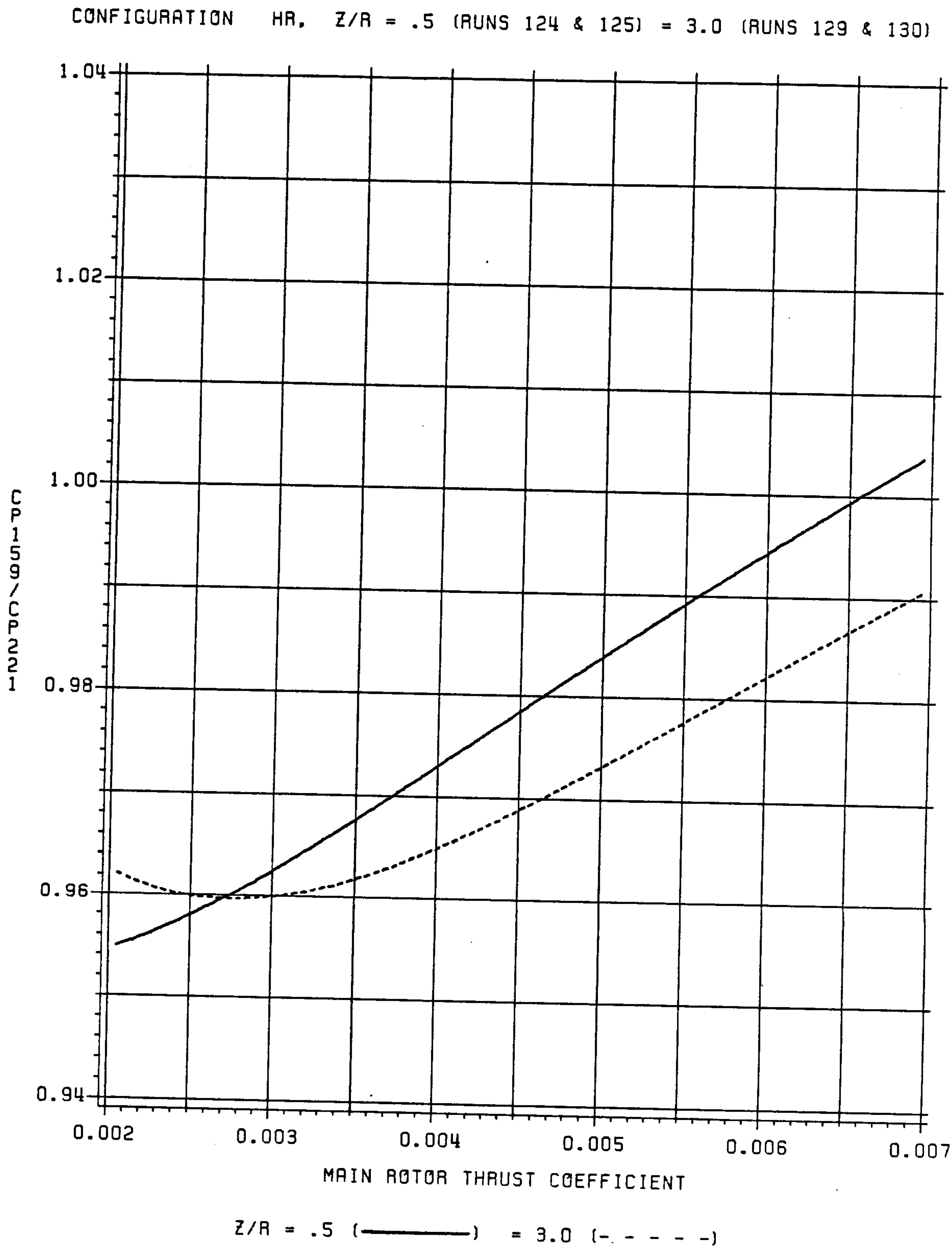
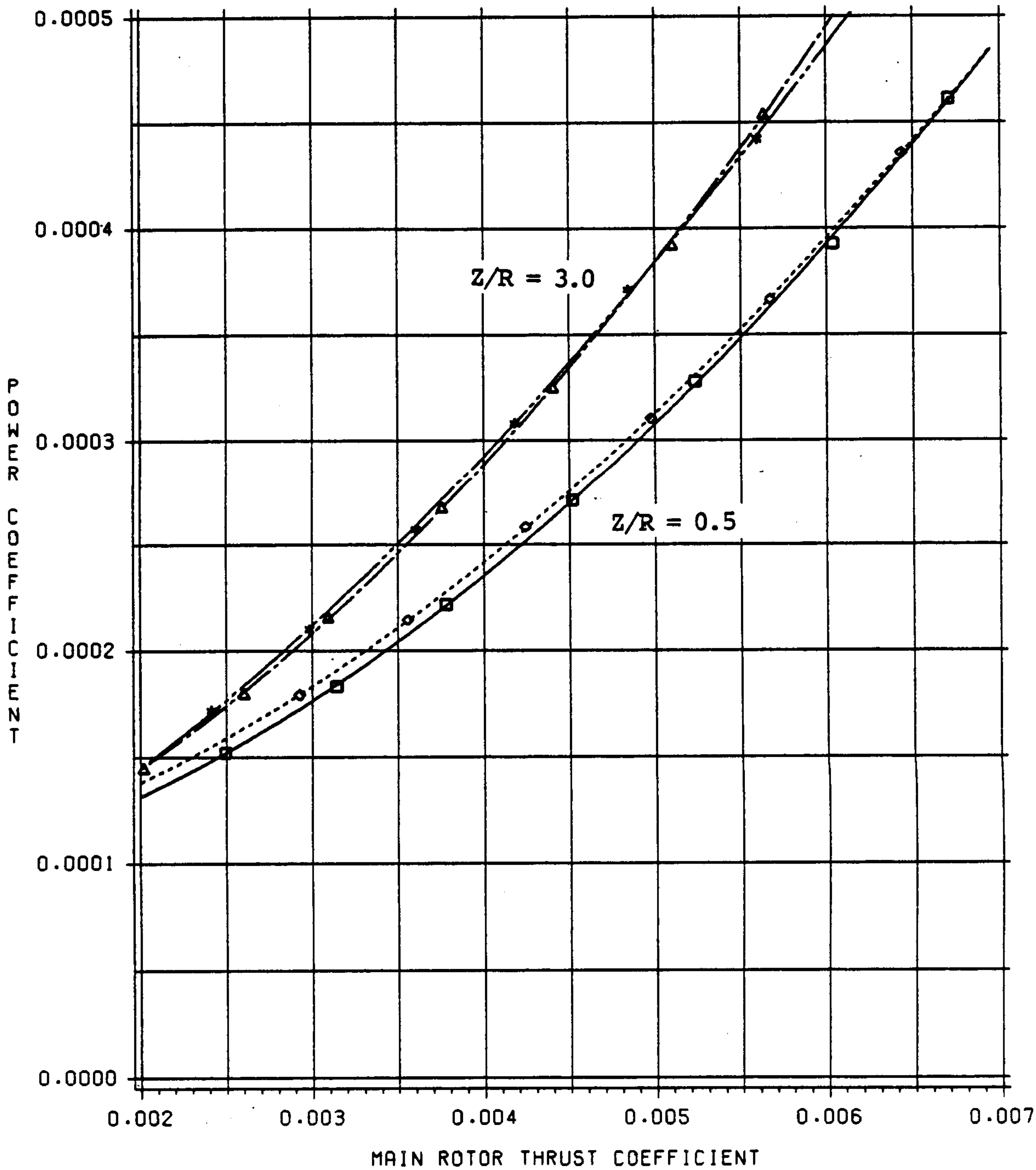


Figure 40. Configuration HR power ratio for tip speeds of 159 m/s and 221 m/s.

CONFIGURATION BHRF2L Z/R = 0.5 (RUNS 108 & 111) = 3.0 (RUNS 112 & 113)



TIP SPEED = 221/159 MPS (724/520 FPS) (DIAMOND & STAR/TRIANGLE & SQUARE)

Figure 41. Effect of tip speed on configuration BHRF2L IGE and OGE hover performance.

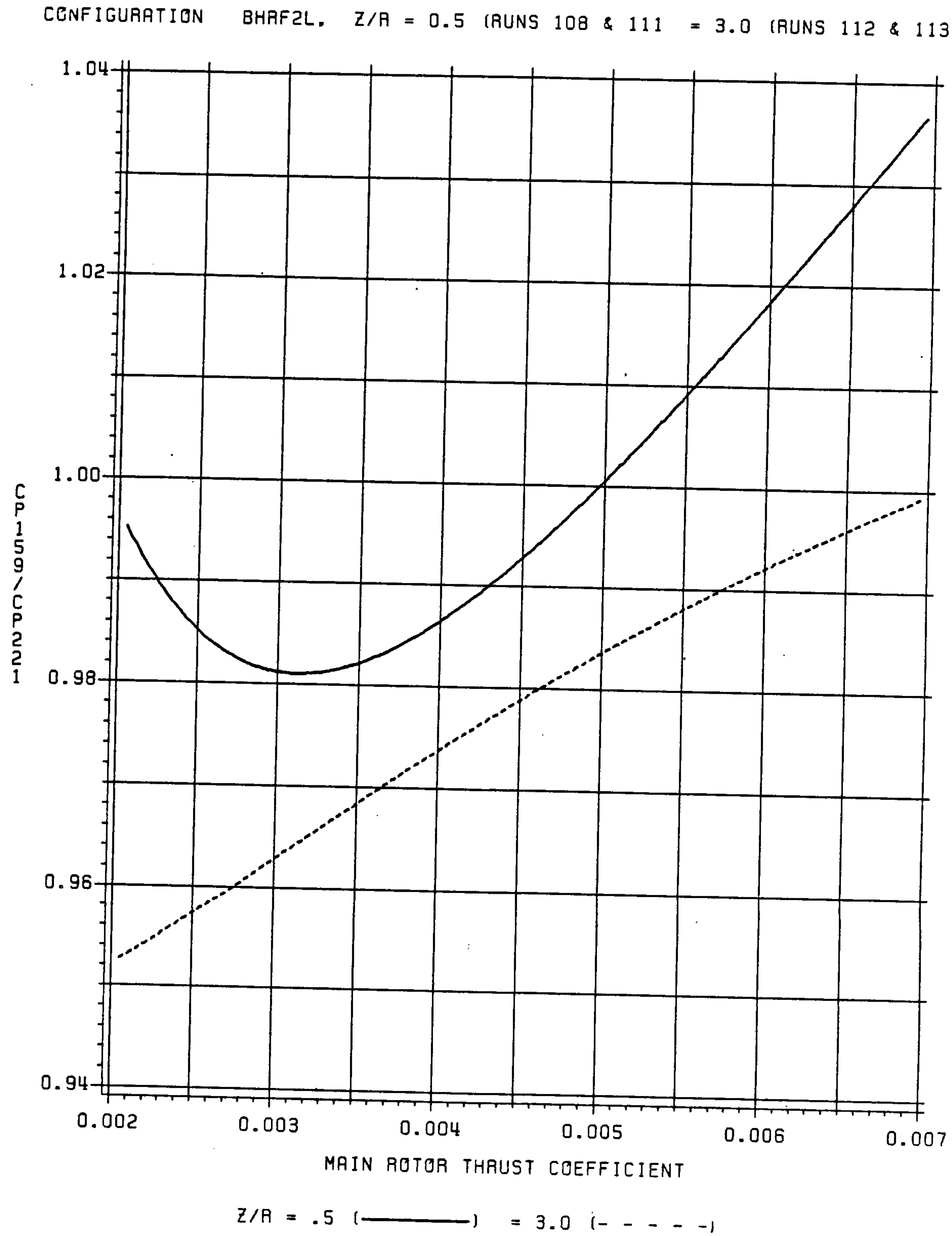


Figure 42. Configuration BHRF2L power ratio for tip speeds of 159 m/s and 221 m/s.

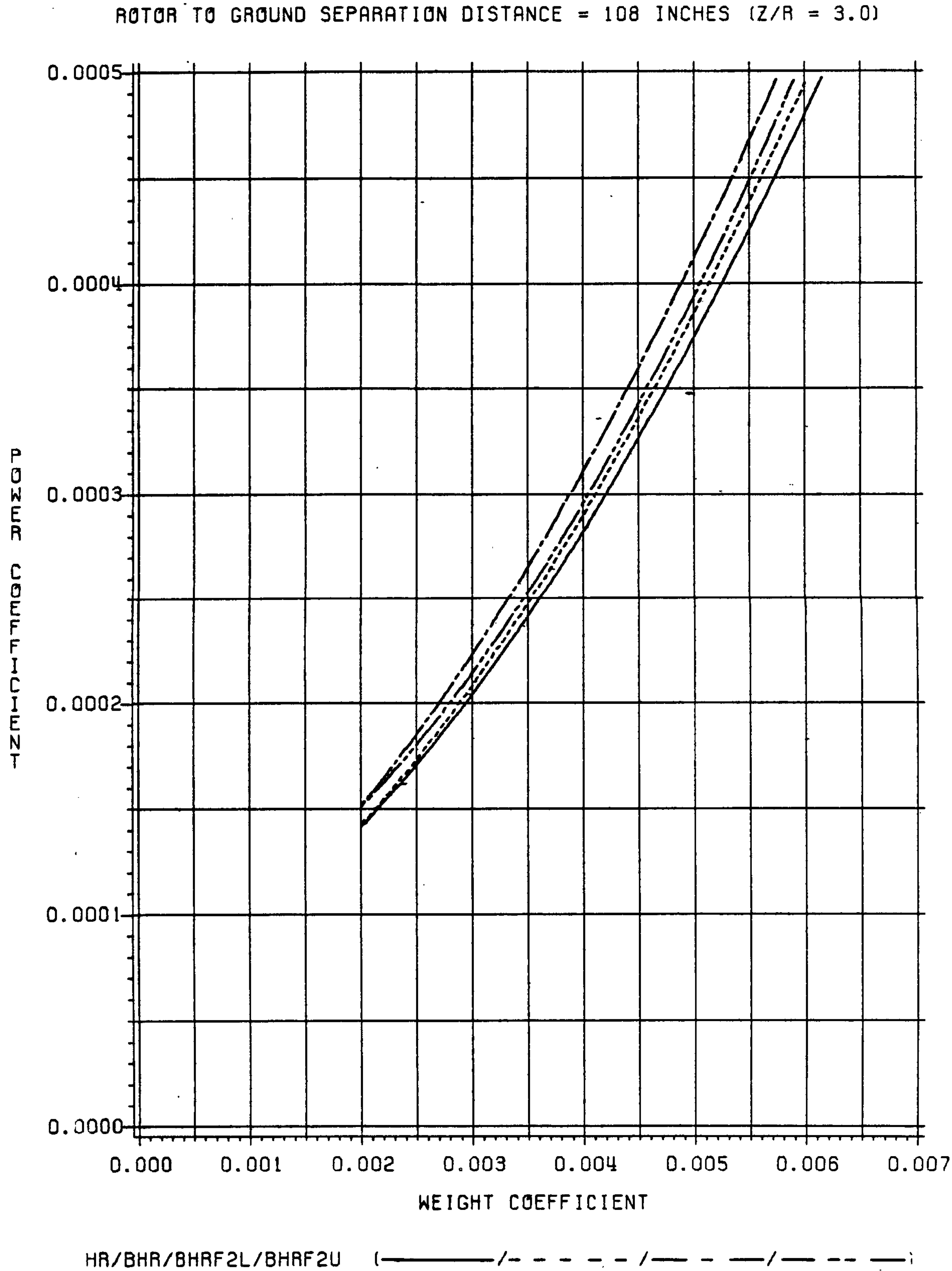


Figure 43. The effect of mutual rotor-fuselage interaction on main rotor power required.

For conventional model force and moment tests, data is taken at Reynolds numbers as high as possible and divided by the test dynamic pressure. The data is considered to be applicable over the majority of the speed range for a geometrically similar full-scale aircraft after corrections for leakage, protuberances, etc. For this test the rotor-off force and moment data was taken over the powered configuration speed range and not assumed to be independent of Reynolds number due to the scale of the model tested. This does not assure that the viscous effects on the body aerodynamic characteristics are the same for the powered and unpowered configurations at a given airspeed. However, it may identify any changes in the body aerodynamic characteristics which might lead to incorrect conclusions concerning full-scale interactions. Figures 44 through 52 present data for configurations BF2L, BHF2L, and BHRF2L to show the effect of the rotor on body aerodynamic characteristics. The data was non-dimensionalized by dynamic pressure, maximum body cross-sectional area, and maximum body diameter when appropriate which is similar to a form used in References 10 and 13. This form was chosen for a twofold purpose, first, to identify any variations in rotor-off body characteristics as discussed above and secondly, to determine the nature of the rotors effect with airspeed. Although drift in dynamic pressure was experienced at a speed ratio of 0.10, the 0.10 data is being presented for its qualitative value. The figures are presented for specific speed ratios to identify the rotor test condition.

Data for the rotor-off configurations, BF2L and BHF2L, correspond to Reynolds numbers based on rotor-on speed ratio and sea level standard conditions. The rotor-off data shows a definite change in lift and drag as a function of airspeed with pitching moment not changing as significantly. This is not the case, however, with the winglets removed (BHFW0). The data for BHFW0 remained quite constant for speed ratios of 0.2 and 0.3. Only at the speed ratio of 0.1 (1.5M Reynolds number) is there any indication of change in the aerodynamic characteristic of the body (see Appendix B for BHFW0 graphical data). Figures 53 and 54 show the rotor-off winglet lift and drag characteristics which were obtained from configurations BHF2L and BHFWO. The conclusion drawn from these two figures is that major changes with airspeed for the unpowered conditions appear to be the result of changes in the aerodynamic characteristics of the winglets.

Evaluating the rotor-on data is complex since the rotor interacts with the fuselage and winglets; and the rotor wake changes its skew angle with airpseed and thrust. There is a definite trend for the rotor-on and rotor-off data to converge with increased airspeed implying the influence of wake position;

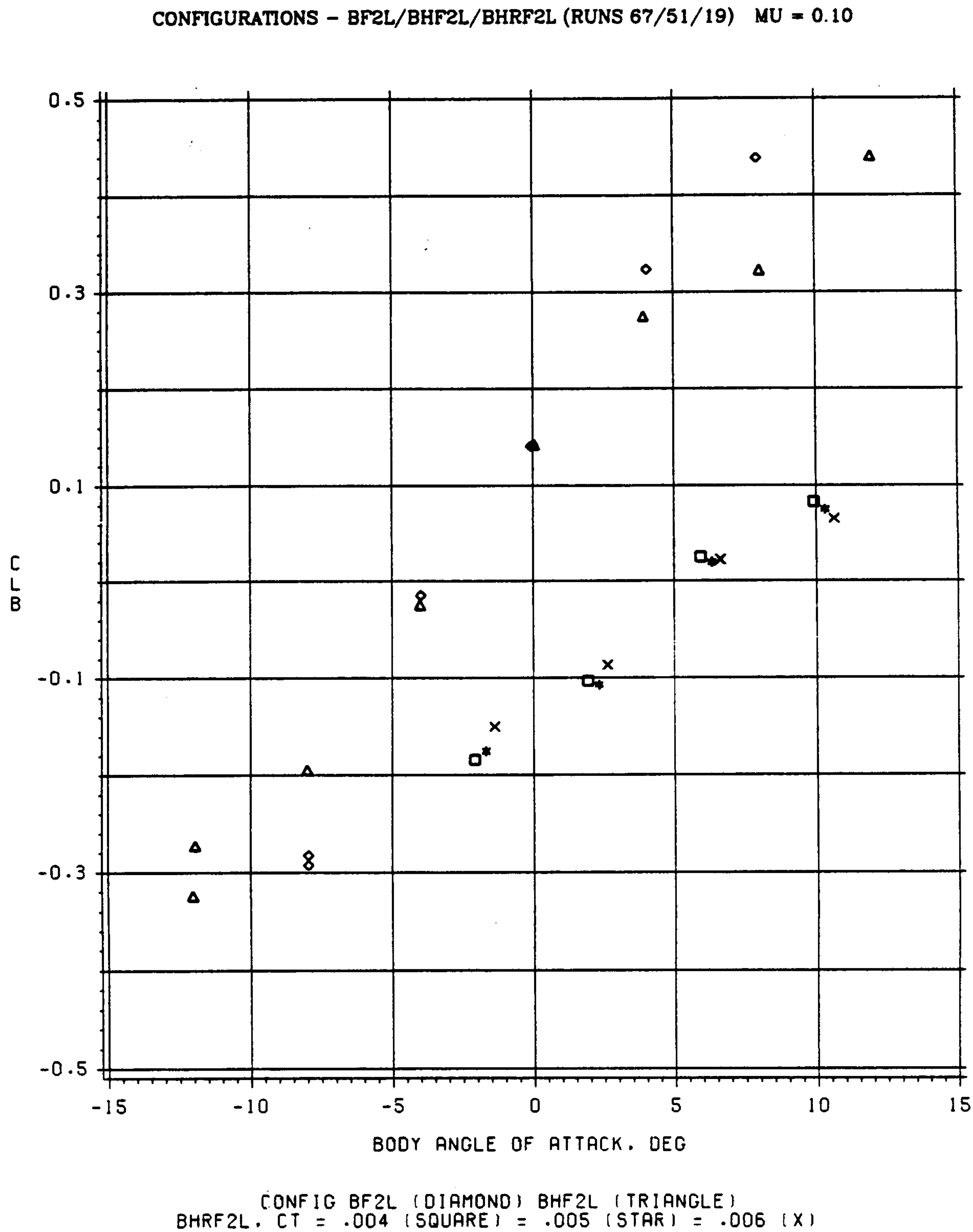
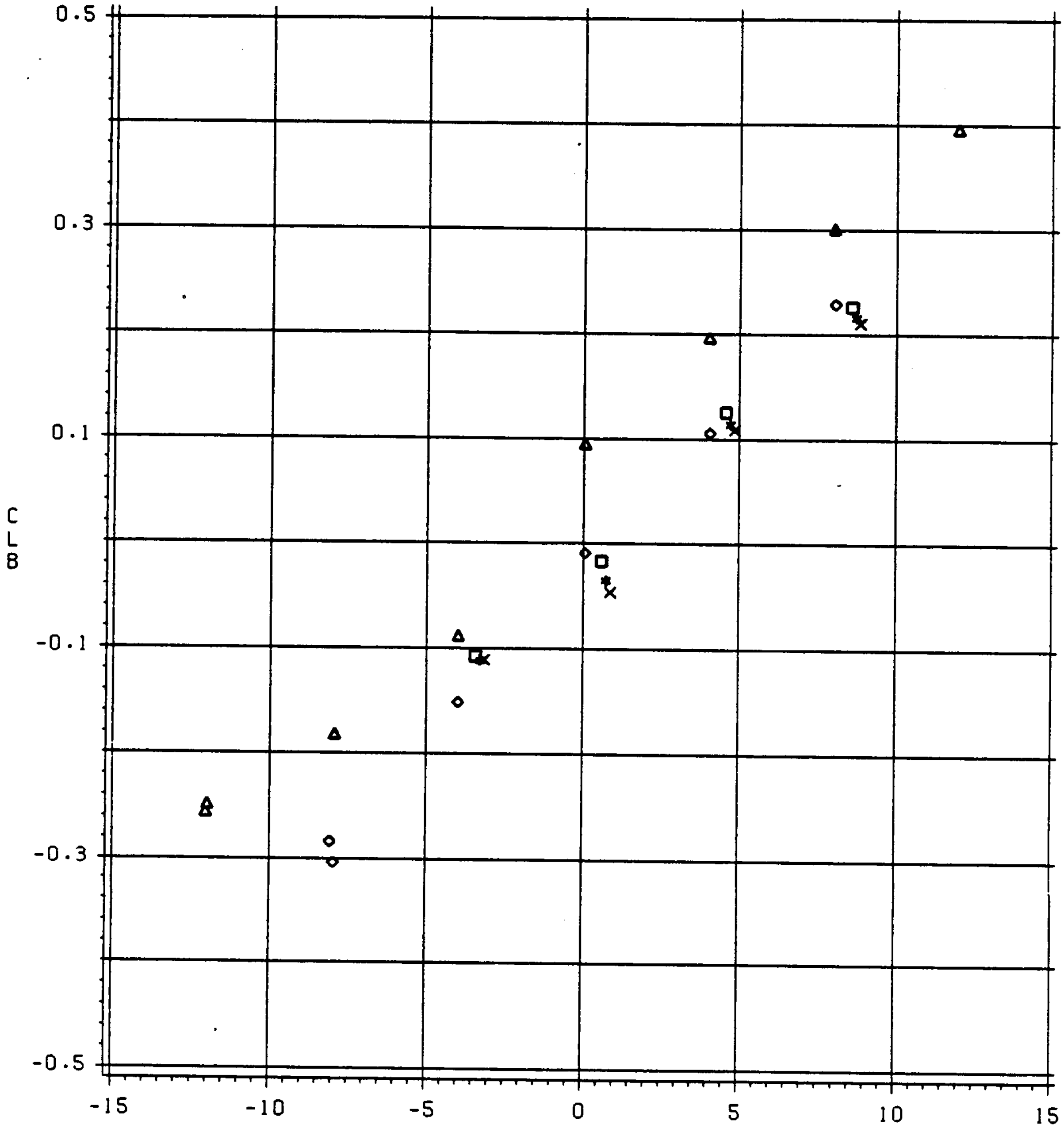


Figure 44. Rotor effect on BHRF2L body lift coefficient, μ=0.10.

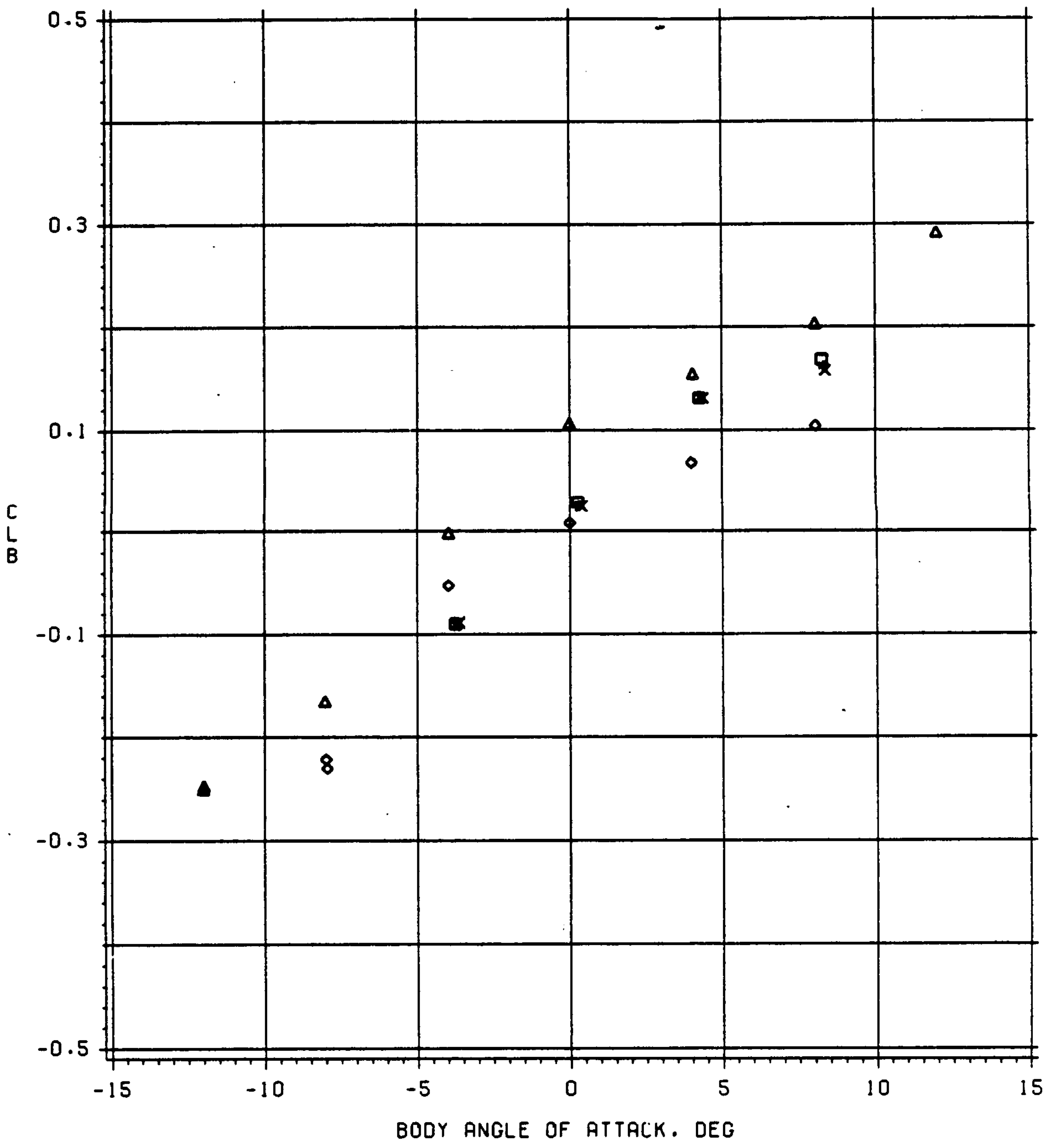
CONFIGURATIONS - BF2L/BHF2L/BHRF2L (RUNS 68/53/21) MU = 0.20



CONFIG BF2L (DIAMOND) BHF2L (TRIANGLE)
BHRF2L, CT = .004 (SQUARE) = .005 (STAR) = .006 (X)

Figure 45. Rotor effect on BHRF2L body lift coefficient, μ=0.20.

CONFIGURATIONS - BF2L/BHF2L/BHRF2L (RUNS 69/55/23) MU = 0.30



CONFIG BF2L (DIAMOND) BHF2L (TRIANGLE)
BHRF2L, CT = .004 (SQUARE) = .005 (STAR) = .006 (X)

Figure 46. Rotor effect on BHRF2L body lift coefficient, μ=0.30.

CONFIGURATIONS – BF2L/BHF2L/BHRF2L (RUNS 67/51/19) MU = 0.10

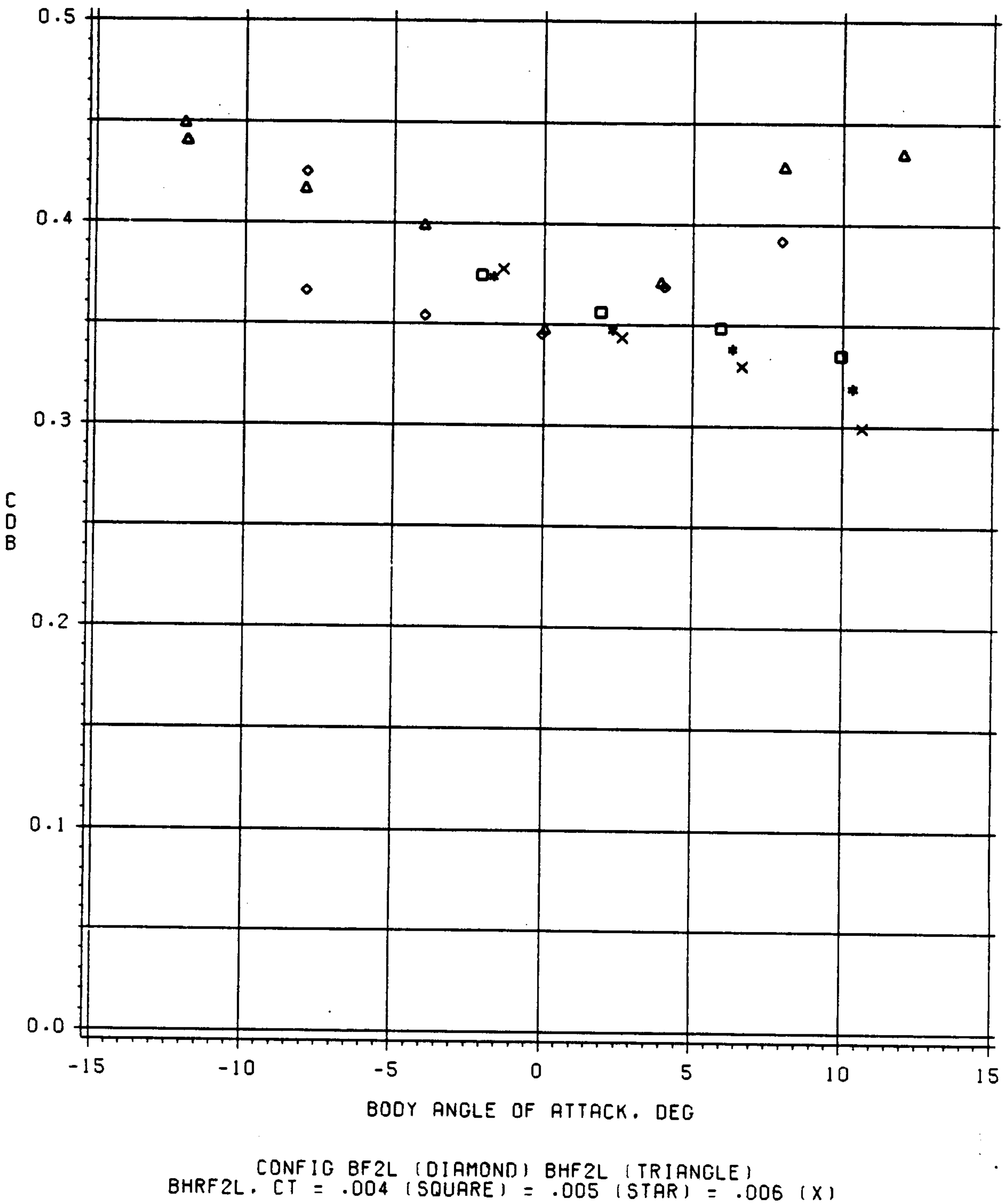


Figure 47. Rotor effect on BHRF2L body drag coefficient, μ=0.10.

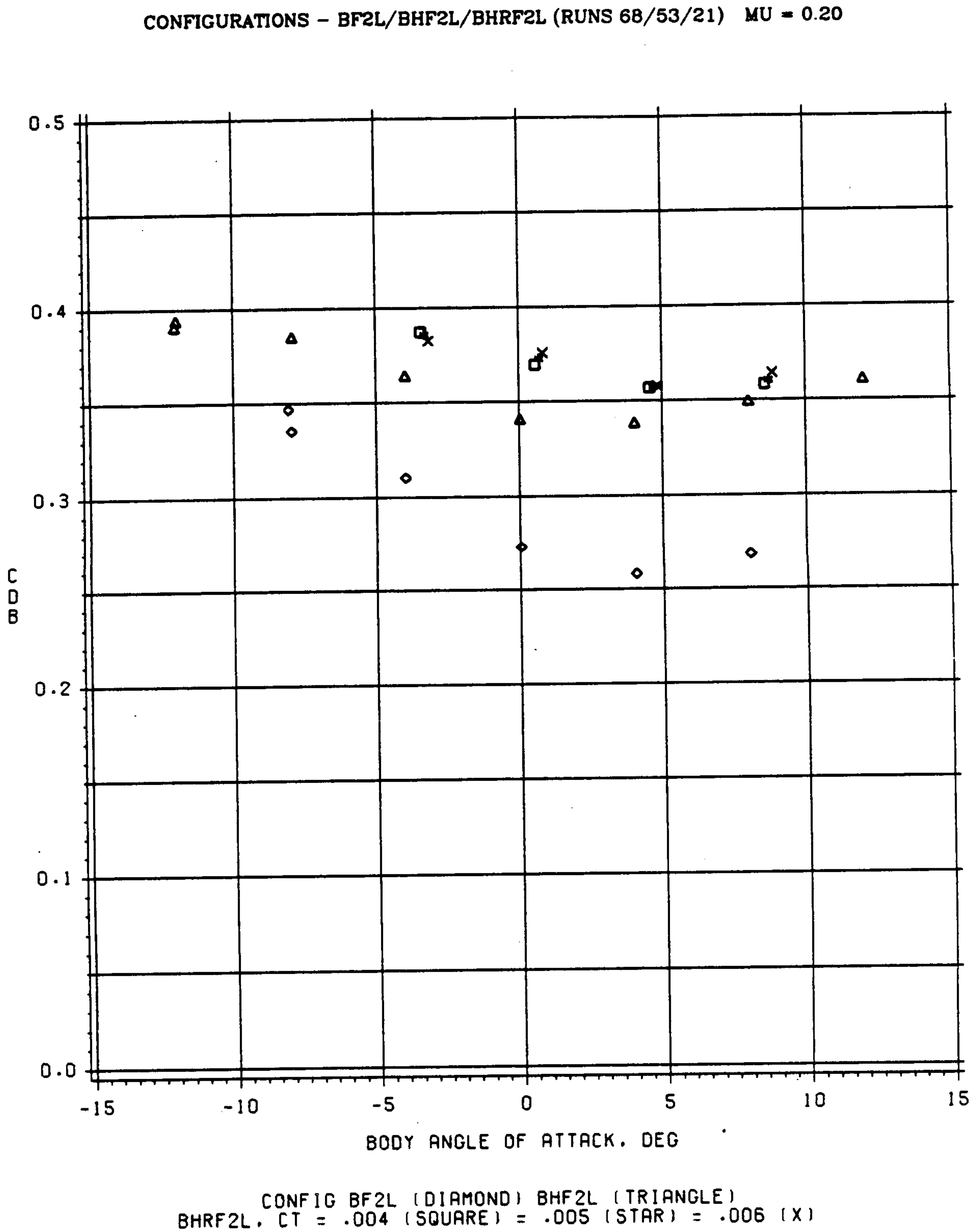
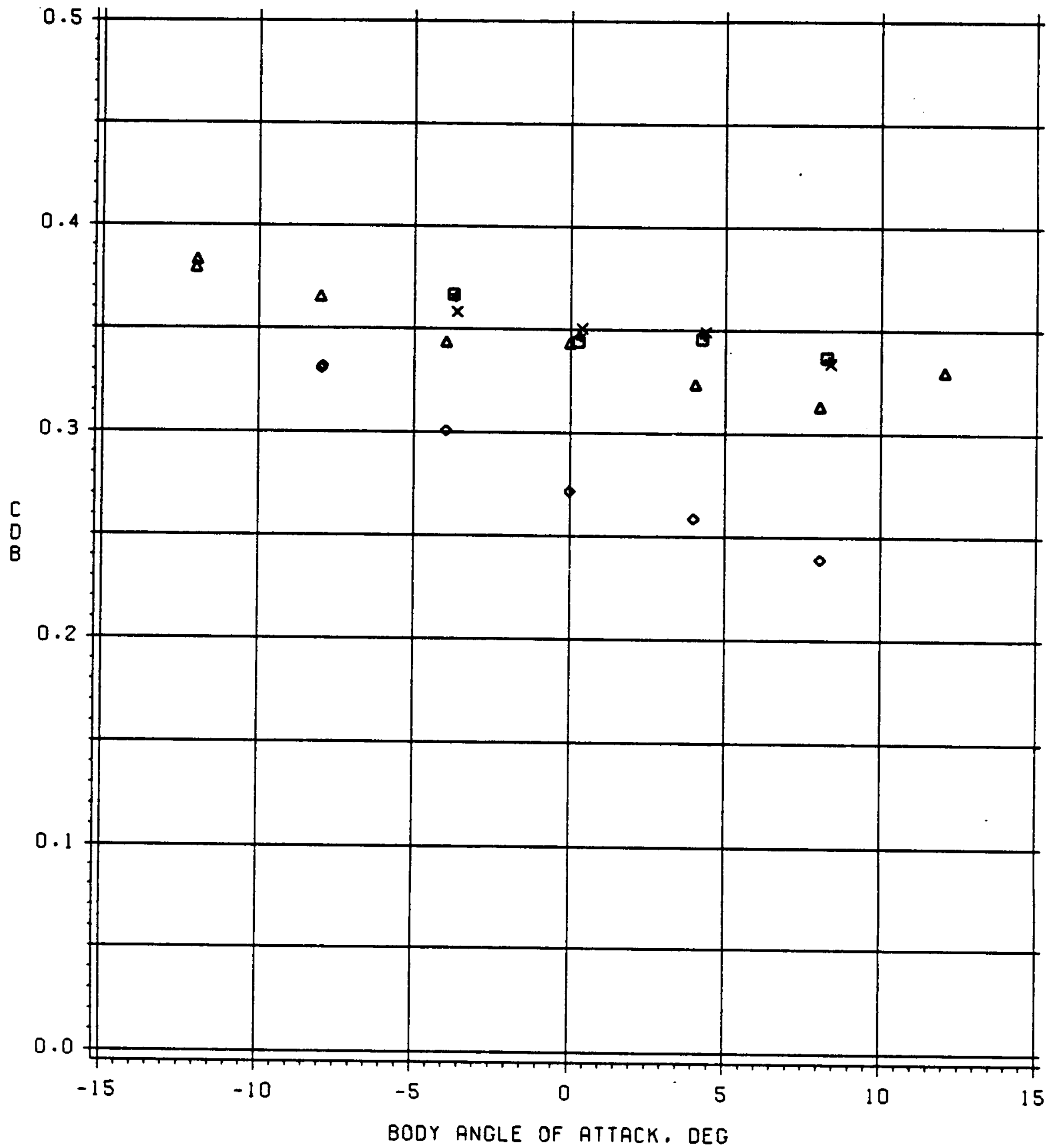


Figure 48. Rotor effect on BHRF2L body drag coefficient, μ=0.20.

CONFIGURATIONS - BF2L/BHF2L/BHRF2L (RUNS 69/55/23) MU = 0.30



CONFIG BF2L (DIAMOND) BHF2L (TRIANGLE)
BHRF2L, CT = .004 (SQUARE) = .005 (STAR) = .006 (X)

Figure 49. Rotor effect on BHRF2L body drag coefficient, μ=0.30.

CONFIGURATIONS - BF2L/BHF2L/BHRF2L (RUNS 67/51/19) MU = 0.10

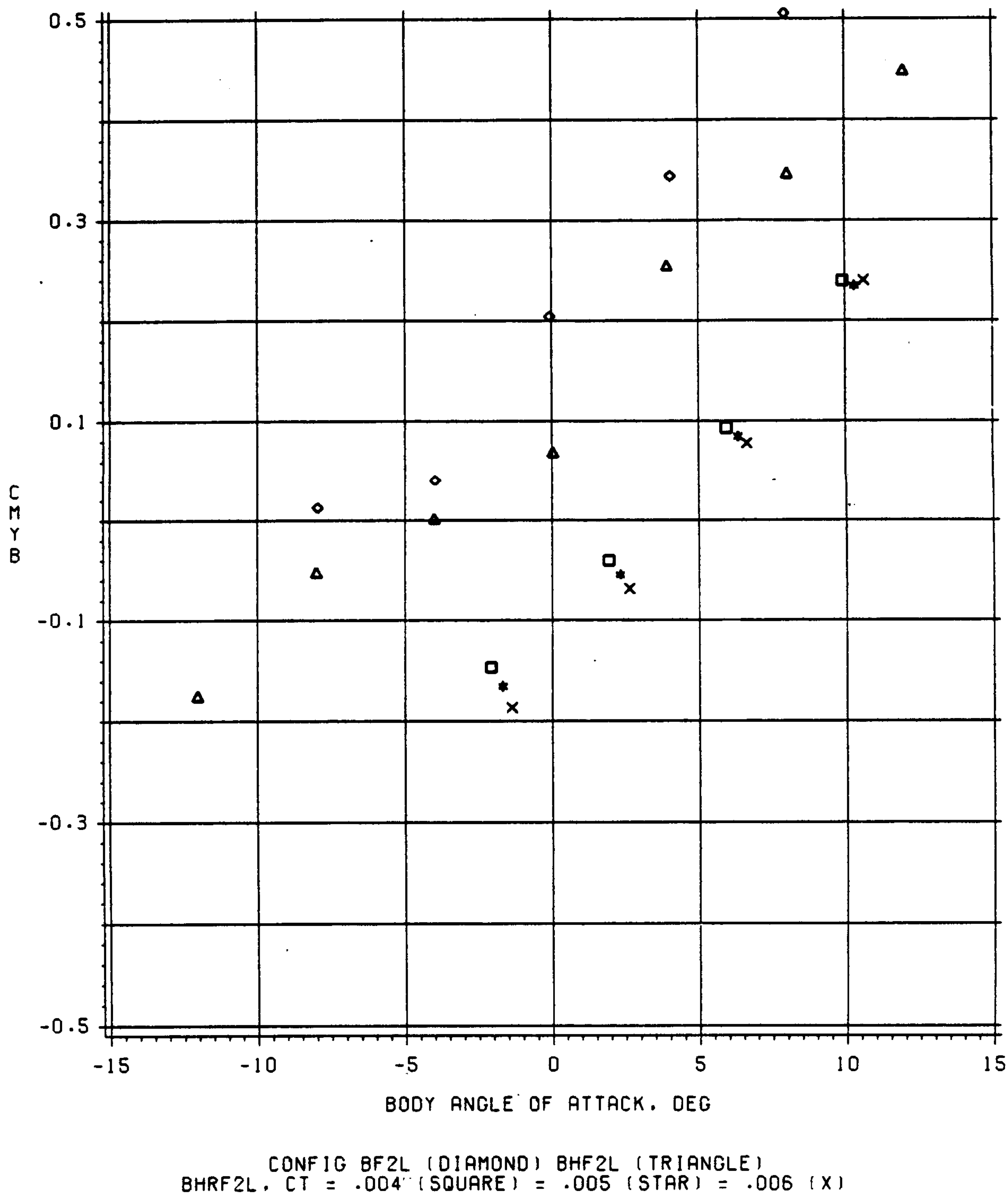


Figure 50. Rotor effect on BHRF2L body pitching moment coefficient, μ=0.10.

CONFIGURATIONS - BF2L/BHF2L/BHRF2L (RUNS 68/53/21) MU = 0.20

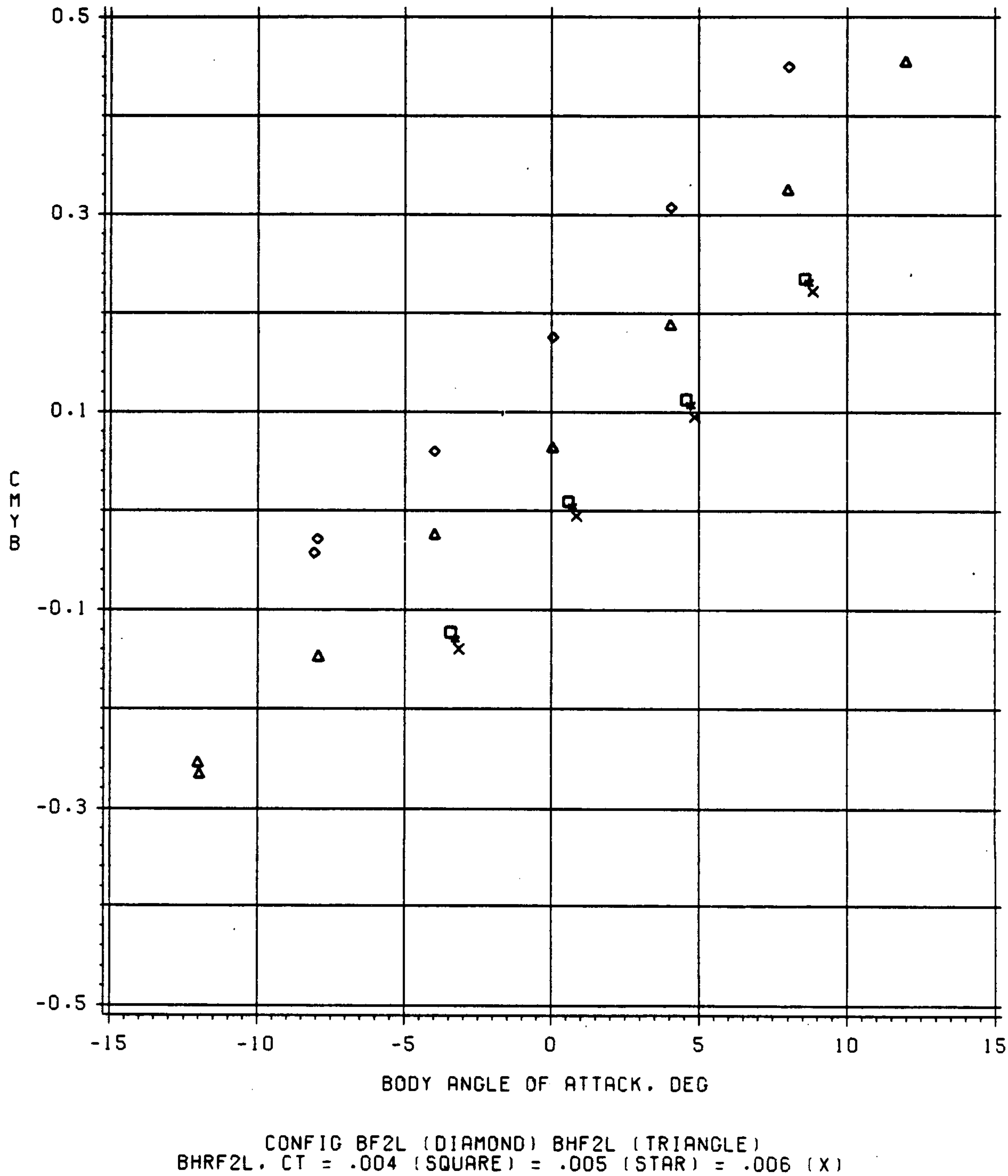


Figure 51. Rotor effect on BHRF2L body pitching moment coefficient, μ=0.20.

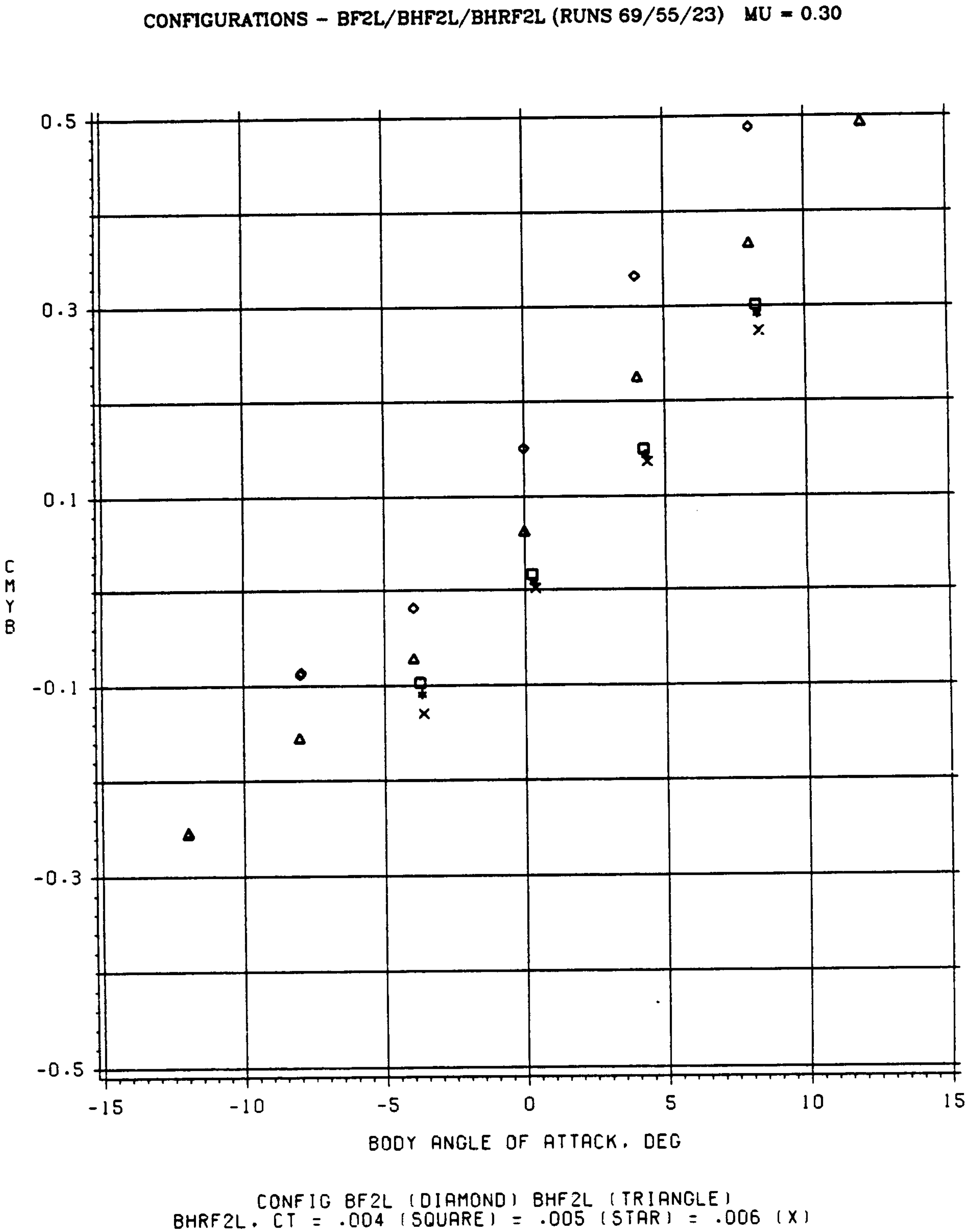


Figure 52. Rotor effect on BHRF2L body pitching moment coefficient, μ=0.30.

CONFIGURATIONS BHF2L/BHFW0 (RUNS 51,53,55/56,57,58)

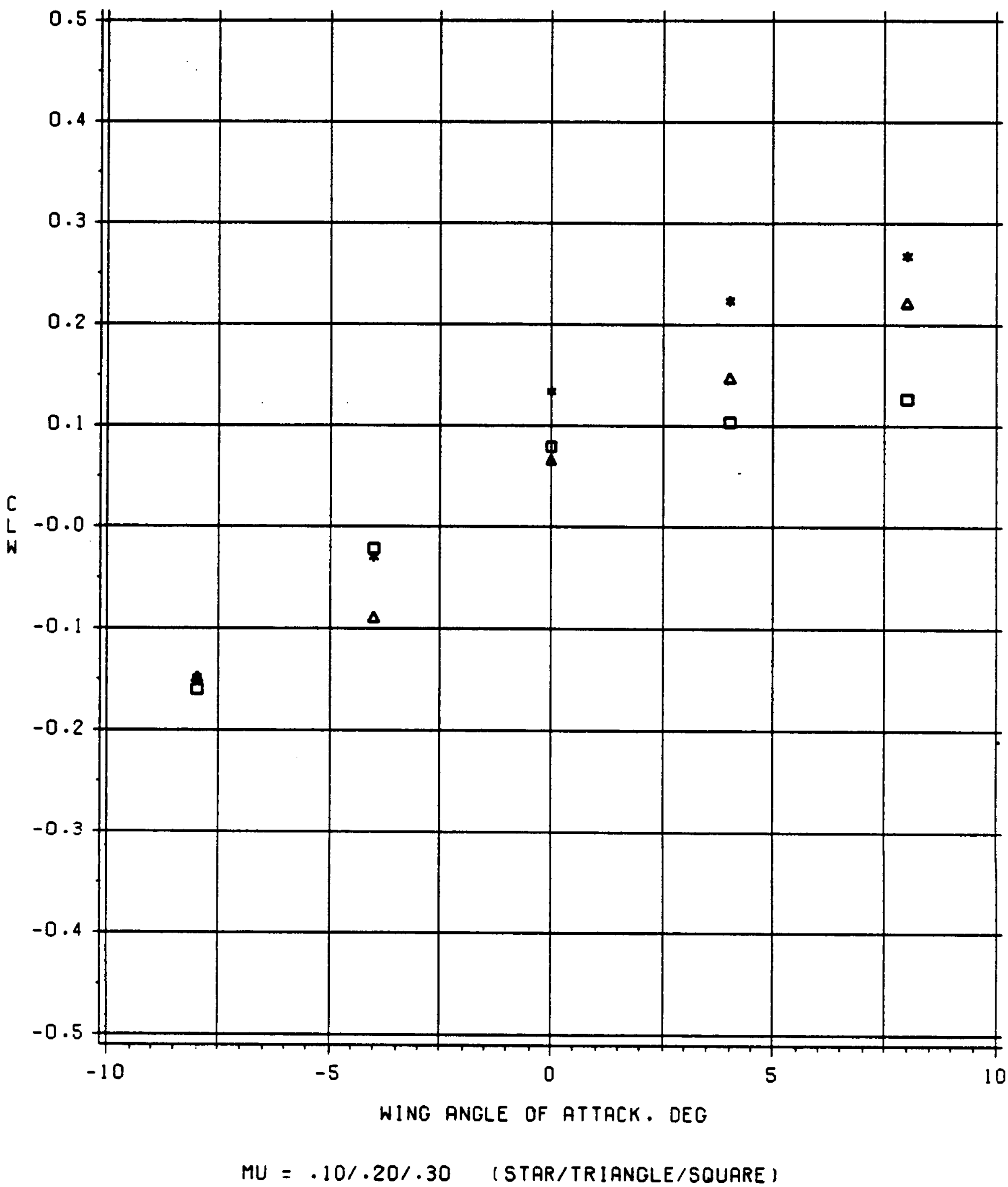


Figure 53. Wing lift coefficient versus angle of attack.

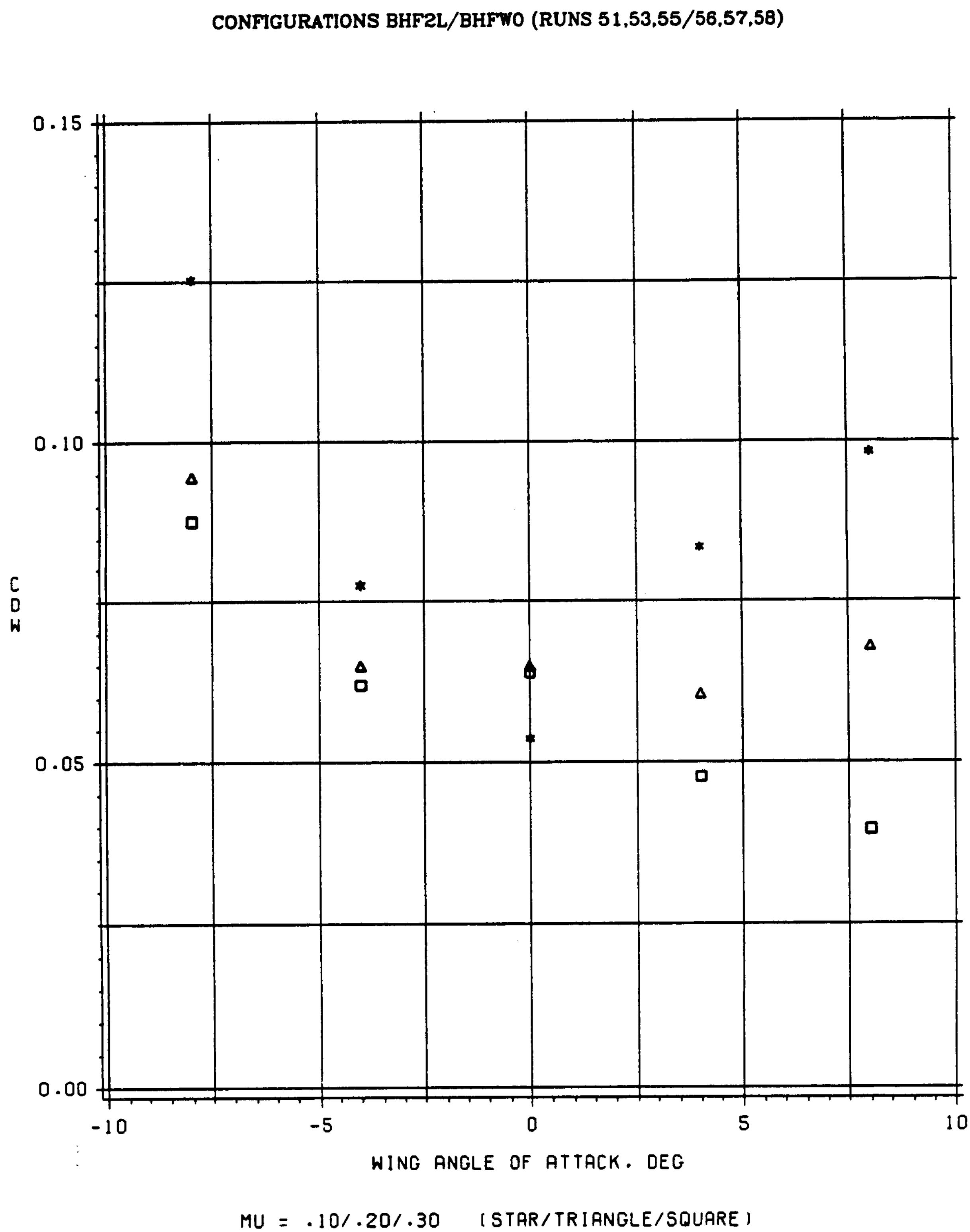
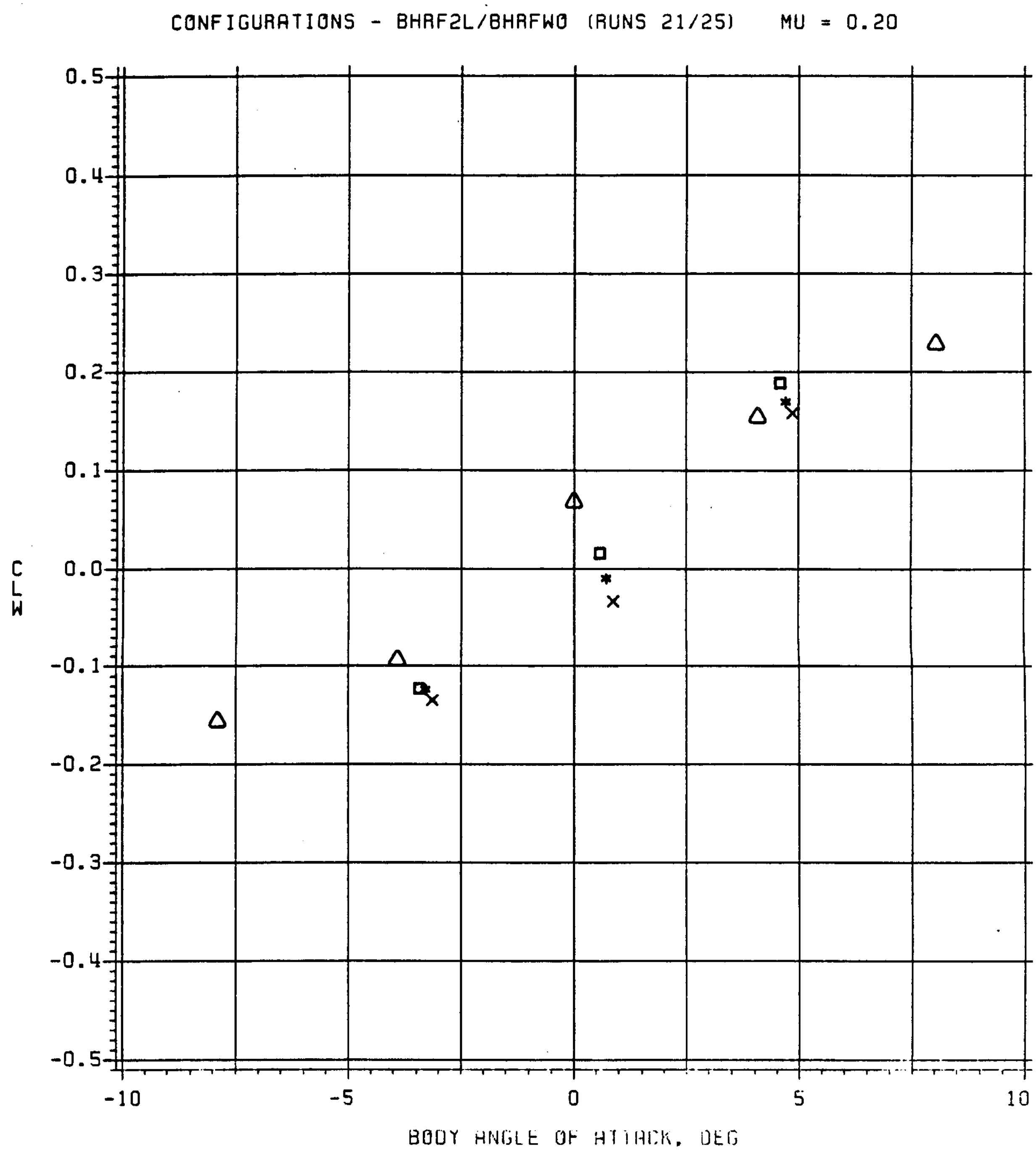


Figure 54. Wing drag coefficient versus angle of attack.

consequently, rotor-on data cannot be obtained at high speeds and then simply divided by dynamic pressure for application at all speeds. Using the classical approach of calculating the rotors effect on the fuselage as a change in angle of attack based on momentum theory, one could explain the speed trend for pitching moment. However, the problem does not appear to be that simple at low speed for lift and drag. Note in Figure 44 the trend in body lift with thrust. This suggests that the rotor-on data at zero thrust does not converge anywhere near the rotor-off/hub-on configuration BHF2L. In Figure 47 the drag at low speed appears to converge, however, it may be more a combination of change in flow characteristics and angle of attack. This may explain the rotor-on drag falling below the rotor-off minimum at the positive angles of attack and higher thrust levels. At the higher speeds the general trends are for nondimensional lift and drag to behave more like a change in angle of attack based on simple momentum theory. For configuration BHRF2L the rotor tends to; 1) increase fuselage download with increased thrust, 2) increase drag, and 3) cause a more nose down pitching moment relative to rotor-off pitch ing moment characteristics. However, further analysis of the winglets is required to understand the above observations.

Limited lift and drag data for the winglets were obtained under powered conditions from configurations BHRF2L and BHRFW0. The results are shown in Figures 55 and 56 for a speed ratio of 0.2. For negative angles of attack the lift curve slope is the same for rotor-on or off conditions. However, this does not hold at positive angles of attack. The rotor-on data indicates no loss in lift as opposed to the rotor-off data. This may be due to the rotor adding energy to the flow around the winglets and delaying stall. The overall trend is for the winglet lift to decrease with increased thrust. In the time averaged sense this says that the main rotor downwash tends to decrease the winglet angle of attack. This should not be considered to be generally valid for all wings regardless of location on the body. The difference in drag between the powered and unpowered configurations of Figure 48 are greater than the difference in powered and unpowered winglet drag shown in Figure 56. Consequently, not all the rotor induced change in drag is directly attributable to the winglets. The winglets were located very close to the aerodynamic center selected for the resolution of pitching moment data; therefore, the effects of the winglets on pitching moment were minimal and is not shown. It may not be possible to completely segregate the causes for the trends observed to this point. No attempt was made to determine what effects were the result of scaling (Reynolds number), wing-body interference or a combination of both.

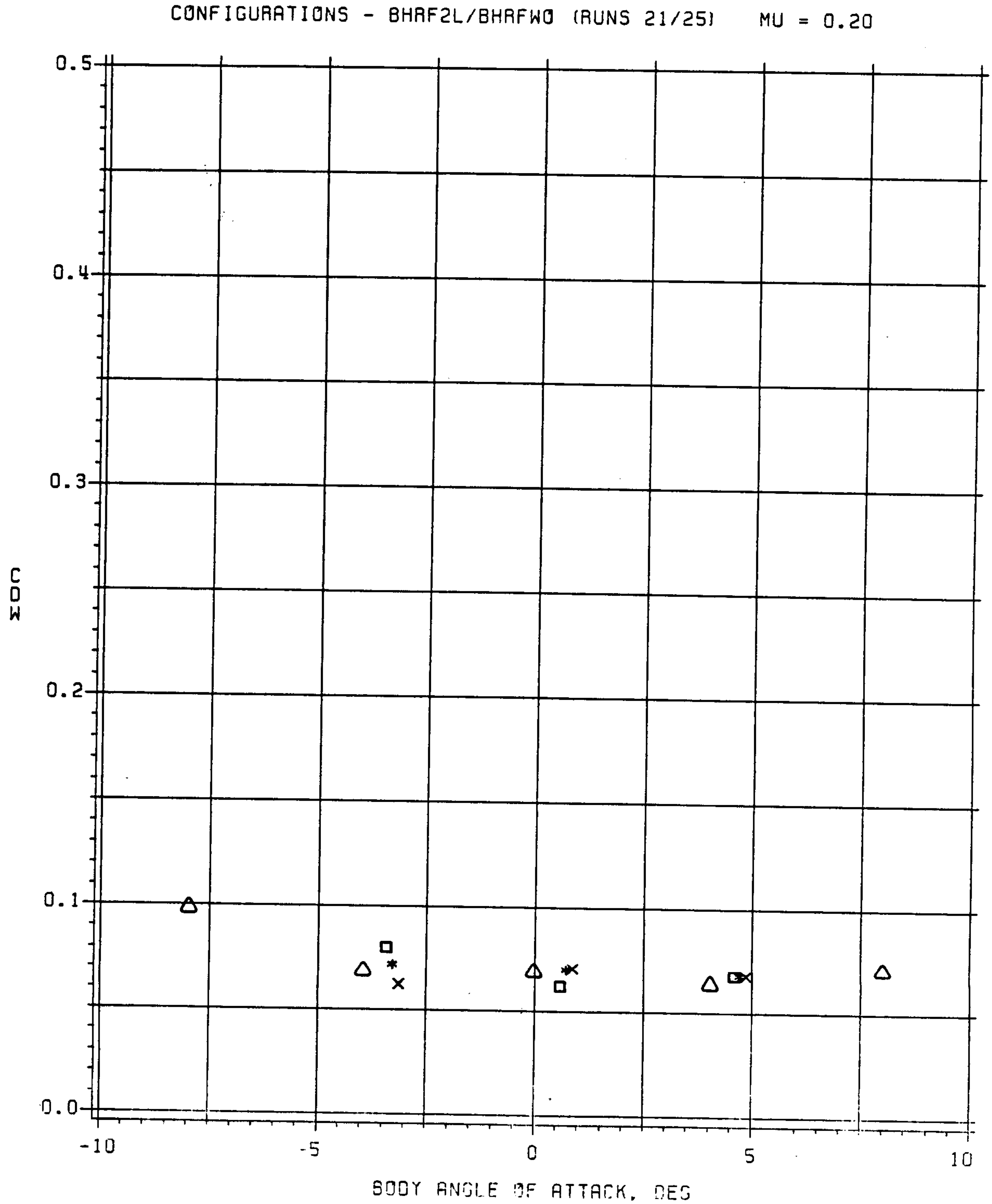
The above discussion concerned itself primarily with rotor effects on the total configuration, including winglets, and



Rotor-on, C_T = .004/.005/.006 (Square/Star/X)

Rotor-off, (Triangle)

Figure 55. Rotor effect on wing lift coefficient, μ=0.20.



Rotor-on, C_T = .004/.005/.006 (Square/Star/X)

Rotor-off, (Triangle)

Figure 56. Rotor effect on wing drag coefficient, μ=0.20.

winglet characteristics. The rotors effect on the fuselage alone, however, can be seen from configuration BHRFW0 data. Figures 57 through 59 present the effect of the rotor on fuselage lift, drag, and pitching moment. The body rotor-off lift characteristics are quite flat. The rotor tends to decrease lift with increase in body angle of attack; and the body lift increases with increased thrust. The trend with angle of attack is not inconsistent with configuration BHRF2L as can be seen from Figure 45. If the difference between rotor-on and rotor-off data from Figure 45 were plotted as body lift coefficient; the effect of the rotor, at a constant thrust, on body lift would be quite similar. The rotor effect on drag and pitching moment are also in agreement between configurations BHRF2L and BHRFW0 when considered on a delta basis rather than in terms of absolutes. The increase in body lift with increased thrust was also noted in References 10 and 13. The body lift characteristics with angle of attack may be due in part to the fairing below the body.

The remainder of the fuselage data will be presented in a form which may be more meaningful in determining configuration effects. Body lift will be divided by thrust to provide a better feel for the thrust requirements the body imposes on the rotor. Drag is also presented as a fraction of thrust which will define the differences in propulsive force requirements due to different configurations. Pitching moment is divided by thrust and rotor radius. Because most horizontal stabilizers are approximately one rotor radius away from the main rotor, this form will translate pitching moment into a download required for trim.

Figures 60 through 65 compare the force and moment data for all powered configurations at speed ratios of 0.2 and 0.3. These figures establish baseline aerodynamic characteristics of each configuration in the presence of the rotor. Lift, drag, and pitching moment are presented as a function of body pitch attitude (angle of attack). The data is presented at a thrust coefficient (.005) approximately equal to design thrust. At a speed ratio of 0.2, Figure 60, the extended nose configurations BHRF2L and BHRF2U both generally exhibit more lift than the body of revolution, BHR, for a given angle of attack. Figure 60b which references rotor-off (hub-on) body lift to the same thrust indicates similar trends. This implies that the lift curves of Figure 60a are inherent to each configuration. At a speed ratio of 0.3, Figure 61, the rotor-off lift trends still hold; however, the rotor-on trend for BHRF2L has changed considerably. Further reduction of body pressure data might be useful in understanding the BHRF2L data. Drag is presented in Figures 62 and 63 and appears to be consistent with rotor-off body data. The drag levels also appear to increase with exposed frontal area. Minimum drag was not reached and the lower test stand fairing is suspected of causing the resultant drag characteristic.

CONFIGURATIONS – BHFWO/BHRFWO (RUNS 56/25)   MU = 0.20

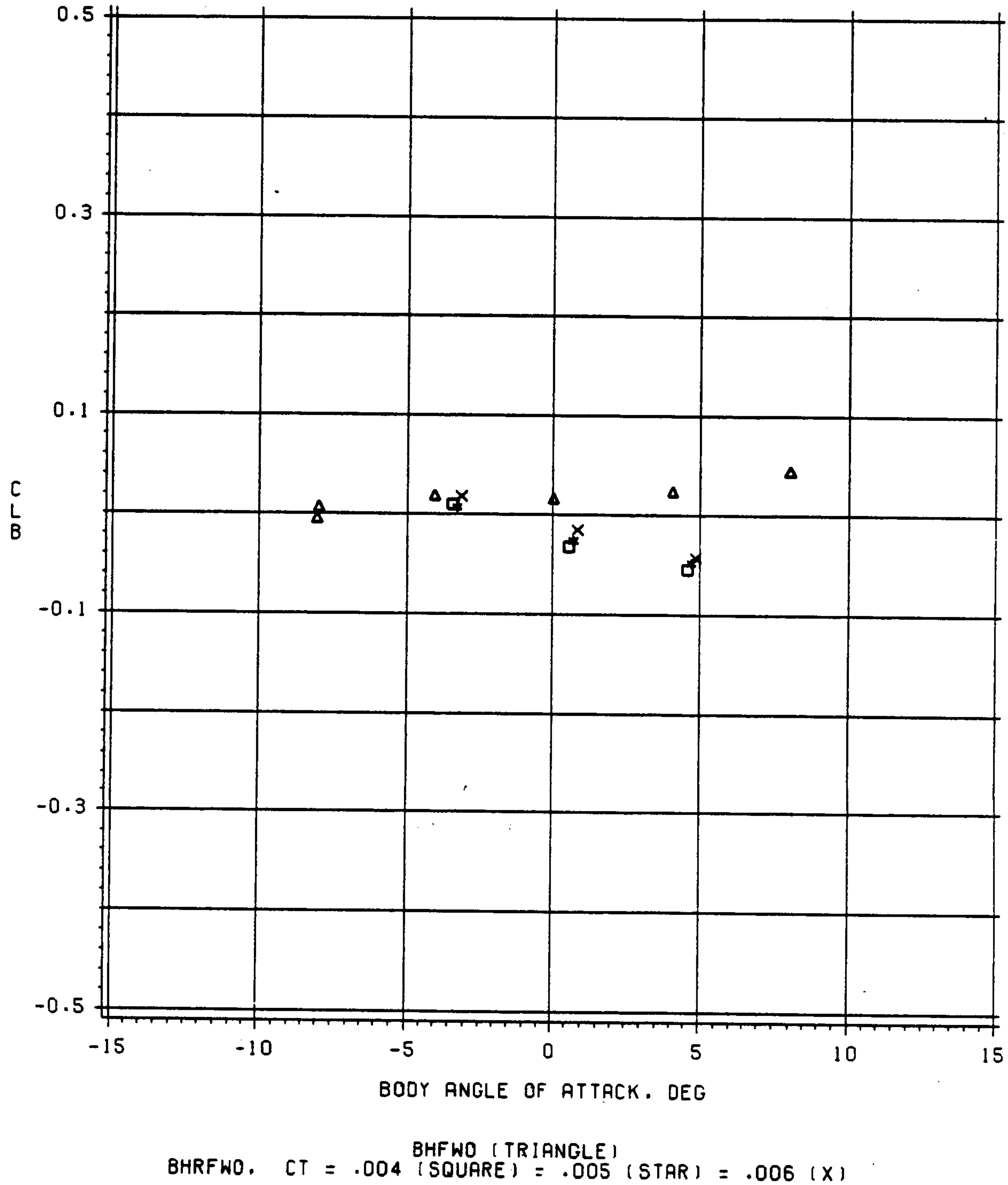


Figure 57. Rotor effect on BHRFWO body lift coefficient, μ=0.20.

CONFIGURATIONS – BHFWO/BHRFWO (RUNS 56/25) MU = 0.20

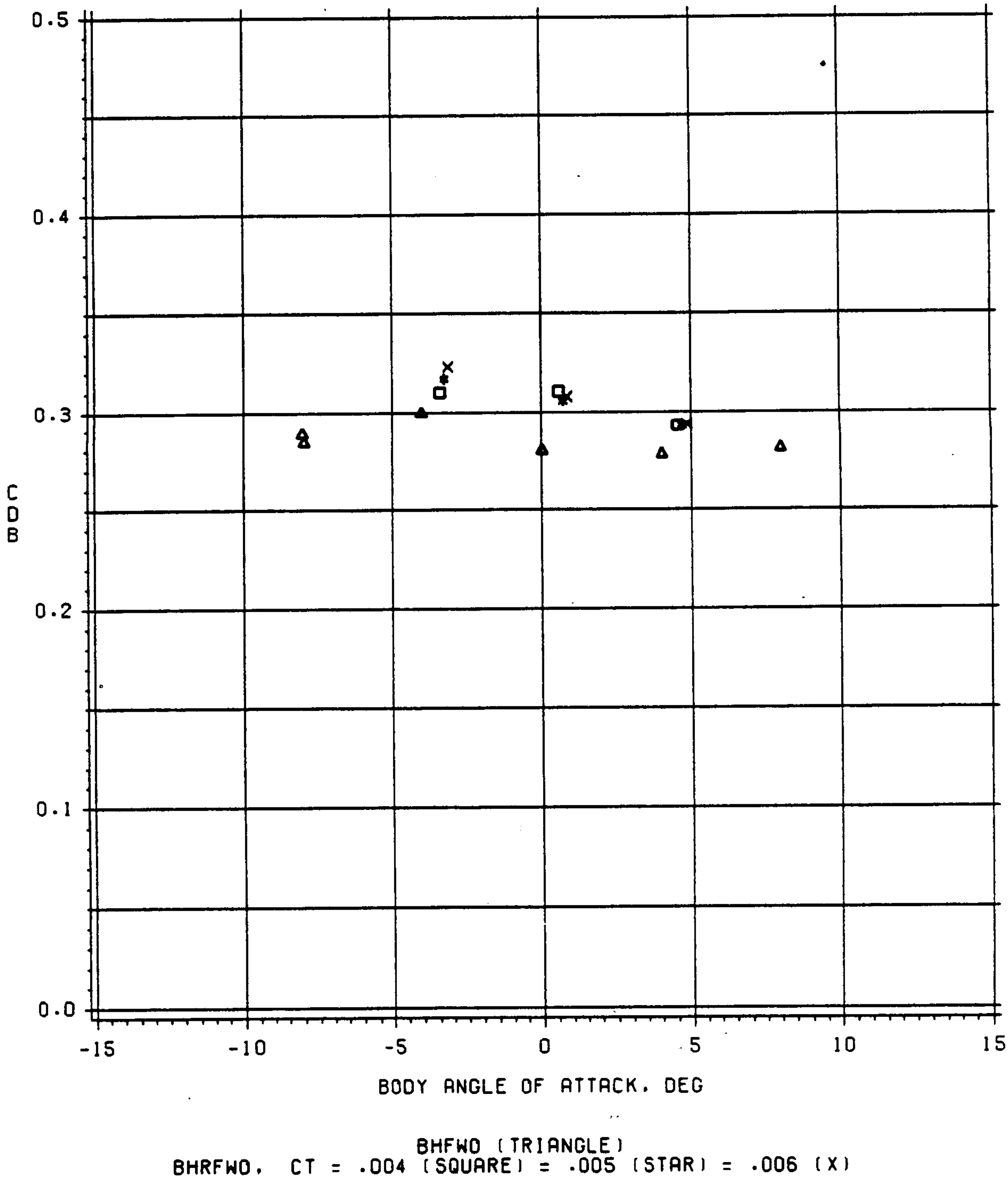


Figure 58. Rotor effect on BHRFWO body drag coefficient, μ=0.20.

CONFIGURATIONS – BHFWO/BHRFWO (RUNS 56/25) MU = 0.20

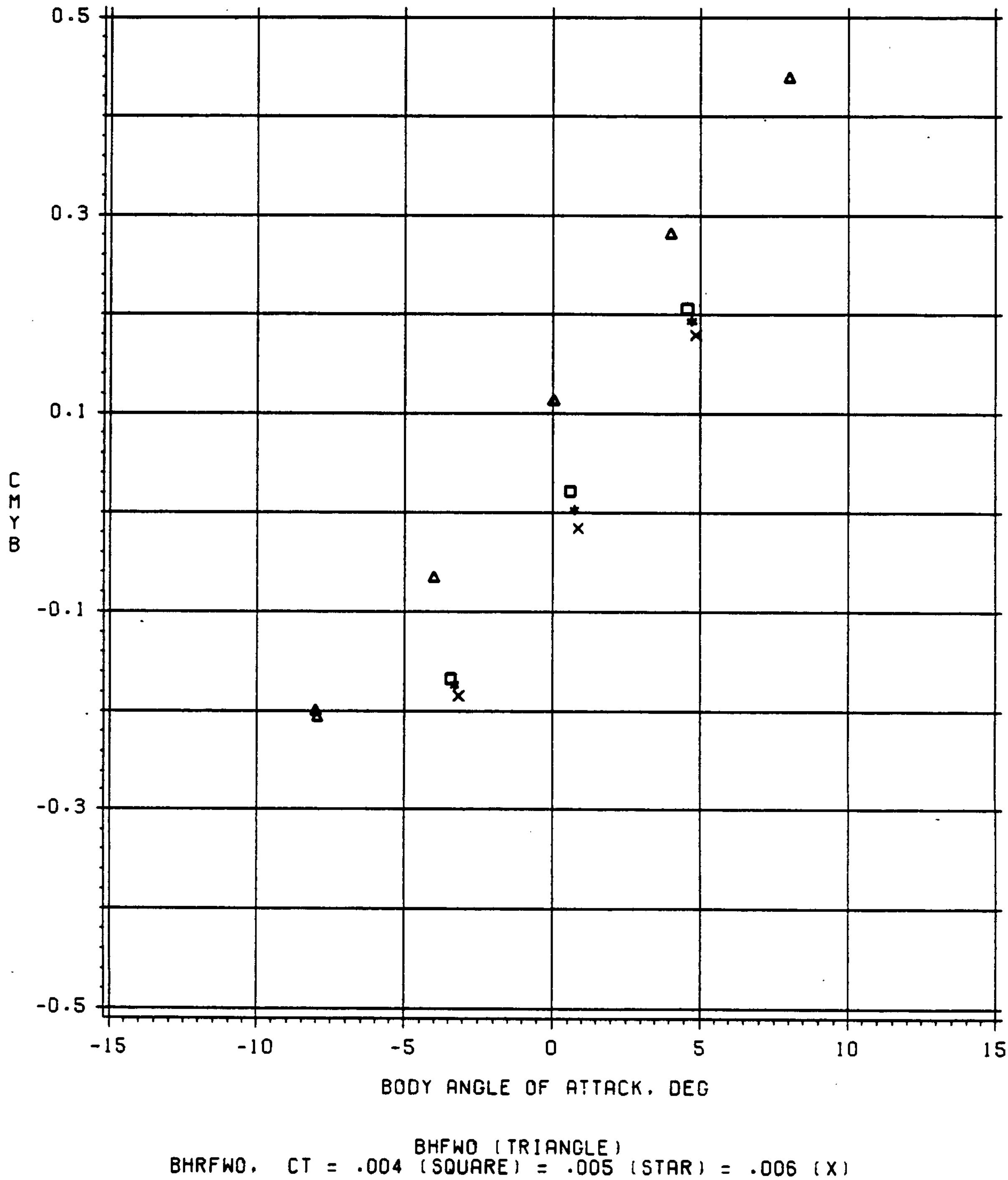


Figure 59. Rotor effect on BHRFWO body pitching moment coefficient, μ=0.20.

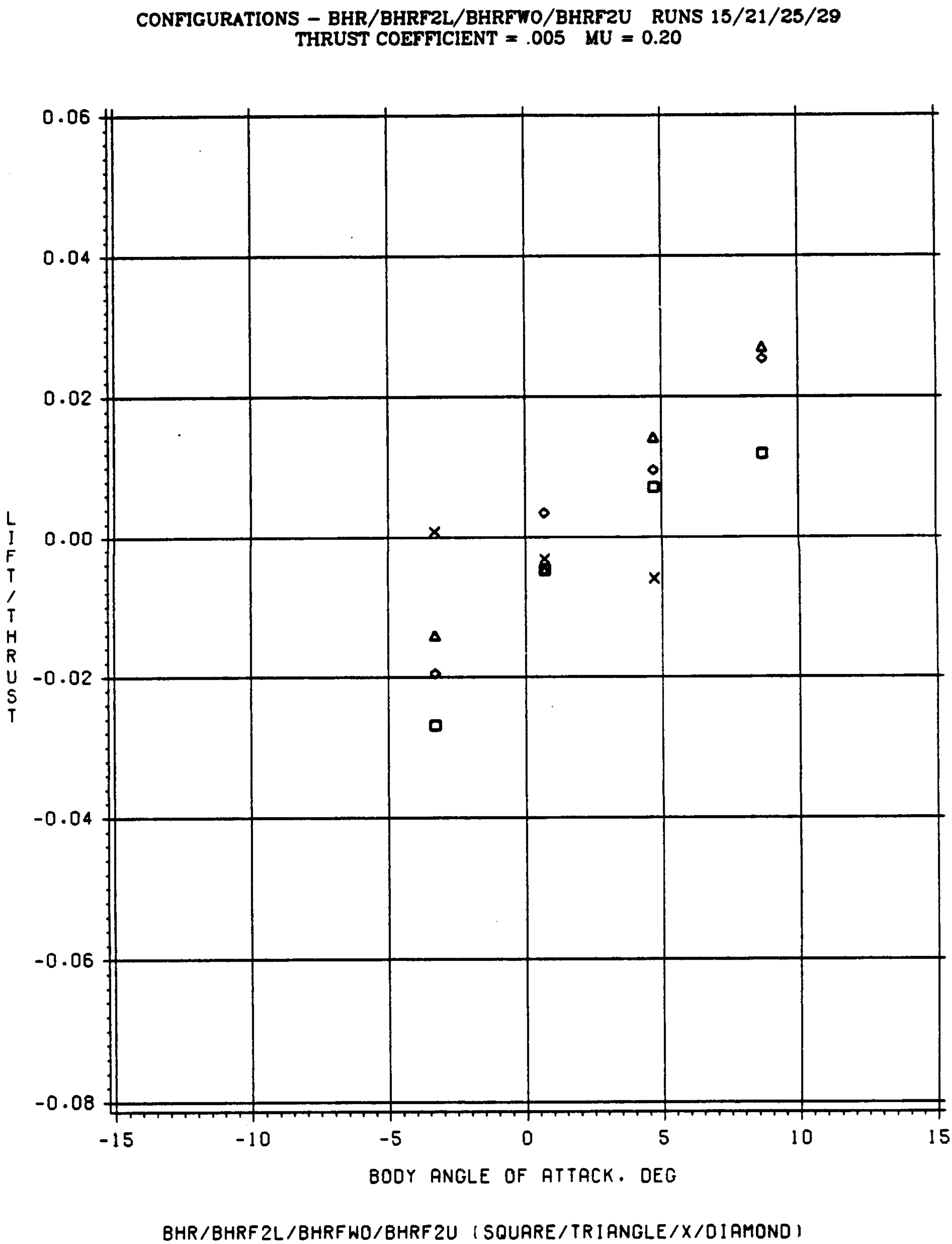
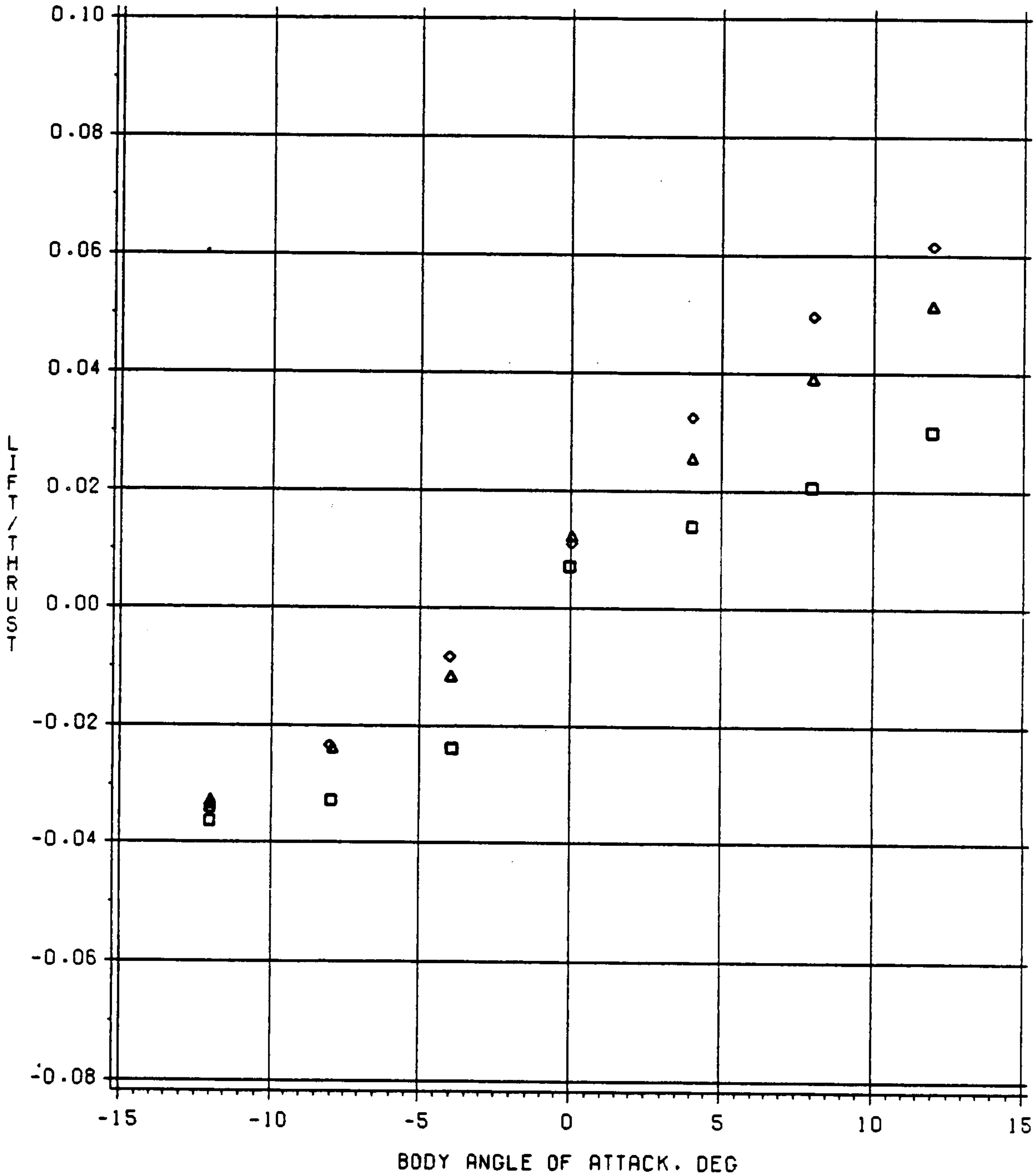


Figure 60a. (Powered) Effect of configuration on body lift for powered and unpowered runs, $\mu=0.20$.

CONFIGURATIONS BH/BHF2L/BHF2U (RUNS 61/53/48)



BH/BHF2L/BHF2U (SQUARE/TRIANGLE/DIAMOND)

Figure 60b. Unpowered.

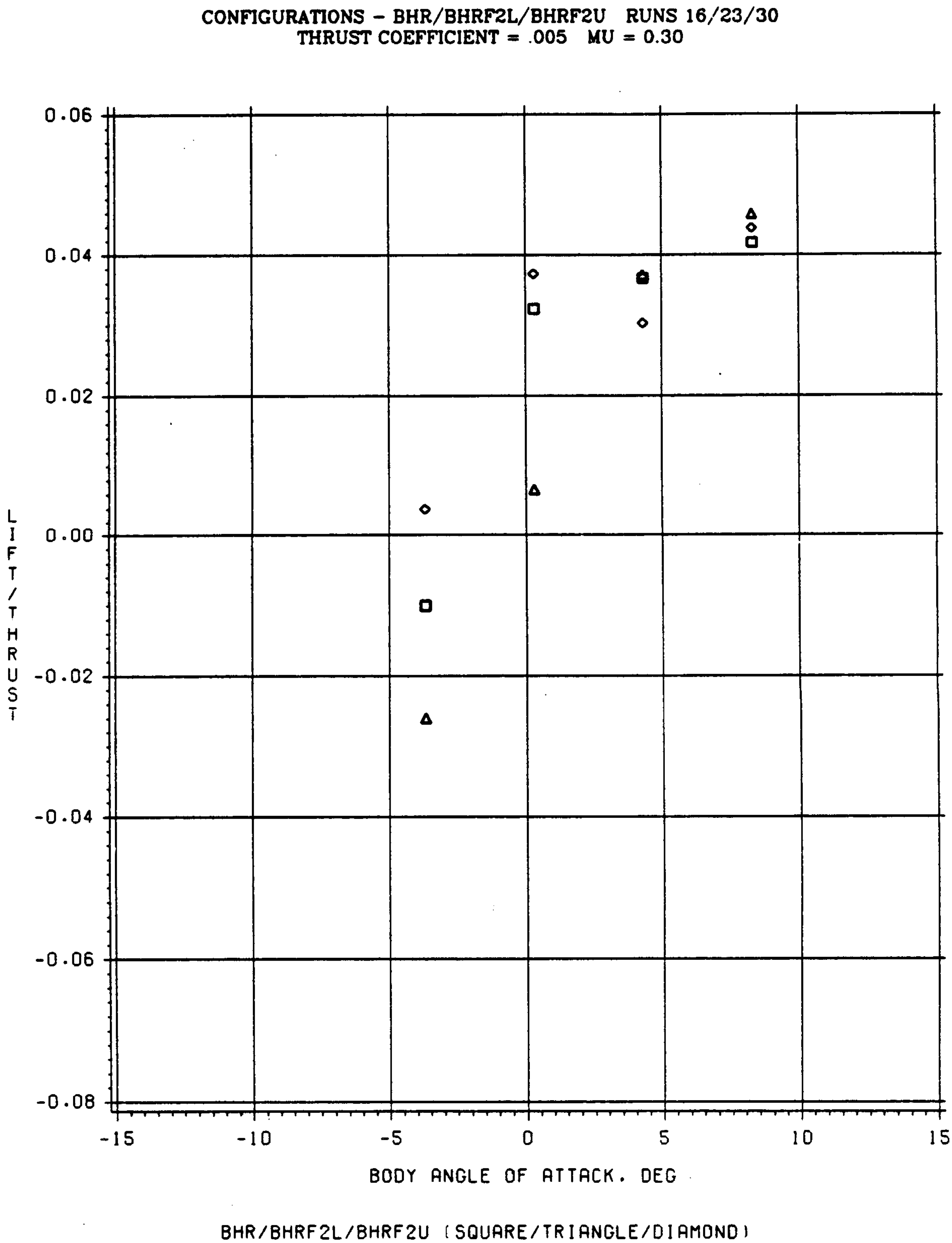


Figure 61a. (Powered) Effect of configuration on body lift for powered and unpowerd runs, μ=0.30.

CONFIGURATIONS BH/BHF2L/BHF2U (RUNS 63/55/50)

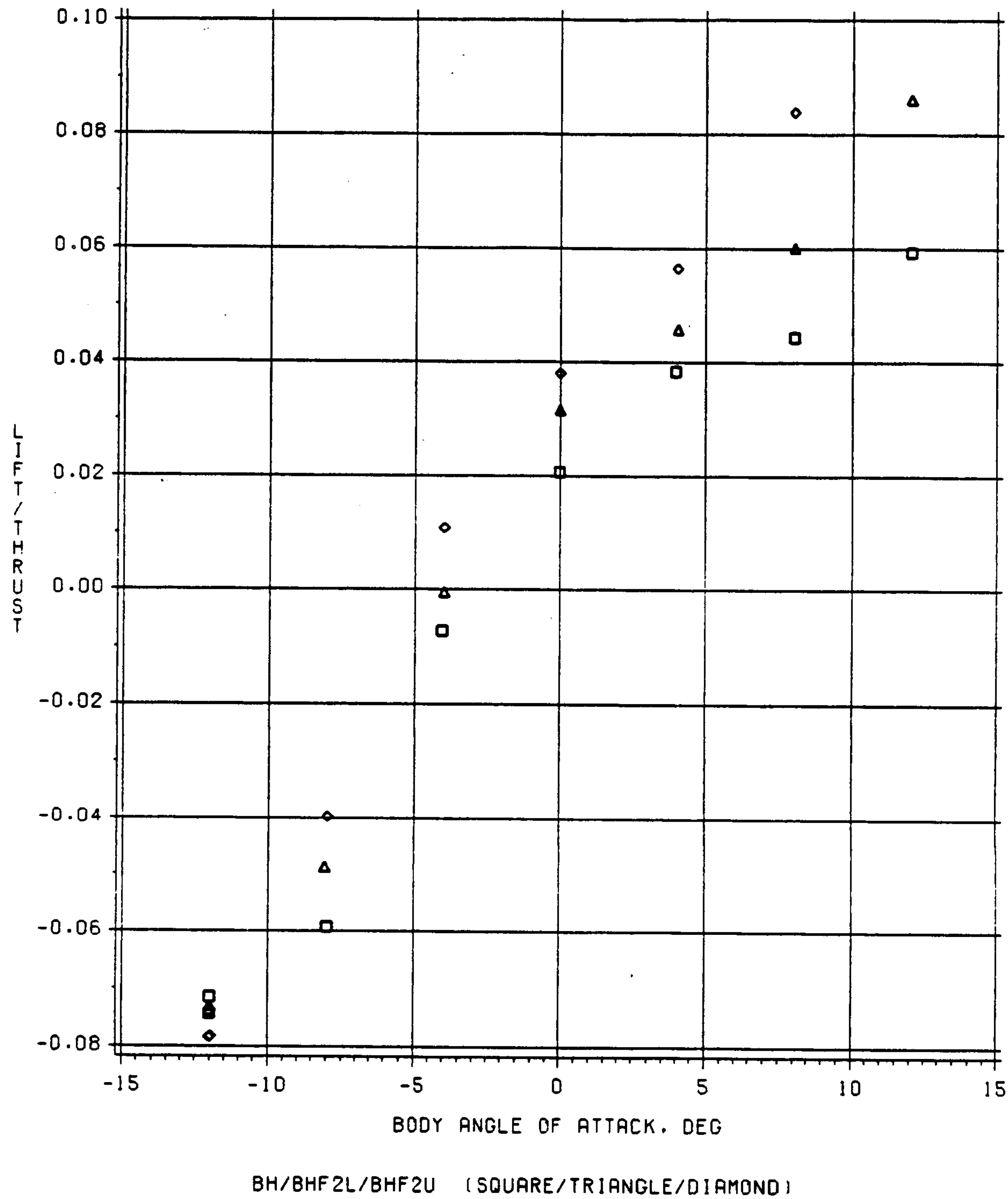


Figure 61b. Unpowered.

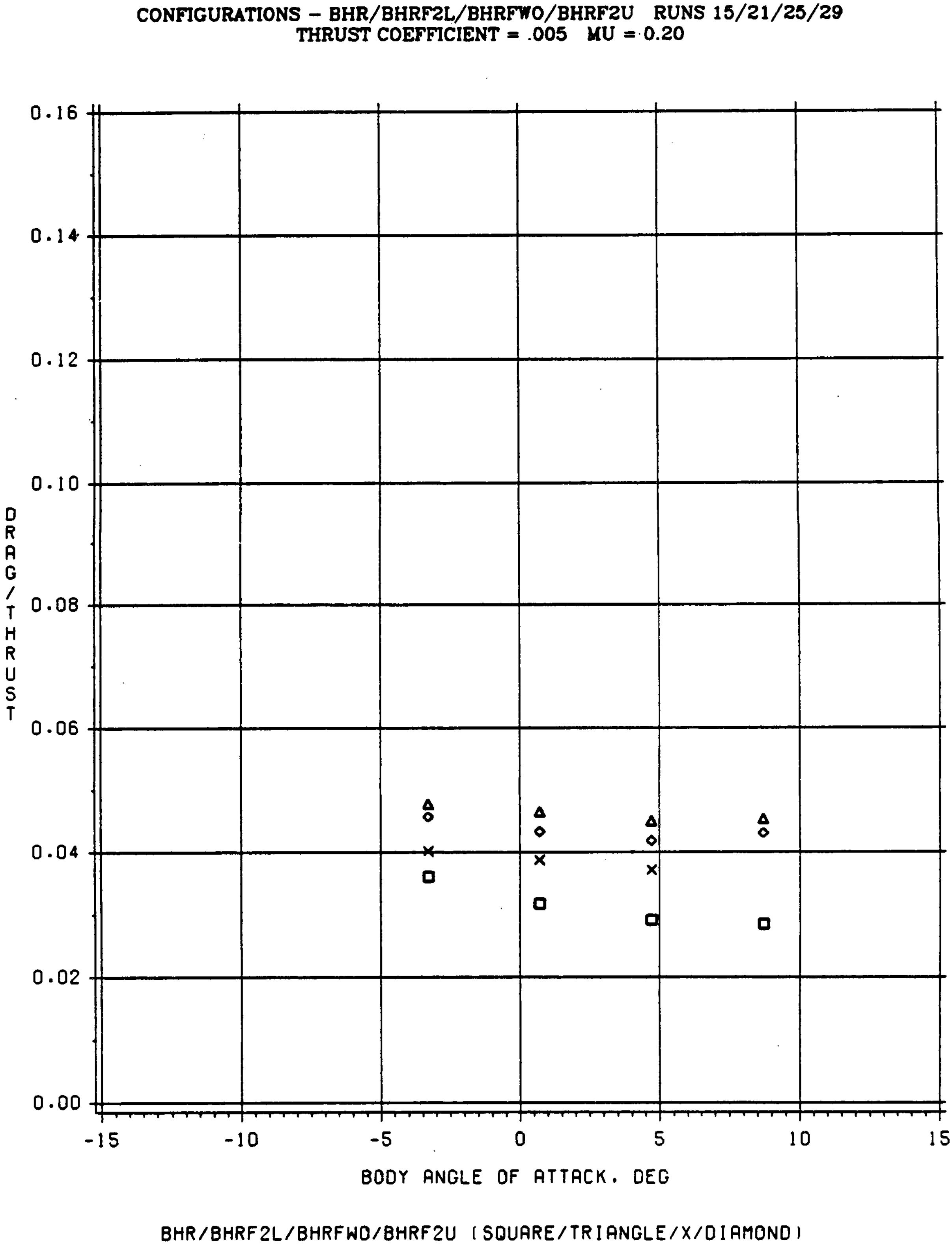


Figure 62. Effect of configuration on body drag for powered runs, μ=0.20.

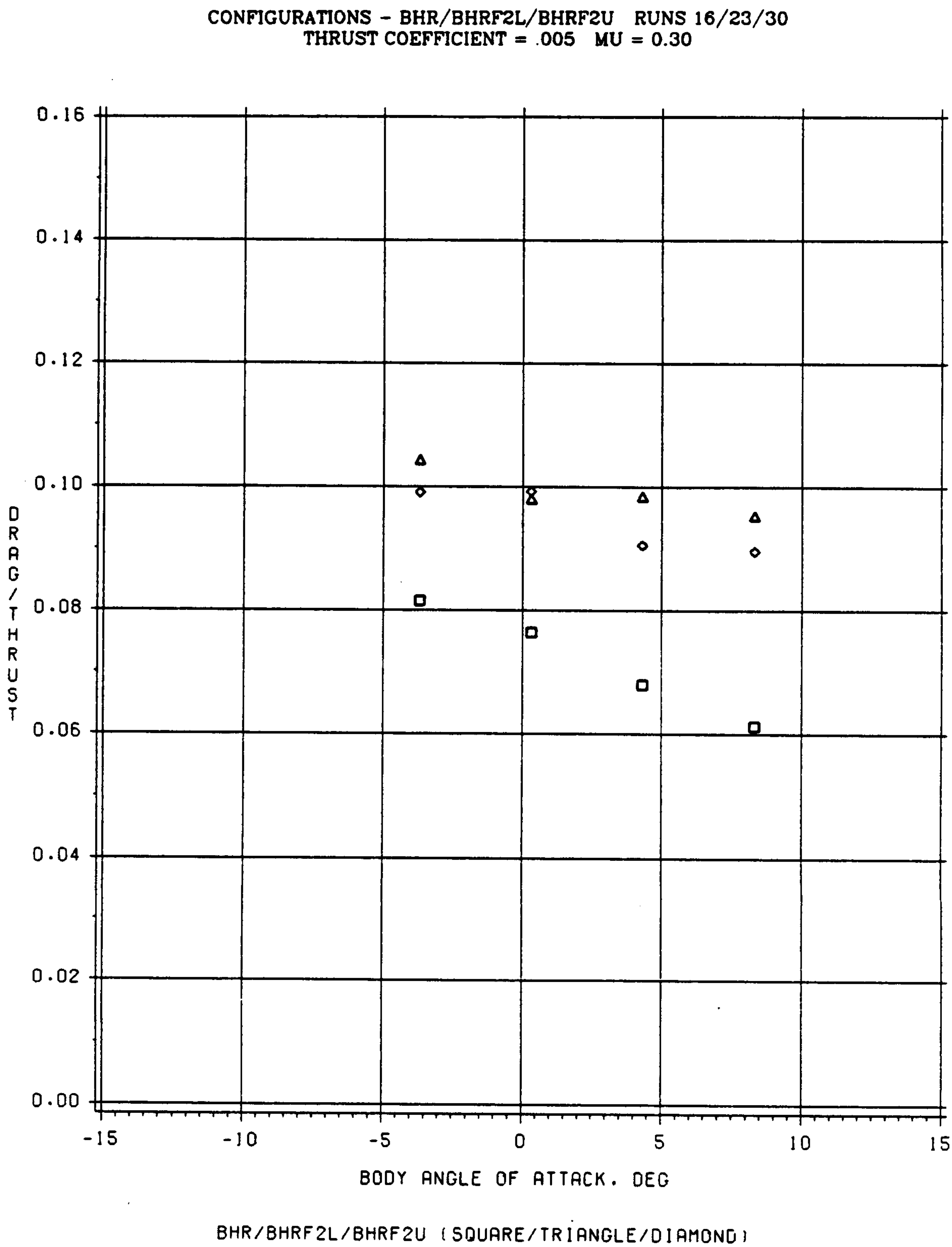


Figure.63. Effect of configuration on body drag for powered runs, μ=0.30.

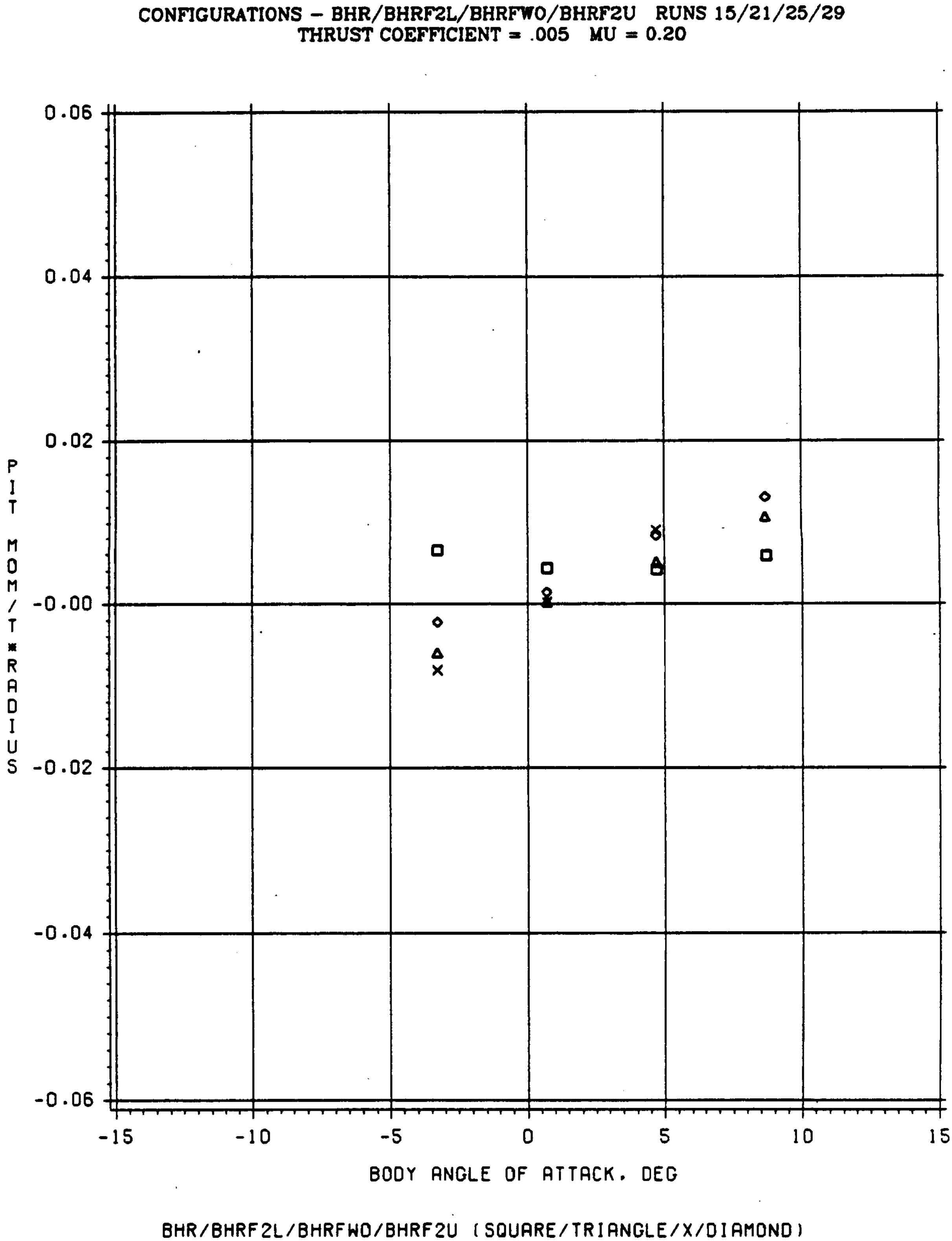


Figure 64. Effect of configuration on body pitching moment for powered runs, $\mu=0.20$.

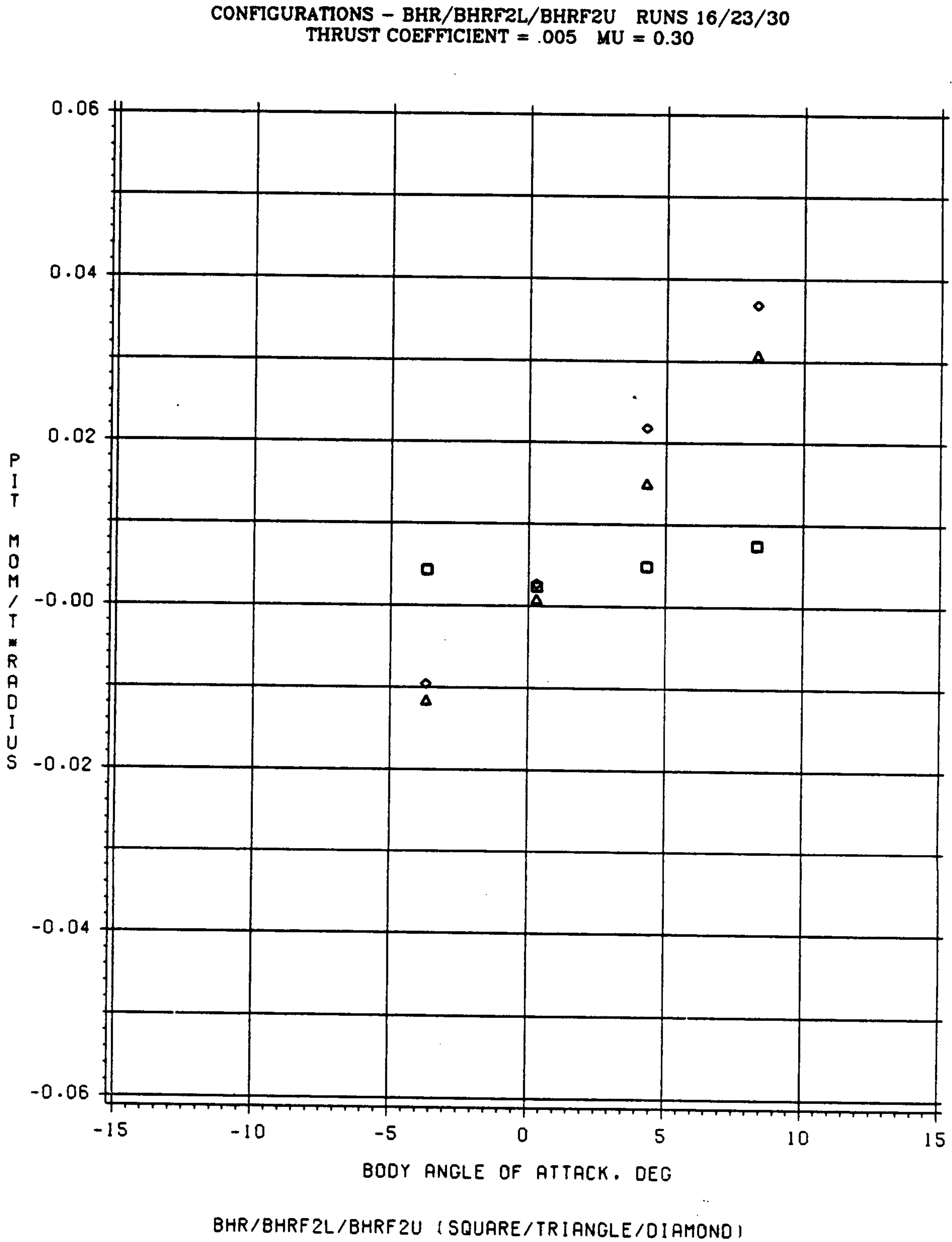


Figure 65. Effect of configuration on body pitching moment for powered runs, μ=0.30.

The pitching moment data of Figures 64 and 65 show fairly consistent trends with speed ratio. The difference in the BHR and BHRF2L pitching moment curves is one primarily of volume. The larger volume bodies inherently have greater pitching moment slopes. This will be discussed further in the analytical section. The slight difference between BHRF2L and BHRF2U pitching moment is due to either the amount of hub exposure or the slight change in afterbody shape required to simulate separation distance. The hub-off data for configuration BHRF2U is not available to establish the effect of the afterbody transition fairing. Figures 66 and 67 are presented only to show the relative efficiency of the bodies tested in the powered and unpowered condition.

The next set of Figures, Figures 68 through 77, show the increment in fuselage aerodynamics due to the rotor. The difference is obtained by subtracting the rotor-off data, with rotating hub, from the rotor-on data. How much of the "rotors effect" is actually due to changes in hub/fuselage interaction is beyond the scope of this study and will be considered as one effect. One of the difficulties with this, as noted in reference 10, is the scale of the hub. If the hub is not scaled, its effect is incorrect. Whether trends may be jeopardized is not known. It should be stressed at this point that the folloiwng results are not representative of trim conditions and are more parametric in nature. Consequently, trends with body angle of-attack may be misleading to the analyst since the rotors angle-of-attack and wake location relative to the body are also changing.

Figure 68 presents the change in rotor induced body lift as a function of body angle of attack at a speed ratio of 0.2. There is an overall trend for download to increase with increase in angle of attack. With the winglets removed (BHRFW0) the amount of rotor induced download is diminished. Decreasing the separation distance increased the download. Figure 69 shows the change in rotor induced lift with angle of attack for a speed ratio of 0.3. Note that there are definite minimums close to zero angle of attack. The increase in download with decreased separation distance applies to only one angle of attack. A comparison of the results in Figures 68 and 69 with momentum theory will be presented in the correlation section.

Figures 70 and 71 present the change in body drag due to the rotor for speed ratios of 0.2 and 0.3 respectively. At a speed ratio of 0.2 the body of revolution actually shows a favorable interference at all angles of attack. Configurations BHRF2L and BHRFW0 show very close to the same drag levels. The primary difference between these two configurations is the winglets.

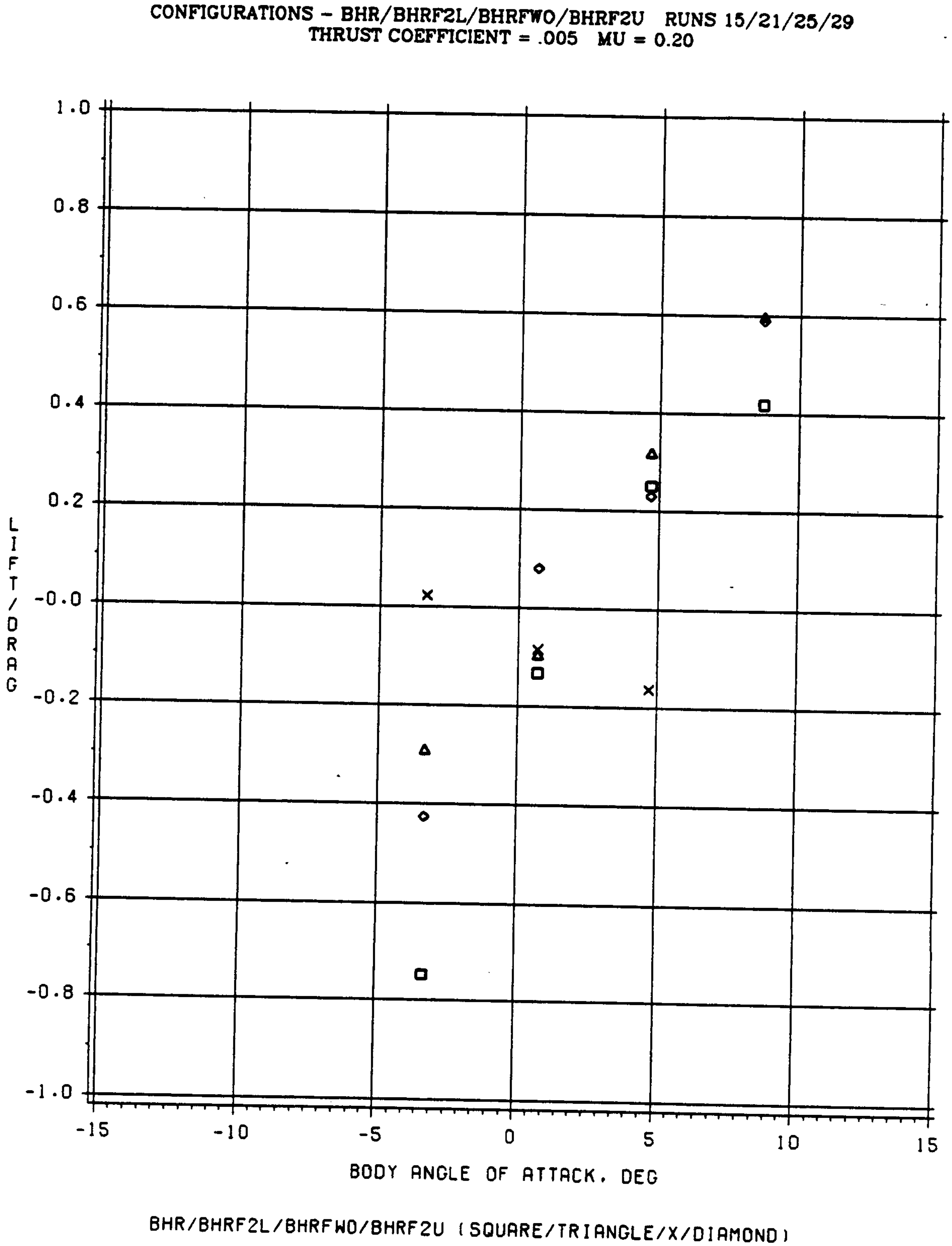


Figure 66a. (Powered). Effect of configuration on body lift/drag for powered and unpowered runs, μ=0.20.

CONFIGURATIONS BH/BHF2L/BHF2U (RUNS 61/53/48)

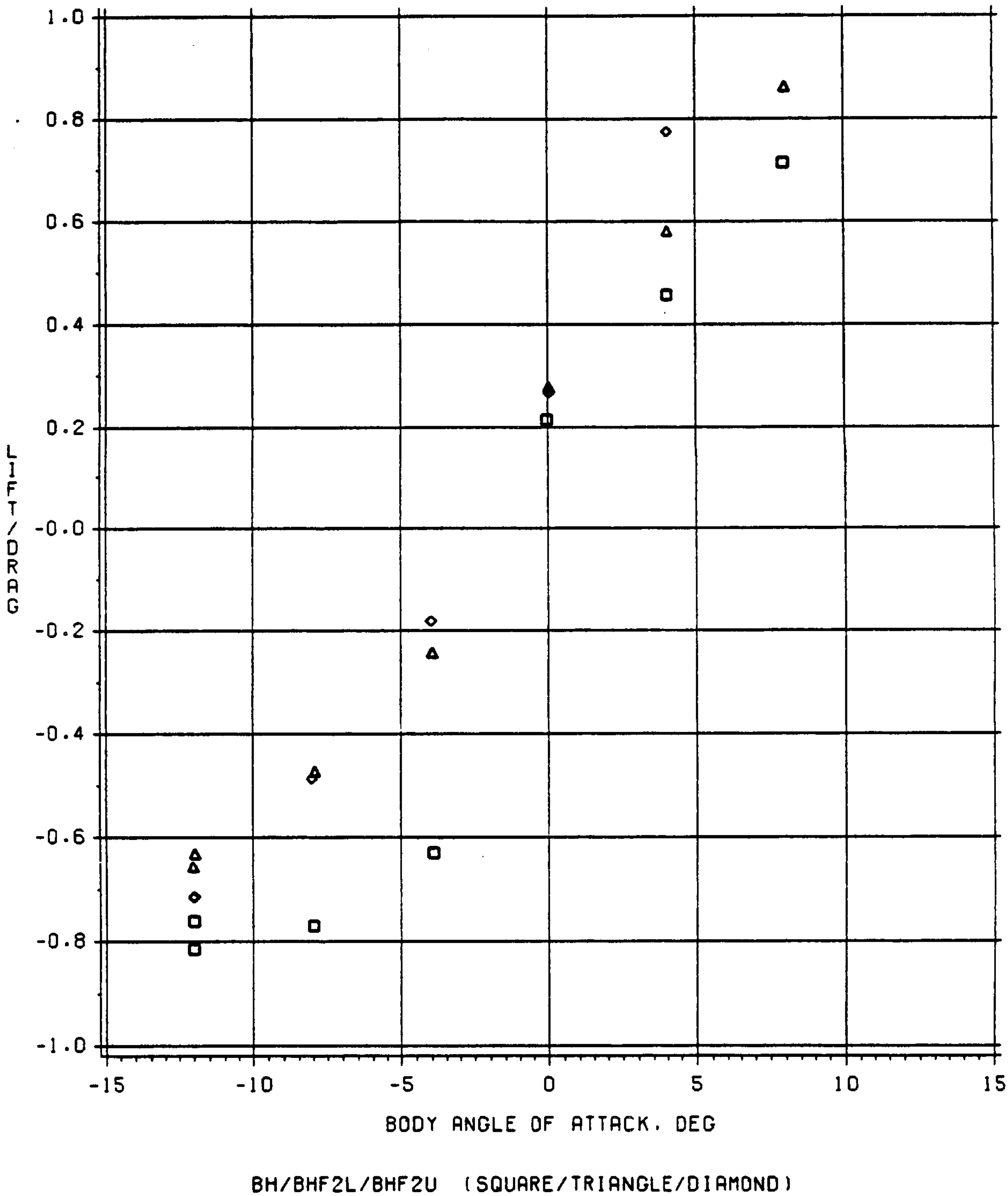
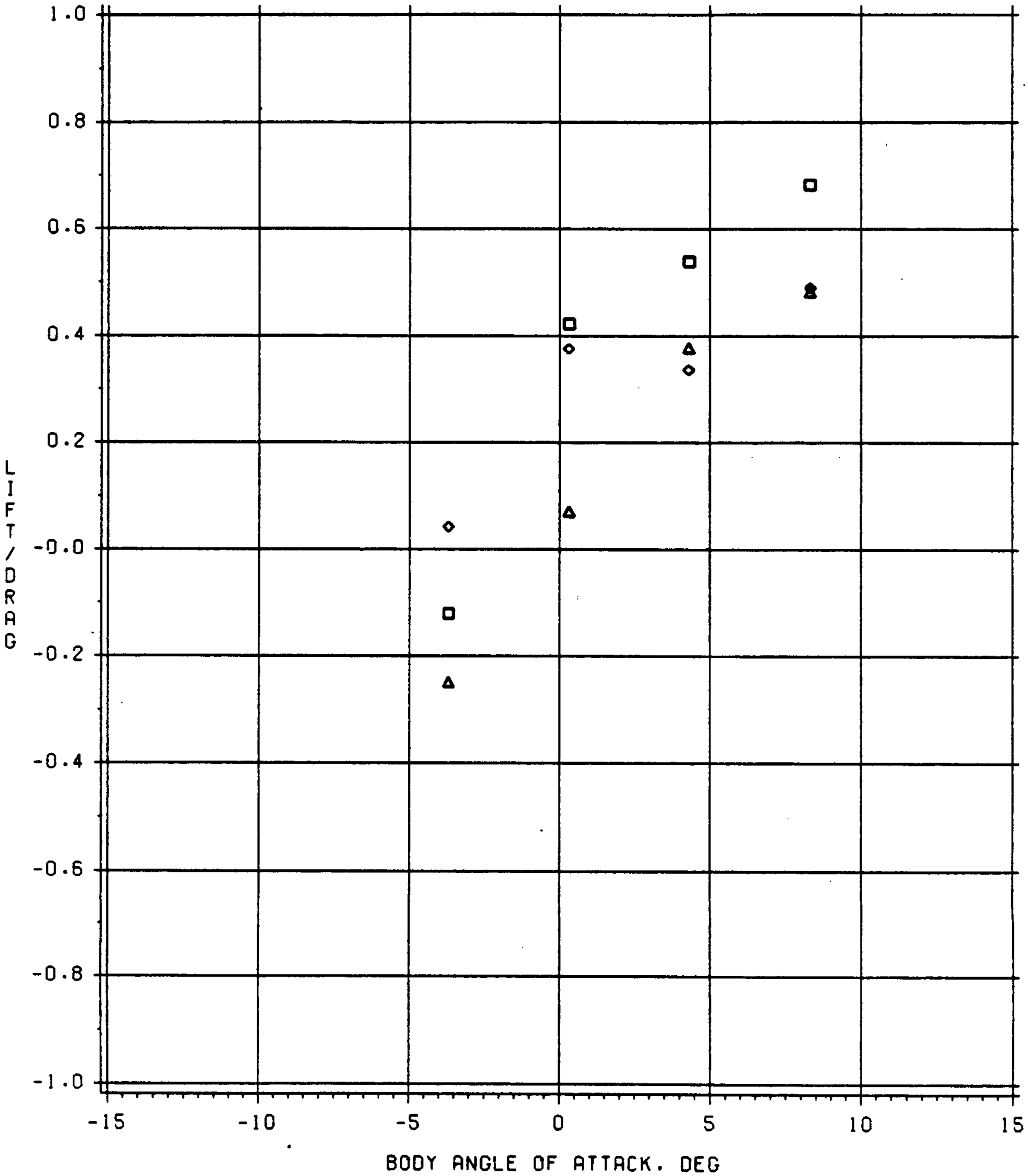


Figure 66b. Unpowered.

CONFIGURATIONS - BHR/BHRF2L/BHRF2U RUNS 16/23/30
THRUST COEFFICIENT = .005 MU = 0.30



BHR/BHRF2L/BHRF2U (SQUARE/TRIANGLE/DIAMOND)

Figure 67a. (Powered) Effect of configuration on body lift/drag for powered and unpowered runs, μ=0.30.

CONFIGURATIONS BH/BHF2L/BHF2U (RUNS 63/55/50)

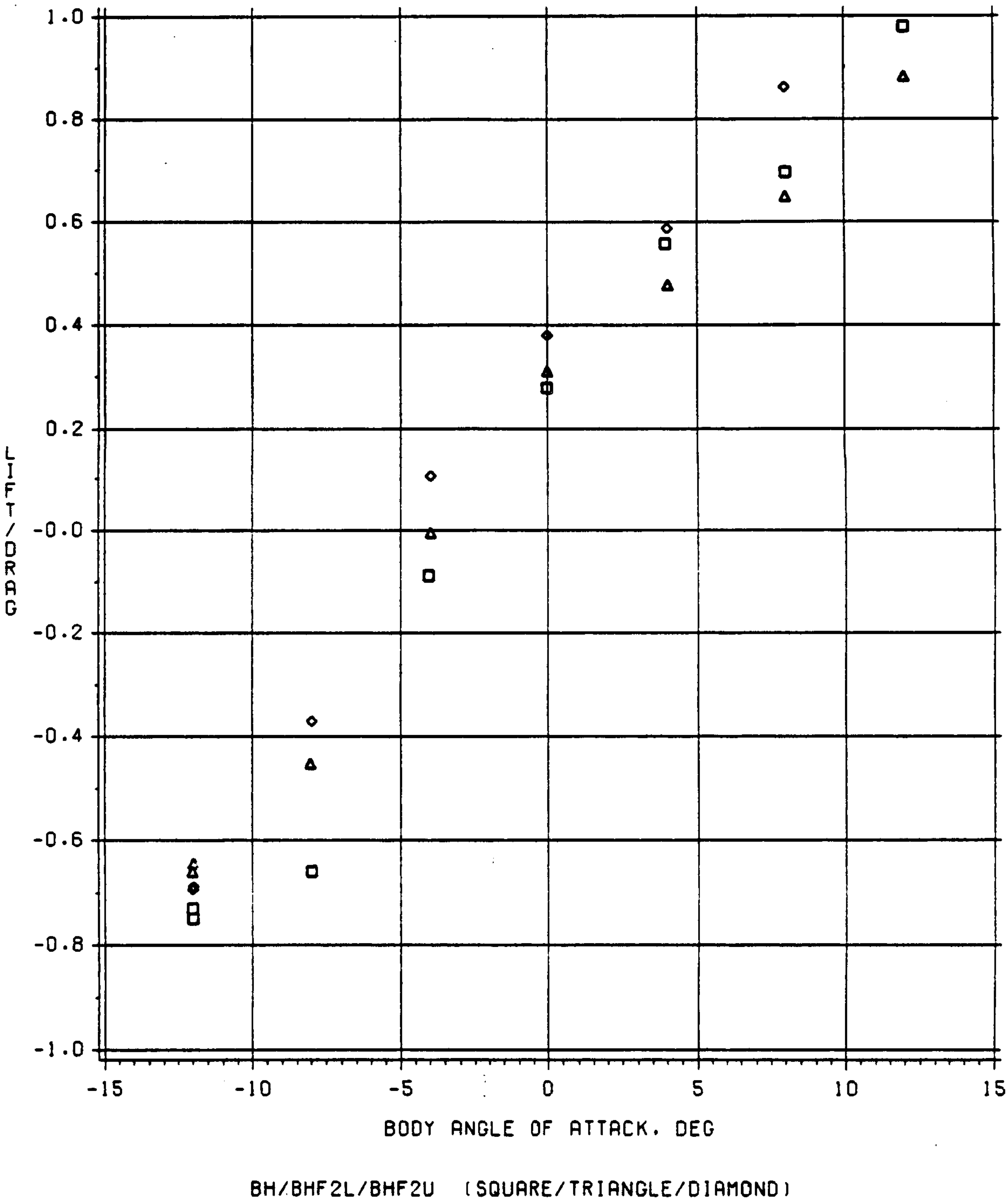
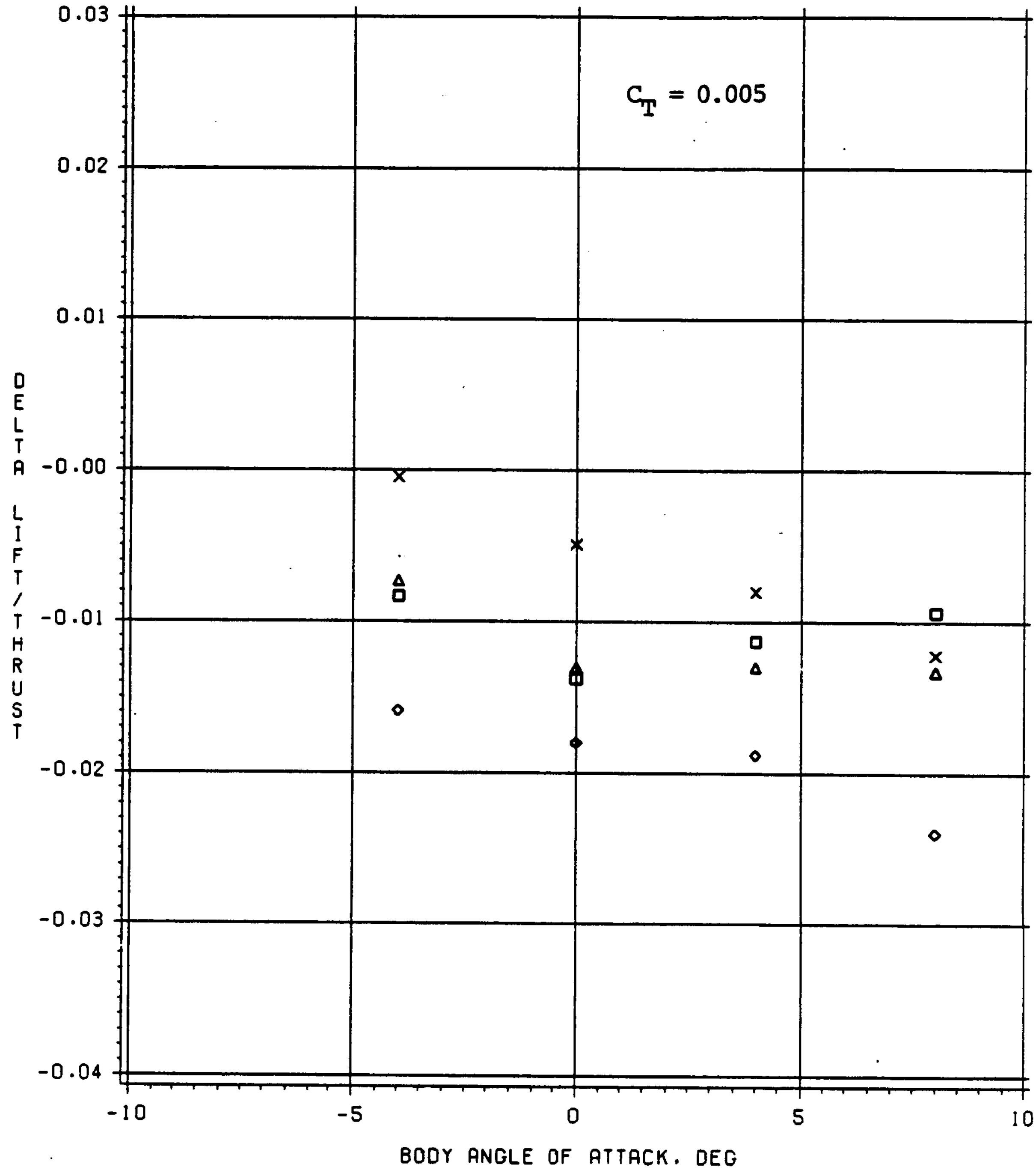


Figure 67b. Unpowered.

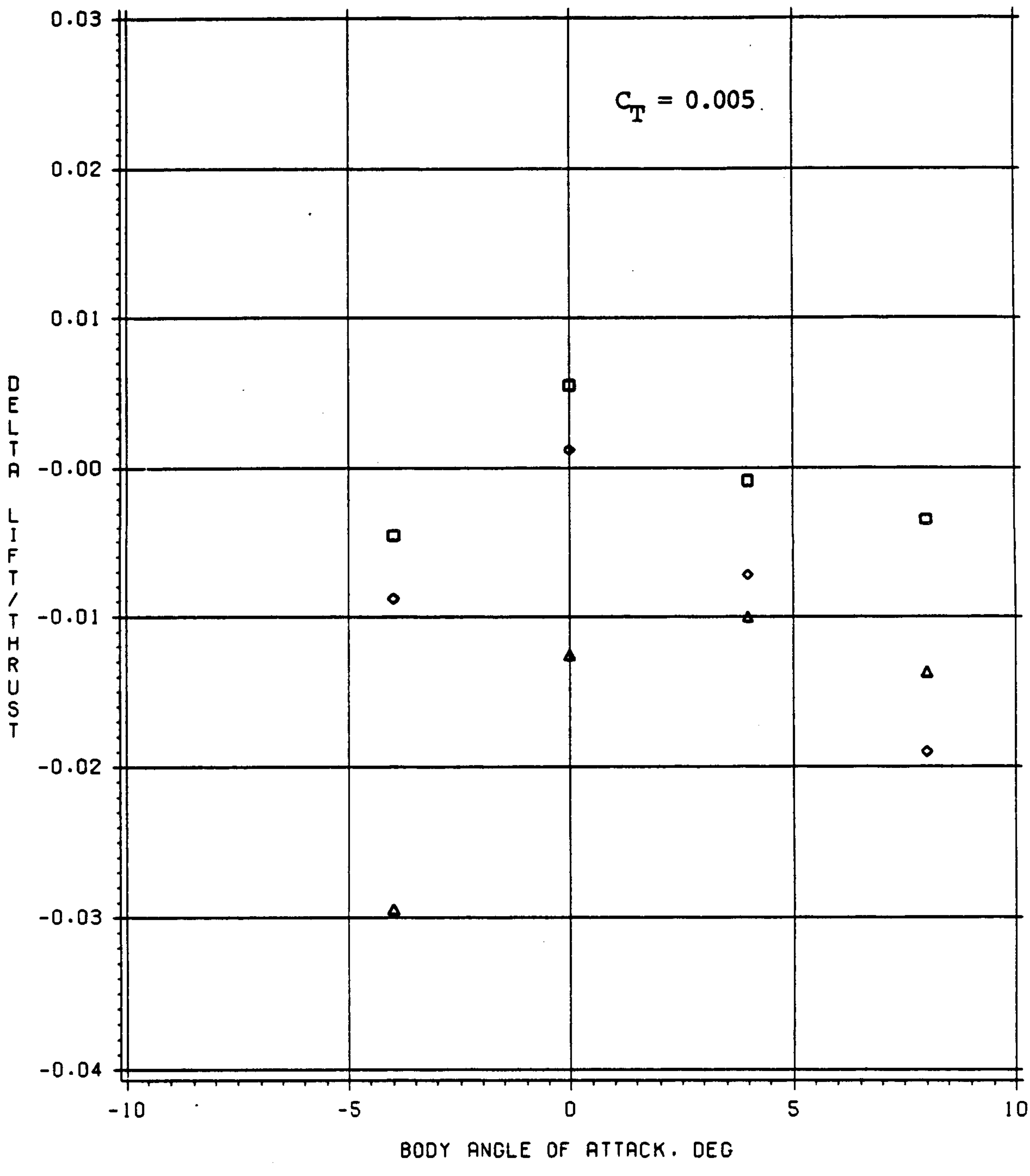
CONFIGURATIONS BHR/BHRF2L/BHRFWO/BHRF2U (RUNS 15/21/25/29)



BHR/BHRF2L/BHRFWO/BHRF2U (SQUARE/TRIANGLE/X/DIAMOND)

Figure 68. Effect of angle of attack on rotor induced body lift for all configurations, μ=0.20.

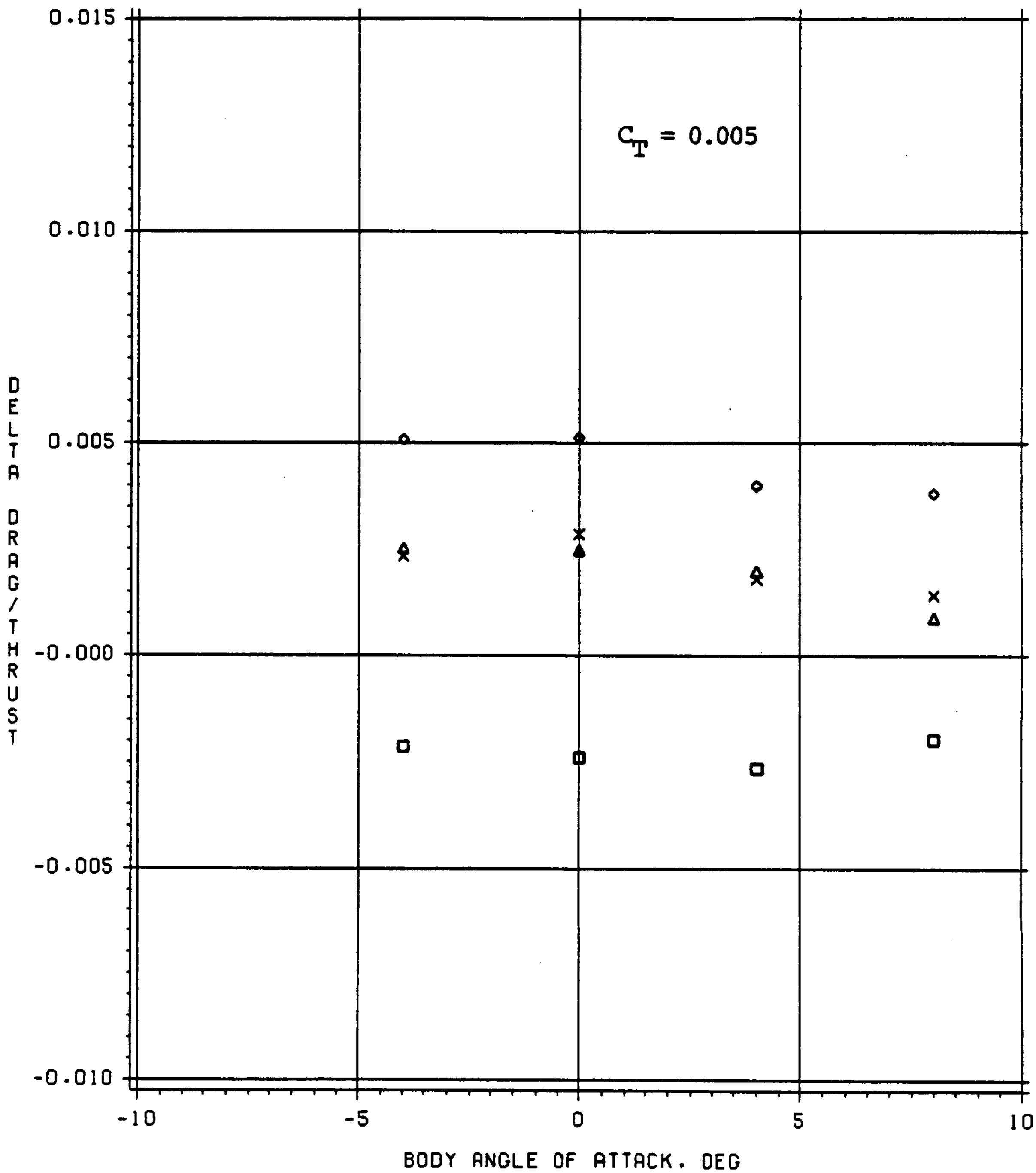
CONFIGURATIONS BHR/BHRF2L/BHRF2U (RUNS 16/23/30)



BHR/BHRF2L/BHRF2U (SQUARE/TRIANGLE/DIAMOND)

Figure 69. Effect of angle of attack on rotor induced body lift for all configurations, μ=0.30.

CONFIGURATIONS BHR/BHRF2L/BHRFWO/BHRF2U (RUNS 15/21/25/29)



BHR/BHRF2L/BHRFWO/BHRF2U (SQUARE/TRIANGLE/X/DIAMOND)

Figure 70. Effect of angle of attack on rotor induced body drag for all configurations, μ=0.20.

CONFIGURATIONS BHR/BHRF2L/BHRF2U (RUNS 16/23/30)

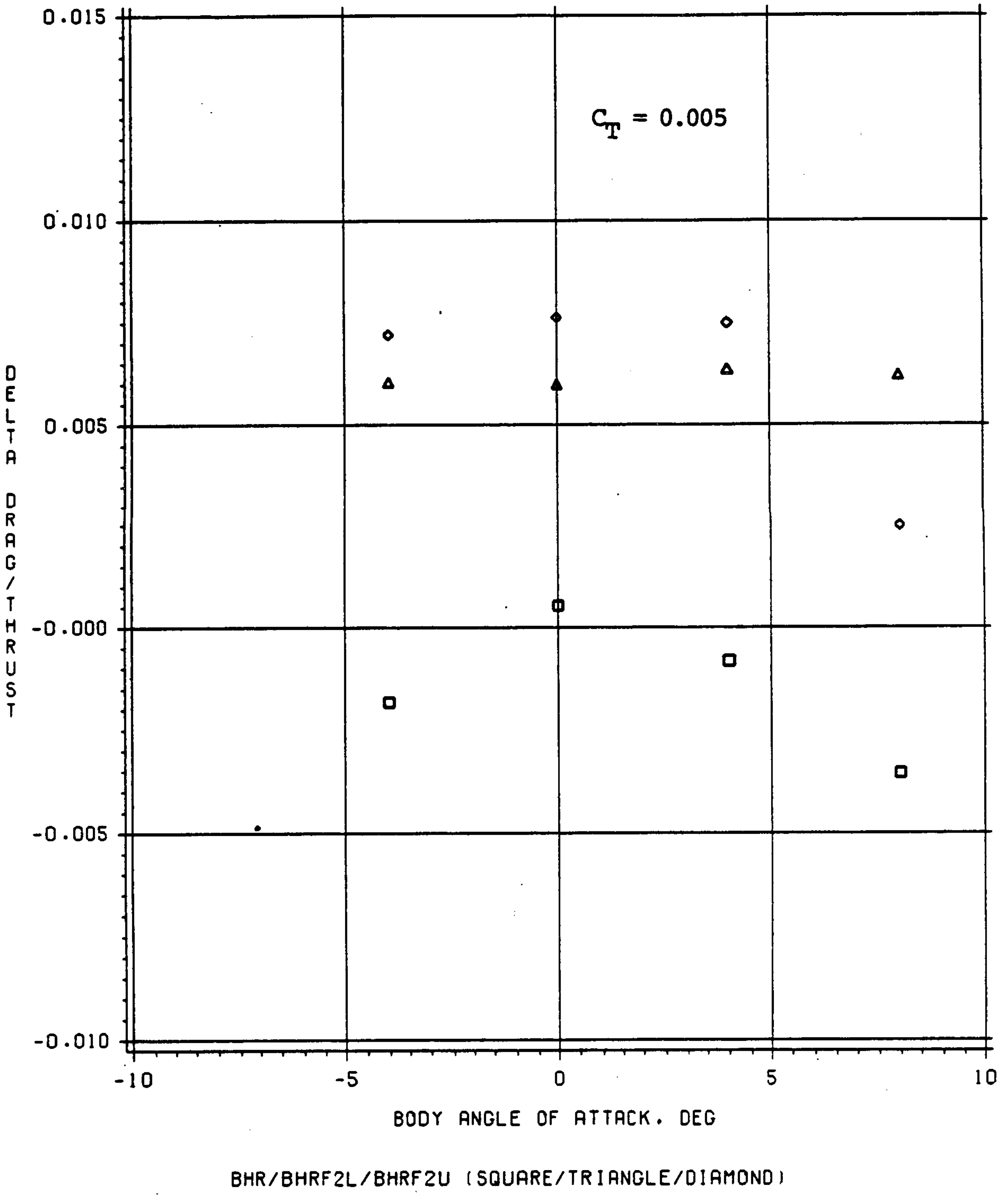
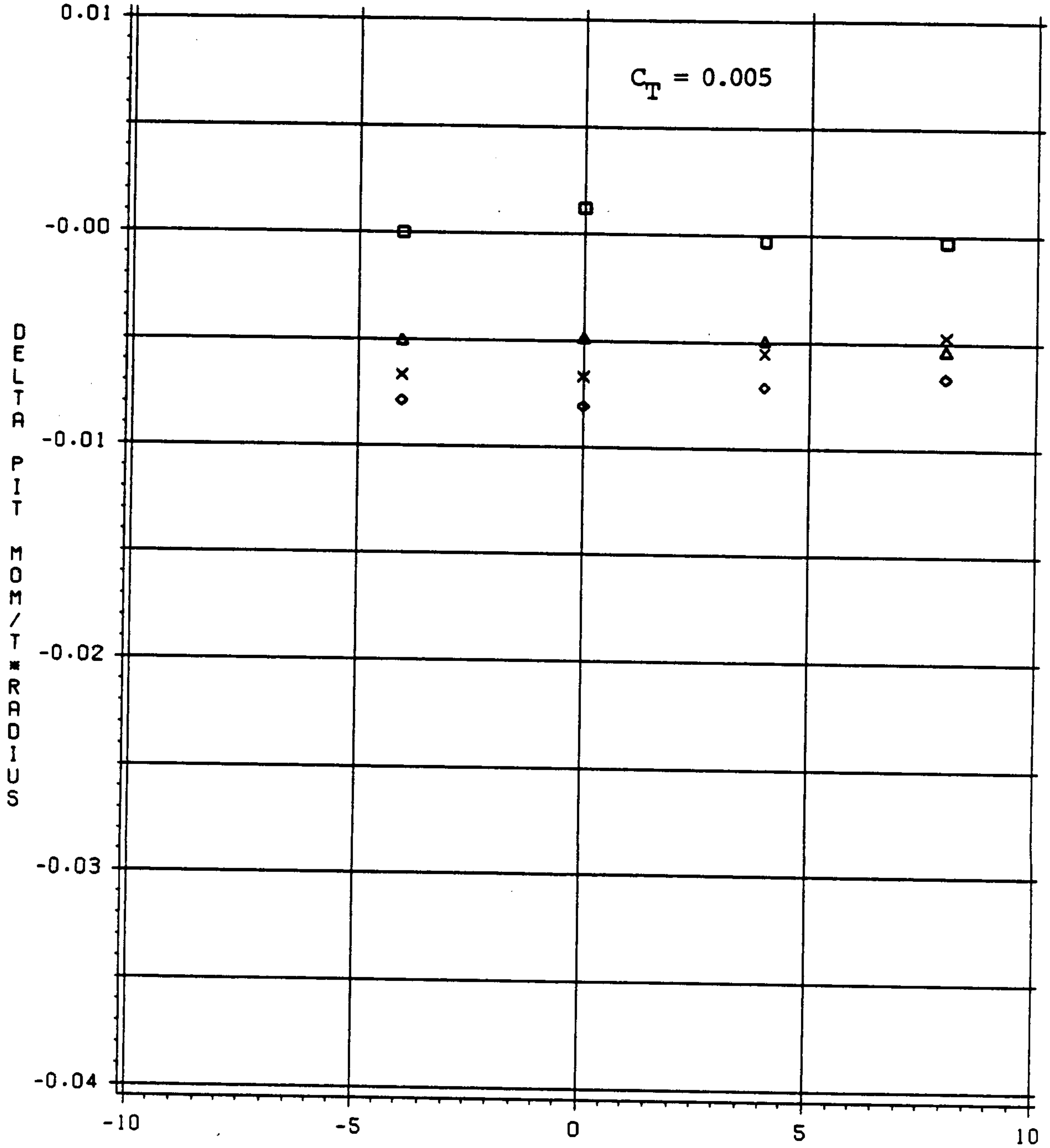


Figure 71. Effect of angle of attack on rotor induced body drag for all configurations, μ=0.30.

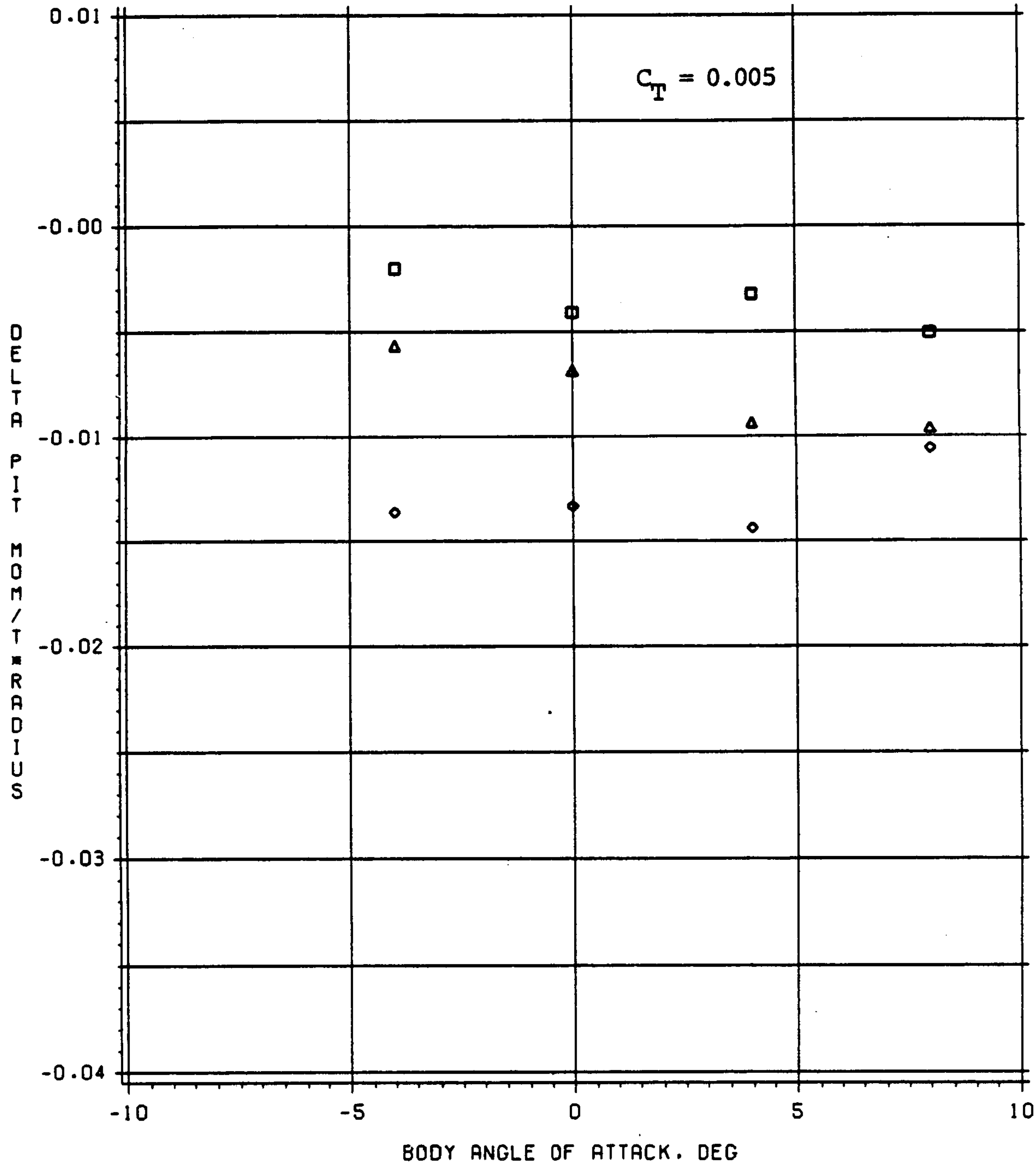
CONFIGURATIONS BHR/BHRF2L/BHRFWO/BHRF2U (RUNS 15/21/25/29)



BHR/BHRF2L/BHRFWO/BHRF2U (SQUARE/TRIANGLE/X/DIAMOND)

Figure 72. Effect of angle of attack on rotor induced body pitching moment for all configurations, μ=0.20.

CONFIGURATIONS BHR/BHRF2L/BHRF2U (RUNS 16/23/30)



BHR/BHRF2L/BHRF2U (SQUARE/TRIANGLE/DIAMOND)

Figure 73. Effect of angle of attack on rotor induced body pitching moment for all configurations, μ=0.30.

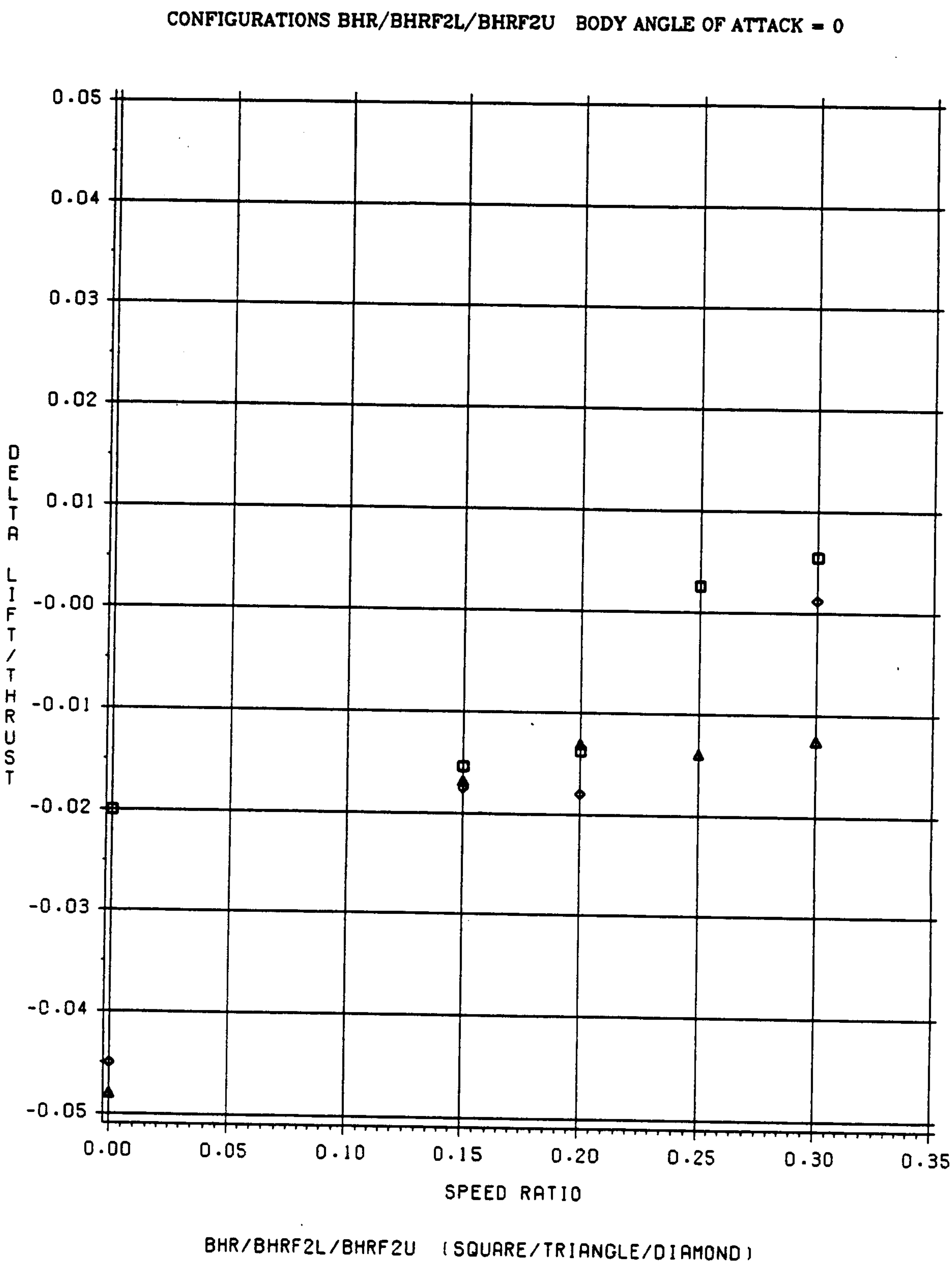
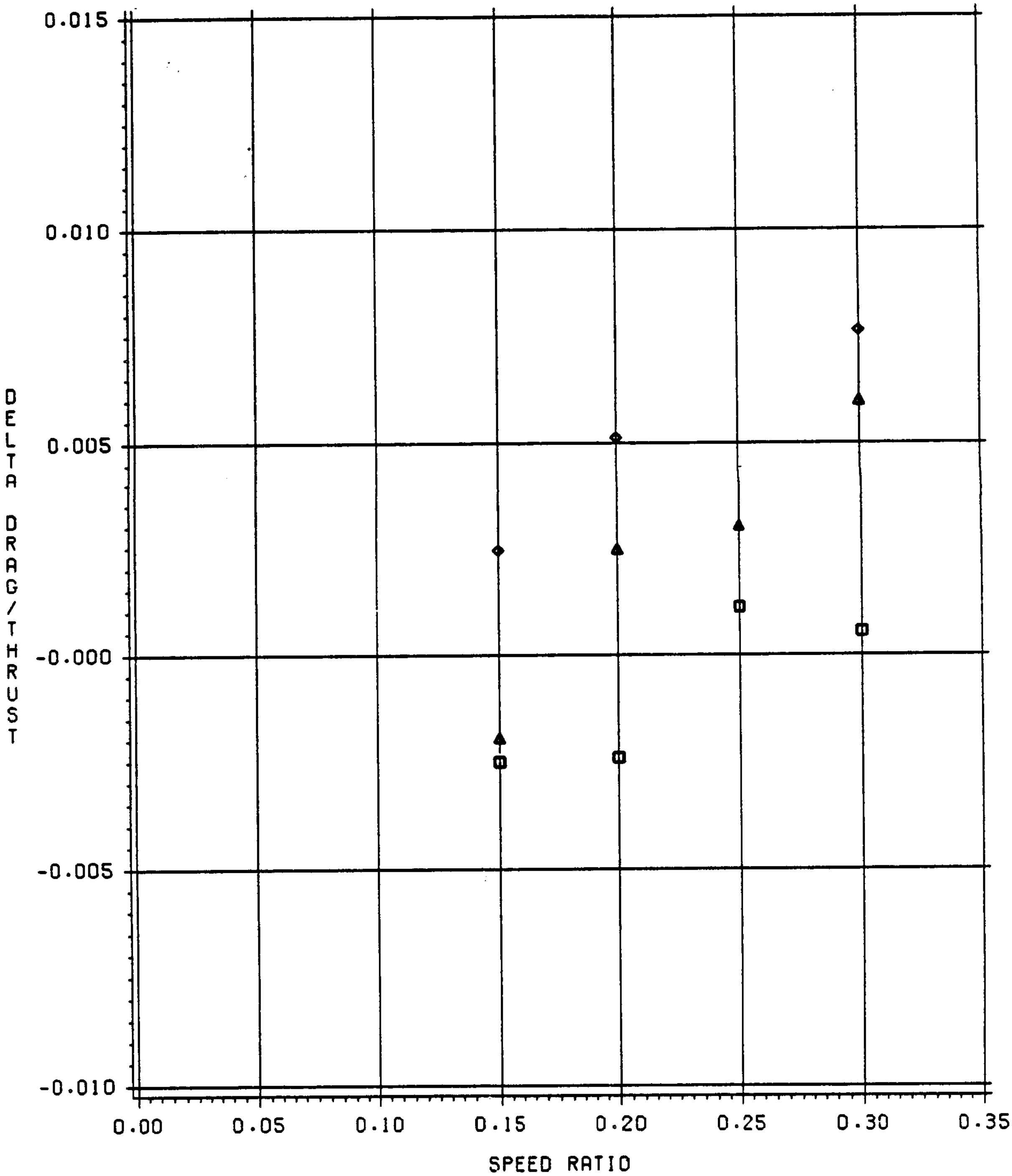


Figure 74. Effect of speed ratio on rotor induced body lift for all configurations, C_T = .005 and θ_B = 0.

CONFIGURATIONS BHR/BHRF2L/BHRF2U BODY ANGLE OF ATTACK = 0



BHR/BHRF2L/BHRF2U (SQUARE/TRIANGLE/DIAMOND)

Figure 75. Effect of speed ratio on rotor induced body drag for all configurations, C_T = .005 and θ_B = 0.

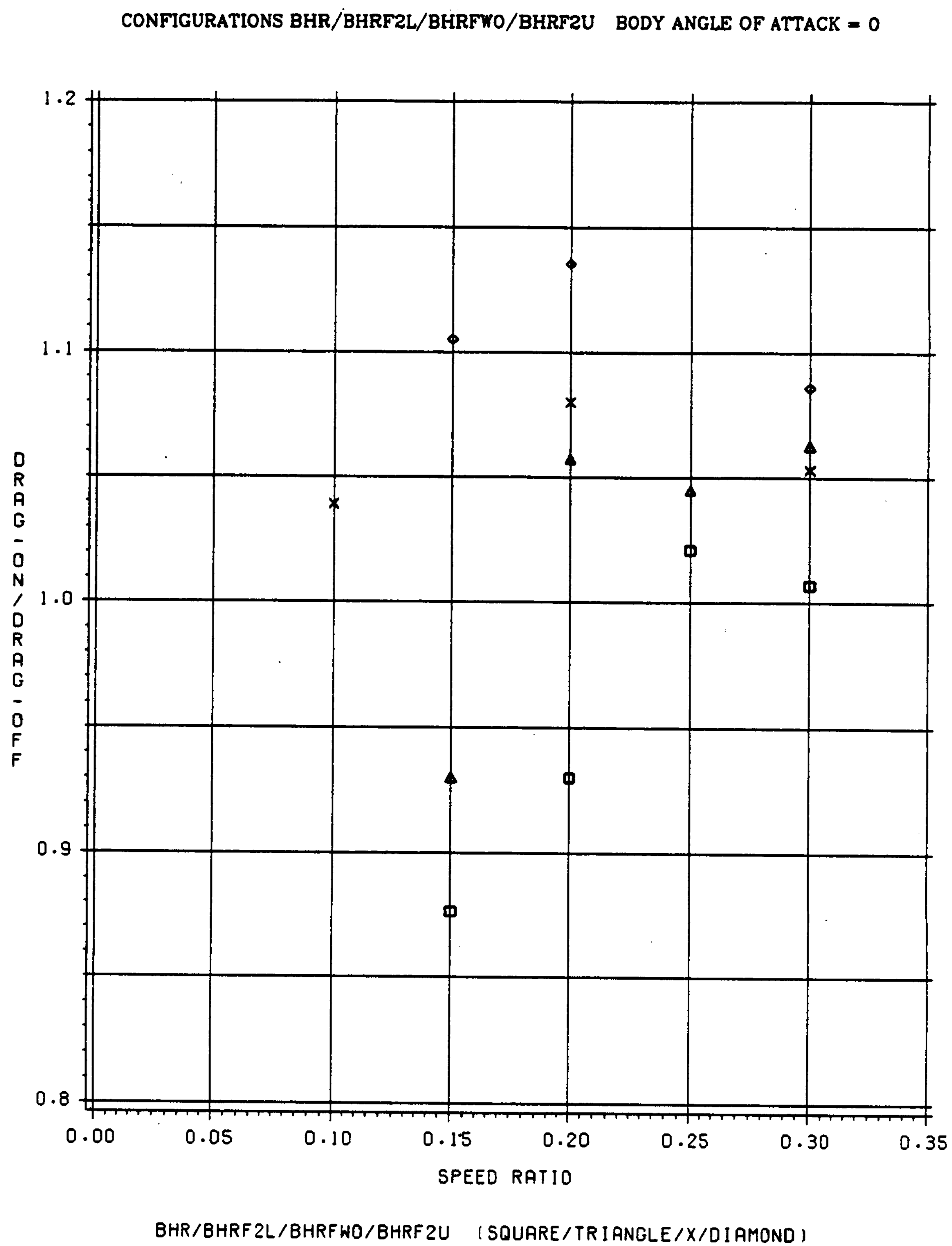


Figure 76. Effect of speed ratio on rotor induced body drag/ rotor-off body drag for all configurations, C_T = .005 and θ_B = 0.

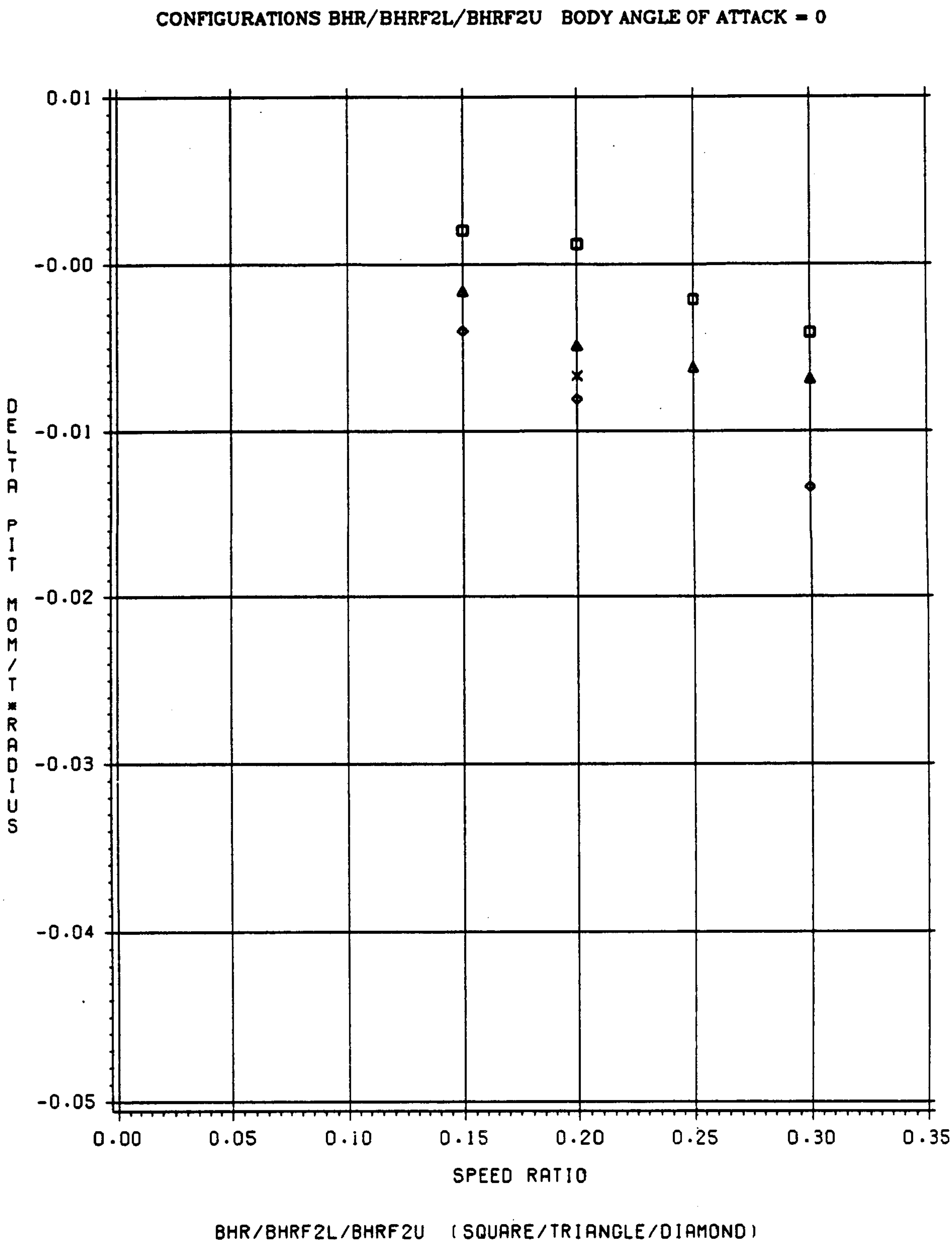


Figure 77. Effect of speed ratio on rotor induced body pitching moment for all configurations, C_T = .005 and θ_B = 0.

Therefore, it can be assumed that the rotor has had little effect on winglet drag for the thrust level being considered. Figure 56 which compares winglet drag for rotor-on and rotor-off conditions supports this conclusion. Figures 62 and 63 showed that at a speed ratio of 0.2 total configuration drag decreased with a decrease in separation distance; however, as can be seen in Figure 70 the rotor influence is to increase drag with a decrease in separation distance. This indicates then, from a fuselage performance consideration only, that reducing hub and rotating controls exposed area is more effective in reducing drag than increasing separation distance. At a speed ratio of 0.3, Figure 71 shows a definite overall increase in the rotor induced drag level for each configuration including the simple body of revolution, BHR. Reducing separation distance still causes an increase in drag for most angles of attack.

Figures 72 and 73 present the rotors effect on pitching moment. The configuration effect shows that the greater the pitching volume, the greater the rotors influence. Also decreasing separation distance increased the rotors influence on the pitching moment. These trends are consistent with speed. The speed ratio of 0.3 shows higher overall levels of rotor influence. At the higher speed there appears to be a tendency for the rotors influence to become less nose down for configurations BHRF2L and BHRF2U at the positive angles of attack.

Figures 74 through 77 show the change in rotor induced body aerodynamics as a function of airspeed. The data are presented for zero body angle of attack and a thrust coefficient of .005. No data is available for BHRF2U at a speed ratio of 0.25; however, it does appear as if there may be a family of curves developing which indicate that the download measured in hover decreases as air speed increases and becomes lift at the higher speeds. It was seen from data in Figures 68 through 73 that the trends varied with body angle of attack. The effect of speed ratio on body aerodynamics at angles of attack other than zero requires further analysis of the data.

Figure 75 shows that the rotors effect on drag generally increases with airspeed. When one considers the rotors effect relative to the total configuration drag, Figure 76 results. In this figure the rotor-on configuration drag is ratioed to the rotor-off drag. This puts each configuration in proper perspective relative to its individual performance. Figure 76 indicates that the maximum rotor influence on total drag does peak over the speed ratio range investigated.

Rotor induced pitching moment as a function of speed ratio is presented in Figure 77. The trend is very consistent for all configurations investigated. The pitching moment data is presented in the form of an equivalent tail download required for trim. Consequently, reducing body-rotor separation distance increases configuration download as opposed to the decrease in body download seen in Figure 74. The magnitude of this tradeoff would be dependent upon the location of the horizontal stabilizer.

The final set of data presents lift, drag, and pitching moment as a function of a speed ratio defined as the forward flight speed divided by momentum theory hover induced velocity. This form is used in both References 9 and 13 and is similar to the classical definition of wake skew angle. Hence the data to be presented in Figures 78 through 86 show the test results as a function of rotor wake position.

Before proceeding with a discussion of the data several points should be made concerning this form of data presentation. First, this form of data presentation may be misinterpreted. For instance rotor-off data referenced to the same levels of thrust as the rotor-on data will provide a very similar curve. Unless the rotor-off body forces are zero, it is the difference in these two curves which actually defines the rotors influence on the body. It is also not possible to determine whether the body lift is decreasing or increasing with thrust based on these curves. A very strong point in favor of this method of presentation is that any significant nonwake related changes in aerodynamic characteristics will be revealed.

Figures 78 through 80 present the lift, drag, and pitching moment data for configuration BHRF2L. The data is presented for all shaft angles and speed ratios tested for this configuration. Appendix B presents most of this data graphically as body lift coefficient versus thrust. In that form the data is a series of relatively parallel lines shifted primarily by body angle of attack. Note the apparent jumps in the data of Figure 78 at positive body angles of attack. The two parallel lines in the zero degree data for instance is a speed ratio effect. The upper set of data was taken at a speed ratio of 0.25. The lower set of data was taken at speed ratios of 0.20 and 0.30. The cause for this is not completely understood; however, it also appeared in the rotor-off data and may be due to the winglets as is implied by Figure 49. The drag and pitching moment data of Figures 79 and 80 appear to be fairly well behaved. Figures 81 through 86 present the lift, drag, and pitching moment for configuration and separation distance effect at body angles of attack of -4 and 4 degrees.

Based on momentum theory, Figures 78 through 86 represent functions of rotor induced angle of attack. However, the data is still a function of body pitch attitude. The following paragraph shows the development of a more universal parameter for reducing the body data based upon momentum theory.

Utilizing small angle assumptions, the rotor induced angle of attack is:

$$\alpha_R = \upsilon_i/V$$

CONFIGURATION - BHRF2L RUNS 19/20/21/22/23

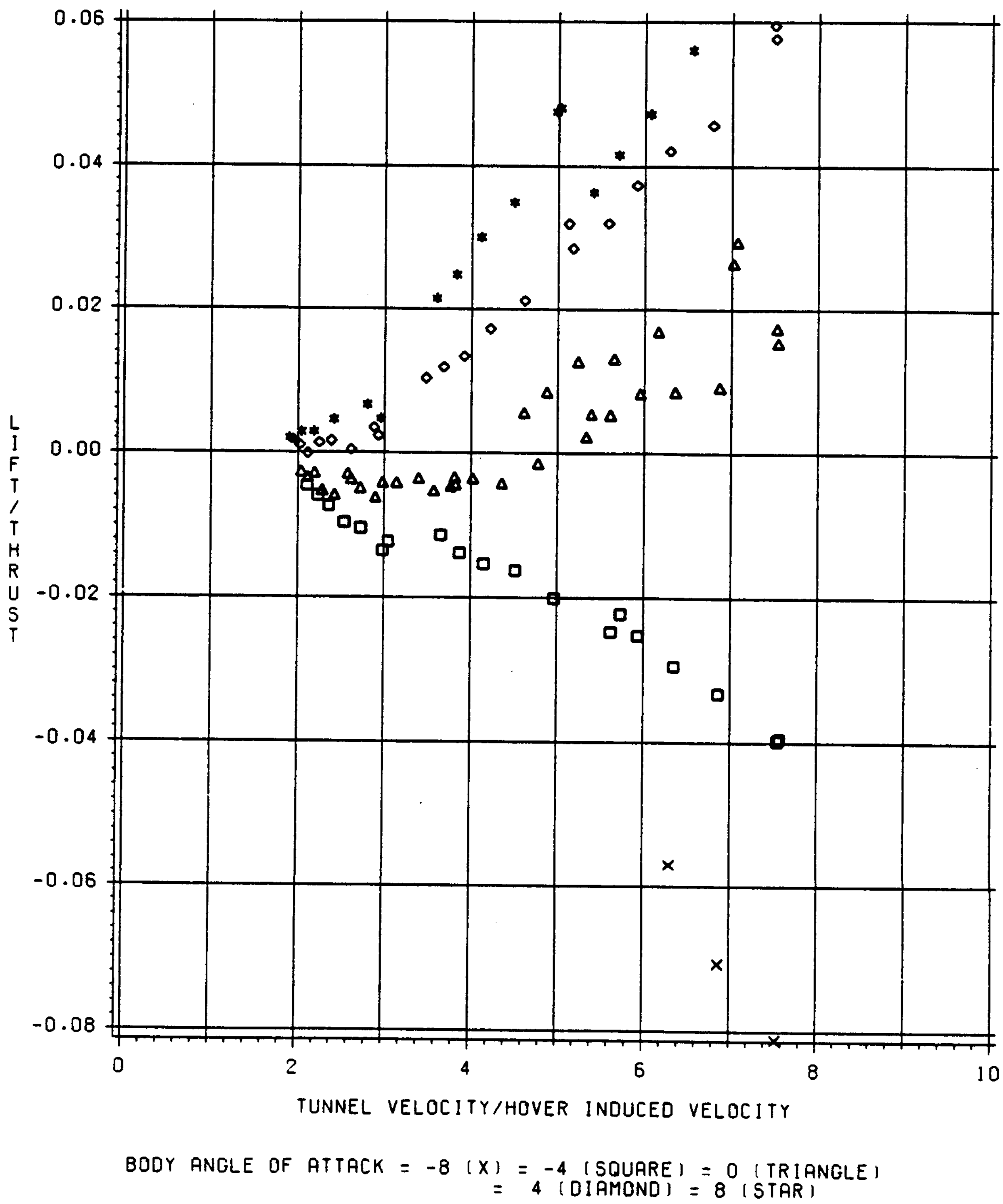


Figure 78. Effect of wake location on BHRF2L body lift.

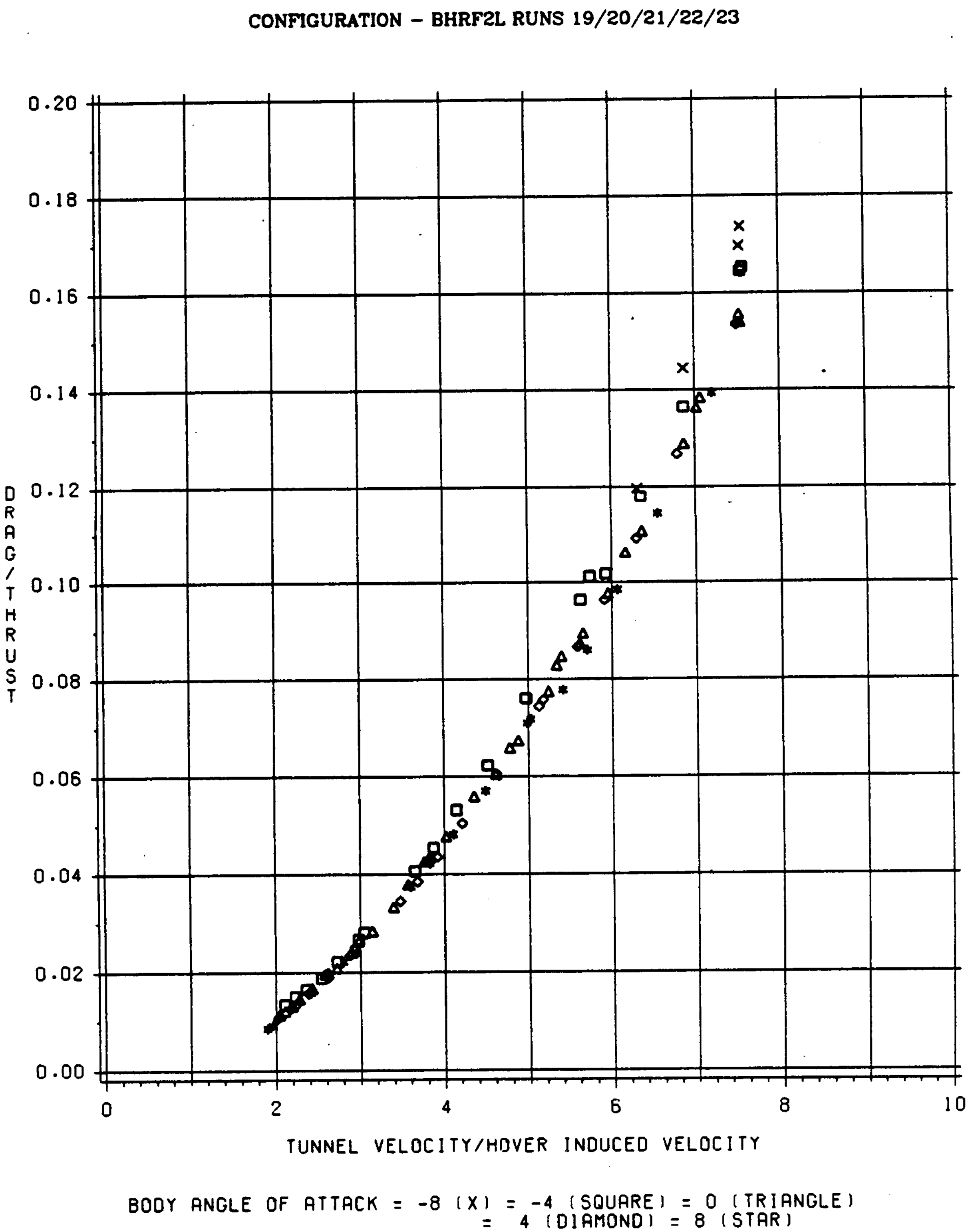
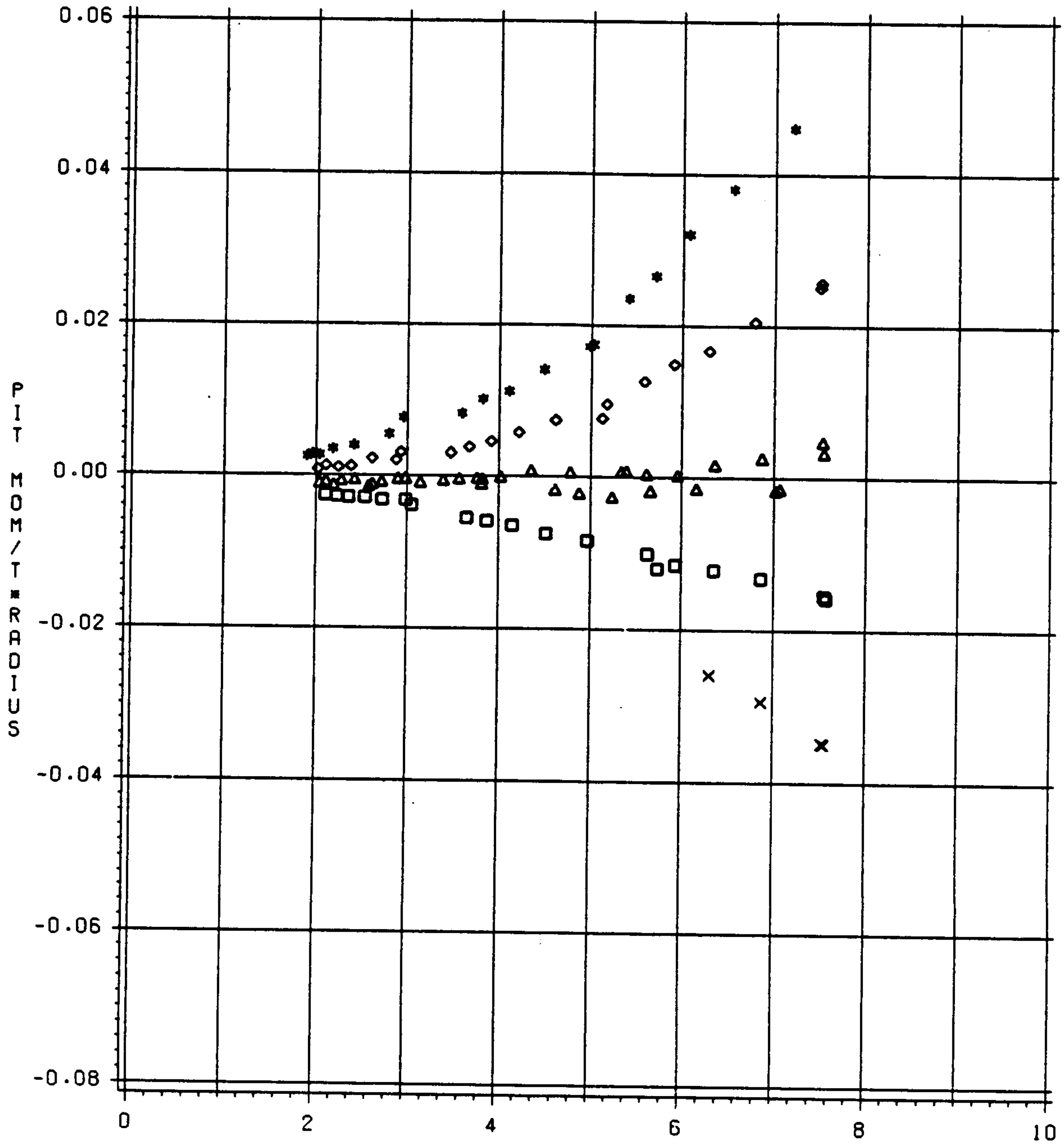


Figure 79. Effect of wake location on BHRF2L body drag.

CONFIGURATION - BHRF2L RUNS 19/20/21/22/23



BODY ANGLE OF ATTACK = -8 (X) = -4 (SQUARE) = 0 (TRIANGLE)
= 4 (DIAMOND) = 8 (STAR)

Figure 80. Effect of wake location on BHRF2L body pitching moment.

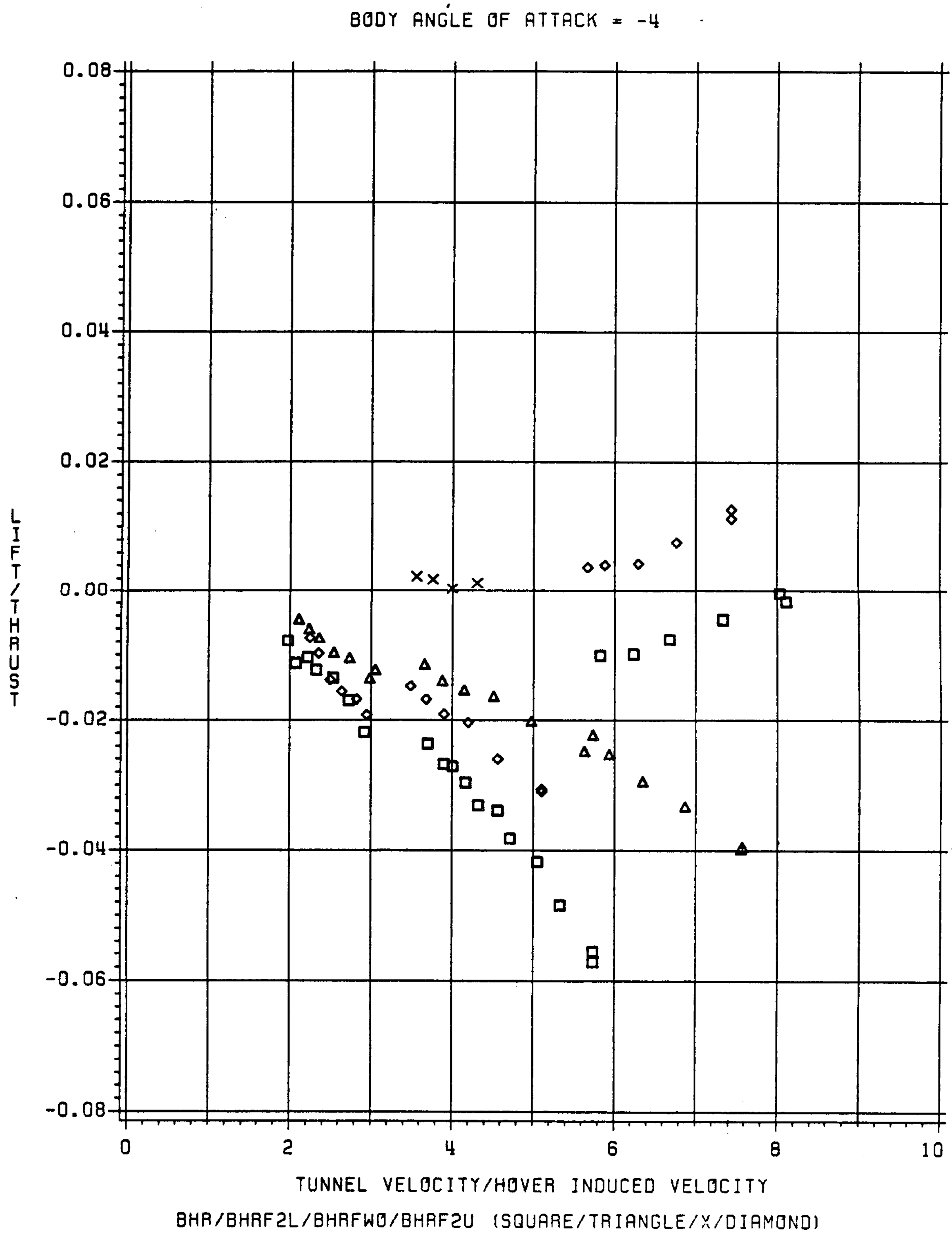


Figure 81. Effect of wake location on body lift for all configurations, θ_B = -4 degrees.

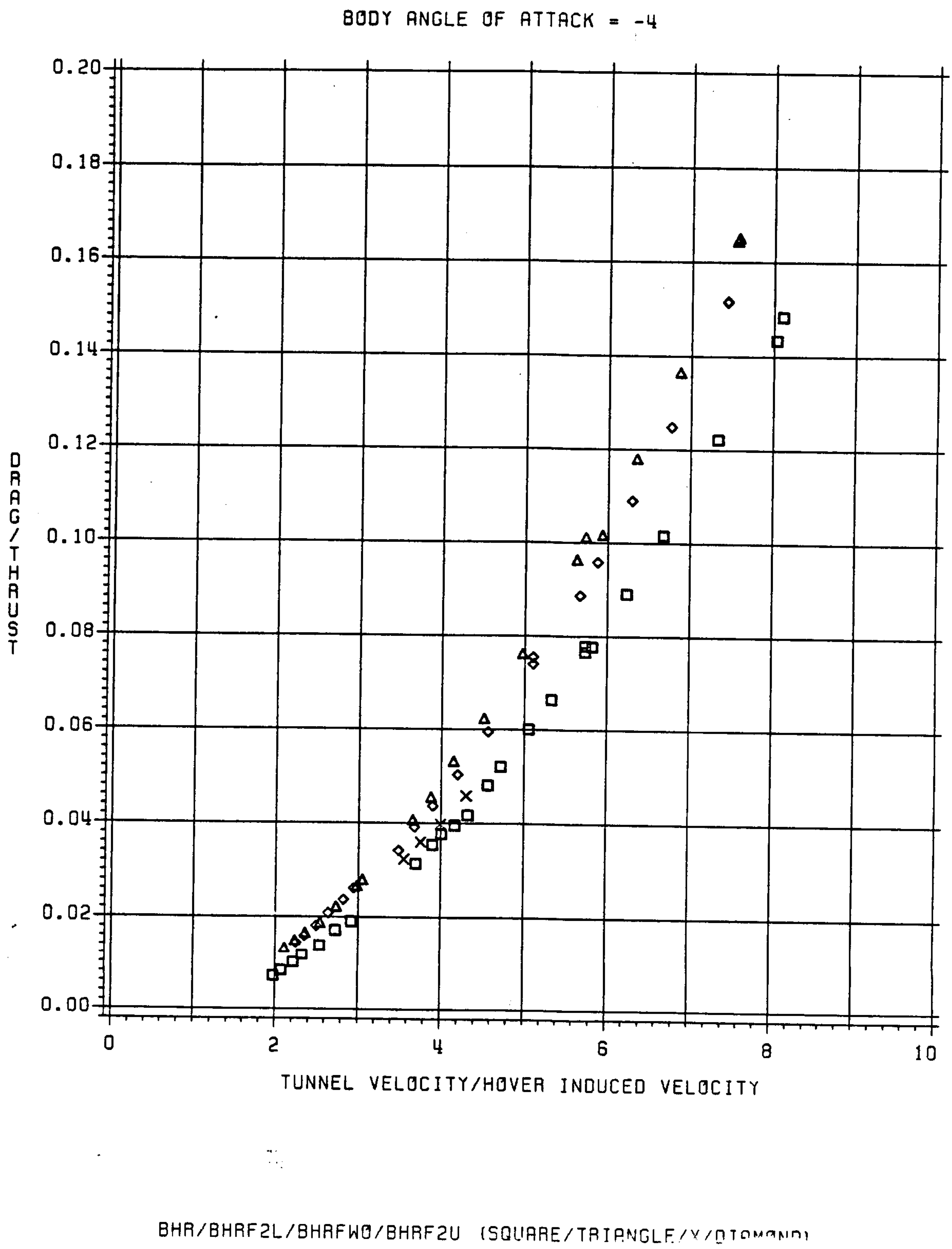


Figure 82. Effect of wake location on body drag for all configurations, θ_B = -4 degrees.

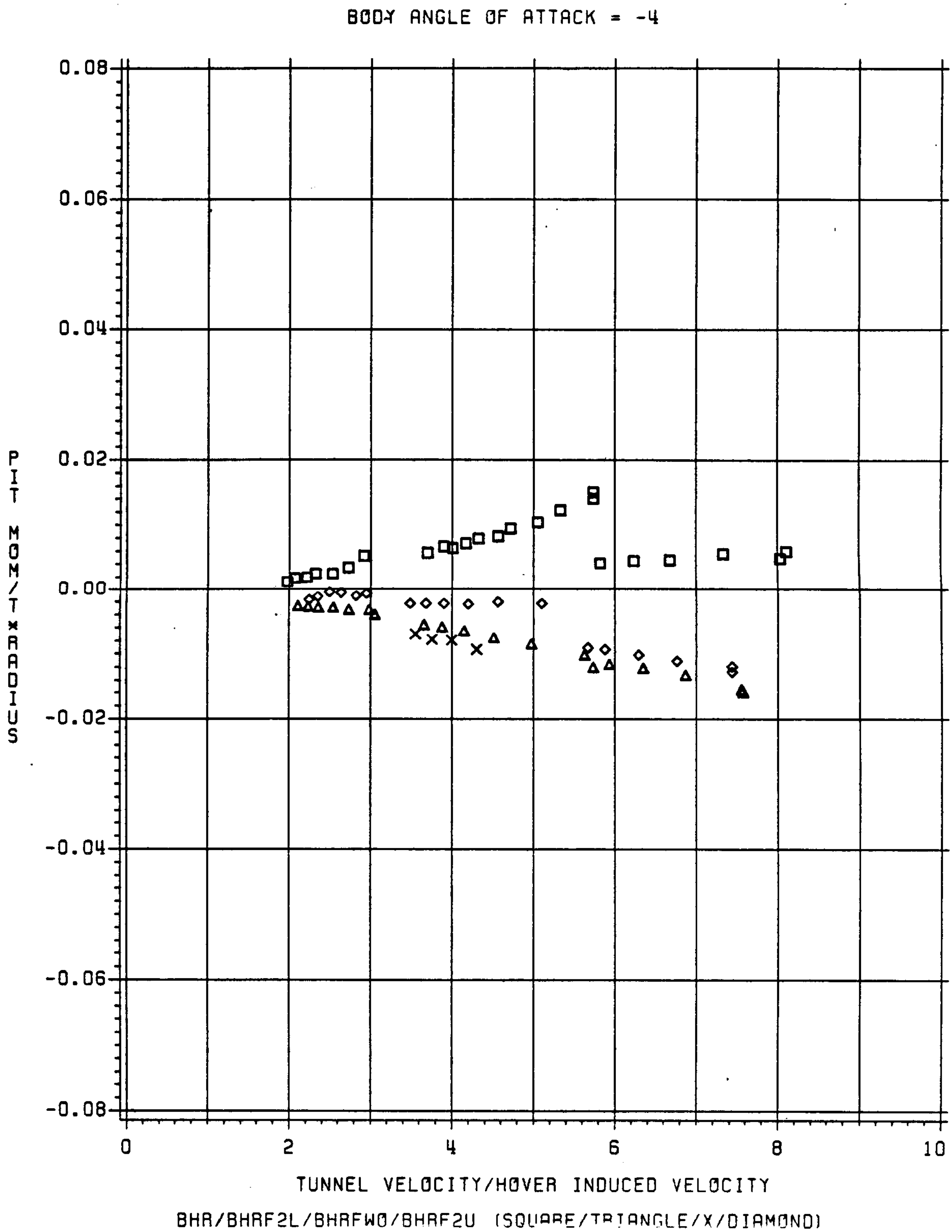


Figure 83. Effect of wake location on body pitching moment for all configurations, θ_B = -4 degrees.

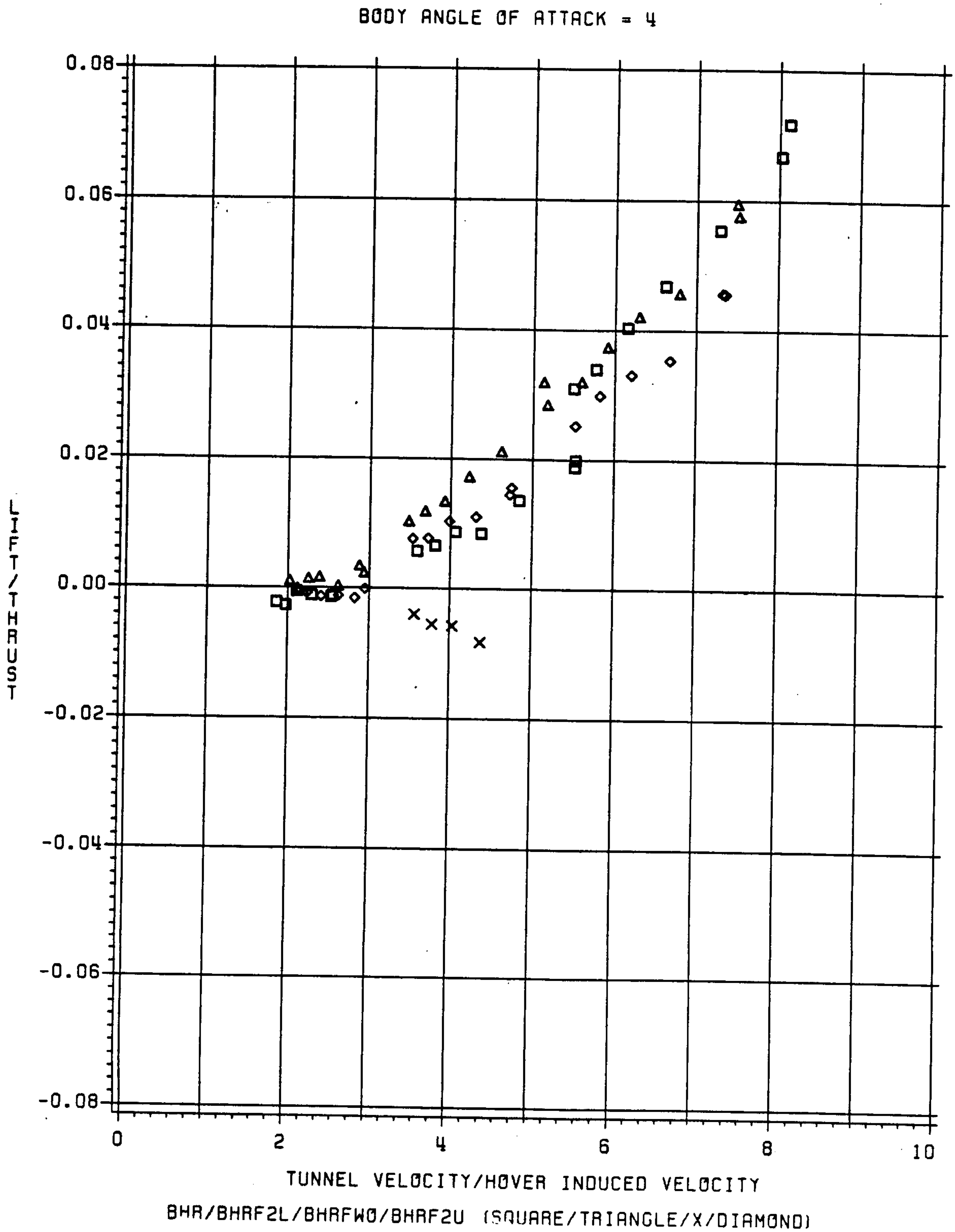


Figure 84. Effect of wake location on body lift for all configurations, θ_B = 4 degrees.

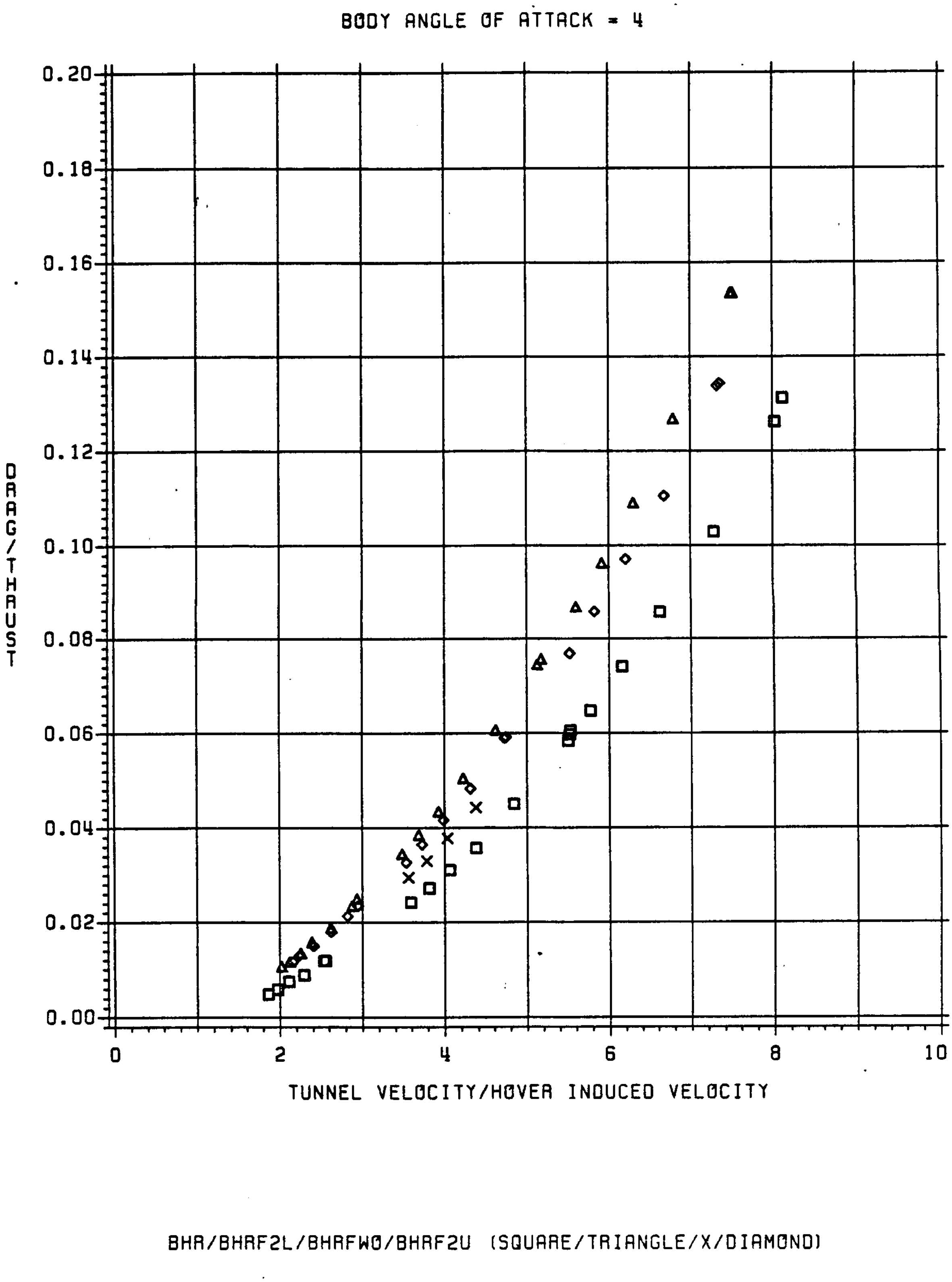


Figure 85. Effect of wake location on body drag for all configurations, θ_B = 4 degrees.

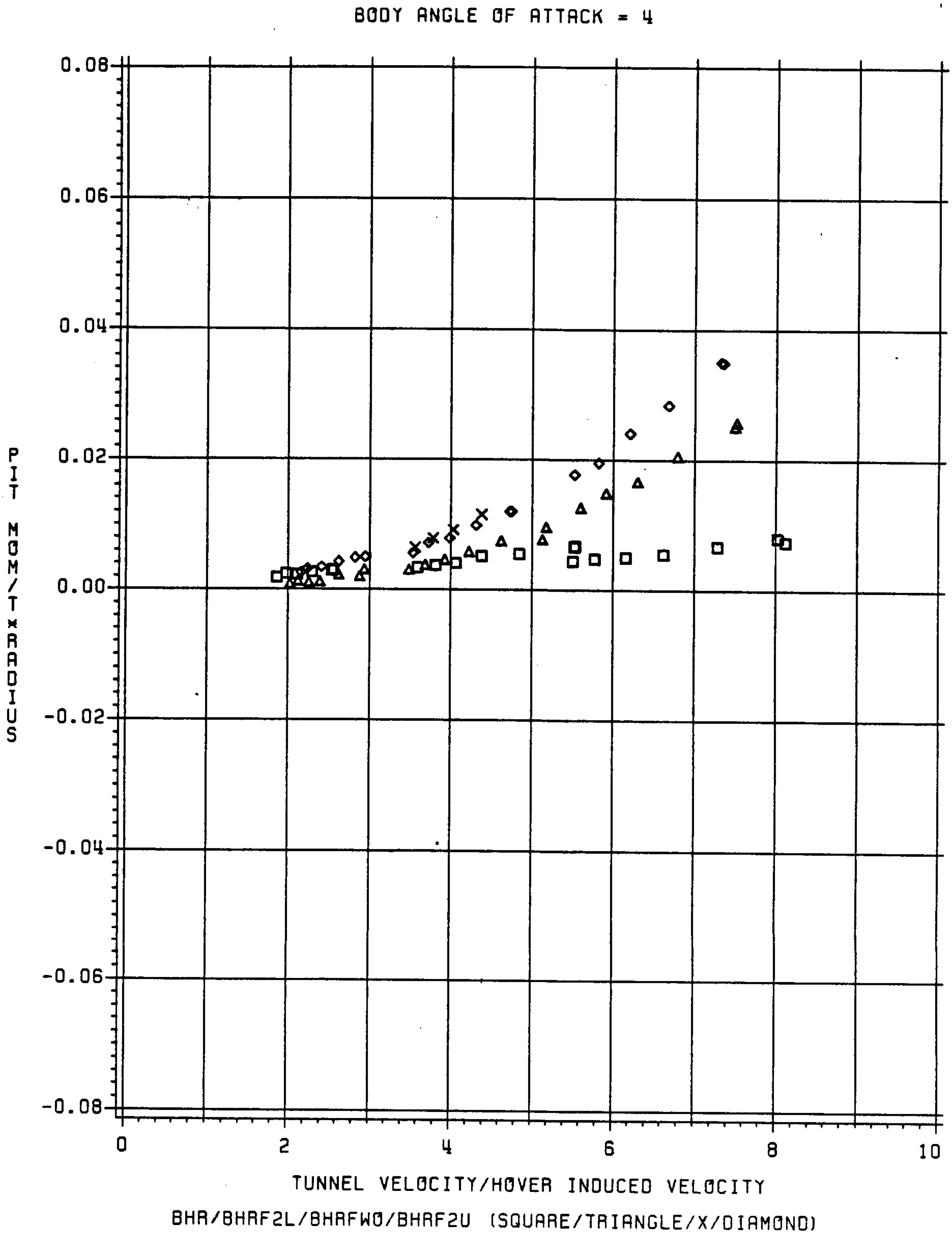


Figure 86. Effect of wake location on body pitching moment for all configurations, θ_B = 4 degrees.

Assuming $\upsilon_i = C_T \Omega R/2\mu$ at high speeds, α_R can be defined by:

$$\alpha_R = C_T/2\mu^2$$

Lift and pitching moment ratios of Figures 78 and 80 can be defined in coefficient form as follows:

$$L/T = C_{l_B} q S_B / C_T \rho \pi R^2 (\Omega R)^2$$

$$M/TR = C_{M_{Y_B}} q S_B d_B / C_T \rho \pi R^3 (\Omega R)^2$$

Writing dynamic pressure, q, in terms of speed ratio and substituting α_R where appropriate results in the following:

$$L/T = (C_{l_B} S_B / 4\pi R^2)/\alpha_R$$

$$M/TR = (C_{M_{Y_B}} S_B d_B / 4\pi R^3)/\alpha_R$$

Assuming that lift and pitching moment coefficients are a function of the following expression for body angle of attack;

$$\alpha_B = \theta_B - C_T/2\mu^2 - \Delta\alpha$$

L/T and M/TR become functions of θ_B/α_R. Figures 87 and 88 show the data of Figures 78 and 80 as functions of θ_B/α_R. It should be remembered that the data of Figures 87 and 88 represent total powered configuration aerodynamic characteristics and not the increment of forces and moments due to the rotor.

<u>Fuselage Pressure Data</u> - Pressure data was reduced to evaluate effects of configuration, thrust, and angle of attack at a speed ratio of 0.2. Pressure data variations with speed ratio are not presented. The pressure data will be limited to the upper surface centerline only and presented as differential pressure or pressure coefficient versus body station. Unscaled body profiles are provided at the bottom of each figure to show a relationship between geometry and pressure. Corrections were not made for wall effects or slight variations in thrust coefficient due to insufficient reduced data. However, these effects where checked given the available data and analysis using a panel code. It was determined that the corrections would have no bearing on conclusions drawn from the data presented.

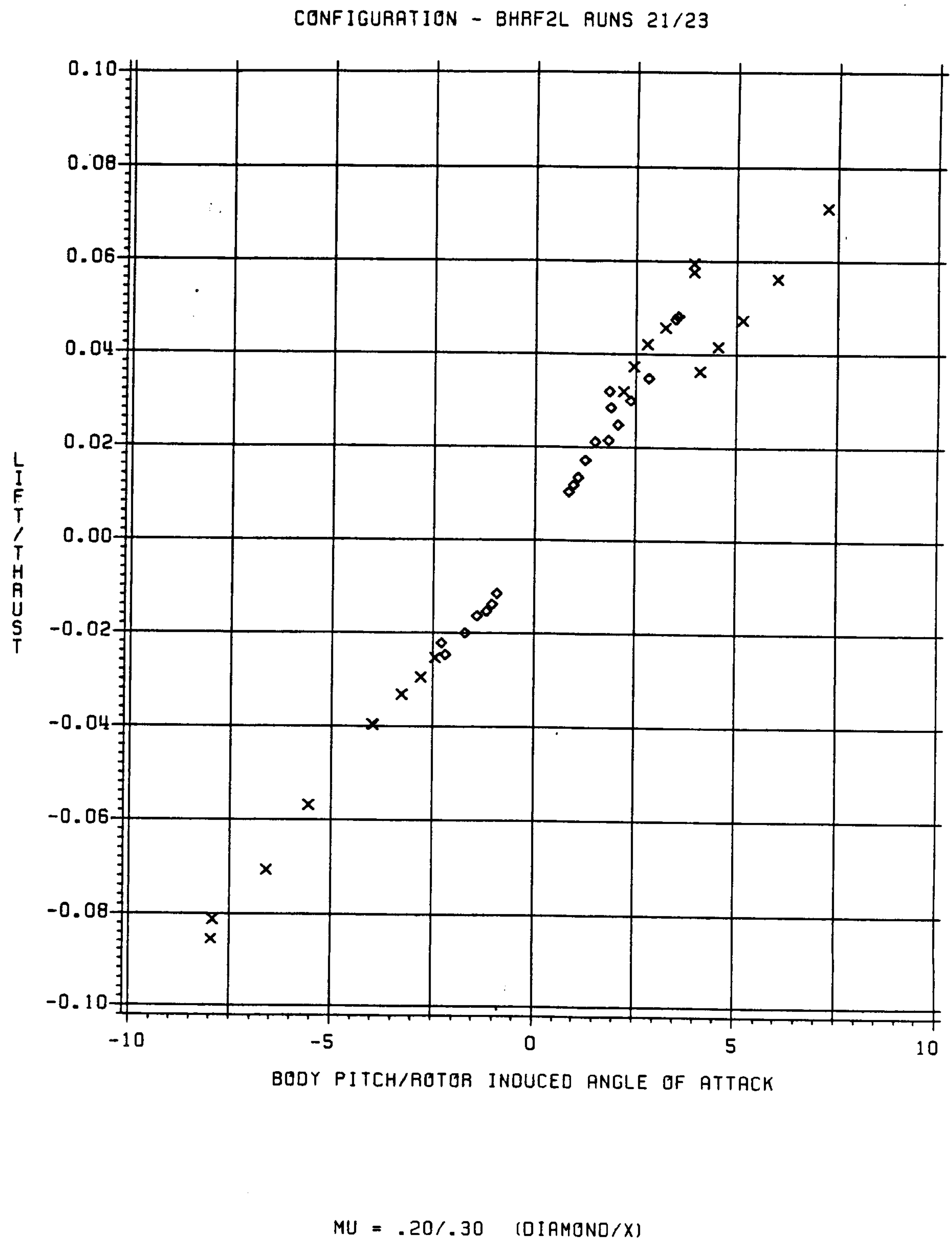


Figure 87. **Effect of body angle of attack/rotor induced angle of attack on body lift.**

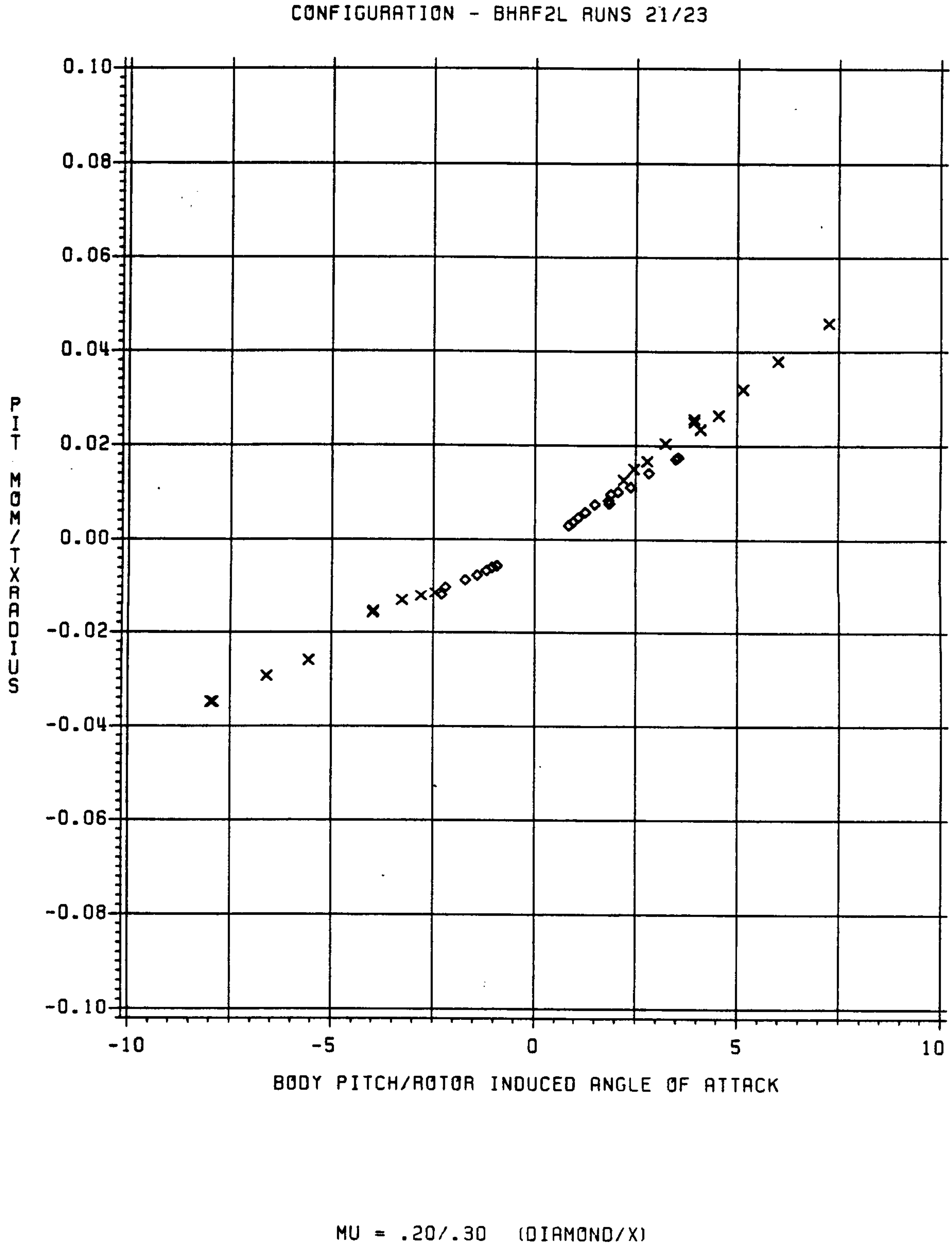


Figure 88. Effect of body angle of attack/rotor induced angle of attack on body pitching moment.

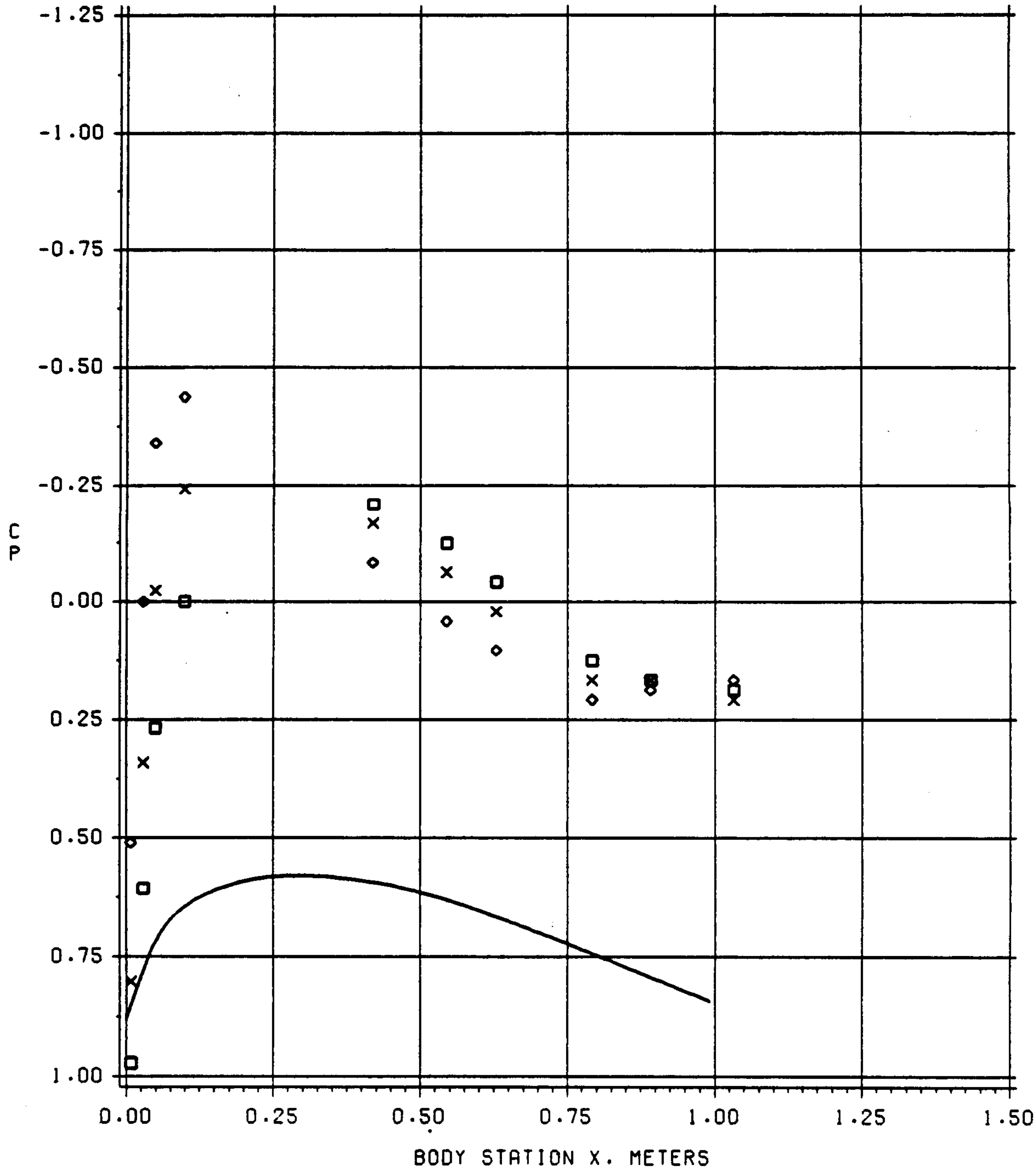
A study of the pressures in the nose region indicated that there was some flow angularity. This was partly due to the test stand fairing on the lower surface of each body configuration. Consequently, the angles of attack called out in the following text are actually the geometric angles of attack relative to the tunnel floor. Figures 89 and 90 present the pressure distribution for the isolated body (hub-off) configurations B and BF2L. Each figure shows measured pressure data over a 16 degree range of angle of attack. The data show increased suction over the nose with an increase in angle of attack (nose up).

Figures 91 and 92 show the influence of configuration buildup on pressure distribution. Each figure compares the pressure distribution for the isolated body to body with hub only and body with a rotor producing a thrust coefficient of approximately 0.0055. Each configuration has a body geometric angle of zero degrees relative to the tunnel floor. Adding the hub to each configuration shows a pressure increase in front of the hub. Similar results were shown in Reference 13. Because configuration BH has such a short nose the apparent solid body blocking of the hub extends over a greater part of the nose section. The extended nose configuration BHF2L of Figure 92 shows very little deceleration due to the hub from the windscreen to the hub. In fact, there is an apparent flow acceleration over the nose.

The rotor-on data of Figure 91 indicates that relative to the hub-on data of BH the rotor reduces pressure over the entire body. This is contrary to the effect shown in Figure 92 where configuration BHRF2L shows an increase in pressure over a body span equivalent to the length of BHR. This changes, however, over the nose region where the rotor apparently accelerates the flow and decreases the pressure relative to BHF2L. Reference 49 data showed the same acceleration over the nose due to the rotor. This may be due to the time-averaged upwash near the rotors leading edge which is similar to a fixed wing. If the rotor-on afterbody pressure data is correct for BHR and BHRF2L, it may be that the nose is influencial on near wake trajectories and effects.

Figure 93 compares the isolated configurations B and BF2L. The data is referenced to the hub station to provide a correct alignment for comparison of the afterbody data of the two configurations. Figure 94 compares the hub-on data in the same manner. Both figures show that the afterbody pressure distributions are quite similar with only a slight deviation immediately behind the hub. This is not the case, however, for the rotor-on configurations shown in Figure 95. Further evaluation of pressure data will be required to understand whether the effects observed are correct. Figure 96 summarizes the rotors effect on the upper surface pressures by plotting the difference in the rotor-on and isolated body data.

SPEED RATIO = 0.2   RUN 65



BODY ANGLE OF ATTACK = -8/0/8 (SQUARE/X/DIAMOND)

Figure 89. Effect of angle of attack on measured configuration B pressure coefficients.

SPEED RATIO = 0.2 RUN 68

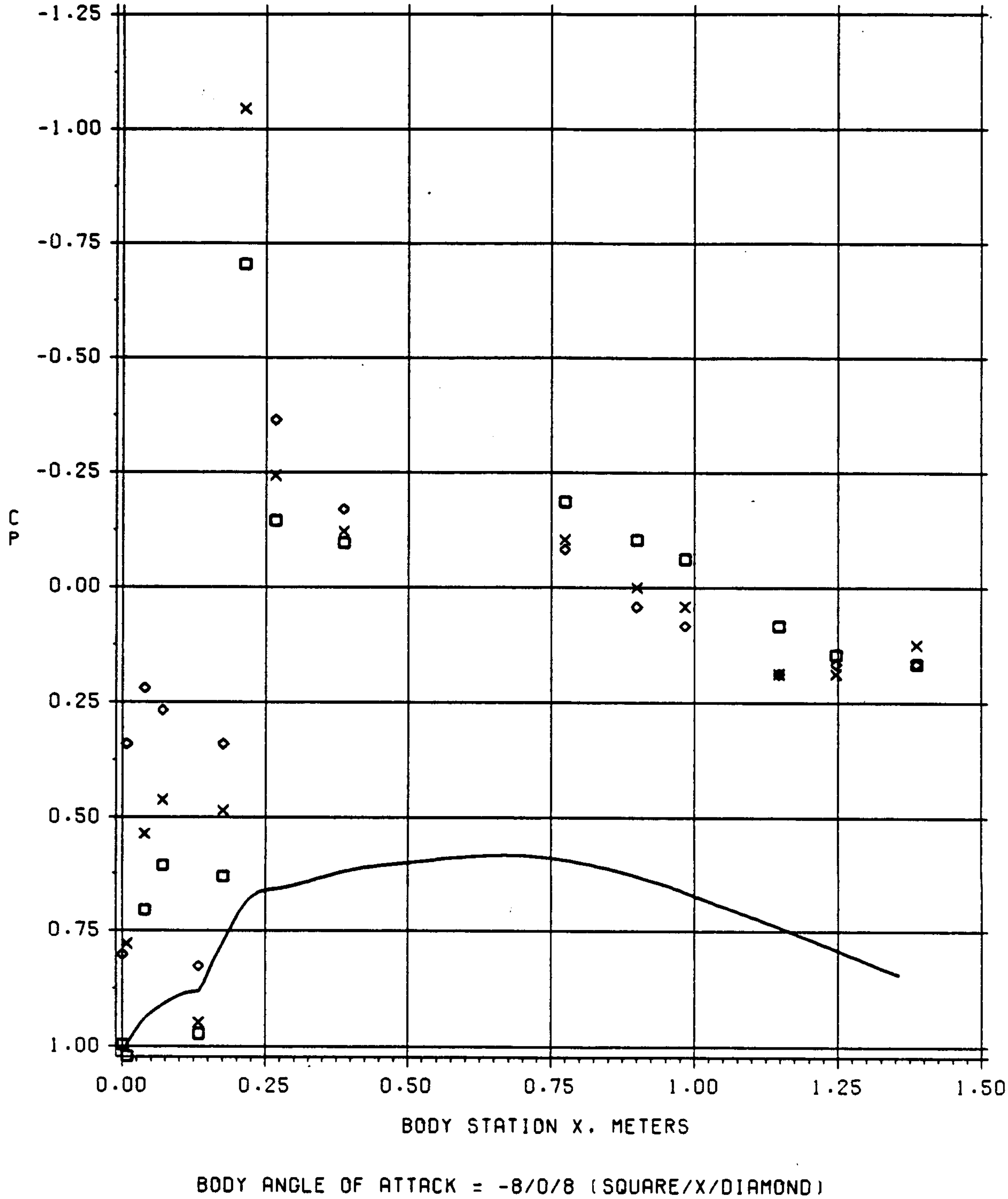


Figure 90. Effect of angle of attack on measured configuration BF2L pressure coefficients.

SPEED RATIO = 0.2   RUNS 15/61/65

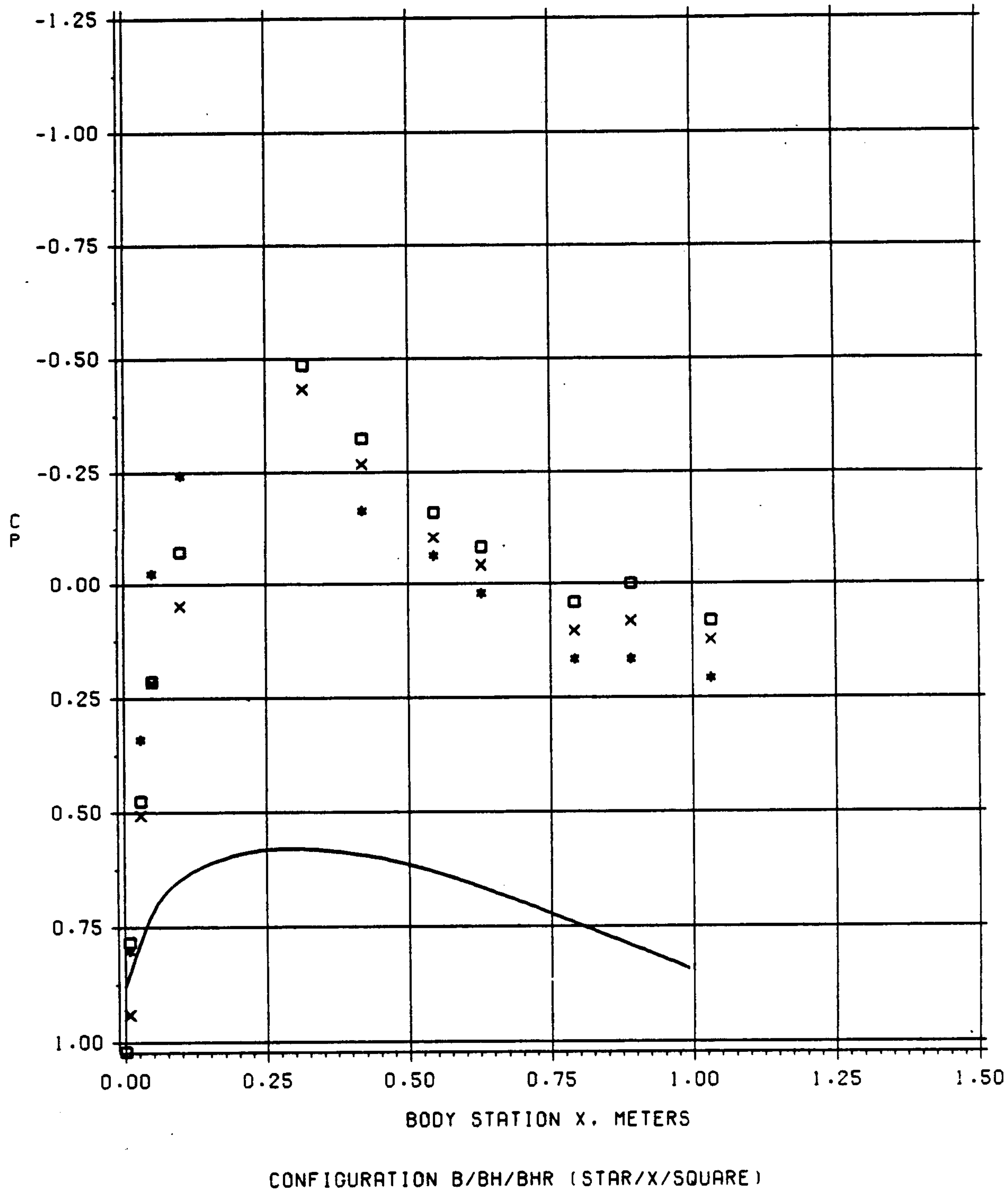
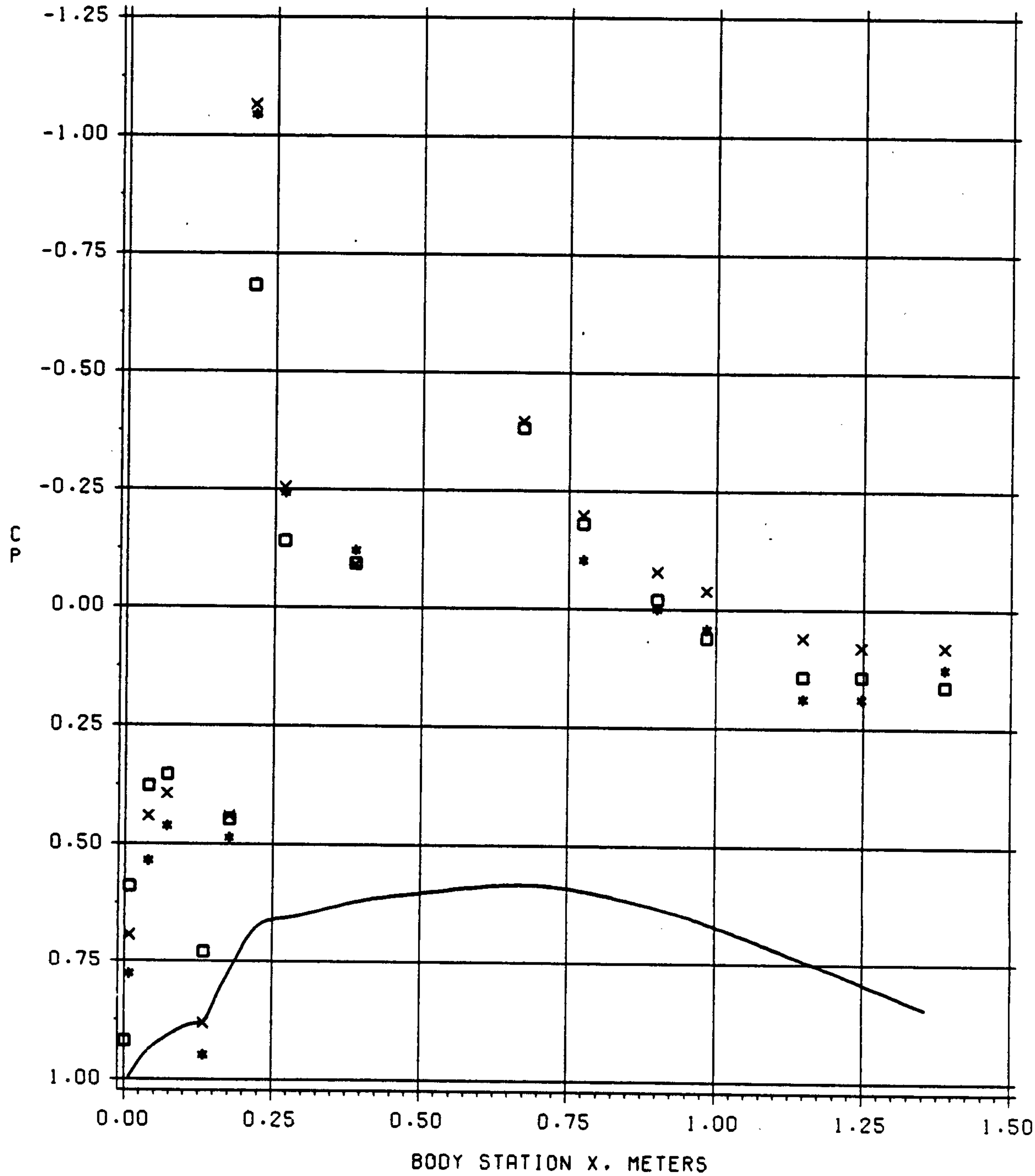


Figure 91. Effect of hub and rotor on measured configuration B pressure coefficients, C_T = 0.0055, θ_B=0.

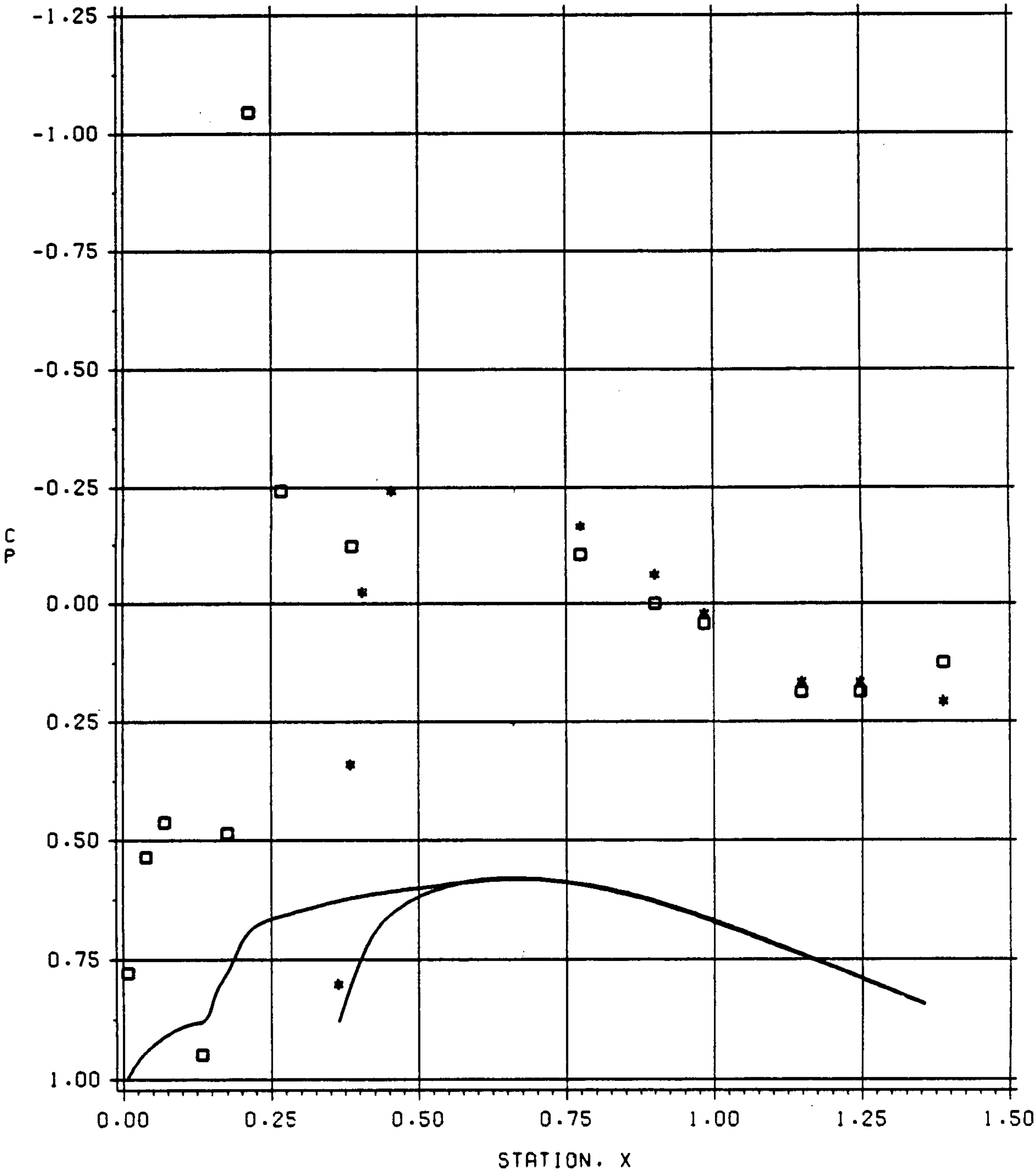
SPEED RATIO = 0.2   RUNS 21/53/68



CONFIGURATION BF2L/BHF2L/BHRF2L (STAR/X/SQUARE)

Figure 92. Effect of hub and rotor on measured configuration BF2L pressure coefficients, C_T = 0.0055, θ_B=0.

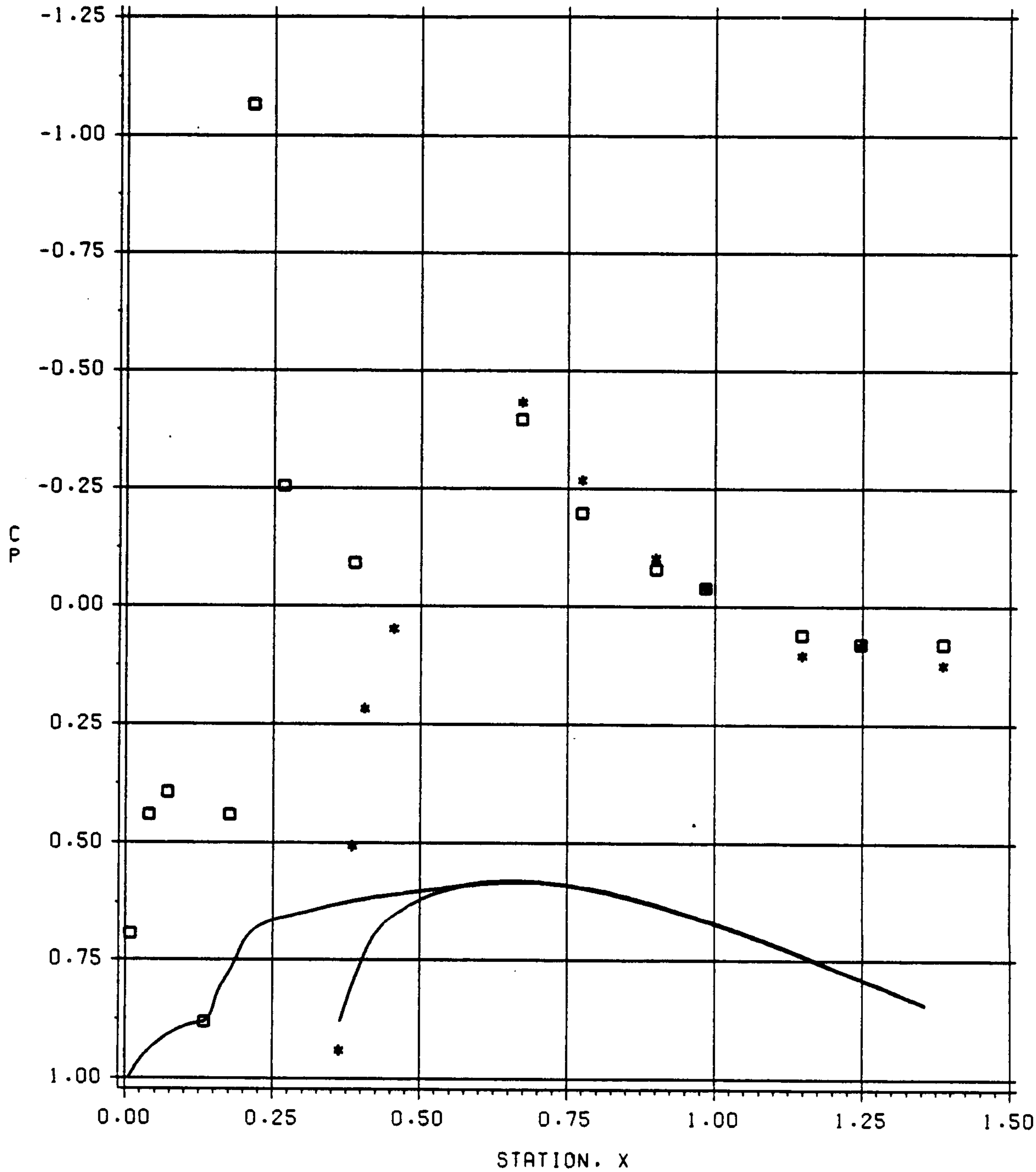
SPEED RATIO = 0.2   RUN 65/68



CONFIGURATION B/BF2L (STAR/SQUARE)

Figure 93. Comparison of measured pressure coefficients for configurations B and BF2L, θ_B=0.

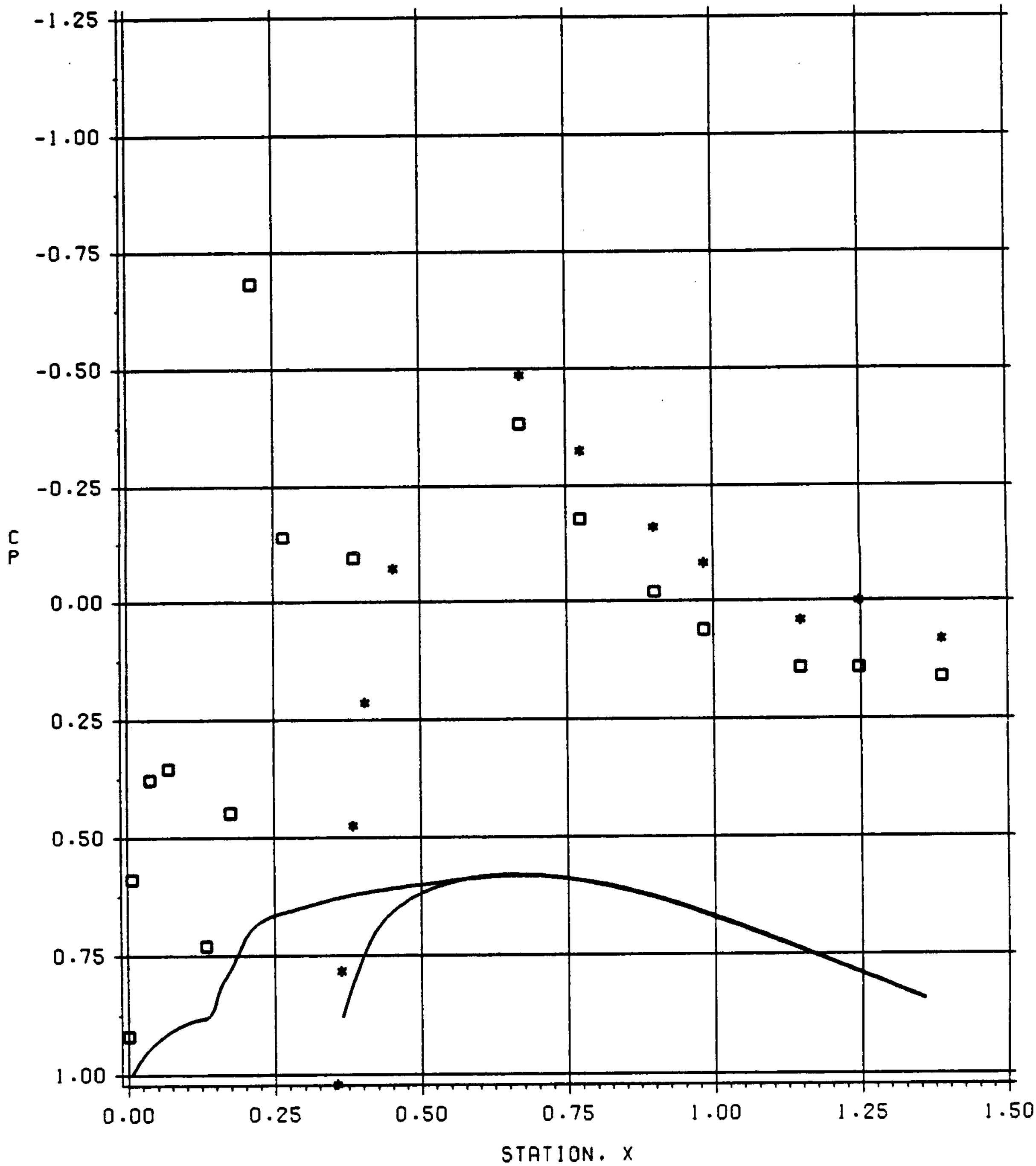
SPEED RATIO = 0.2 RUN 53/61



CONFIGURATION BH/BHF2L (STAR/SQUARE)

Figure 94. Comparison of configuration BH and BHF2L pressure coefficients, θ_B=0.

SPEED RATIO = 0.2 RUN 15/21



CONFIGURATION BHR/BHRF2L (STAR/SQUARE)

Figure 95. Comparison of configuration BHR and BHRF2L pressure coefficients, C_T = 0.0055, θ_B=0.

SPEED RATIO = 0.2 RUN 15/21/65/68

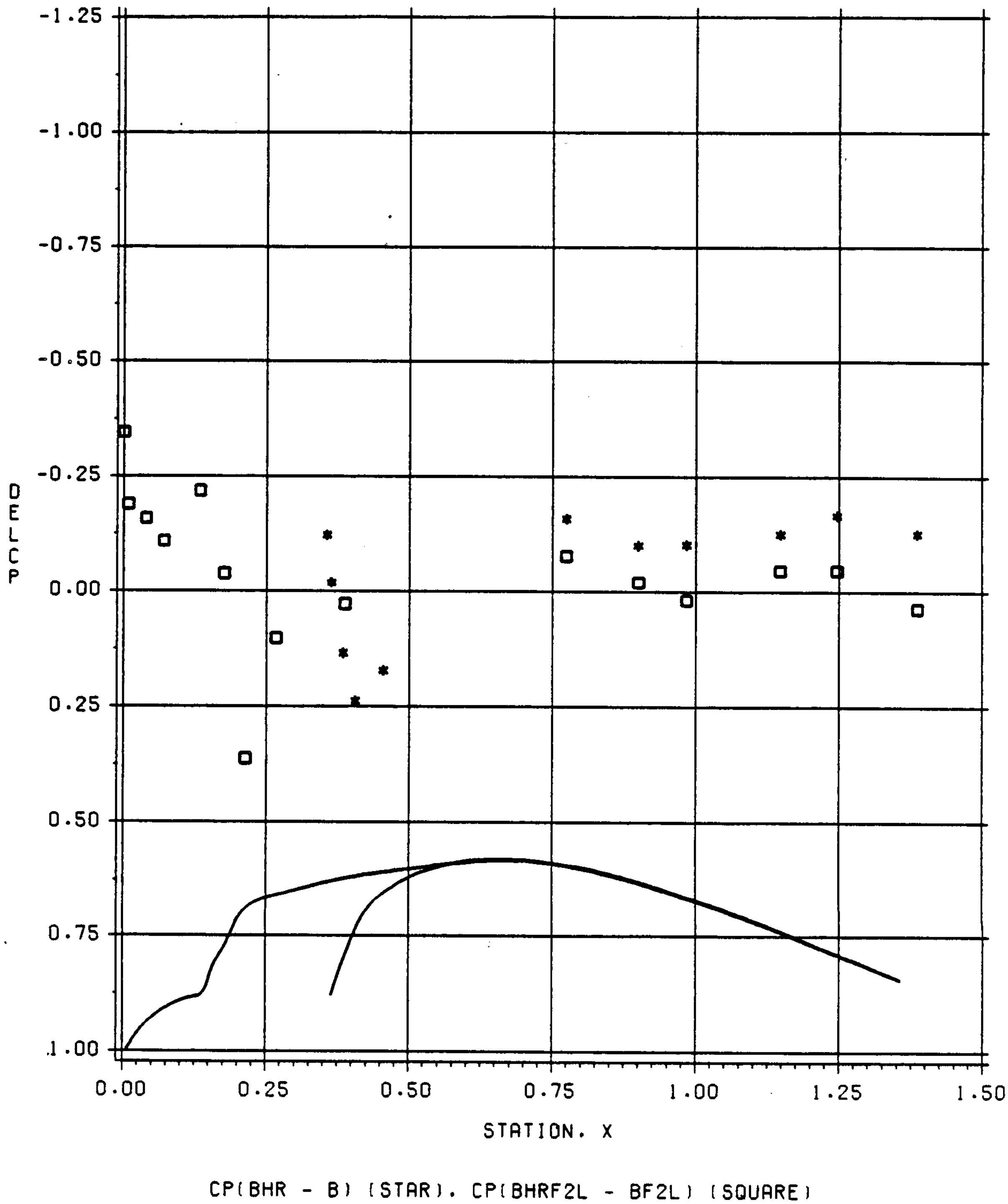


Figure 96. Increment in configuration BHR and BHRF2L pressure coefficients due to the rotor and hub, $C_T = 0.0055$, $\theta_B=0$.

The effect of rotor-body separation distance is shown in Figure 97. Decreasing the separation distance increased the surface pressures along the entire body. The increase was more pronounced ahead of the hub than behind it. This same trend was shown in Reference 13 for a body of revolution identical to configuration BHR with the winglets removed. For this comparison the thrust coefficient was .0055. Figure 98 presents the same data as the difference in pressure between the two configurations. The data of Figures 97 and 98 are repeated in Figures 99 and 100 for a thrust coefficient of approximately .003.

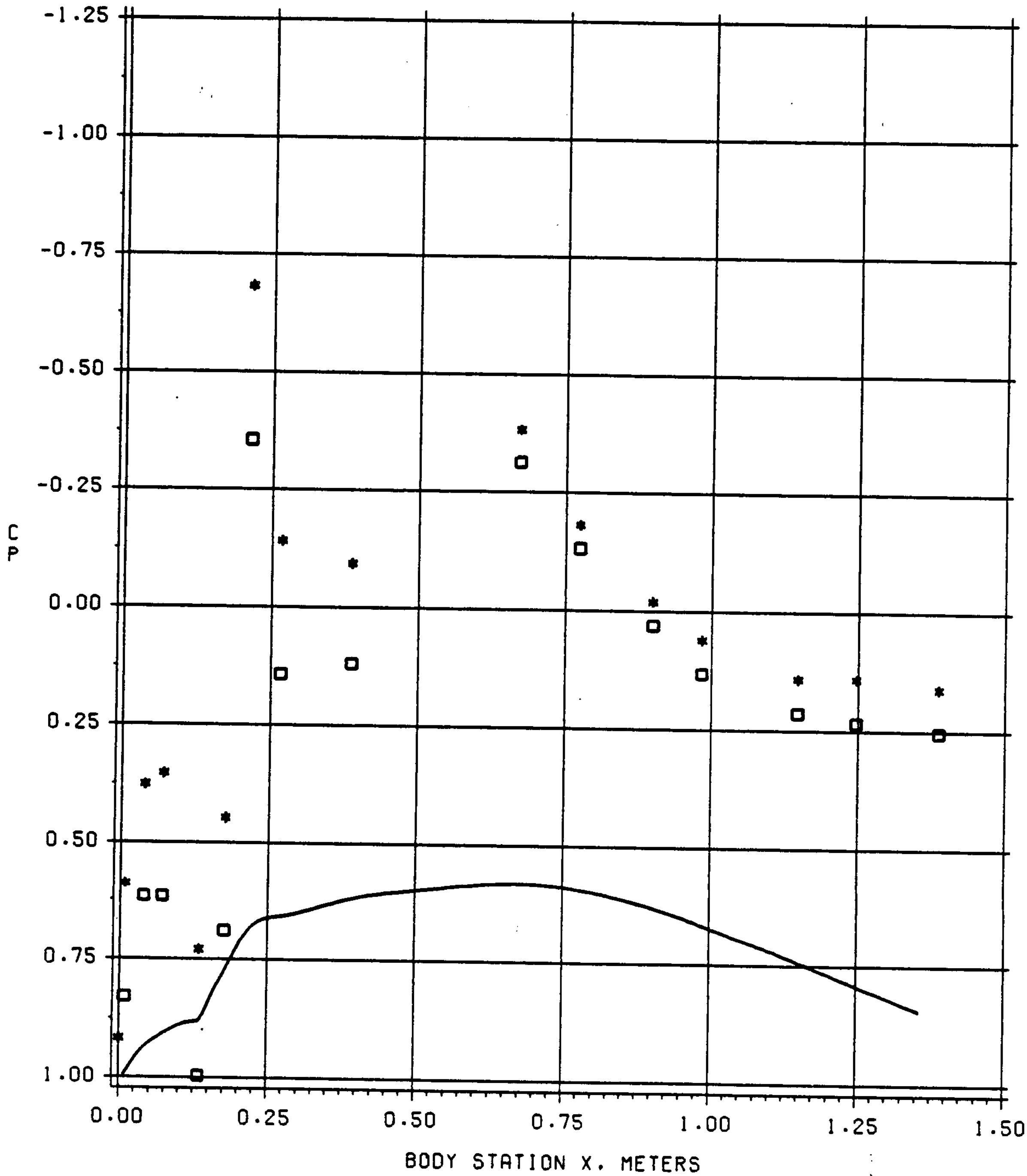
The presentation of pressure data is concluded with the effect of thrust shown in Figures 101 and 102 for configurations BHRF2U and BHRF2L respectively. The pressure increases with thrust for both configurations. The results of these two figures indicate that the change in pressure with rotor thrust is greater as the rotor-fuselage separation distance decreases.

Main Rotor data - Measured rotor data for each configuration except BHRFWO is presented in the forms of thrust coefficient versus power coefficient, control axis angle of attack, H-force coefficient, propulsive force coefficient, and main rotor pitching moment coefficient. In addition, equivalent rotor lift/drag ratio is calculated based on the data and presented versus rotor lift coefficient. Cross plotting is used to present some of the data as a function of control axis angle of attack. The reason for this form is explained further into the text.

In general the rotor performance data was found to be very well behaved. A second order polynomial with respect to thrust was found to provide a very good curvefit of the power required data. An additional check as to the nature of the data was to plot power required as a function of thrust squared. The data was very linear and well behaved to the point at which profile power became significant. The data then became nonlinear with thrust but did not show any significant increases in scatter. Testing in deep stall was not an objective of this test, consequently, blade loading (thrust coefficient/solidity) ranged from approximately .03 to 0.085. For the Model 222 rotor this represents a thrust coefficient range from .0023 to .0065.

Since the presence of a body in a moving fluid stream creates a disturbance in the flow field, it is expected that a rotor in close proximity to the body would experience changes in inflow distribution. Along with the variation of inflow, secondary effects such as wake distortion may become a factor particularly at higher blade loadings. At zero angle of attack a body can be thought of as a simple single source in a free stream. If the strength of the source is varied to maintain a constant fluid body shape, an upwash field normal to the free stream results. The upwash is directly proportional to the free stream velocity

SPEED RATIO = 0.2   RUNS 21/29



CONFIGURATION BHRF2L/BHRF2U (STAR/SQUARE)

Figure 97. Effect of separation distance on measured pressure coefficients, $C_T = 0.0055$, $\theta_B = 0$.

SPEED RATIO = 0.2   RUNS 21/29

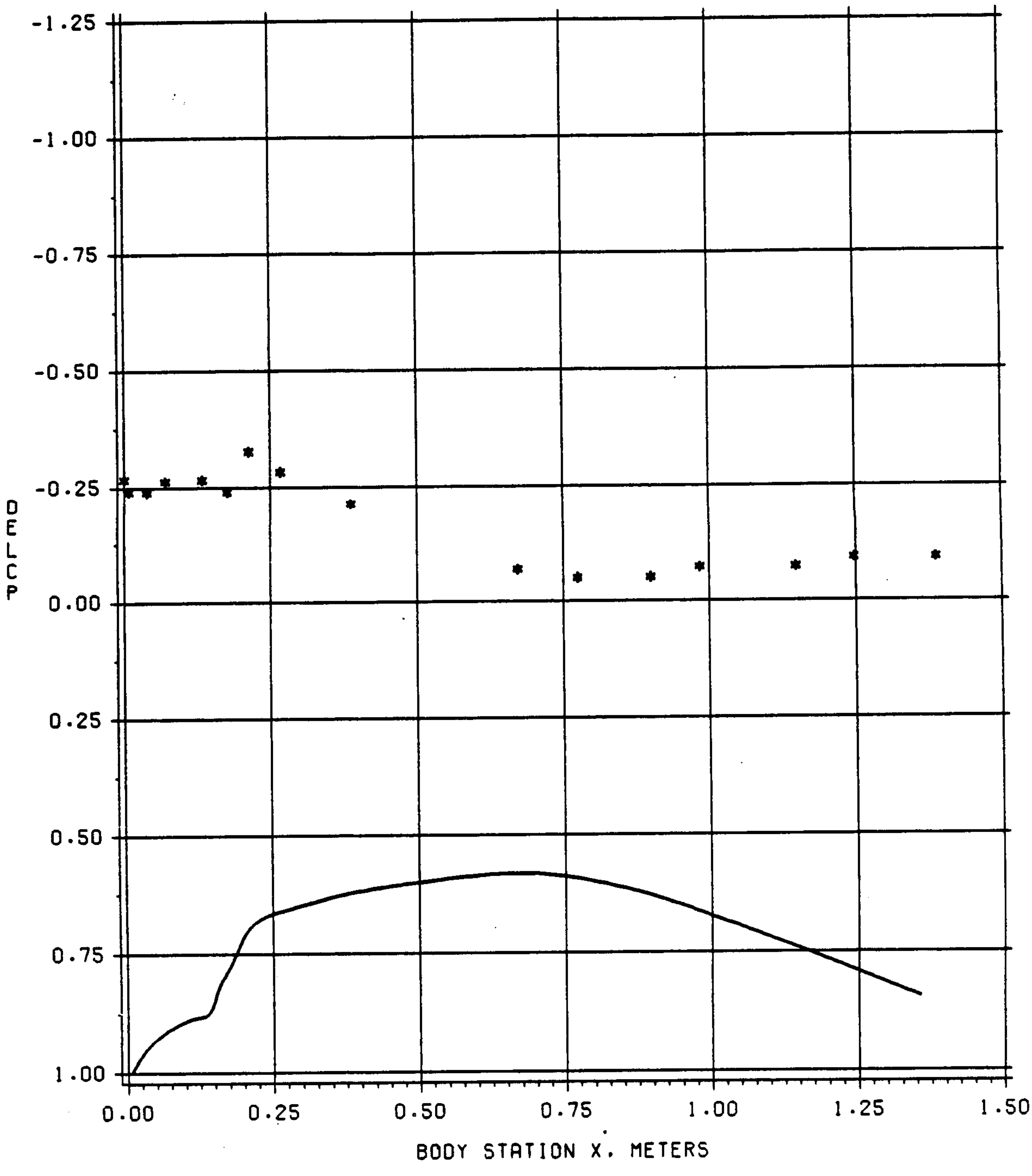
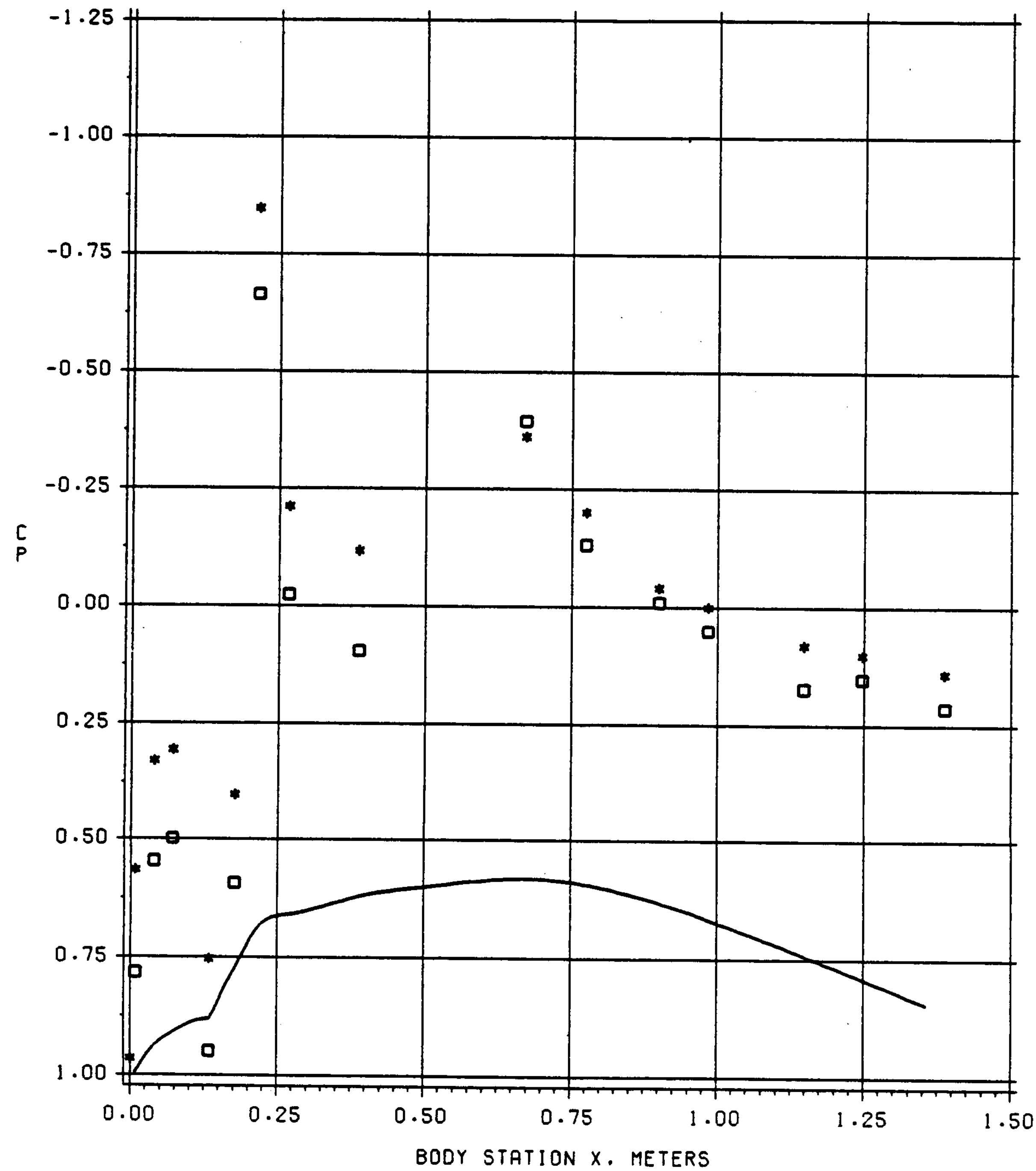


Figure 98. Increment in measured pressure coefficients due to separation distance, $C_T = 0.0055$, $\theta_B = 0$.

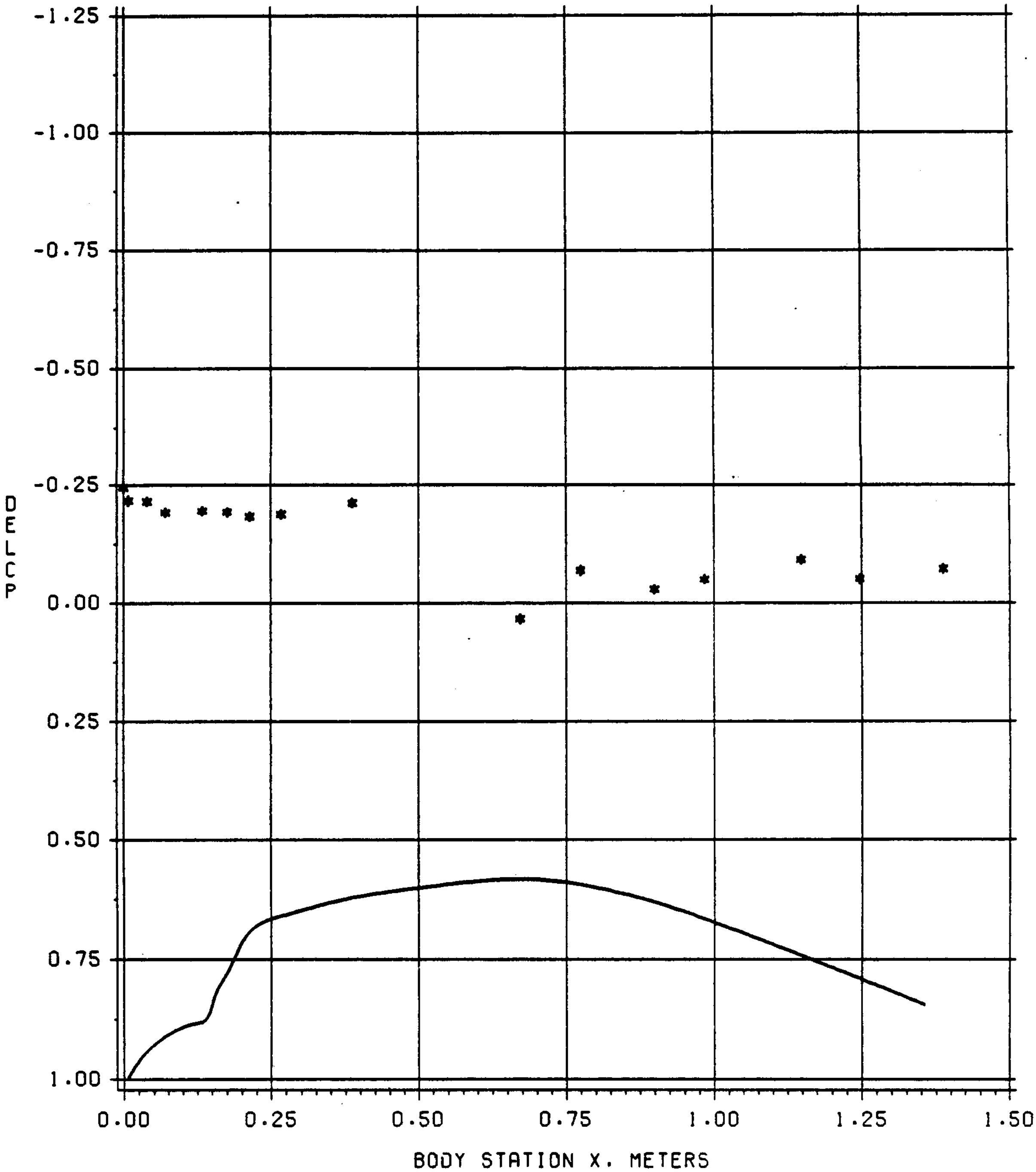
SPEED RATIO = 0.2   RUNS 21/29



CONFIGURATION BHRF2L/BHRF2U (STAR/SQUARE)

Figure 99. Effect of separation distance on measured pressure coefficients, $C_T = 0.003$, $\theta_B = 0$.

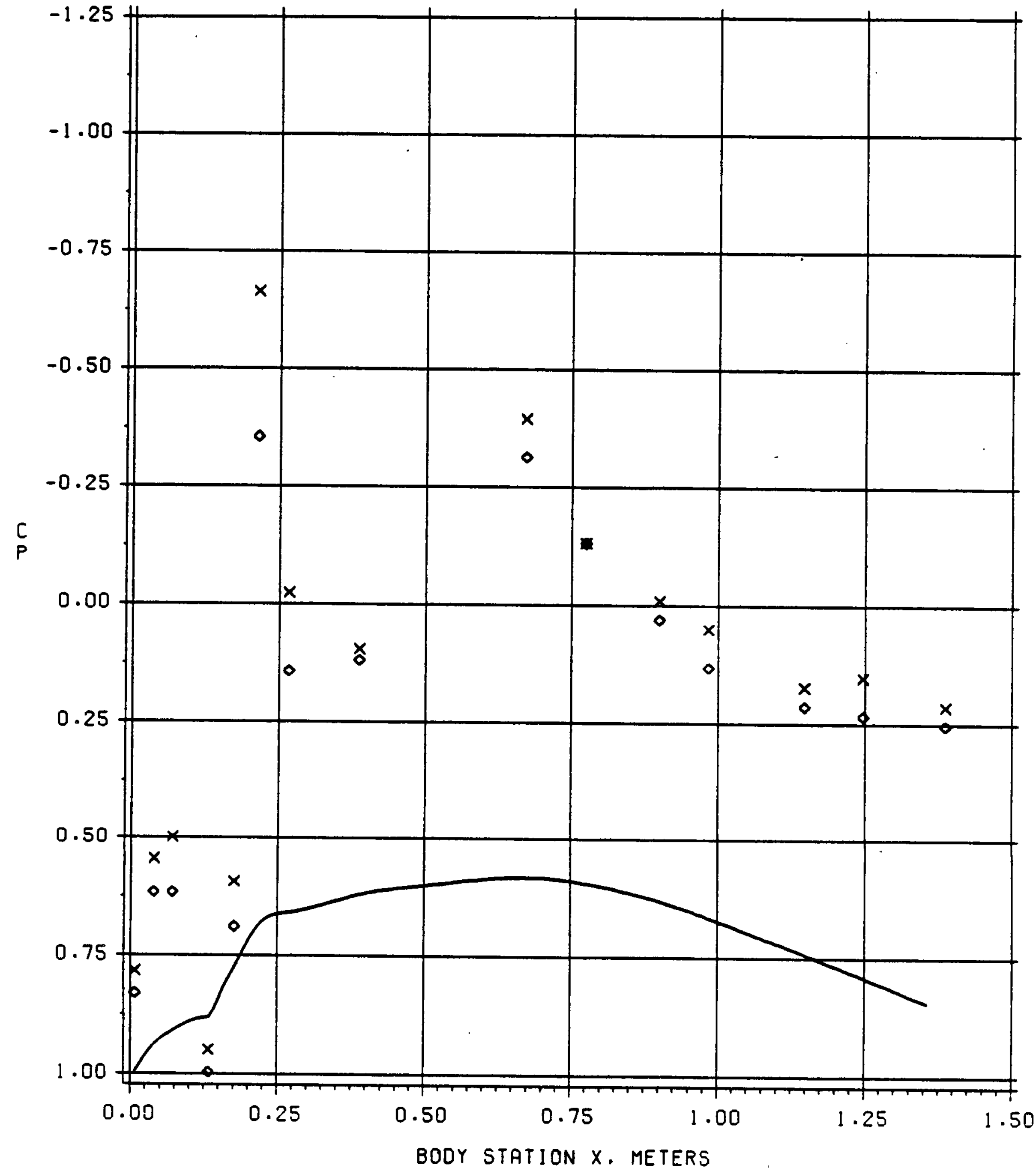
SPEED RATIO = 0.2 RUNS 21/29



DELCP = CP(BHRF2L - BHRF2U)

Figure 100. Increment in measured pressure coefficient due to separation distance, $C_T = 0.003$, $\theta_B = 0$.

SPEED RATIO = 0.2 RUN 29



CT = 0.003/0.0055 (X/DIAMOND)

Figure 101. Effect of main rotor thrust on configuration BHRF2U measured pressure coefficients, $\theta_B = 0$.

SPEED RATIO = 0.2   RUN 21

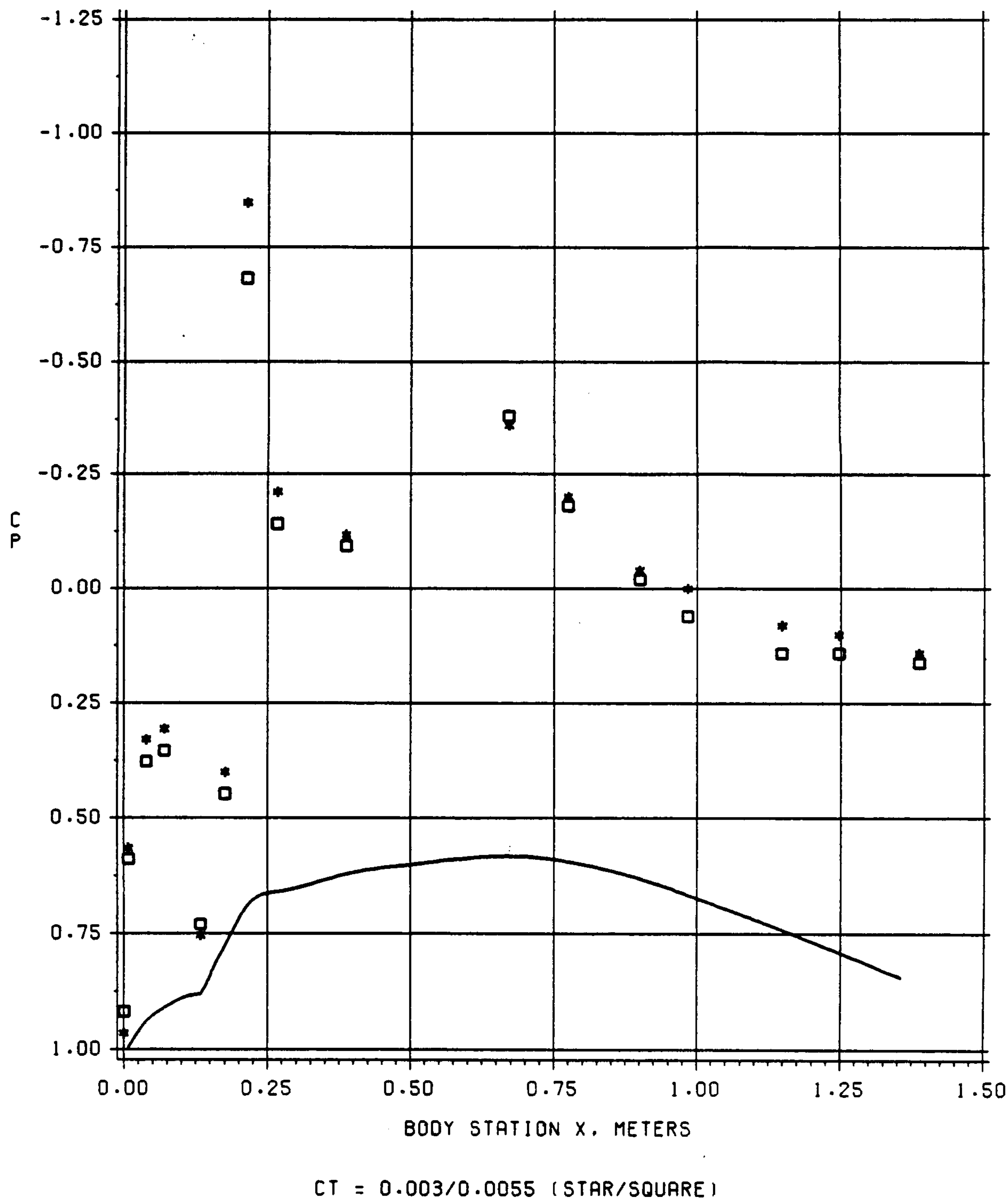


Figure 102.   Effect of main rotor thrust on configuration BHRF2L measured pressure coefficients, $\theta_B = 0$.

inversely proportional to approximately the vertical distance between the body and point of interest squared. In addition the rotor may sense equivalent ground plane or blockage effects due to the body. Consequently, the rotor may be operating at different effective shaft angles for different body configurations, eventhough, the geometric shaft angle is the same.

Rotor thrust coefficient versus power coefficient is presented in Figures 103 through 104 for configurations HR, BHR, BHRF2L, and BHRF2U at speed ratios of 0.15, 0.20, 0.25, and 0.30. Without any flow field distortion due to the presence of a body, all data for a given shaft angle would collapse into one curve within a given error band. However, the spread in the curves implies that the inflow was modified in some manner. The control axis angle of attack data corresponding to Figures 103 through 106 is shown in Figures 107 through 110. This data shows that there are clear shifts between configurations as opposed to scatter. In several cases it was as much as 1 degree or more between configurations. Model position and flapping errors may account for some of the shifts observed, however, position was held to within ±.05 degrees and flapping to within ±.12 degrees.

If the change in control axis is an indication primarily of change in rotor angle of attack, or inflow, the performance data can be corrected by control axis angle of attack. This will not work precisely because the inflow distribution due to each configuration will vary and rotor H-force may not be precisely the same. The power coefficient data was plotted against control axis angle of attack for a constant thrust coefficient of 0.005. The results are shown in Figures 111 and 112 respectively for speed ratios of 0.2 and 0.3. The performance variations with configuration are reduced considerably and fall within approximately a 4 percent band. Several observations can be made of this data when viewed on a constant control axis angle of attack basis.

1. The body of revolution has the least overall impact on performance relative to the isolated rotor.

2. Decreasing separation distance reduces power required at a speed ratio of 0.30.

3. At a speed ratio of 0.3, the rotor-body configurations tend to decrease power required relative to the isolated rotor under normal forward flight propulsive conditions (possibly ground plane effect). However, BHRF2L and BHRF2U actually increase power required under descent conditions (possible blockage).

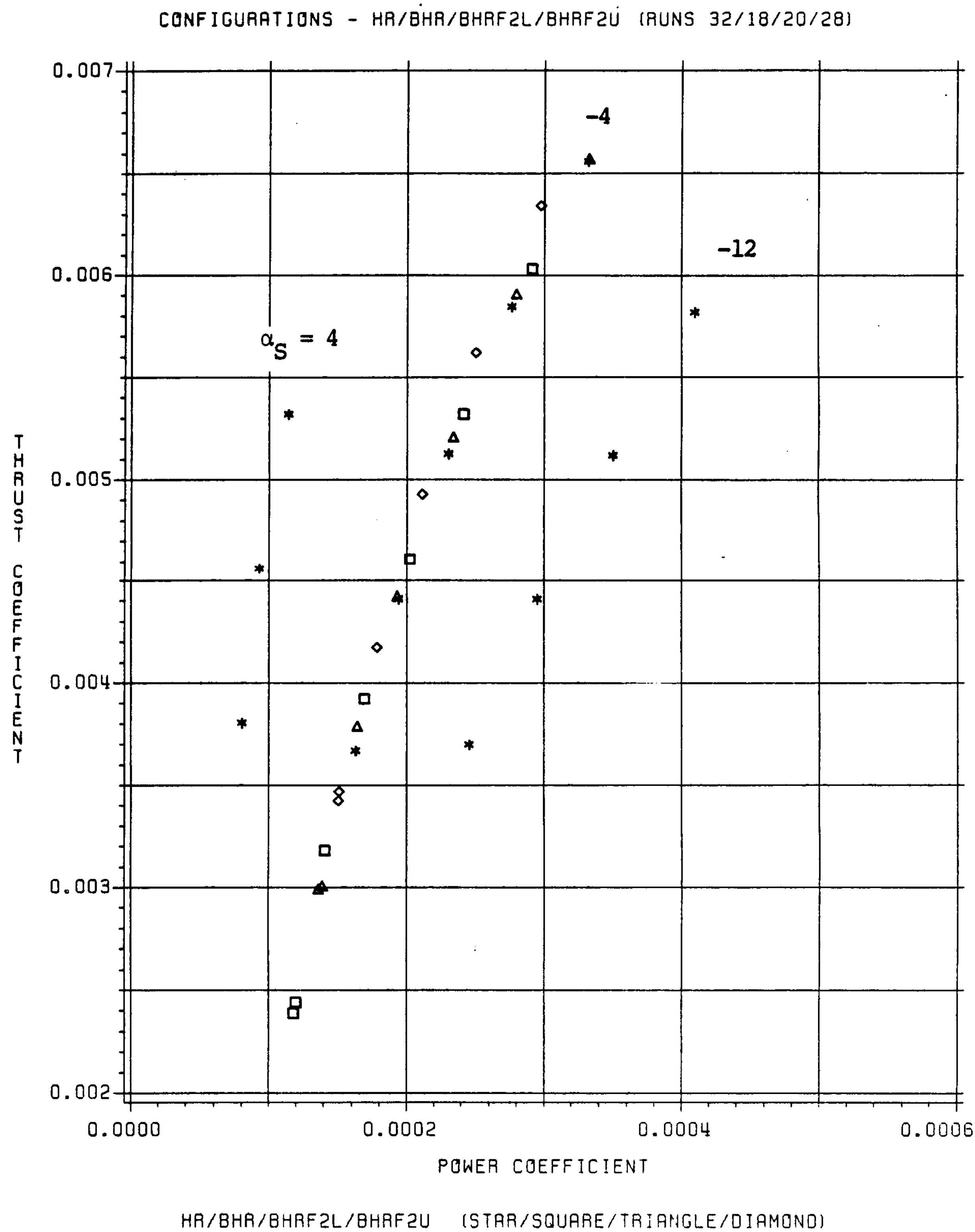


Figure 103. Main rotor C_T versus C_P, all configurations, μ=0.15.

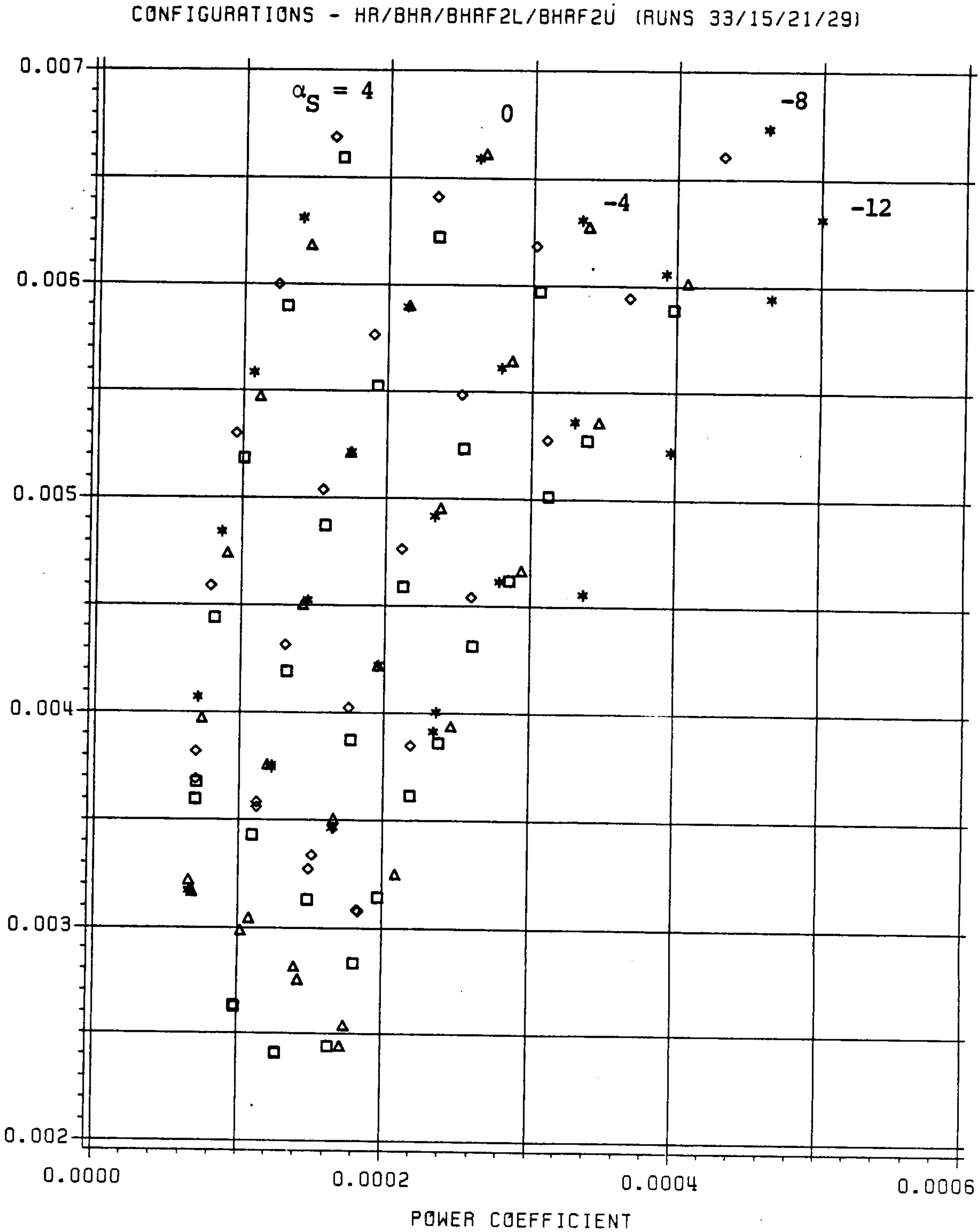


Figure 104. Main rotor C_T versus C_P, all configurations, μ=0.20.

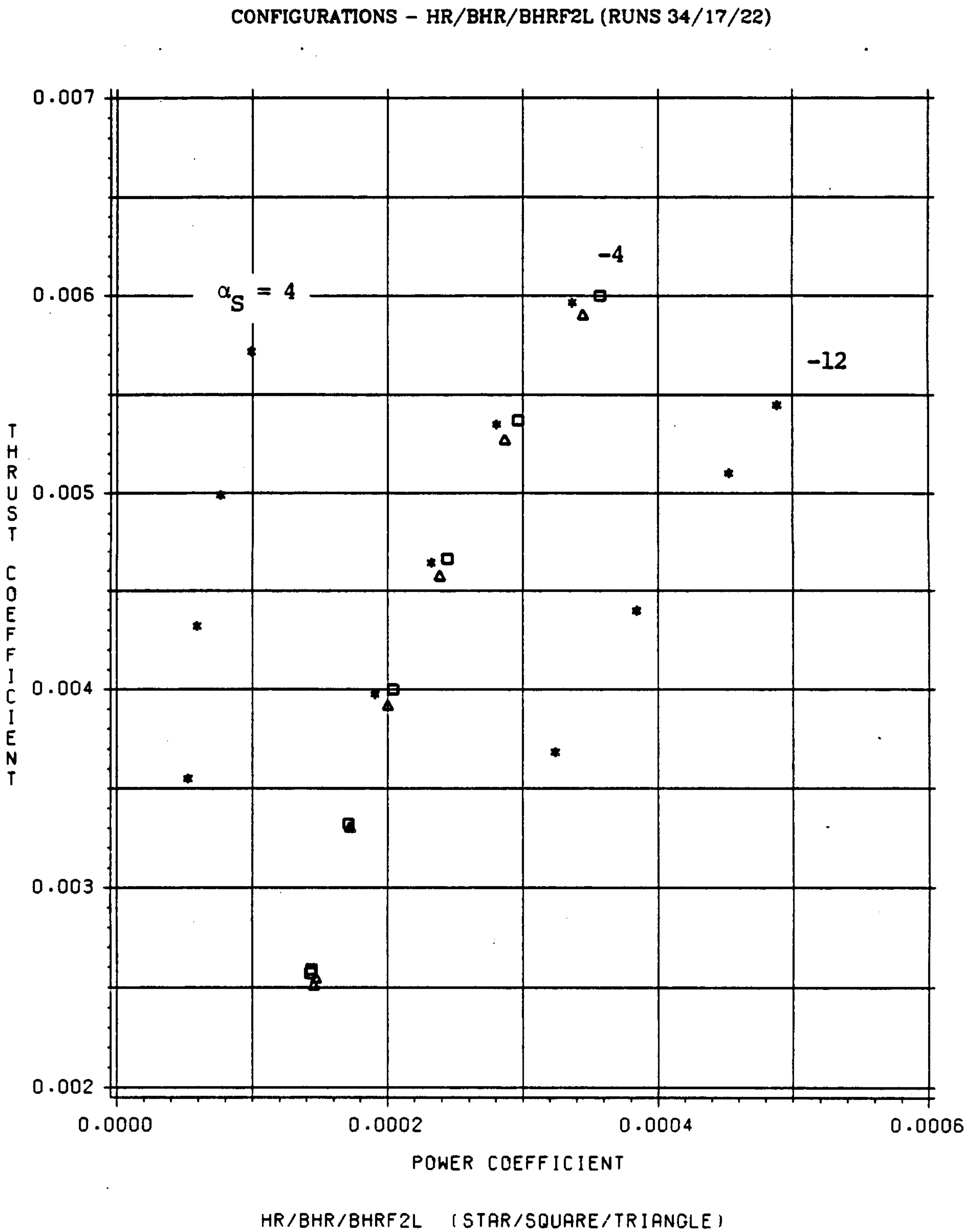


Figure 105. Main rotor C_T versus C_P, all configurations, μ=0.25.

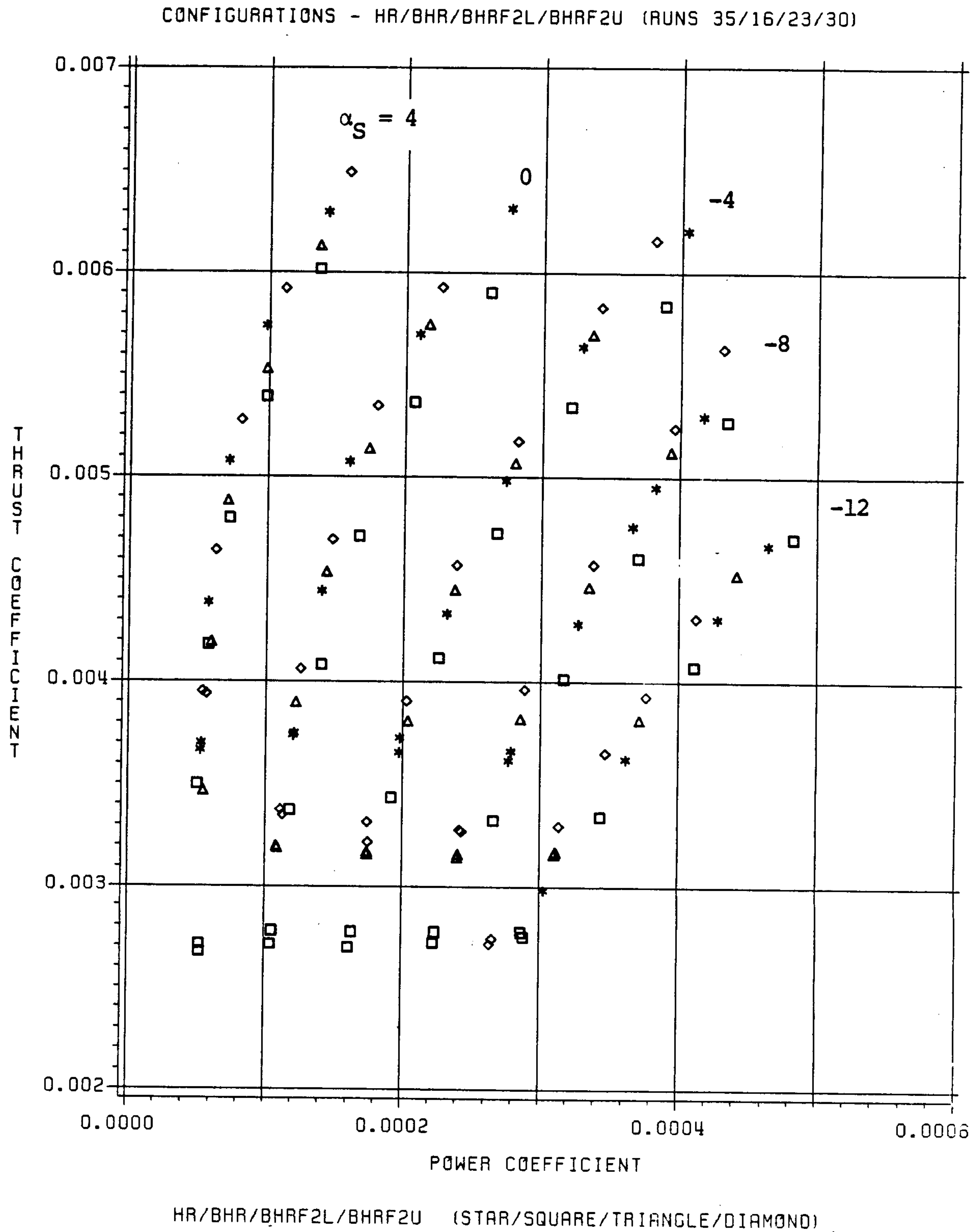


Figure 106. **Main rotor C_T versus C_P, all configurations, μ=0.30.**

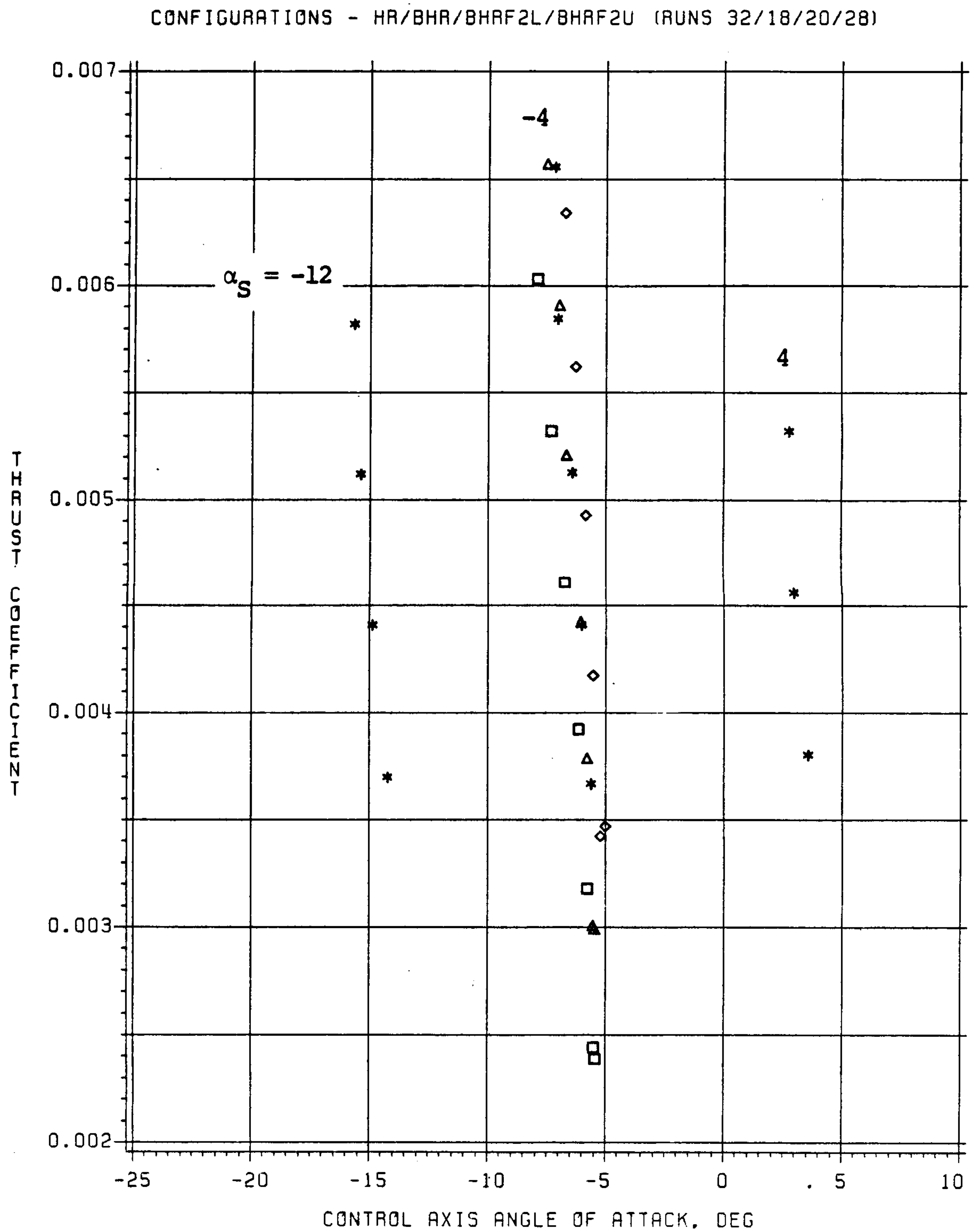


Figure 107. Main rotor C_T versus α_C, all configurations, μ=0.15.

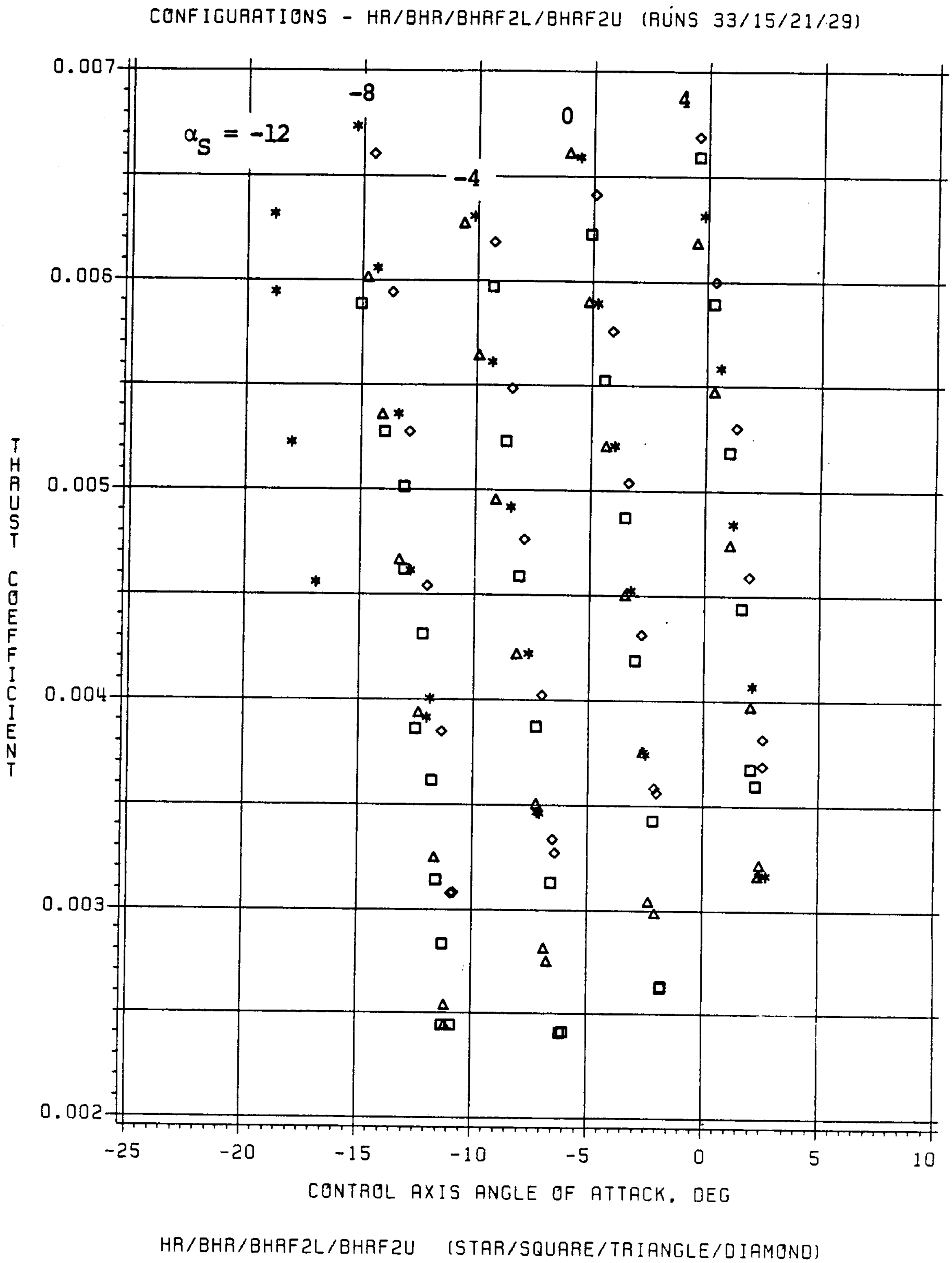


Figure 108. Main rotor C_T versus α_c, all configurations, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L (RUNS 34/17/22)

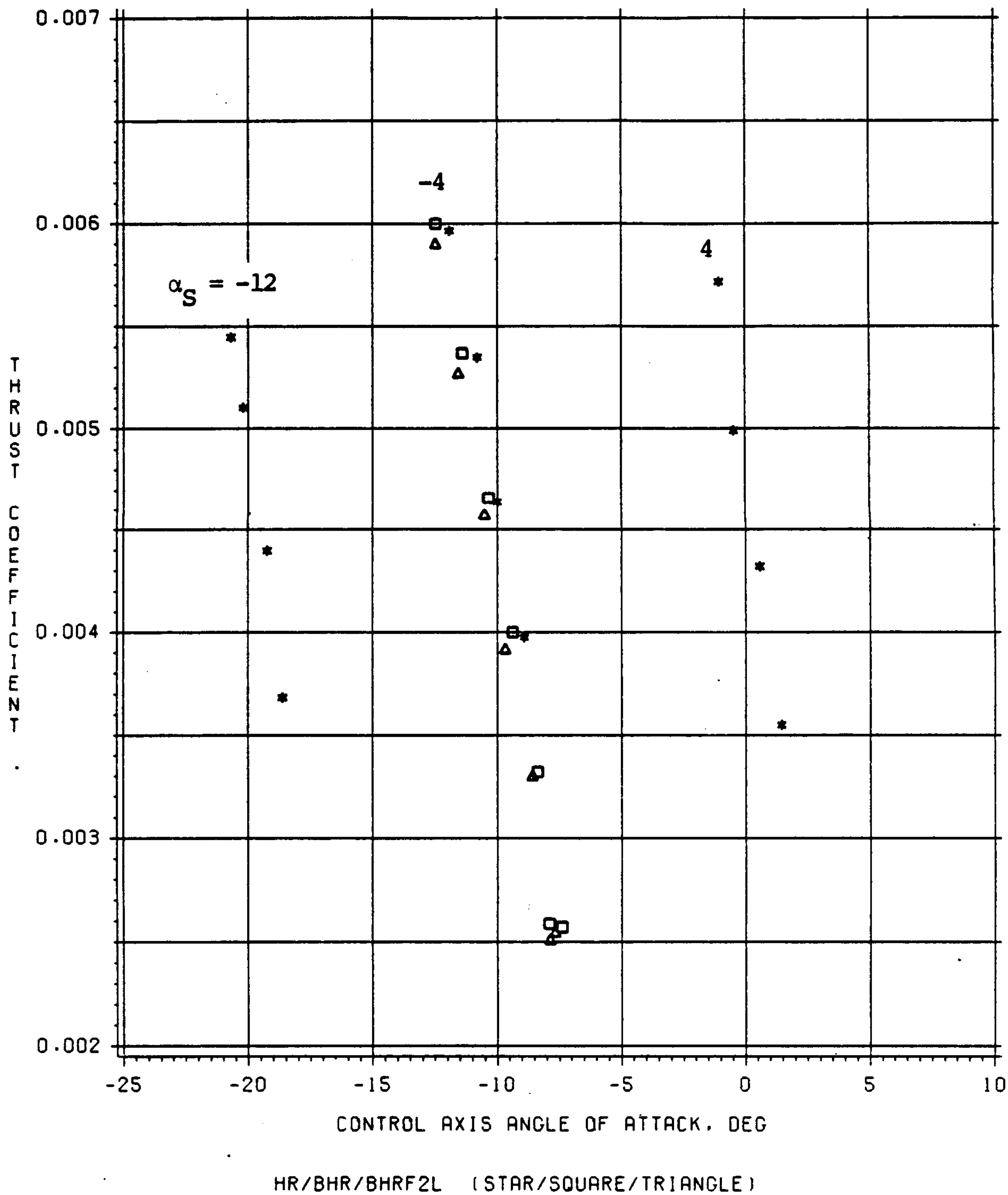


Figure 109. Main rotor C_T versus α_C, all configurations, μ=0.25.

CONFIGURATIONS – HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)

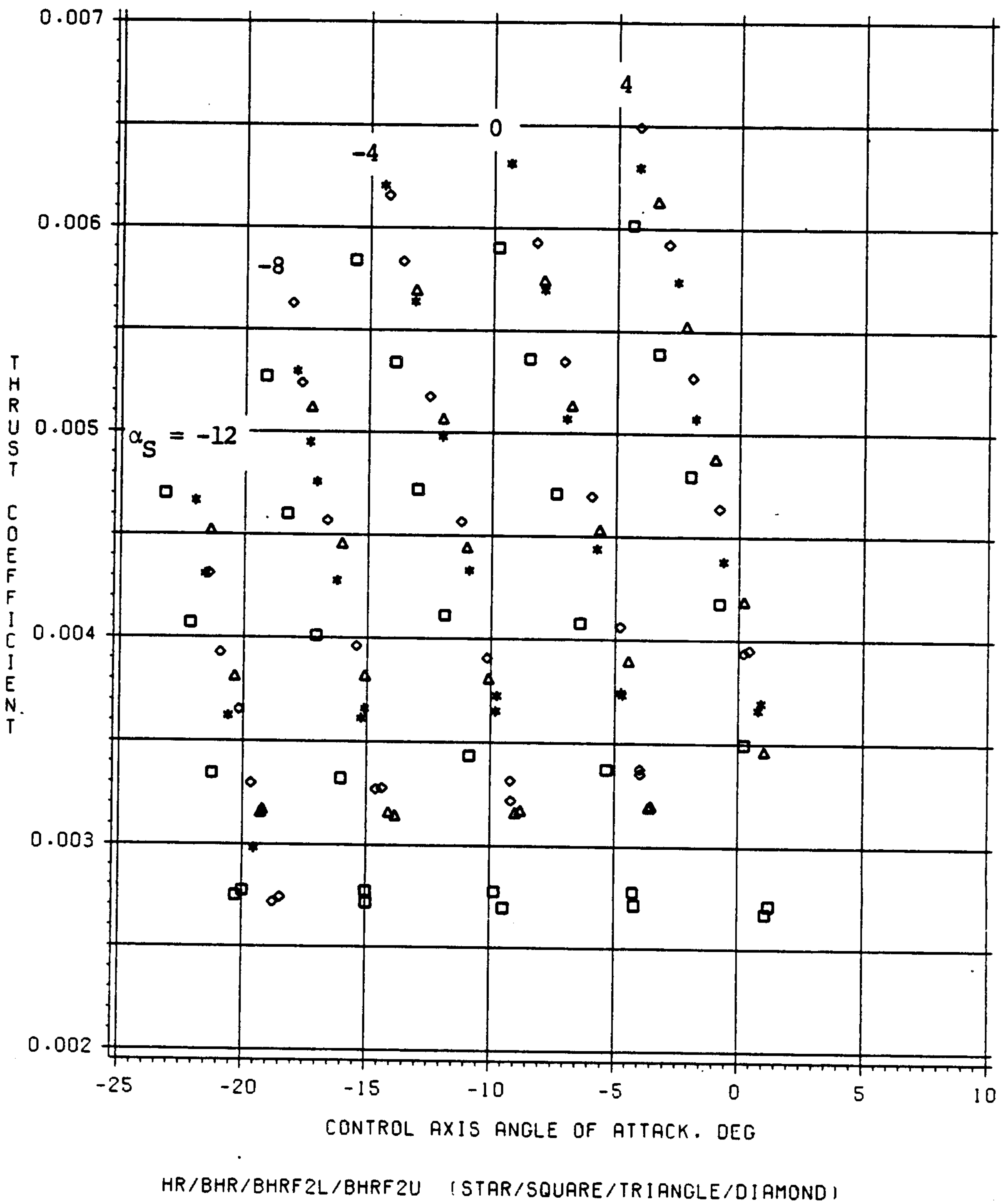


Figure 110. Main rotor C_T versus α_C, all configurations, μ=0.30.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 33/15/21/29)

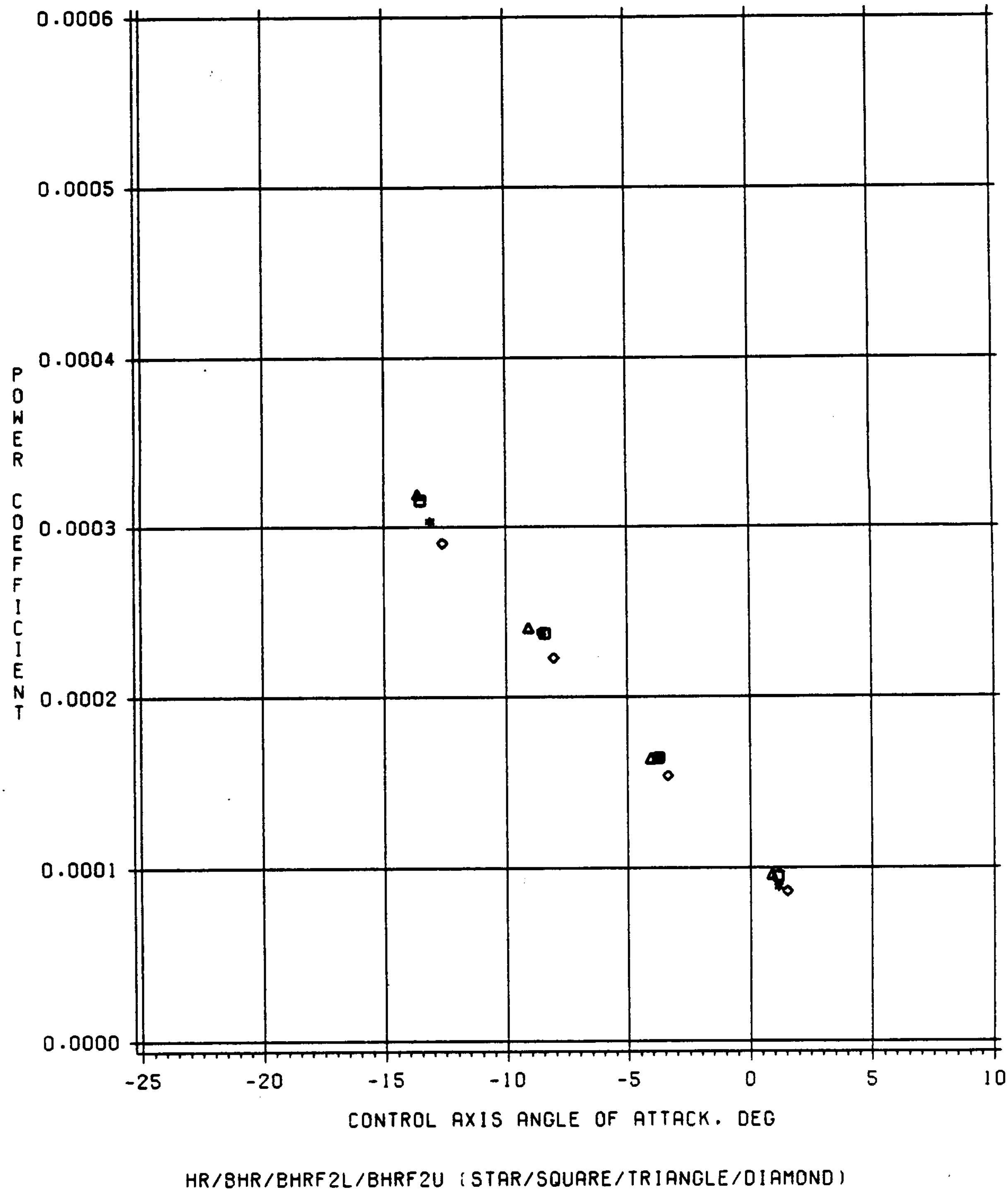
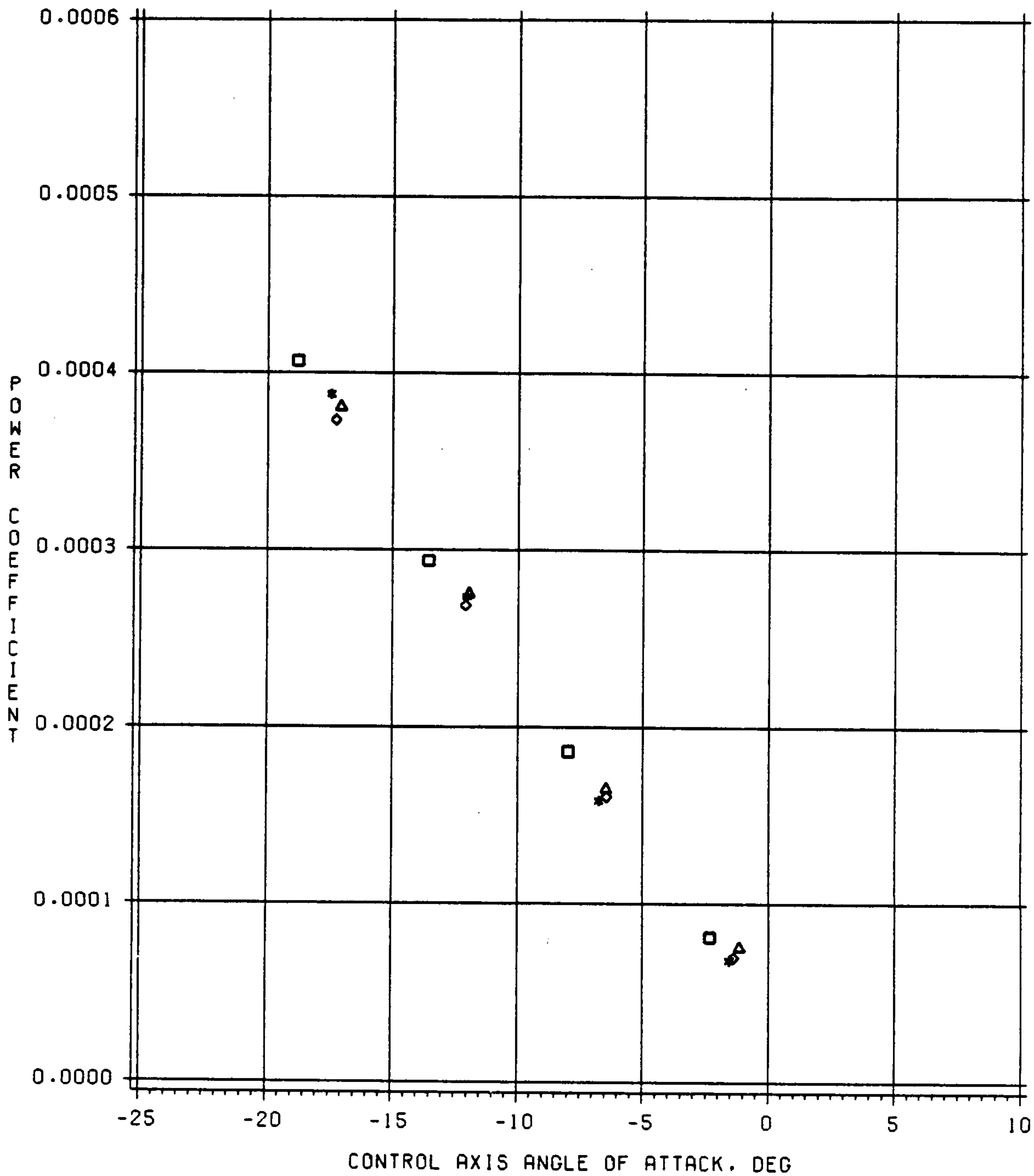


Figure 111. Main rotor C_P versus α_c, all configurations, C_T = .005, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)



HR/BHR/BHRF2L/BHRF2U (STAR/SQUARE/TRIANGLE/DIAMOND)

Figure 112. Main rotor C_P versus α_C, all configurations, C_T = .005, μ=0.30.

It should be noted that the results of Figure 111 and 112 are not the effect of airframe on trimmed rotor performance. This can only be assessed when the overall trimmed body/rotor configuration is evaluated.

To further investigate body effects on the rotors behavior, lateral cyclic control position was plotted against control axis angle of attack. The results are presented in Figures 113 and 114. The BHRF2L and BHRF2U configurations show a definite requirement for additional left lateral cyclic required to maintain zero flapping as compared to the isolated rotor configuration, HR. Although the body of revolution, BHR, would be expected to cause the same effect, it showed an opposite trend. The lateral cyclic data indicates that the inflow distribution is effected by a body beneath the rotor.

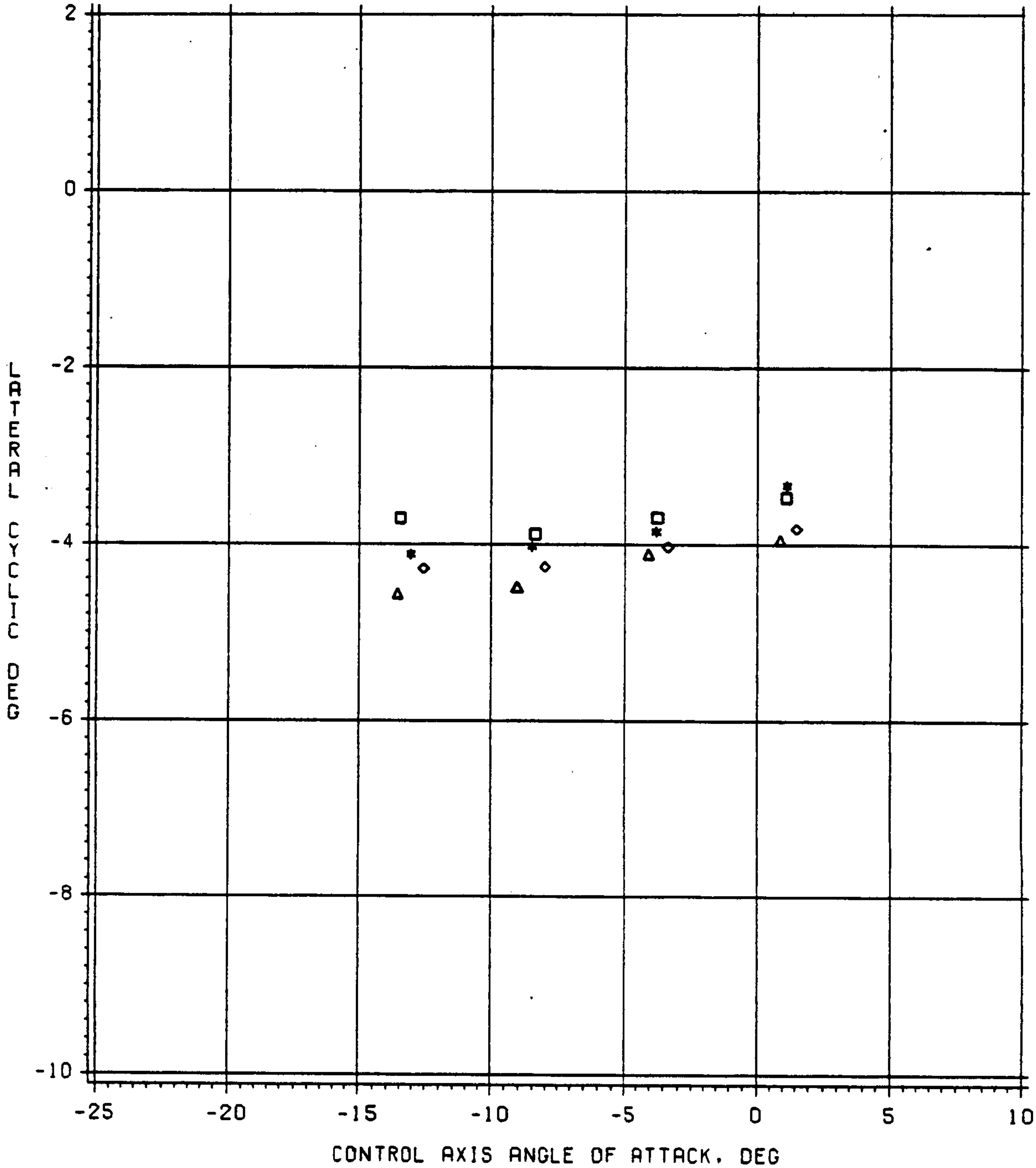
A second approach to evaluating the performance of a rotor uses the definition of rotor efficiency.

$$L/D = L/(P/V - X)$$

Data for -4 degree shaft angle of attack is shown for all configurations in Figures 115 through 118. Significant differences exist between the configurations shown. Except for the speed ratio case of 0.3, all body configurations show a higher efficiency than the isolated rotor. In Reference 10 similar results were shown. In fact the increase in L/D by decreasing separation distance is almost the same as Reference 10 data for zero angle of attack and a speed ratio of 0.2. One noticeable difference between Reference 10 and this study is the isolated rotor efficiency compared to the rotor-body configurations. This may be due in part to the influence of the main rotor wake on the tares since the hub of Reference 10 was above the main rotor.

To assure that differences in L/D were not related to inflow variations, L/D was plotted versus control axis angle of attack for a rotor lift coefficient of .005. The results are shown for an advance ratio of 0.2 in Figure 119 and were found to be relatively insensitive to changes in control axis. Since Figure 111 showed that power required varied only slightly with configuration for a constant control axis angle of attack, the changes in L/D must be due primarily to differences in propulsive force, X. Figures 120 through 123 present thrust coefficient versus propulsive force. A clear difference exists between the various configurations. By definition the shifts at constant thrust levels are due to H-force. Figures 124 through 127 present H-force which has been corrected by the rotor-off hub tares. The corrected H-force is plotted against control axis angle of attack as shown in Figures 128 and 129. These figures indicate that L/D is primarily configuration dependent. A slight control axis sensitivity is experienced at the higher speed ratio, but not of

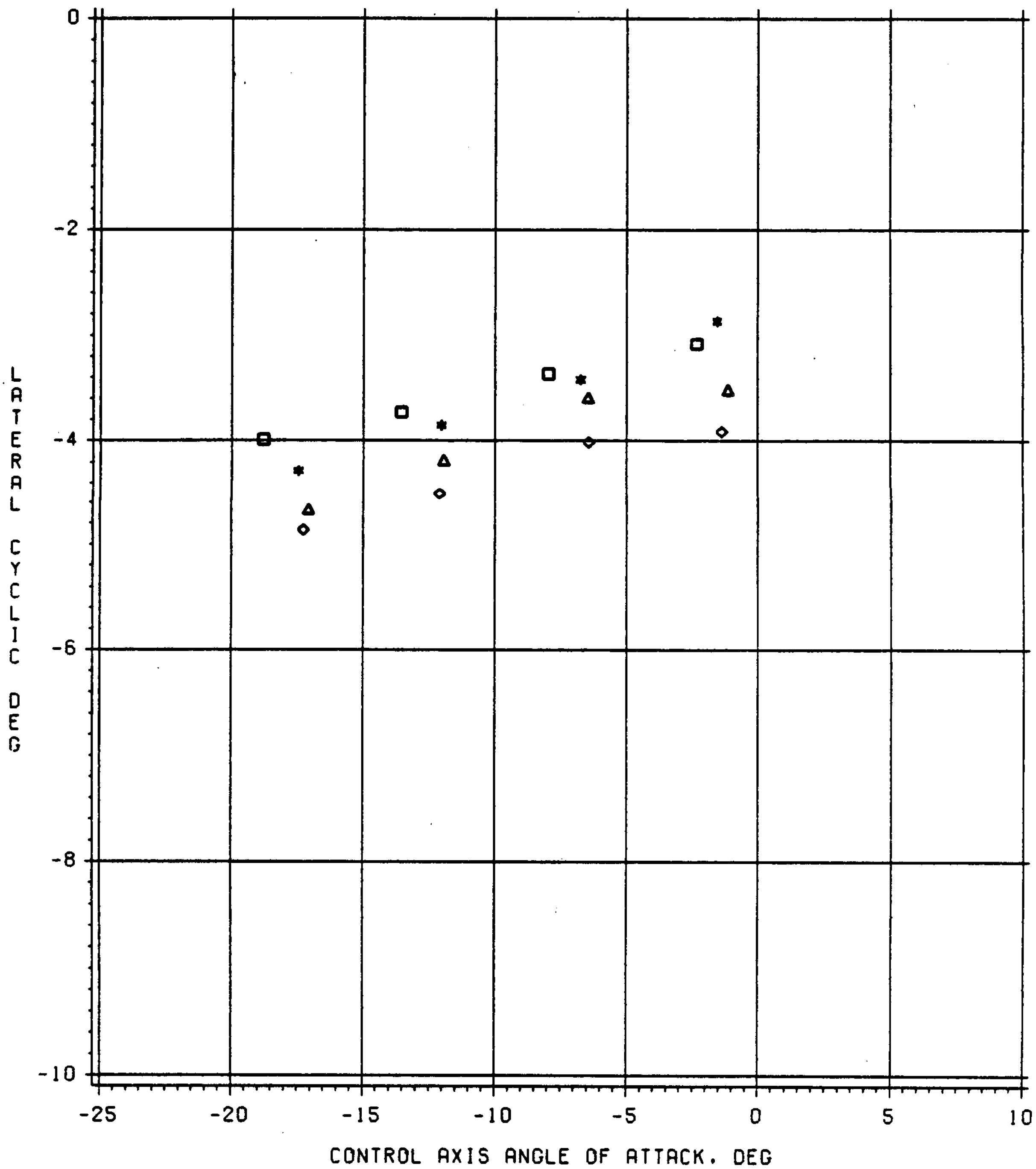
CONFIGURATIONS – HR/BHR/BHRF2L/BHRF2U (RUNS 33/15/21/29)



HR/BHR/BHRF2L/BHRF2U (STAR/SQUARE/TRIANGLE/DIAMOND)

Figure 113. Main rotor lateral cyclic versus α_c, all configurations, C_T = .005, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)



HR/BHR/BHRF2L/BHRF2U (STAR/SQUARE/TRIANGLE/DIAMOND)

Figure 114. Main rotor lateral cyclic versus α_c, all configurations, C_T = .005, μ=0.30.

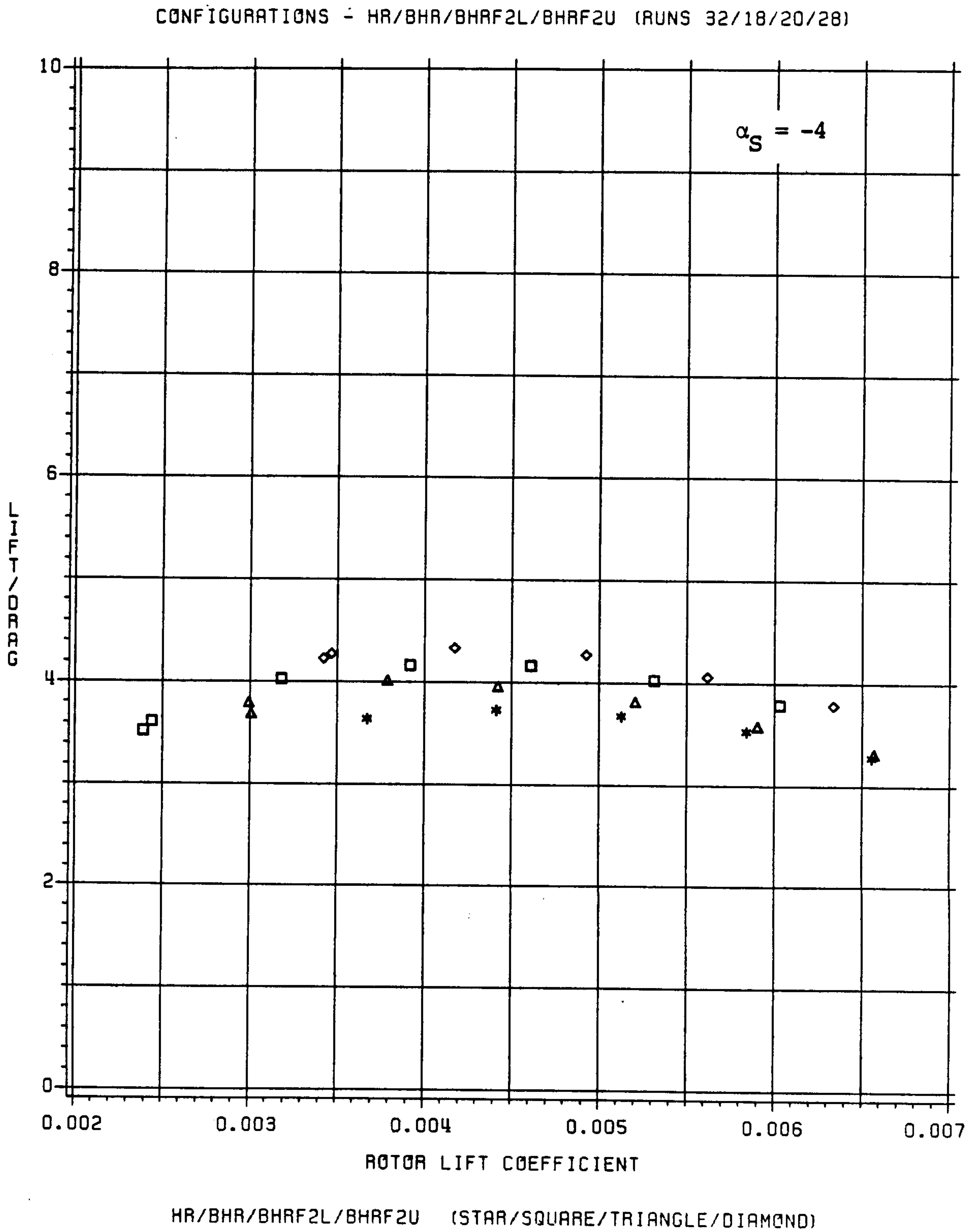


Figure 115. Main rotor L/D versus C_L, all configurations, μ=0.15.

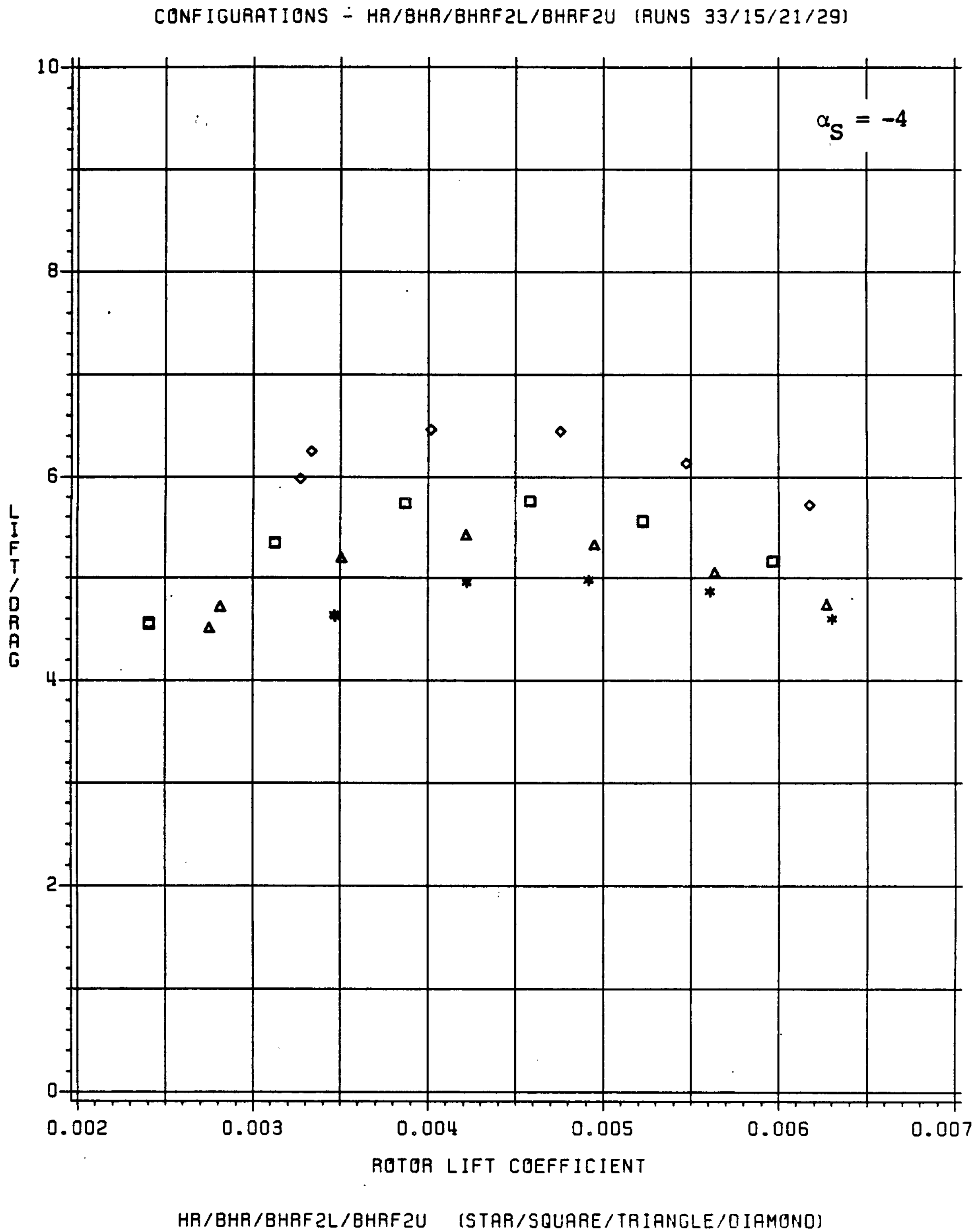
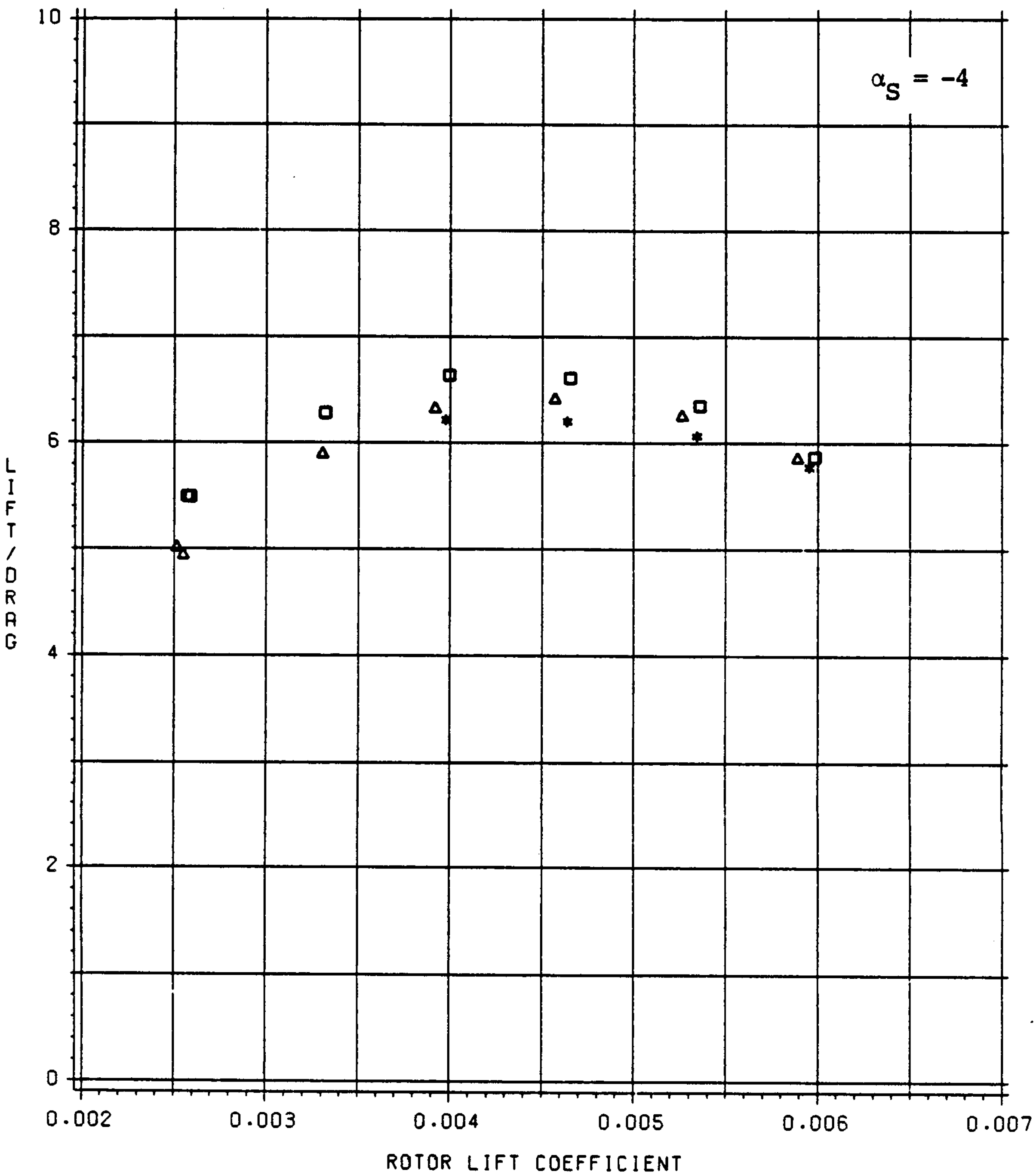


Figure 116. Main rotor L/D versus C_L, all configurations, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L (RUNS 34/17/22)



HR/BHR/BHRF2L (STAR/SQUARE/TRIANGLE)

Figure 117. Main rotor L/D versus C_L, all configurations, μ=0.25.

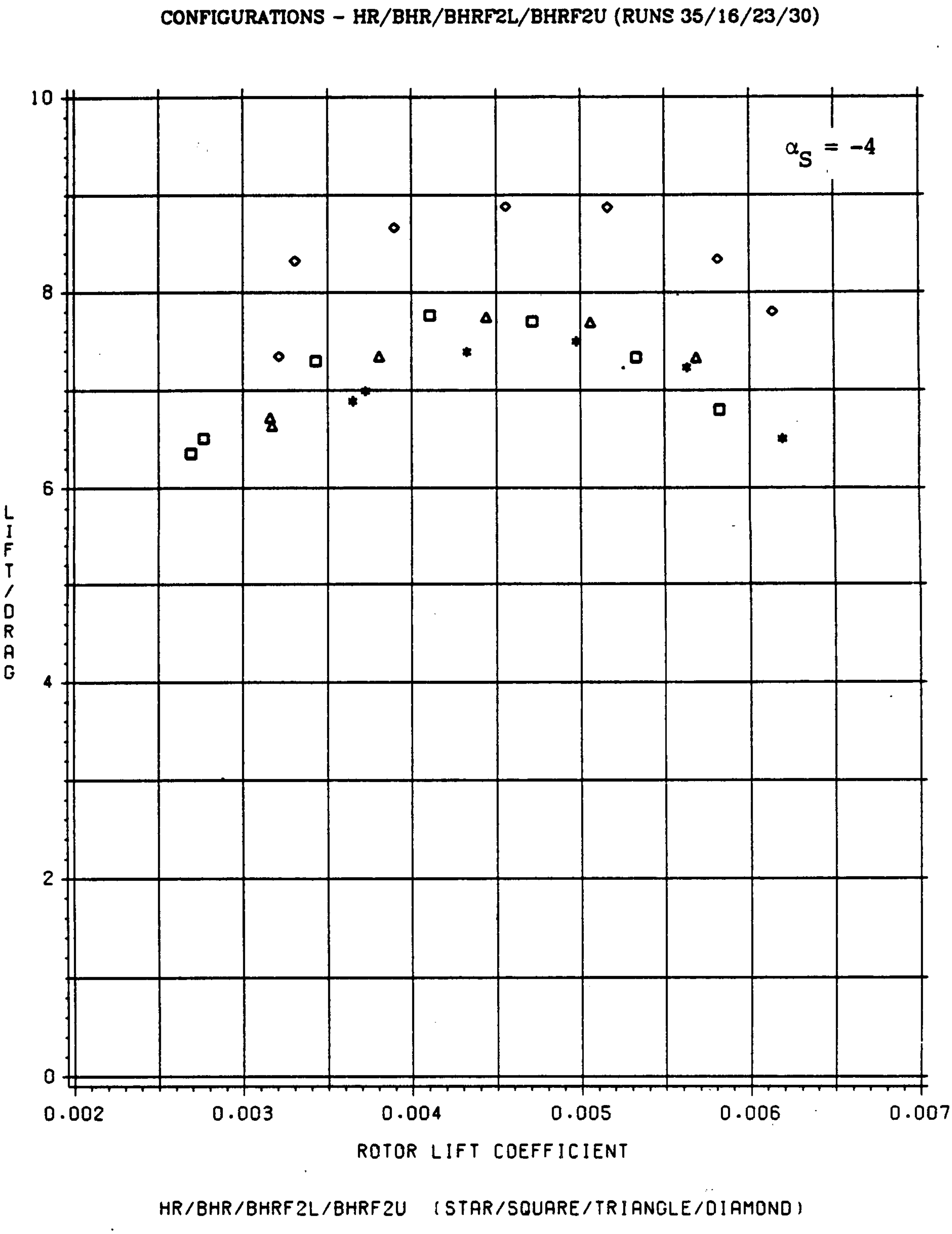


Figure 118. Main rotor L/D versus C_L, all configurations, μ=0.30.

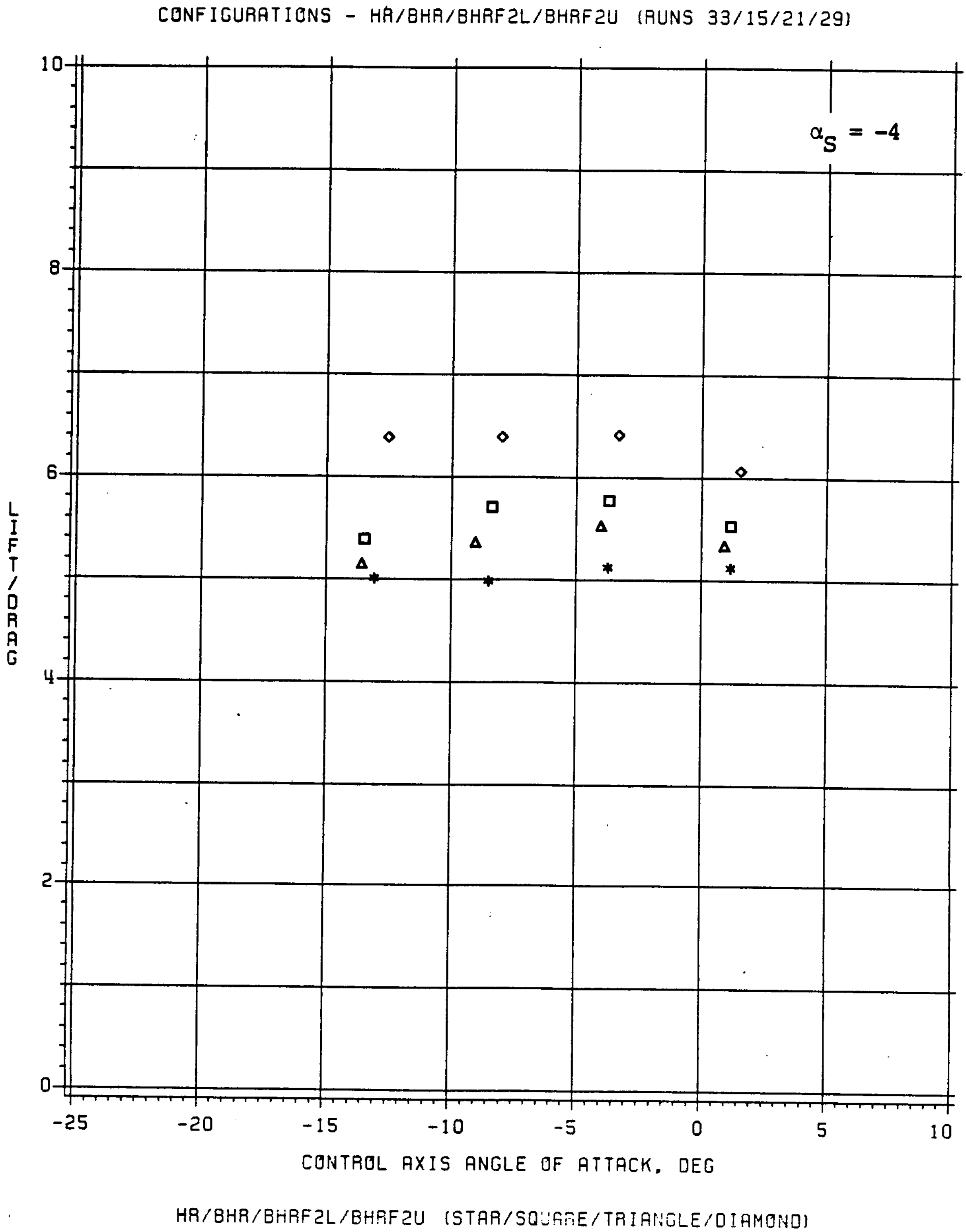


Figure 119. Main rotor L/D versus α_C, all configurations, C_T = .005, μ=0.20.

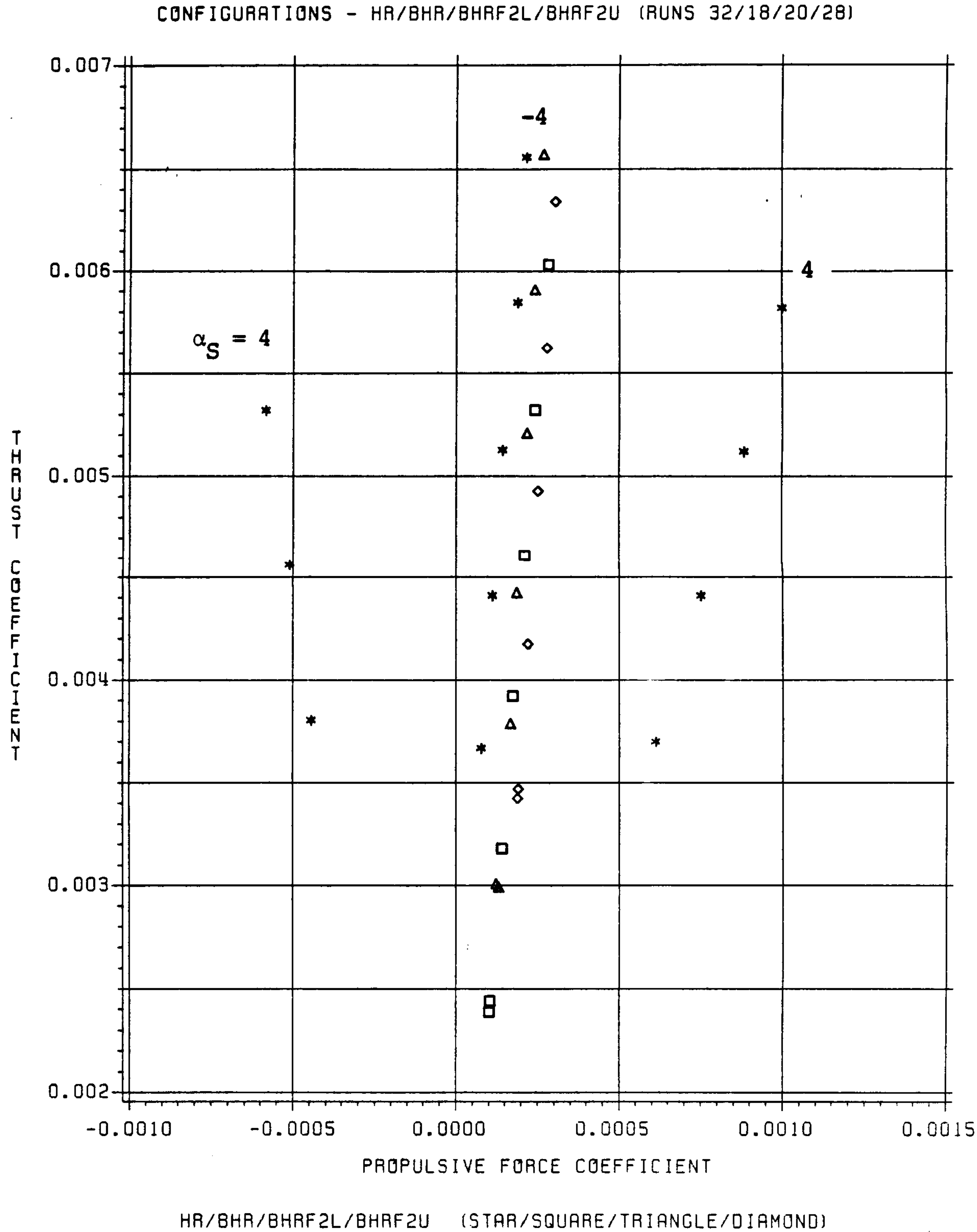


Figure 120. Main rotor C_T versus C_X, all configurations, μ=0.15.

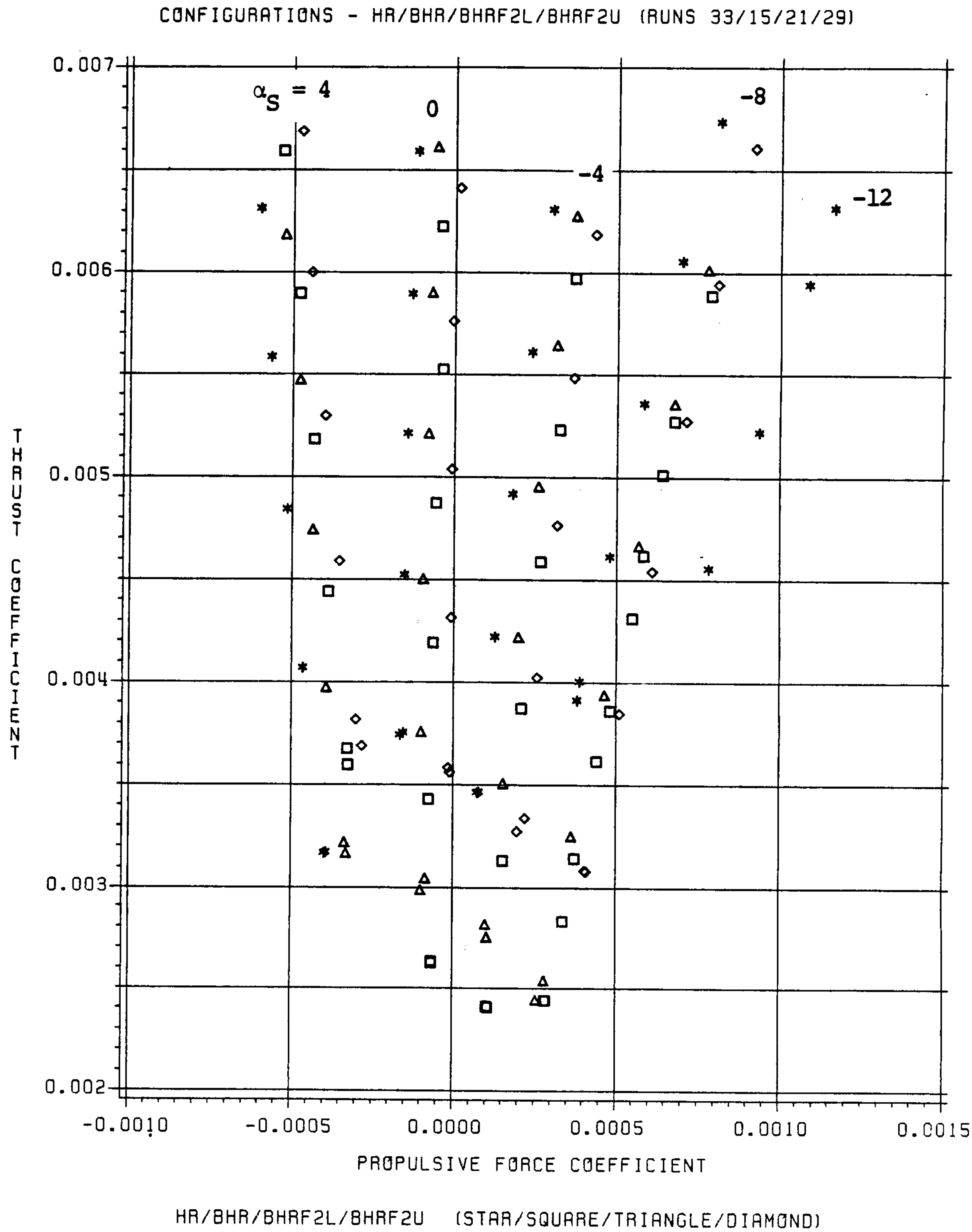


Figure 121. Main rotor C_T versus C_X, all configurations, μ=0.20.

C-3

CONFIGURATIONS - HR/BHR/BHRF2L (RUNS 34/17/22)

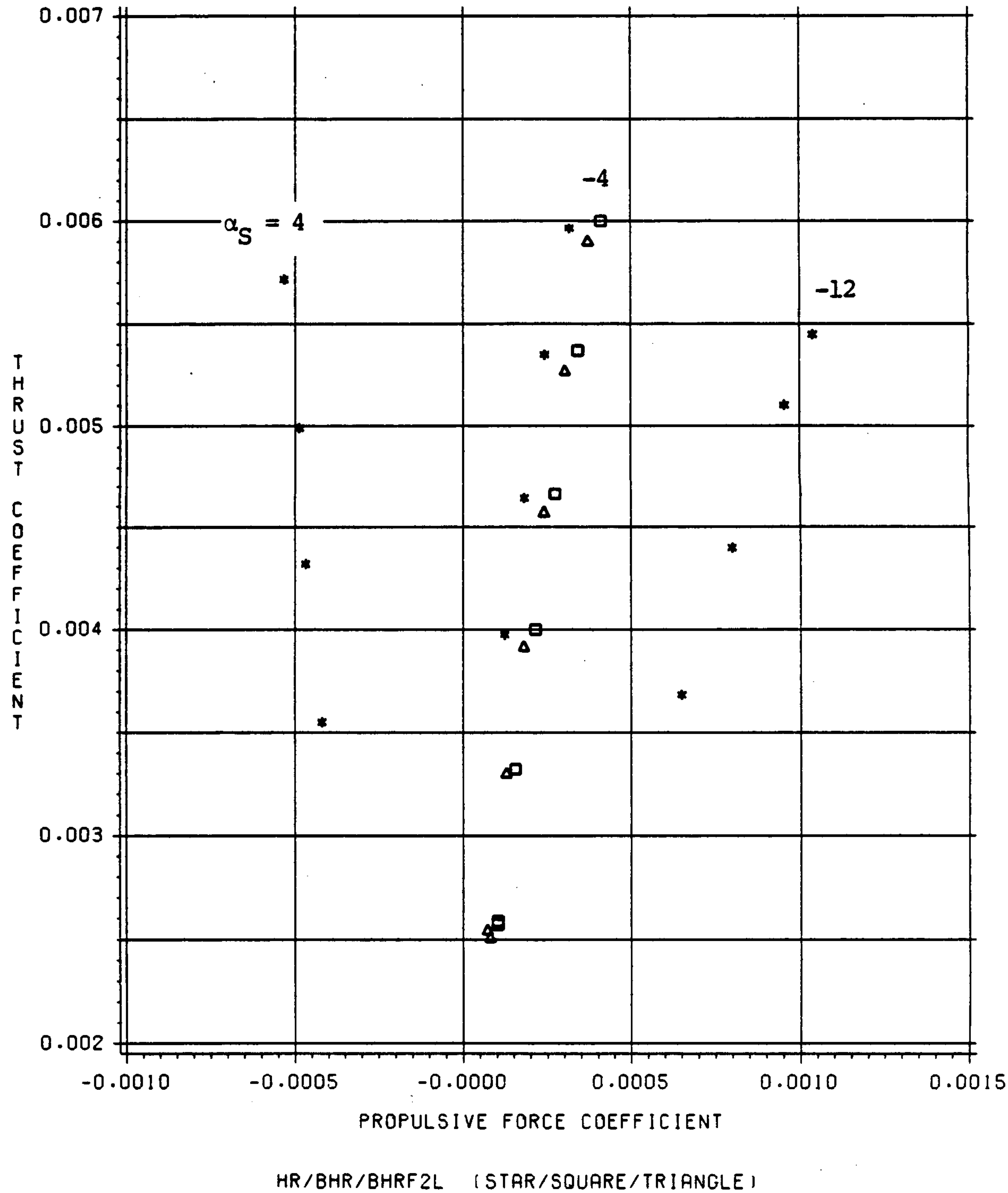


Figure 122. Main rotor C_T versus C_X, all configurations, μ=0.25.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)

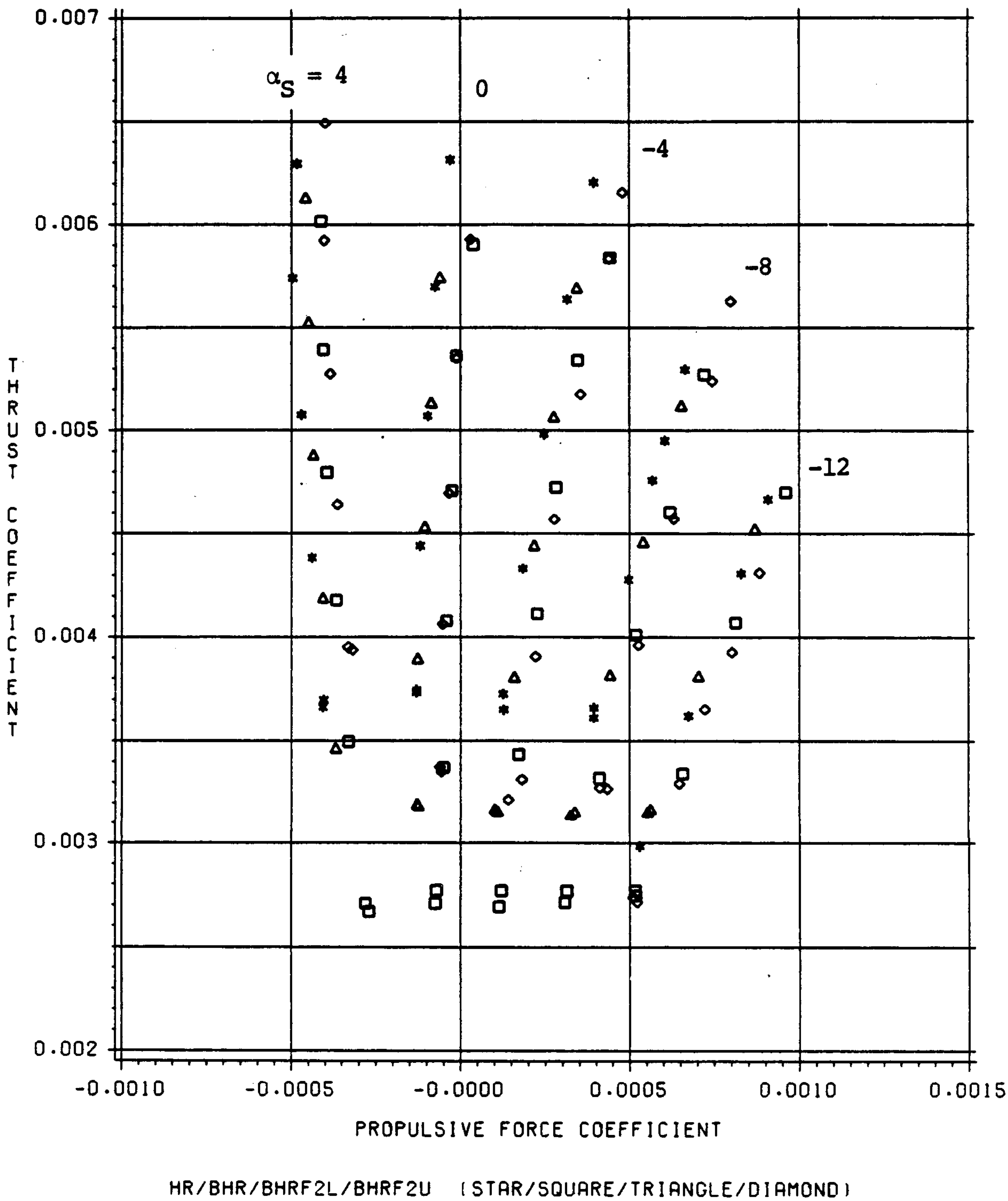


Figure 123. Main rotor C_T versus C_X, all configurations, μ=0.30.

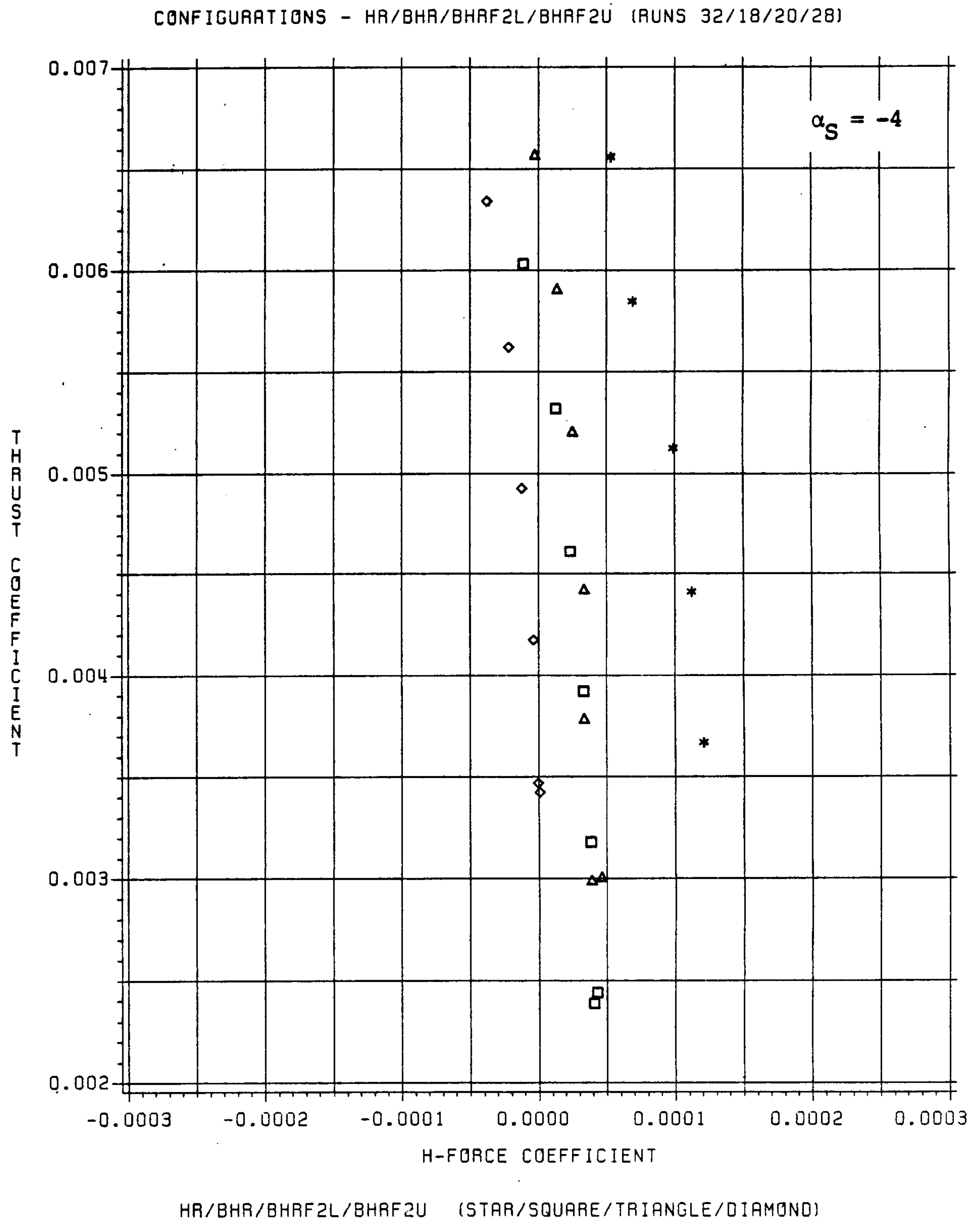


Figure 124. Main rotor C_T versus C_H, all configurations, μ=0.15.

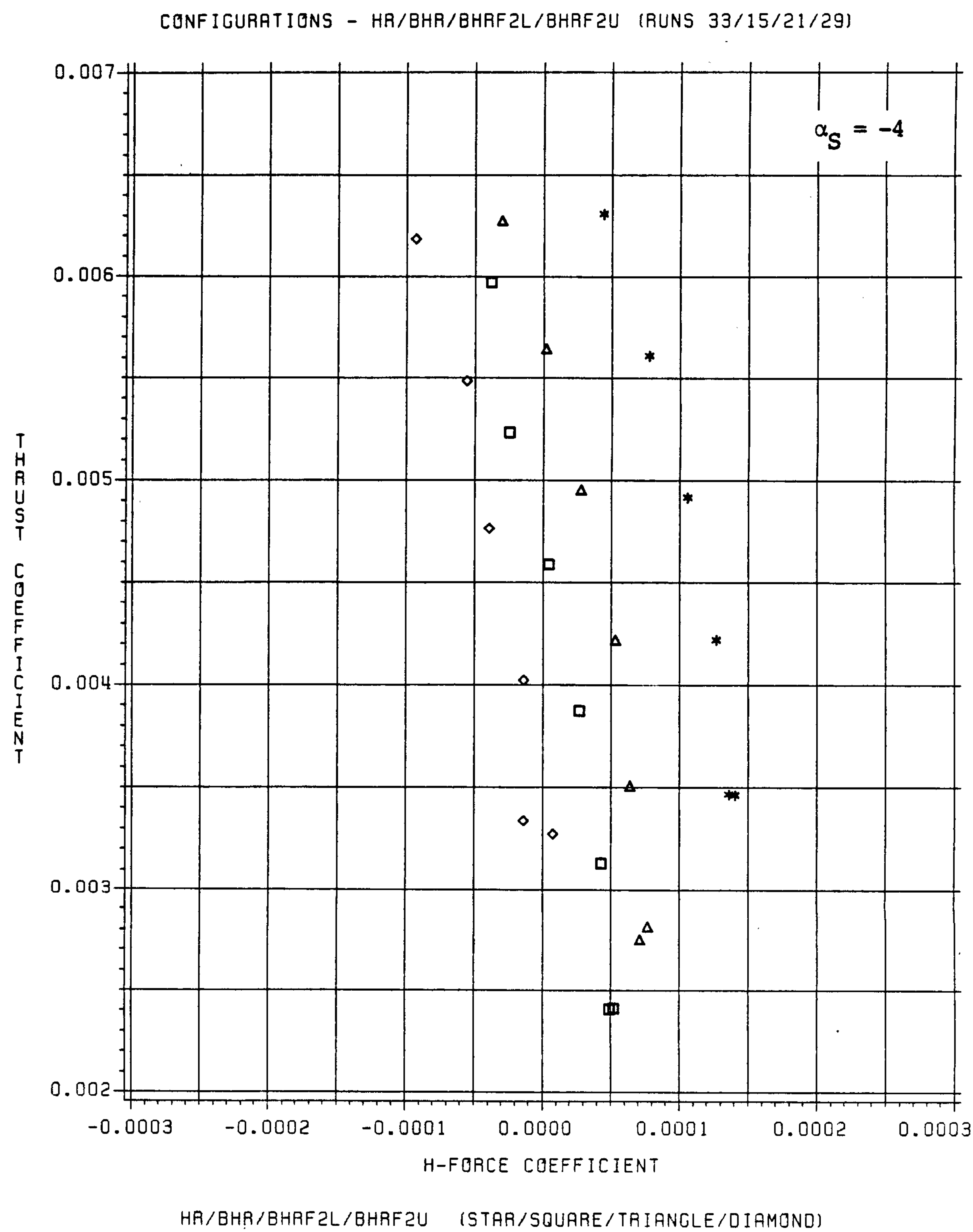


Figure 125. Main rotor C_T versus C_H, all configurations, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L (RUNS 34/17/22)

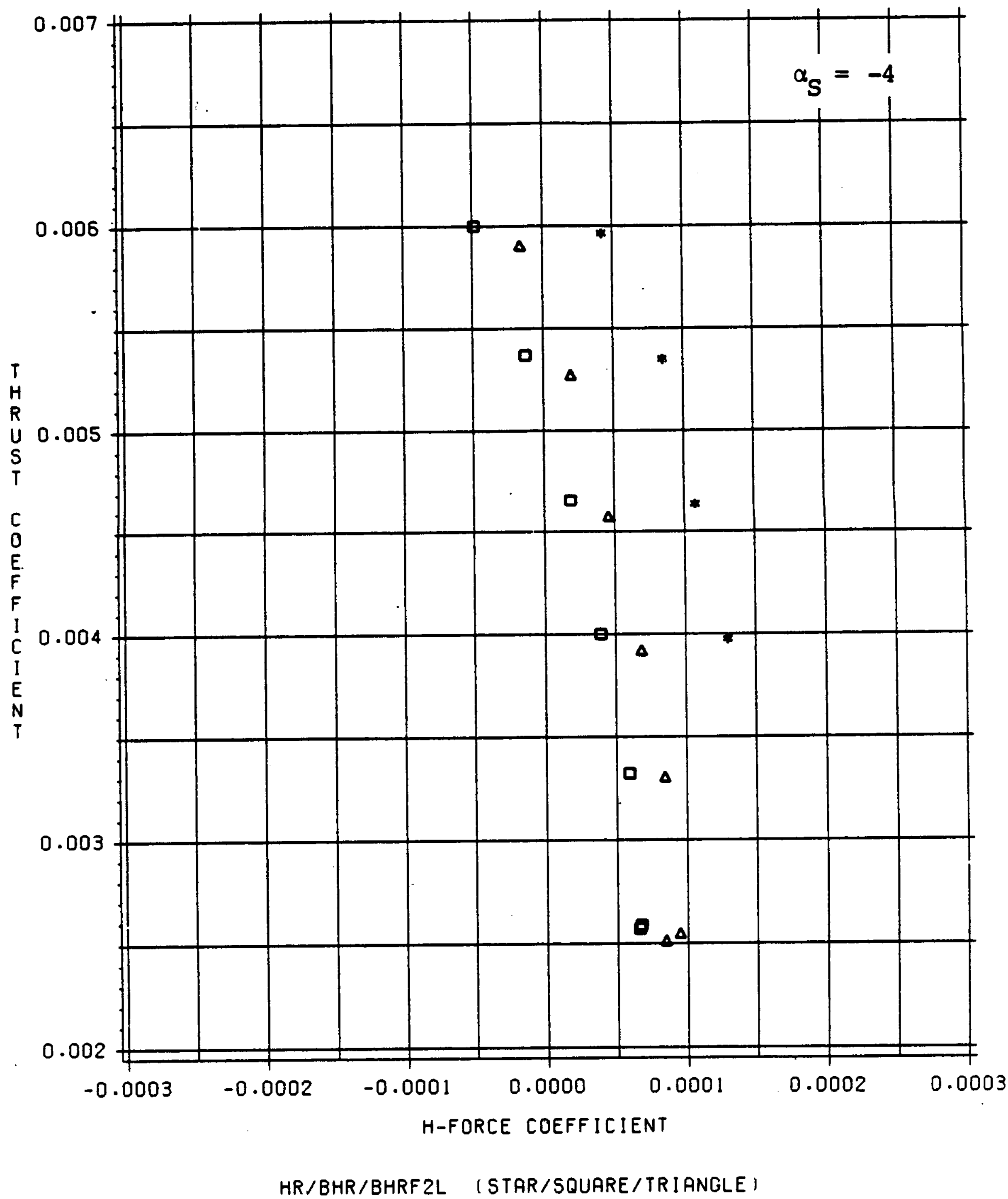


Figure 126. Main rotor C_T versus C_H, all configurations, μ=0.25.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)

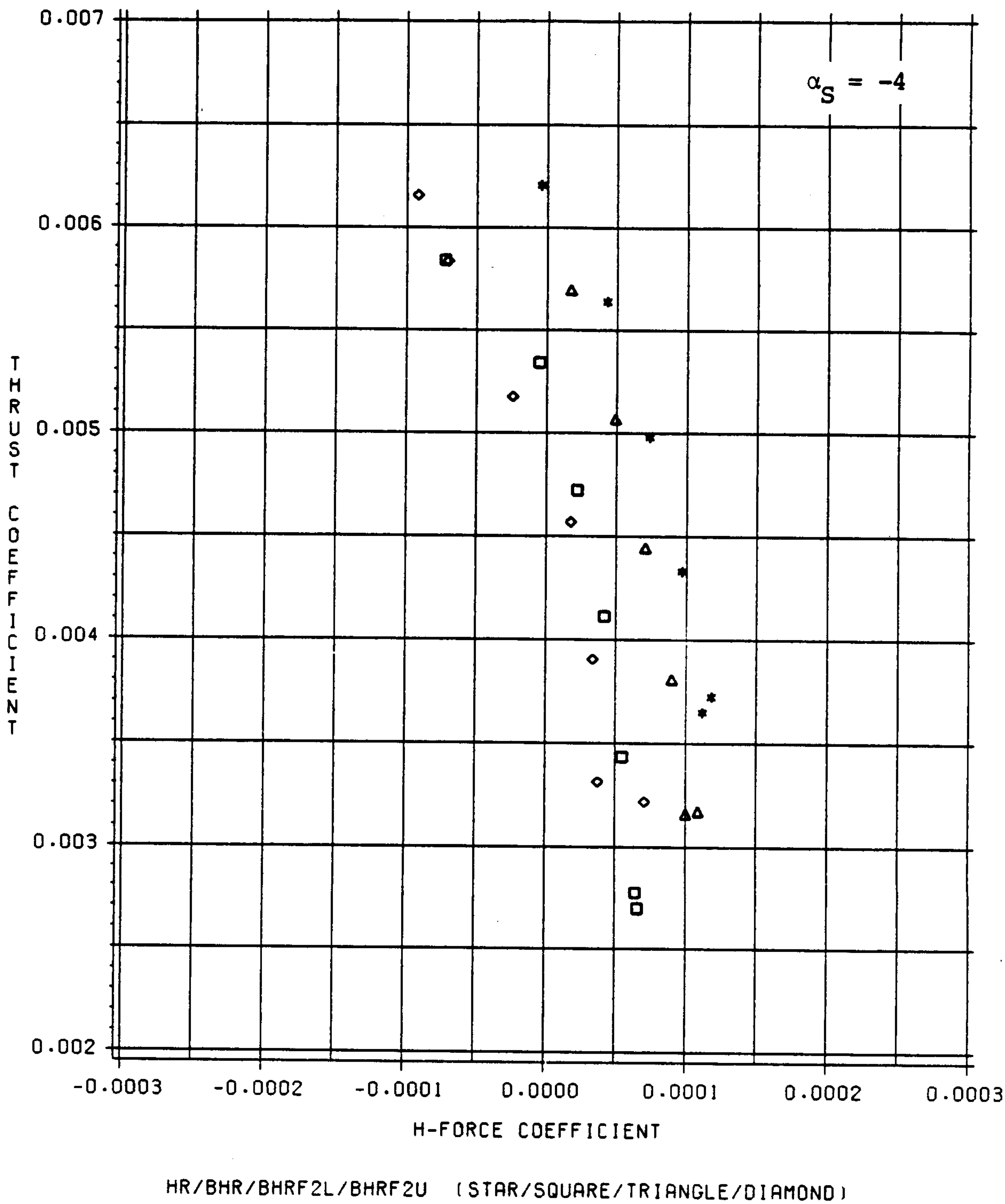


Figure 127. Main rotor C_T versus C_H, all configurations, μ=0.30.

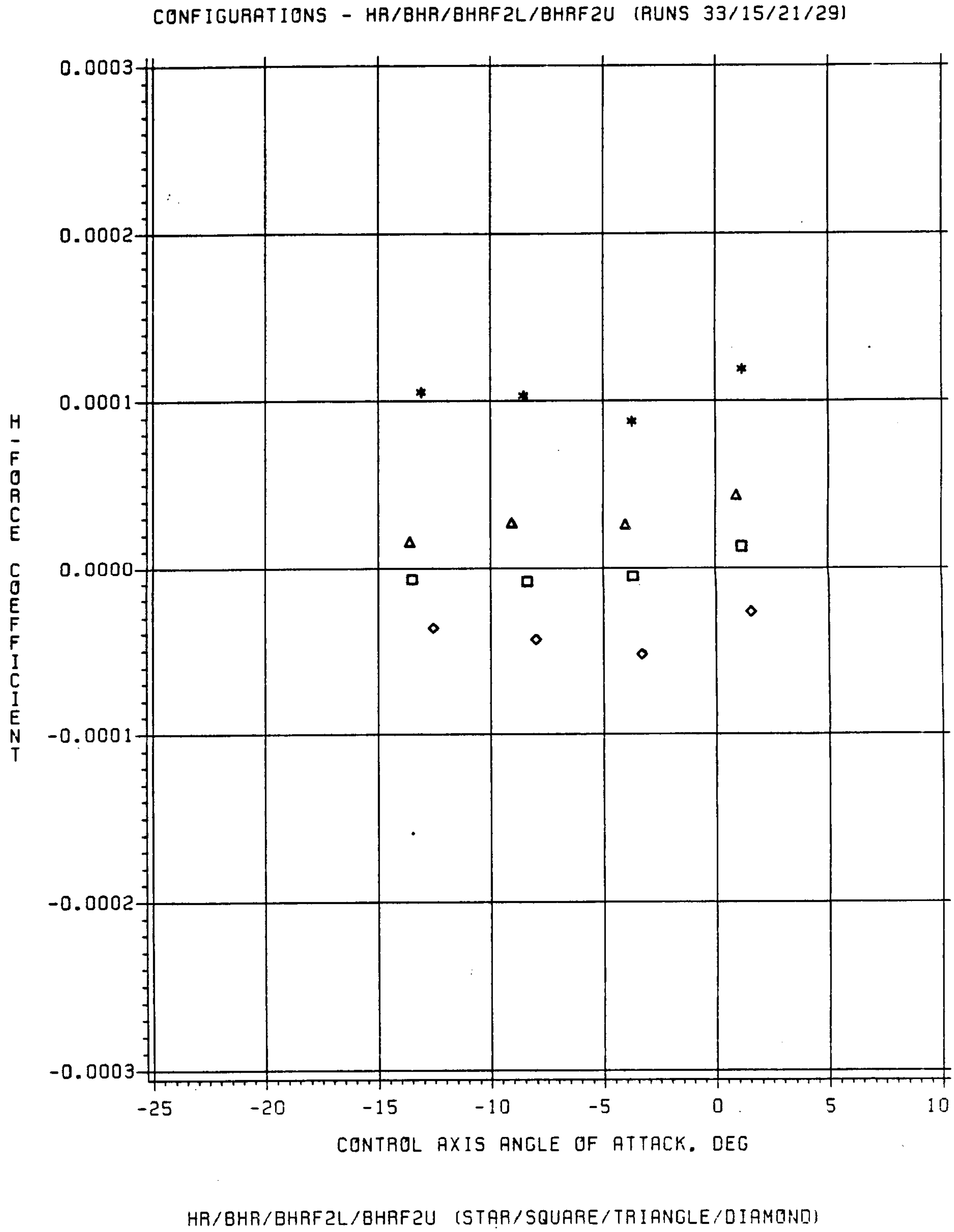


Figure 128. Main rotor C_H versus α_c, all configurations, C_T=.005, μ=0.20.

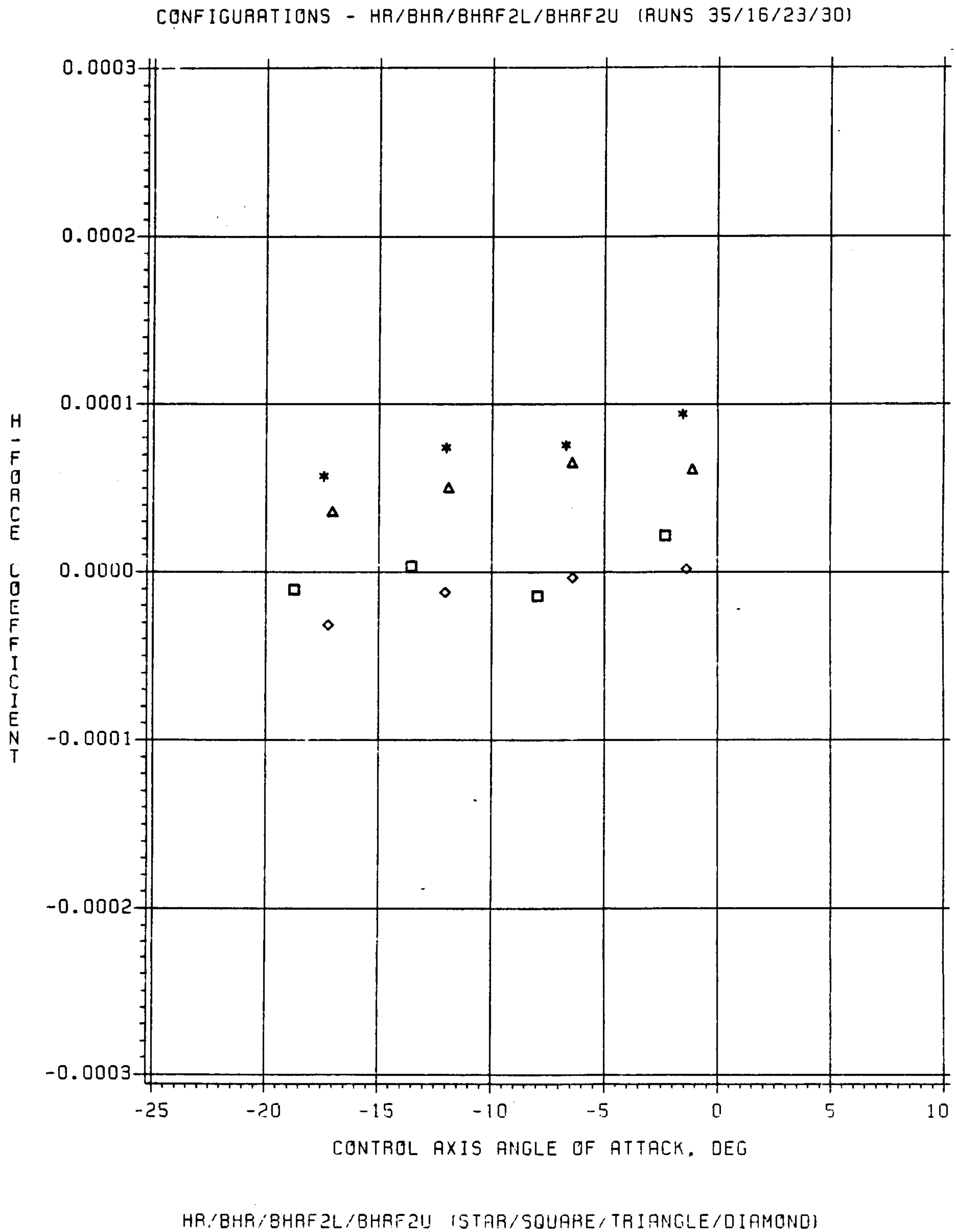


Figure 129. Main rotor C_H versus α_c, all configurations, C_T=.005, μ=0.30.

sufficient magnitude to explain the difference in L/D due to configuration. The real issue becomes one of whether or not H-force is correct.

On the assumption that the rotor wake may have an influence on the hub tares, it is beneficial to look at the uncorrected H-force (hub tare included) or axial force. Figures 130 and 131 present this data for speed ratios of 0.2 and 0.3 respectively. The data of Figure 130 shows that the axial force follows more of an exposed area trend. The isolated rotor had a greater exposed area, whereas, BHRF2L and BHR had identically the same exposed areas. BHRF2U covered approximately 40 percent of the rotating controls which accounts for the substantially lower axial force. At the higher advance ratio the isolated rotor axial force (uncorrected H-force) seems to fall more into line with BHR and BHRF2L. Since the total rotor force includes classical H-force as well as hub tares, it is a linear and quadratic function of speed ratio. The hub tares were found to be a function of speed ratio squared. Subtracting the hub tares from the total rotor inplane force yielded in H-force which is not linear with speed ratio. This implies a rotor-hub interaction. There is one significant factor in the determination of the hub tares which can influence the calculation of H-force. When the rotor-off hub tares versus dynamic pressure are curvefit they may not pass through zero. To call this a zero shift may not be correct because of insufficient low speed data to give a proper fit. Therefore, in this report the rotor-off hub tare zeroes were not corrected. A check was performed as to its impact and it did reduce the differences in calculated H-force particularly at a speed ratio of 0.30. A zero shift of 90.7 gm (0.2 lb) is approximately the limit on the accuracy of the main rotor balance and it is equivalent to a change in H-force of .00001.

An additional check on the nature of the rotor-on/rotor-off hub tares was performed by analyzing the axial force center. This was done by dividing the main rotor pitching moment as measured at the balance reference center by the axial force. Figures 132 through 135 present the results for configurations HR, BHR, BHRF2L, and BHRF2U respectively. These calculations were only performed for a shaft angle of -4 degrees.

Because the distance between the hub center and balance center is almost 0.3048 m (1 foot) the results should be close to 1 for the rotor-off hub tares. Exposure of the rotating controls should actually drop the axial force centers below 1. For low speeds the rotor-off axial force centers (zero thrust) become sensitive to error and can vary considerably. Note that the rotor-on axial force centers show a definite change with thrust. To define the point at which the rotor H-force acts, it was assumed that the rotor-off tares remained the same for the rotor-on configurations. The rotor-on axial forces and moments were then corrected for hub force and moment tares. The results are pre-

CONFIGURATIONS – HR/BHR/BHRF2L/BHRF2U (RUNS 33/15/21/29)

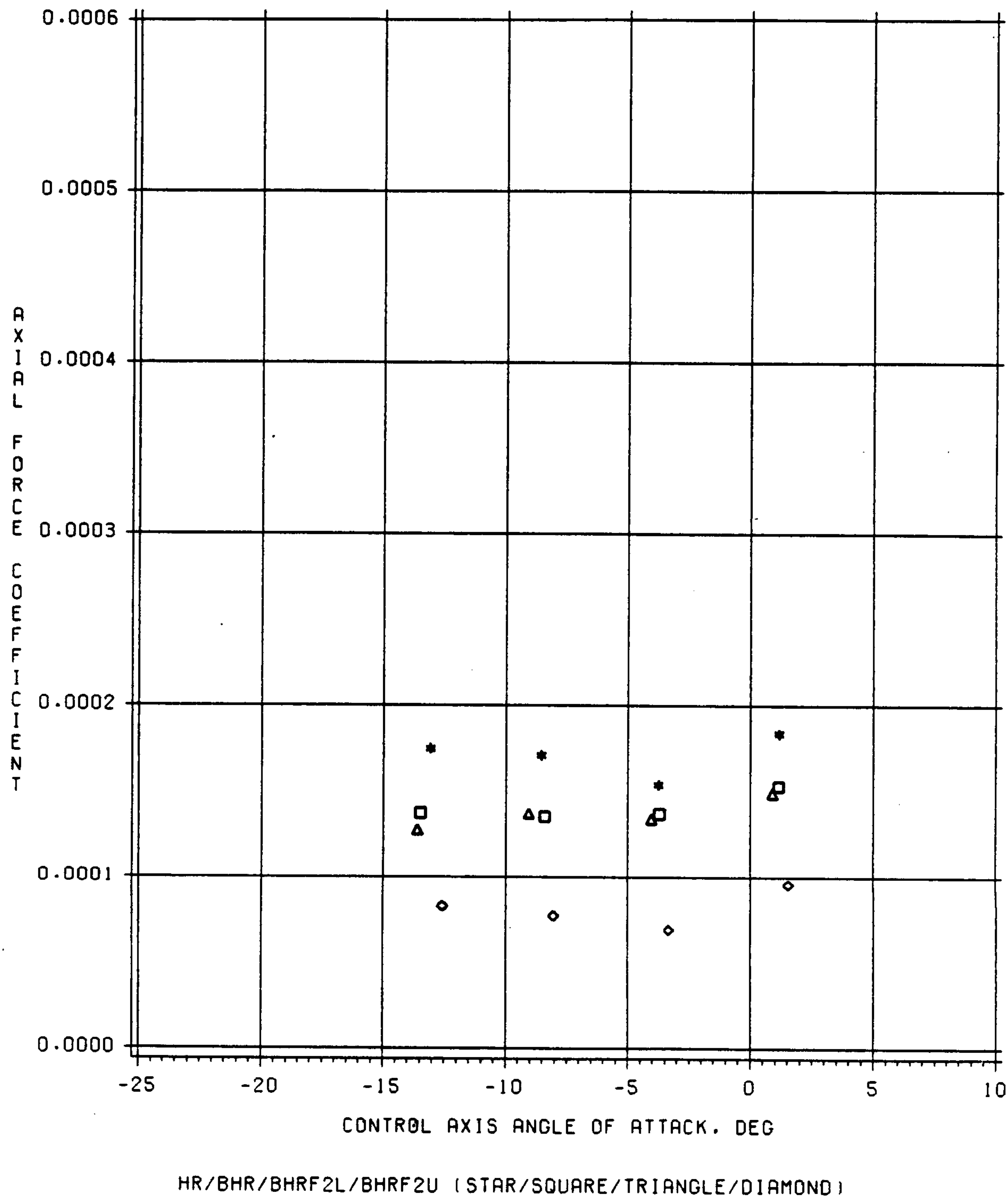


Figure 130. Main rotor axial force versus α_C, all configurations, C_T=.005, μ=0.20.

CONFIGURATIONS - HR/BHR/BHRF2L/BHRF2U (RUNS 35/16/23/30)

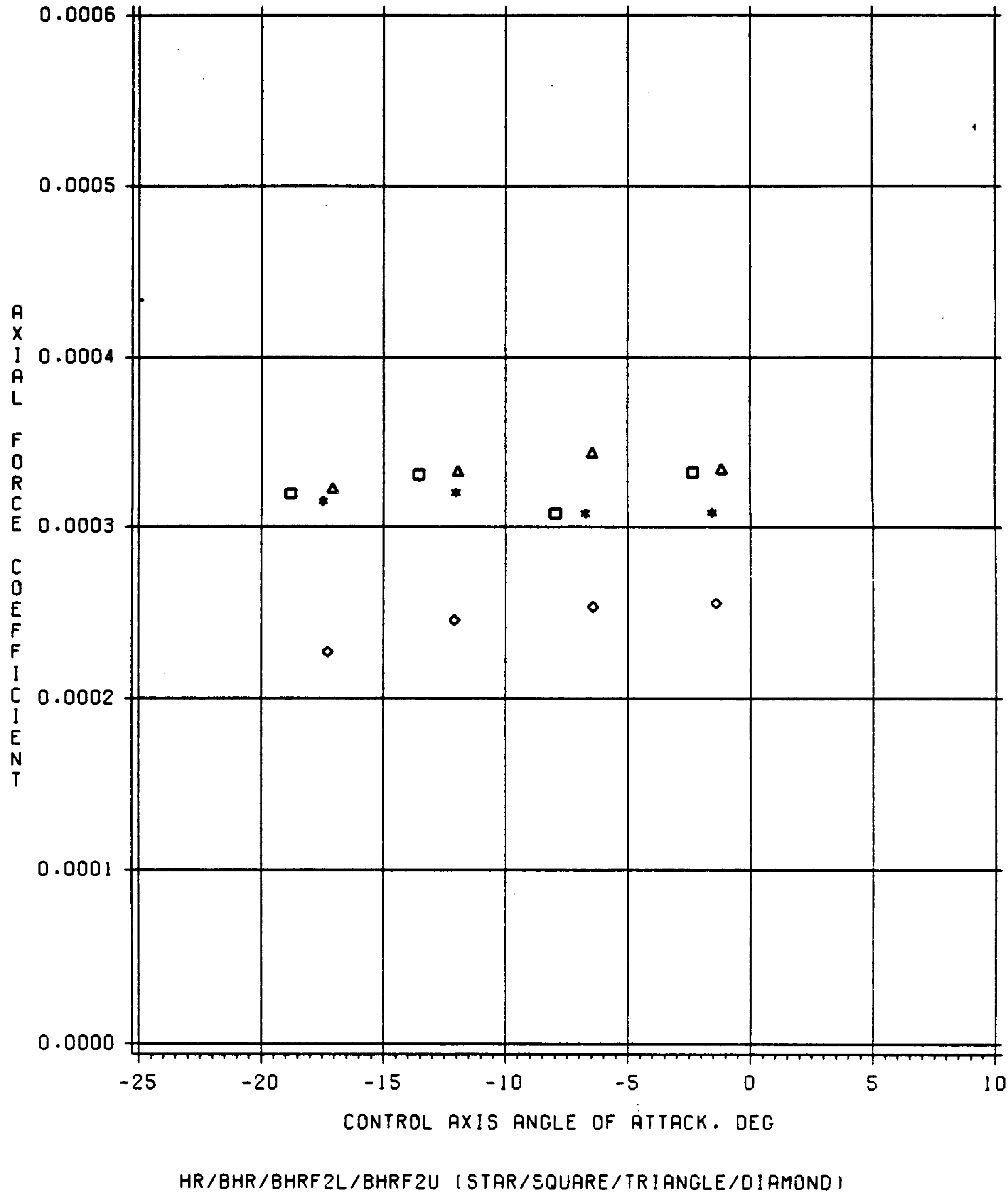


Figure 131. Main rotor axial force versus α_C, all configurations, C_T=.005, μ=0.30.

CONFIGURATION – H (RUNS 40 THRU 45) HR (RUNS 31 THRU 35)

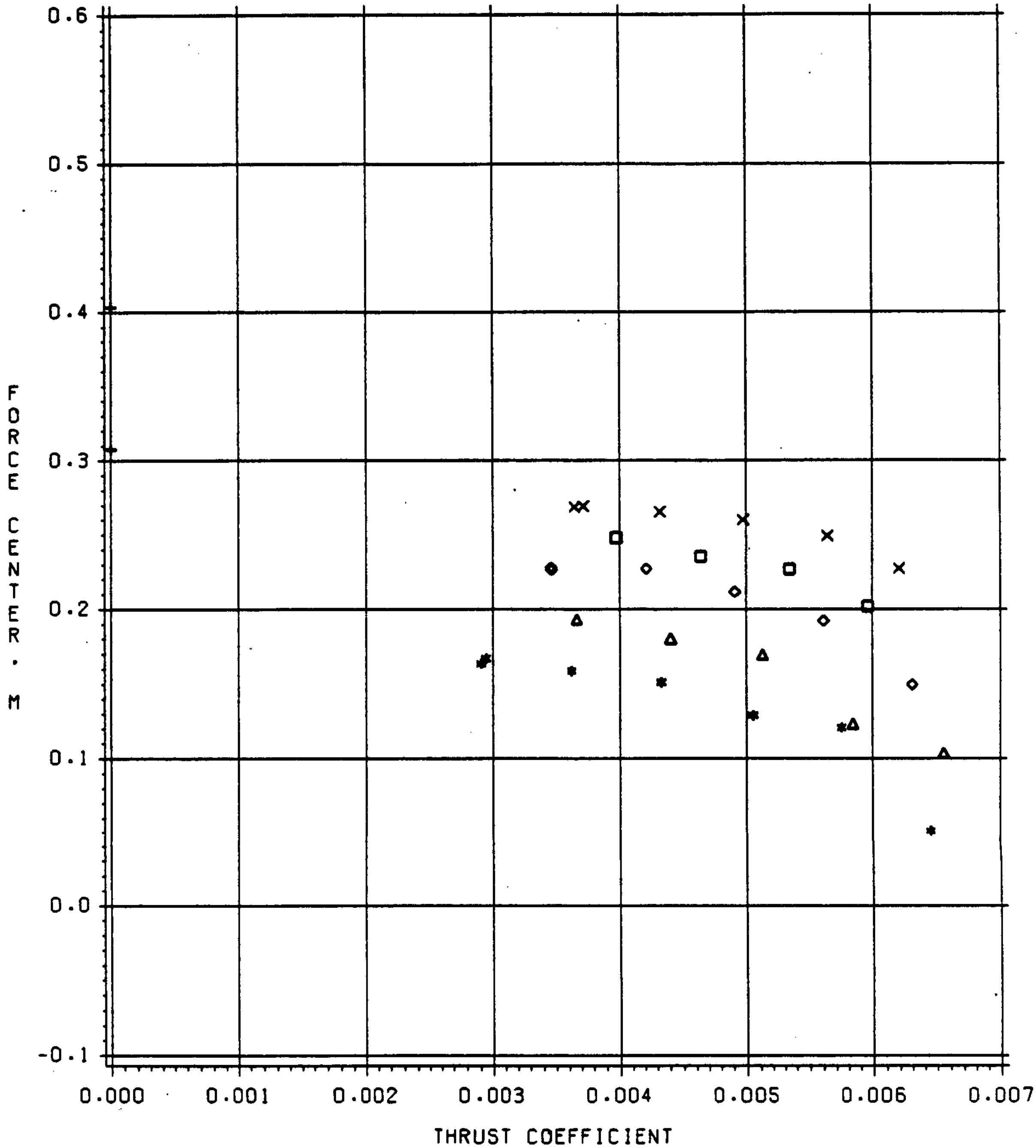
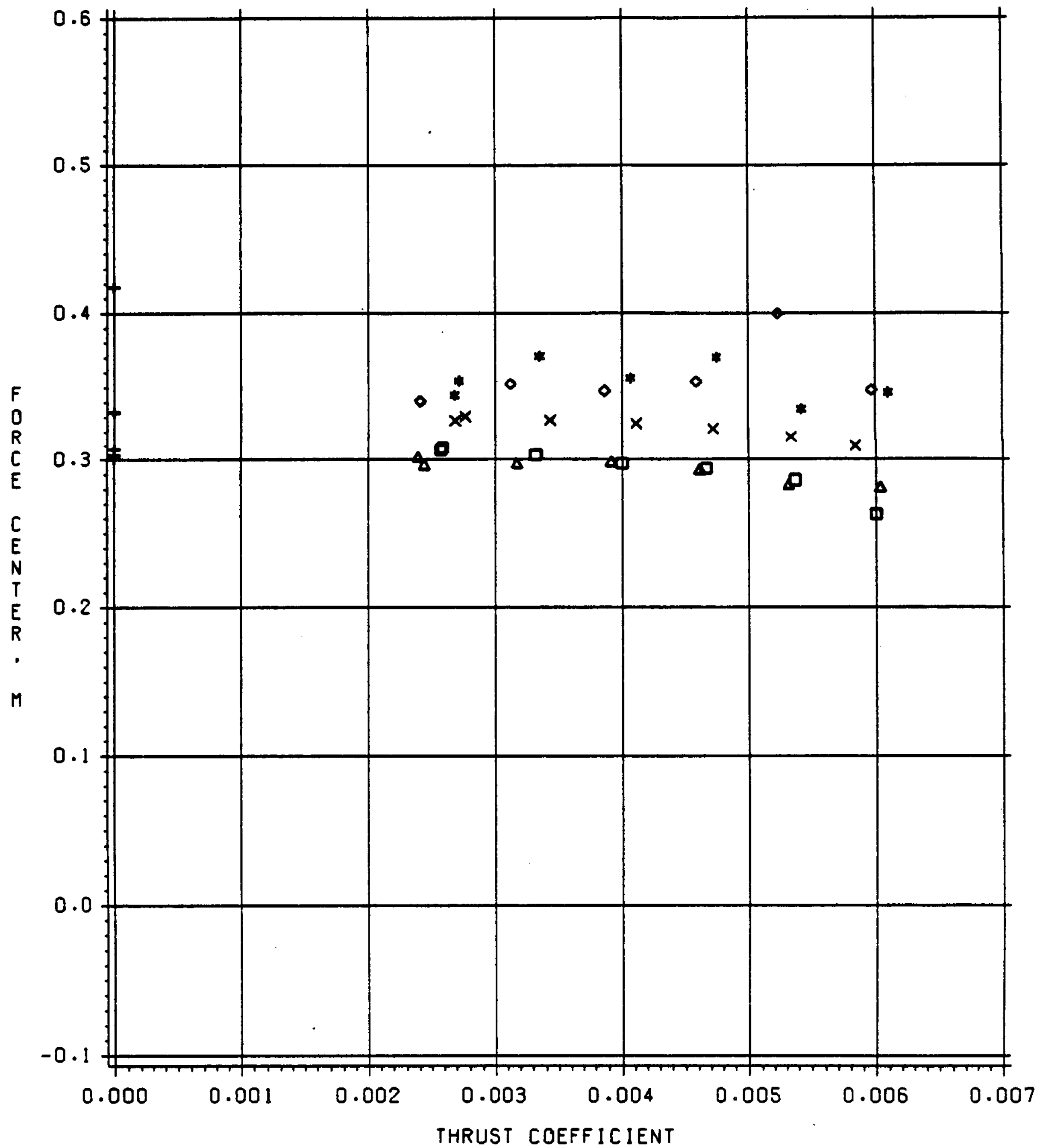


Figure 132. Effect of main rotor thrust on rotor axial force center, HR, α_S=-4 deg.

CONFIGURATION - BH (RUNS 59 THRU 63) BHR (RUNS 14 THRU 18)



MU = .10/.15/.20/.25/.30 (STAR/TRIANGLE/DIAMOND/SQUARE/X)
ROTOR OFF TARES (PLUS)

Figure 133. Effect of main rotor thrust on rotor axial force center, BHR, α_S=-4 deg.

CONFIGURATION - BHF2L (RUNS 51 THRU 55) BHRF2L (RUNS 19 THRU 23)

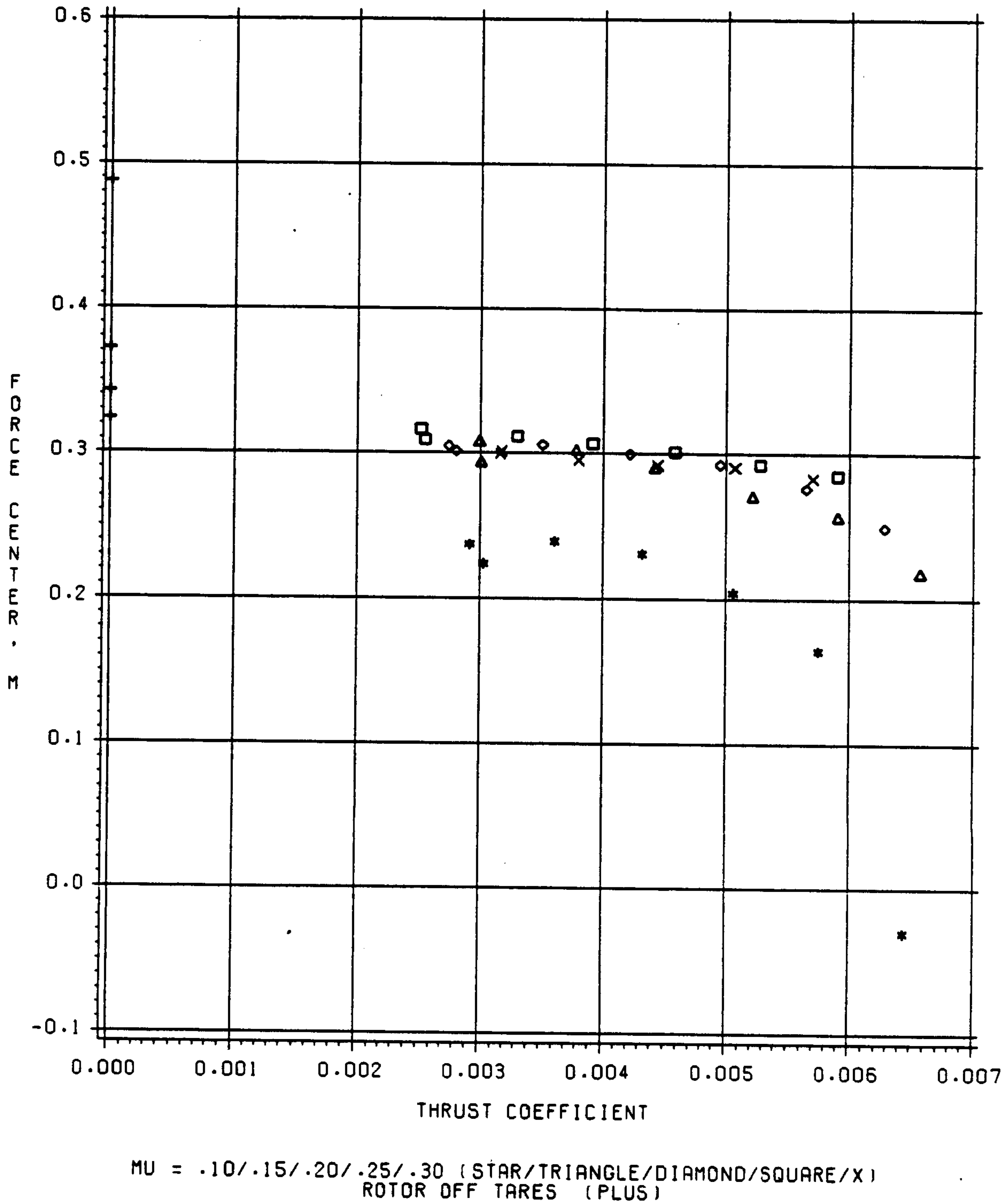


Figure 134. Effect of main rotor thrust on rotor axial force center, BHRF2L, α_S=-4 deg.

CONFIGURATION - BHF2U (RUNS 46 THRU 50) BHRF2U (RUNS 27 THRU 30)

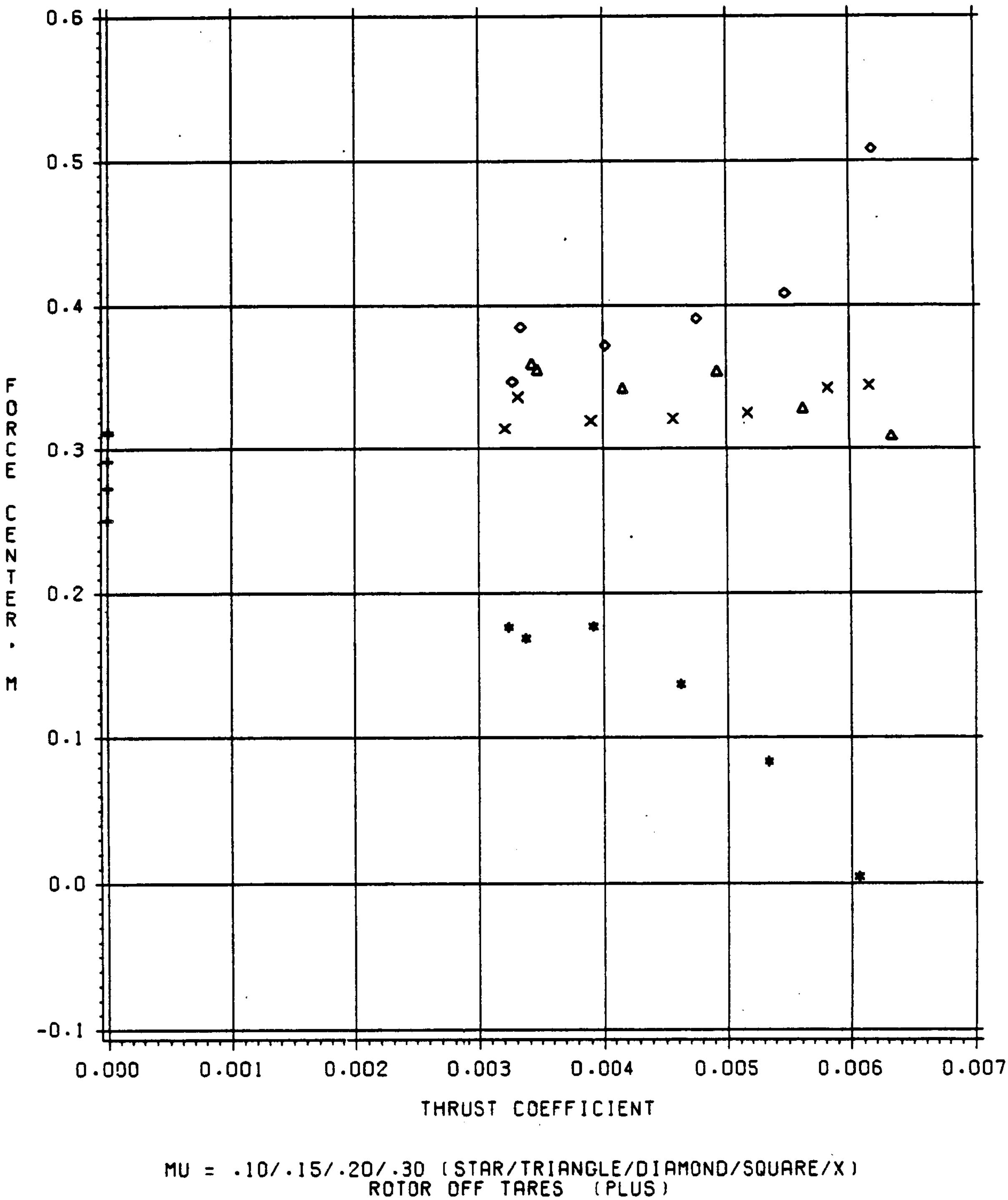


Figure 135. Effect of main rotor thrust on rotor axial force center, BHRF2U, α_S=-4 deg.

sented in Figures 136 and 137 for HR and BHRF2L. Figures 136 and 137 show that the H-force which should be physically located near the plane of the rotor is in fact not, based upon measured data.

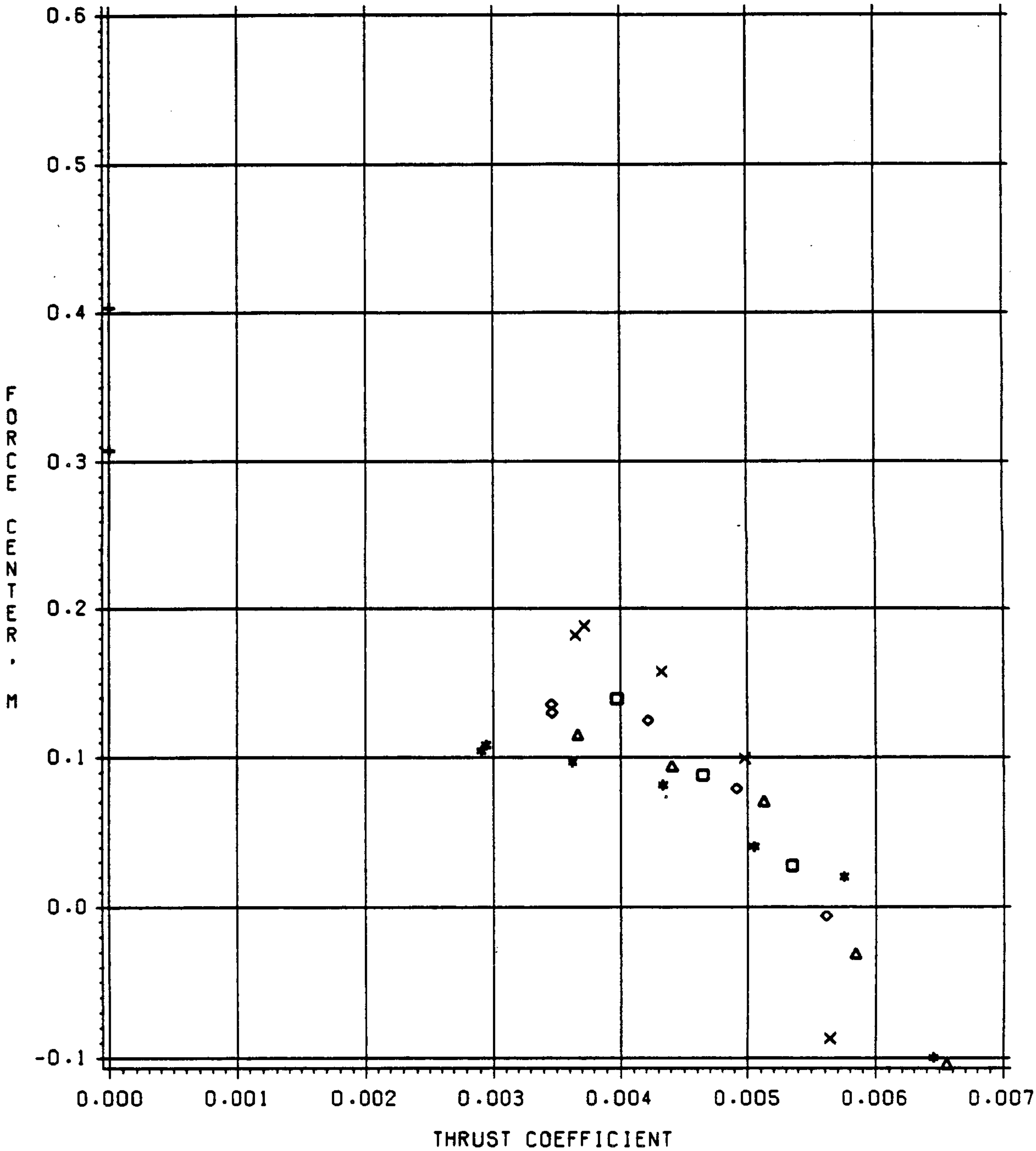
Because of questions related to the application of measured H-force to the calculation of rotor efficiency it was determined that propulsive force should be defined to include the hub tares for configuration performance evaluation. This definition of propulsive force was then plotted versus control axis angle of attack and is presented in Figures 138 and 139.

Table 8 is presented to compare the effect of separation distance on rotor performance under trim conditions. It is assumed that the rotor is operating in the presence of a non-lifting body with an equivalent flat plate drag area of 1.49 sq m (16 sq. ft), not including the drag of the hub and exposed rotating controls. The thrust coefficient required is .005. Propulsive force required for trim is calculated and used in Figures 138 and 139 to determine the control axis angle of attack required. The control axis angle of attack is then used in Figures 111 and 112 to determine the power required. The net result is that BHRF2U would use 8.9 percent less power at a speed ratio of 0.2 and 7.1 percent less power at a speed ratio of 0.3. Including body effects would further improve the performance of BHRF2U over BHRF2L. It should be noted that the majority of the performance differences were due to the amount of hub and controls exposure accounted for in the propulsive force. Bodies beneath the rotor appear to improve rotor performance with additional benefits to be gained at higher speeds by reducing the rotor-body separation distance. This conclusion must be weighed, however, relatve to other considerations such as canopy drumming and rotor loads.

FLOW VISUALIZATION RESULTS

Although tufts were used for flow visualization in hover and forward flight, only results of the forward flight smoke visualization work will be presented. There was no attempt to obtain quantitative data from the smoke work. Only qualitative investigations were conducted to determine whether specific test parameters or conditions would manifest themselves clearly enough to warrant further work. Some of the parameters investigated include configuration, thrust, speed ratio, body angle of attack, and blade azimuth. All photographs presented in this section were taken with the smoke filament in a vertical plane along the centerline of the fuselage (zero buttline plane).

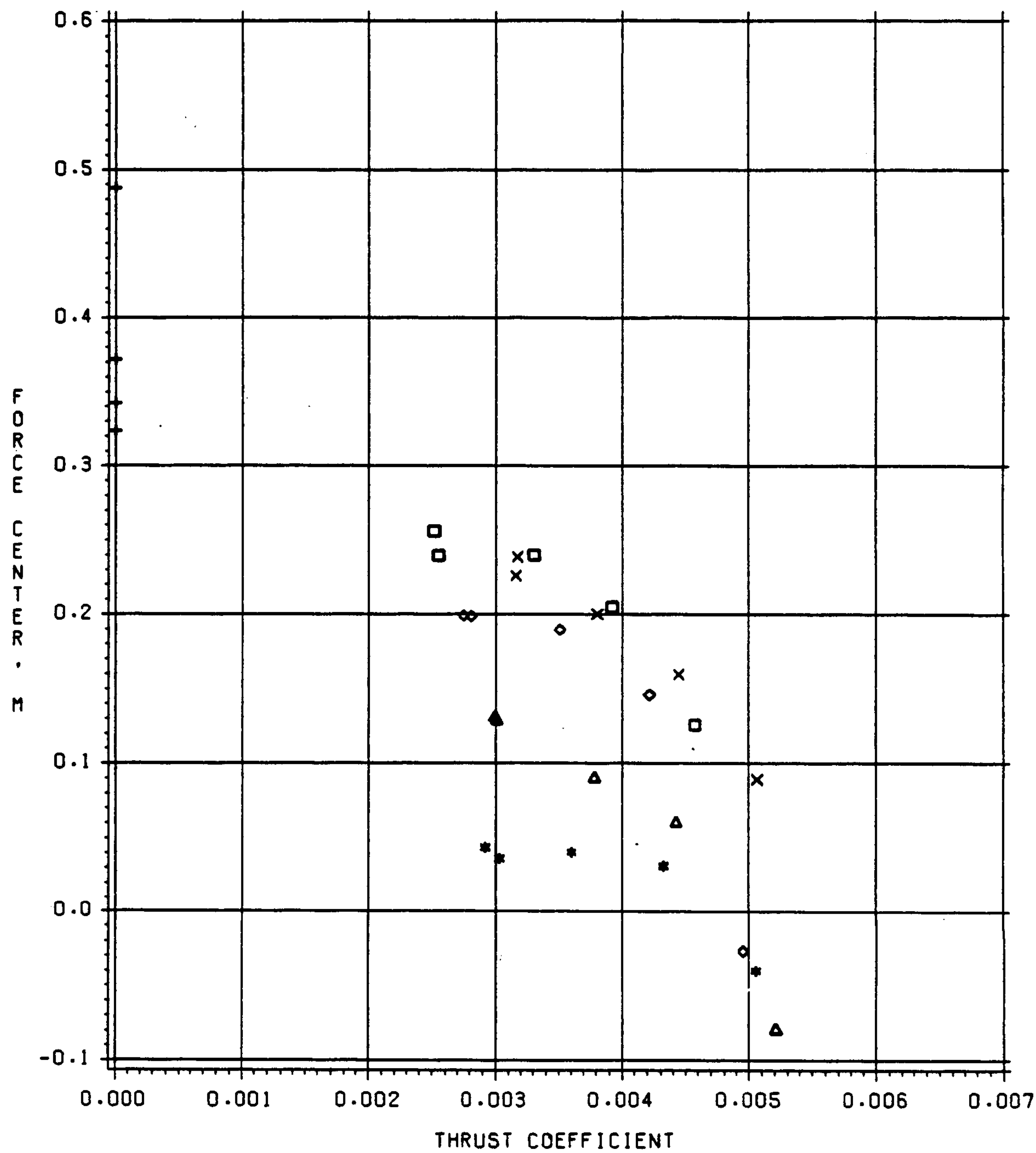
CONFIGURATION - H (RUNS 40 THRU 45) HR (RUNS 31 THRU 35)



MU = .10/.15/.20/.25/.30 (STAR/TRIANGLE/DIAMOND/SQUARE/X)
ROTOR OFF TARES (PLUS)

Figure 136. Effect of main rotor thrust on center of H-force, HR, α_S=-4 deg.

CONFIGURATION – BHF2L (RUNS 51 THRU 55) BHRF2L (RUNS 19 THRU 23)



MU = .10/.15/.20/.25/.30 (STAR/TRIANGLE/DIAMOND/SQUARE/X)
ROTOR OFF TARES (PLUS)

Figure 137. Effect of main rotor thrust on center of H-force, BHRF2L, α_S=-4 deg.

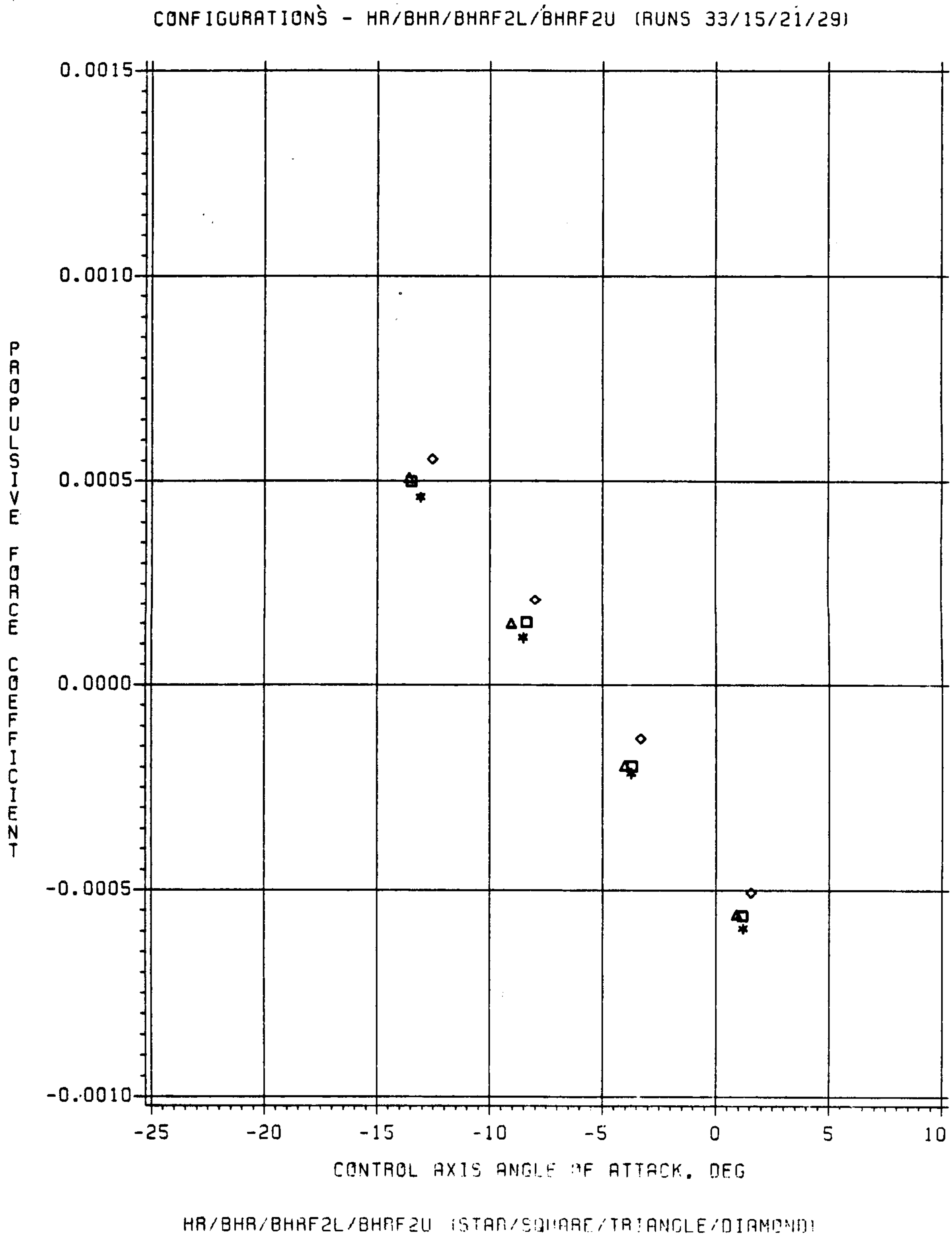


Figure 138. **Main rotor uncorrected propulsive force versus α_C, all configurations, C_T=.005, μ=0.20.**

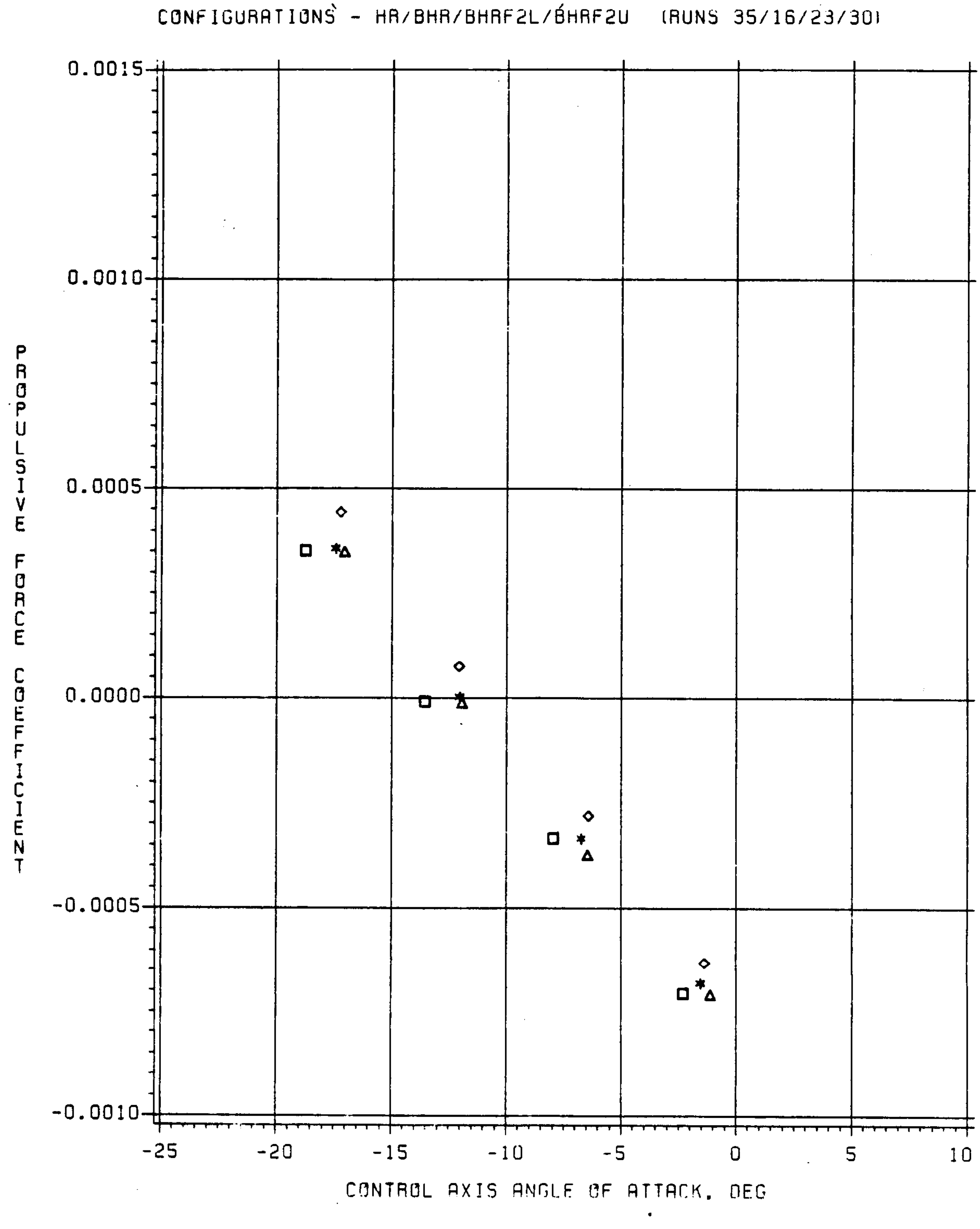


Figure 139. Main rotor uncorrected propulsive force versus α_c, all configurations, C_T=.005, μ=0.30.

Table 8. Effect of Separation Distance on Forward Flight Rotor Performance

Configuration: Equivalent flat plate drag area = 1.86 sq. m (20 sq ft)
Sea level standard day conditions

Configuration	μ (-)	C_T (-)	C_X (-)	α_C (deg)	C_P (-)	C_P (%)
BHRF2L	0.2	.005	.000318	-11.1	.000269	0
BHRF2U	0.2	.005	.000318	- 9.4	.000245	-8.9
BHRF2L	0.3	.005	.000720	-22.6	.000492	0
BHRF2U	0.3	.005	.000720	-21.3	.000457	-7.1

The flow visualization results are presented for three of the configurations tested. Figures 140 through 145 present photographs of configuration BHRF2L. BHRF2U is shown in Figures 146 through 150. Figure 151 illustrates the trailing blade tip vortex for configuration HR.

Figures 140 and 141 are presented primarily to illustrate the visual extent of the influence of the tip vortex circulation on the smoke filament. The test condition is a speed ratio of 0.10 with a thrust coefficient of 0.00268 and 0.00644 for Figures 140 and 141 respectively. The configuration is BHRF2L at a zero geometric body angle of attack. The thrusting rotor changes the wind axis causing an effective upwash. Consequently, the equivalent body angle of attack for Figures 140 and 141 were 1.25 deg and 3.0 deg respectively. At the low thrust condition of Figure 140 the tip vortex strength is not as great as at the higher thrust condition of Figure 141. However, even at the higher thrust coefficients, the vertical band of visibility appears to have a width equal to 10 to 20 percent radius. Also, note in Figure 141a the apparent interaction between the rotor and winglet.

Figure 142 shows a sequence of photographs in which the smoke filament was moved upward in the vertical plane beginning in Figure 142a at approximately the bodies stagnation point. The test conditions are identical to that of Figure 140. Note in Figure 142b the flatness of the streamline immediately ahead of the windscreen. In Figure 142c the filament is slightly higher and is beginning to show signs of losing some of the finer details associated with the body contour. This tendency of the streamlines to lose the finer details of a fuselage is consistent with results presented in Reference 16. There it was demonstrated that a single source in a free stream meeting certain general criteria was able to predict the upwash induced by a helicopter fuselage as well as a complex panel analysis. This, however, is only applicable in cases where fuselage details do not induce separation and abrupt changes in contour are not large relative to the total thickness of the body of interest.

The effect of body angle of attack is shown in Figure 143. The speed ratio is 0.10 and the thrust coefficient is 0.0048. Note that the wake moves further away from the rotor as the rotor inflow changes. This implies that the rotors effect on the fuselage in terms of unsteady loads would be expected to decrease with increased body angle of attack. However, a noticeable blade-vortex interaction was taking place manifesting itself as an increase in noise. How induced loads from this effect may

a)

b)

c)

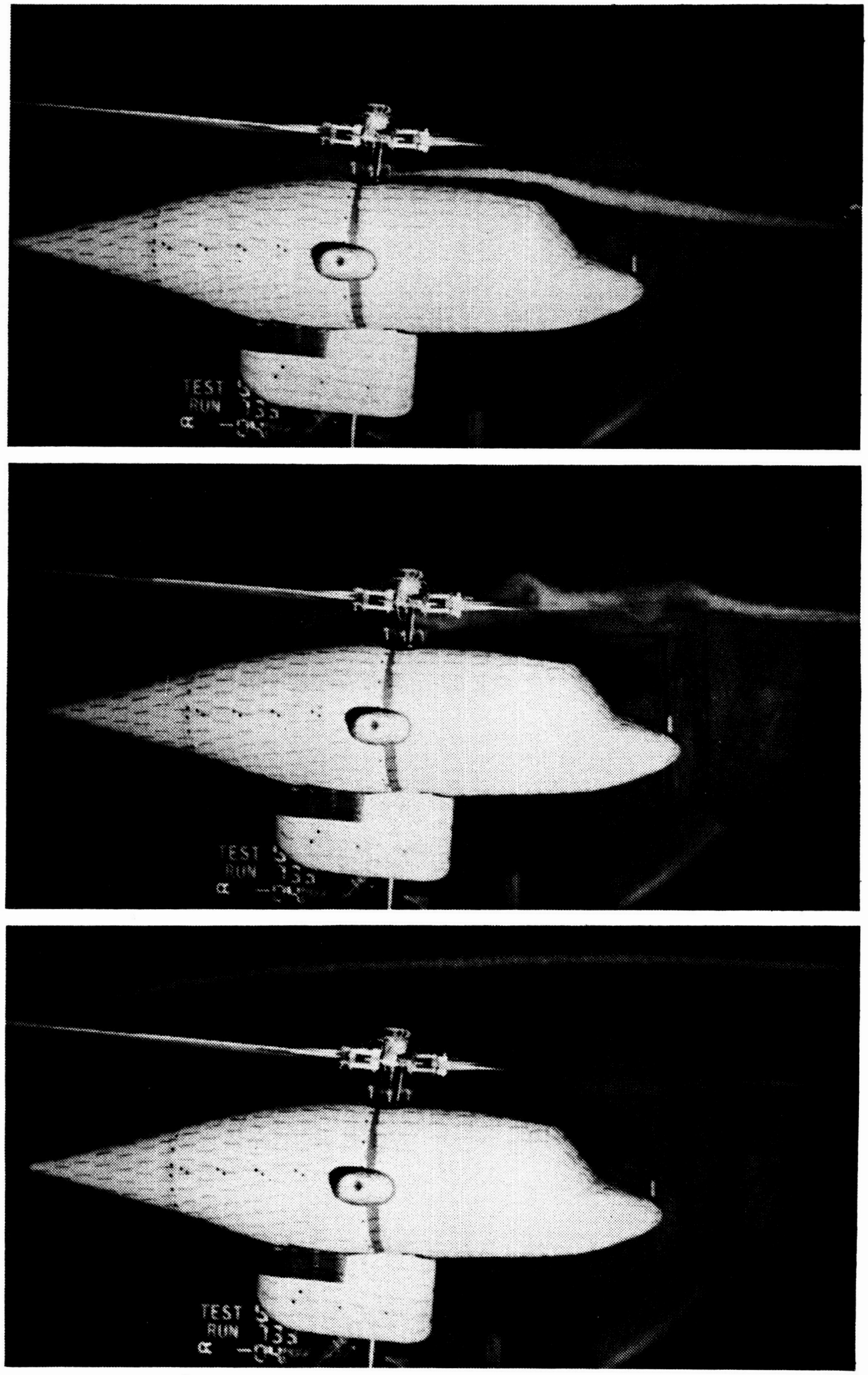
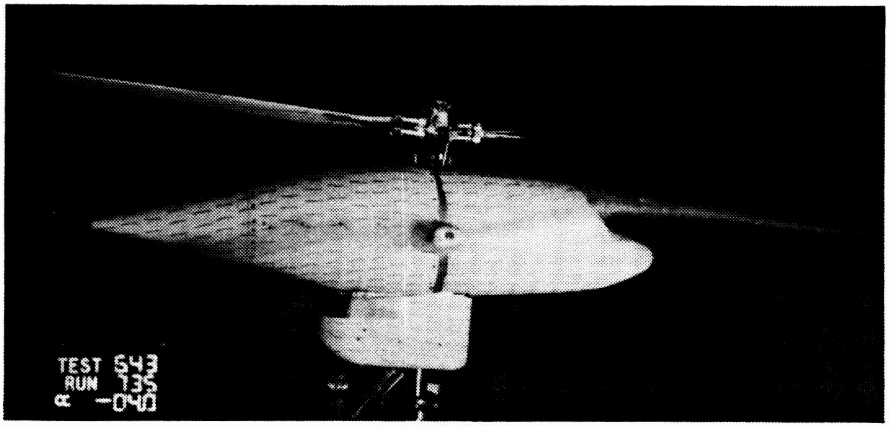


Figure 140. Vertical smoke scan of BHRF2L to illustrate visual limits of discrete circulation, μ=0.10, C_T = 0.00268, θ_B = 0.

a)



b)

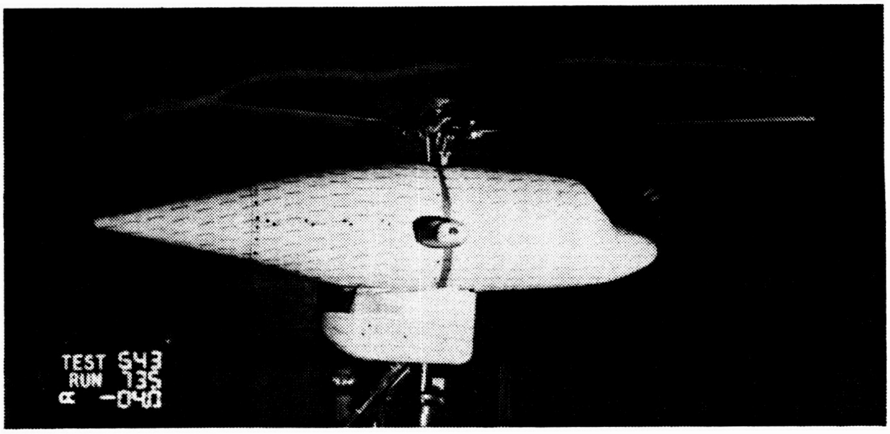


Figure 141. Vertical smoke scan of BHRF2L to illustrate visual limits of discrete circulation, $\mu=0.10$, $C_T = 0.00644$, $\theta_B = 0$.

a)

b)

c)

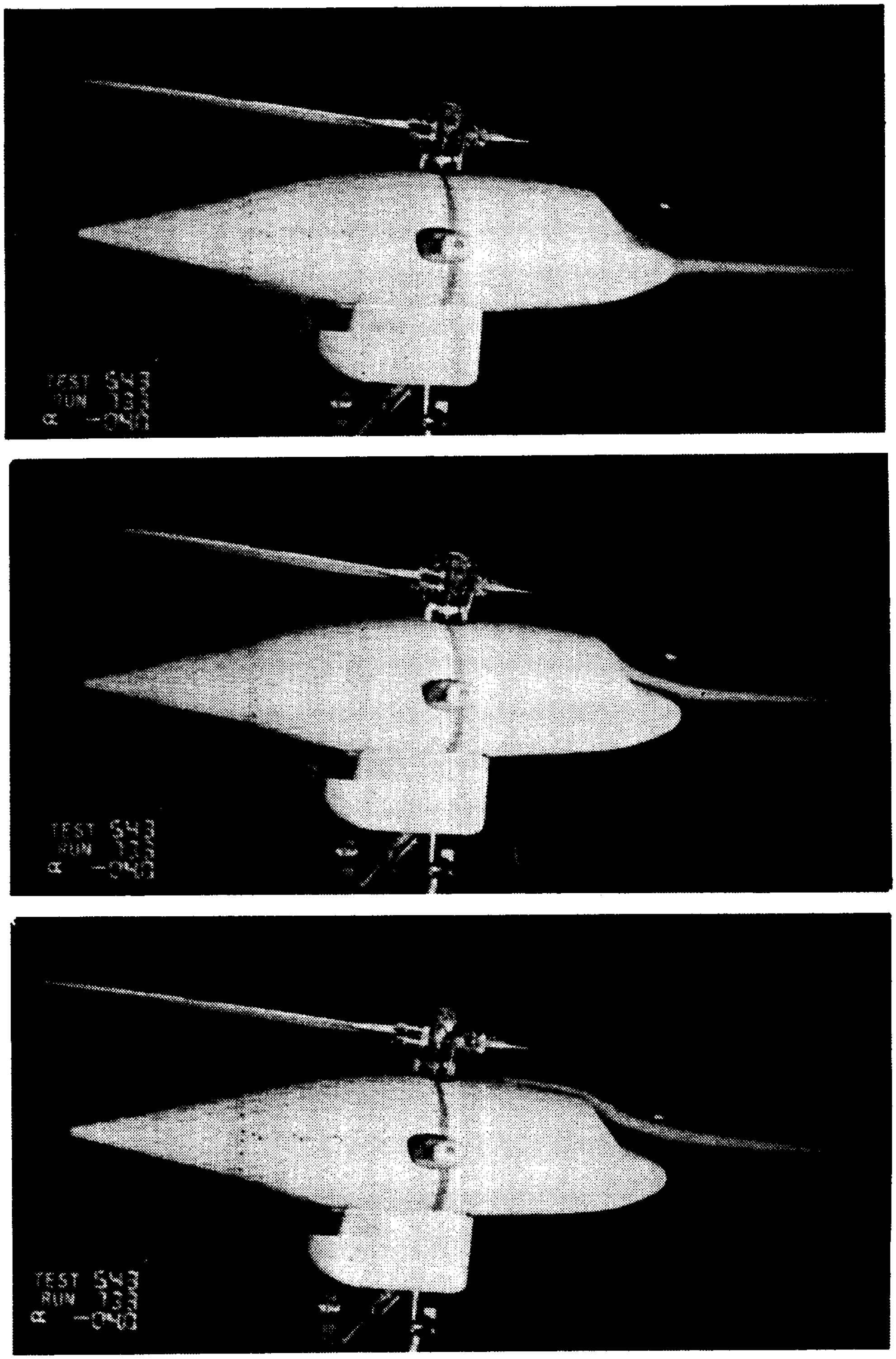


Figure 142. Streamline shape changes above the nose of BHRF2L, $\mu = 0.10$, $C_T = 0.00268$, $\theta_B = 0$.

a) $\theta_B = 0$

b) $\theta_B = +4$

c) $\theta_B = +8$

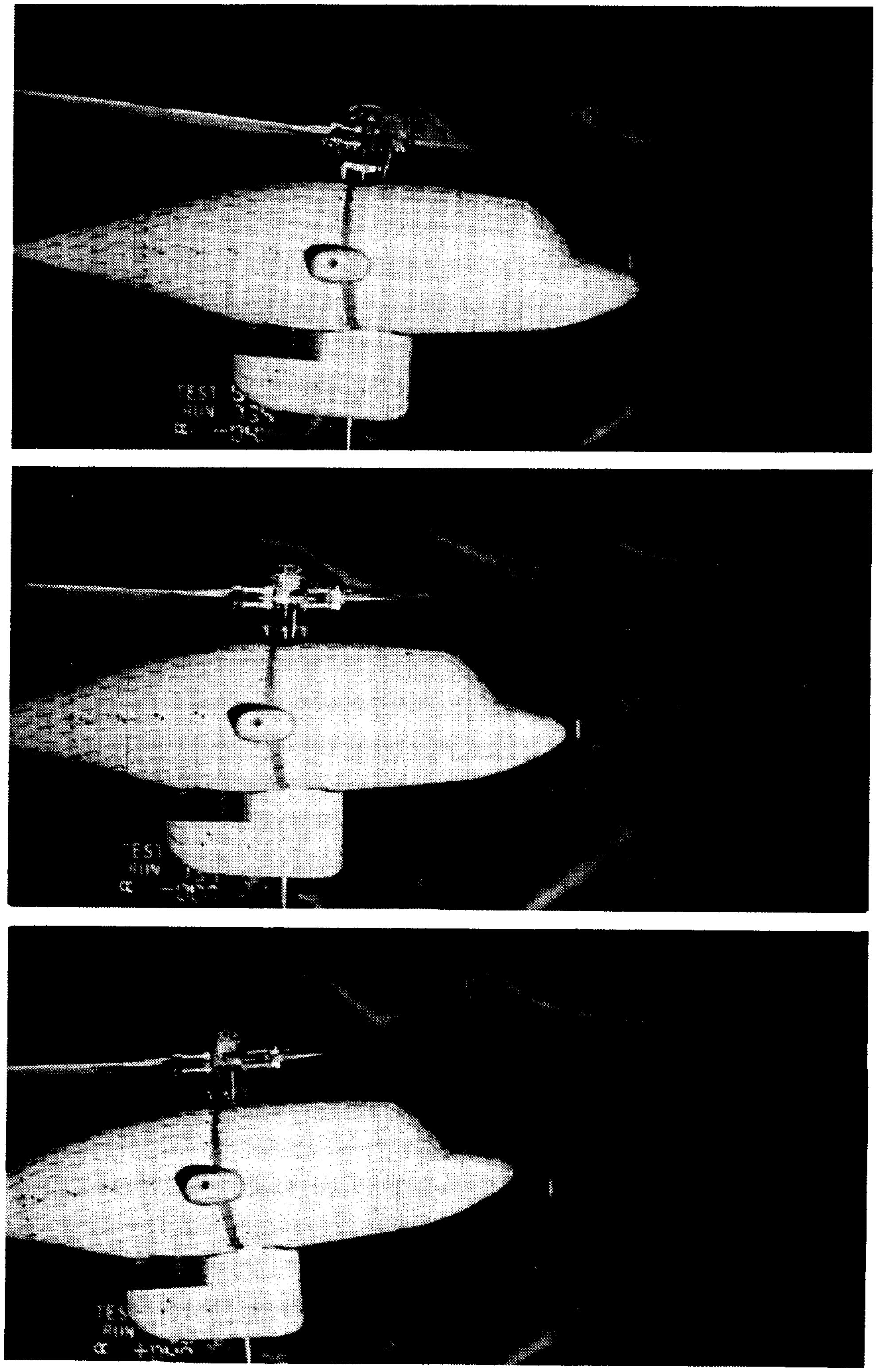
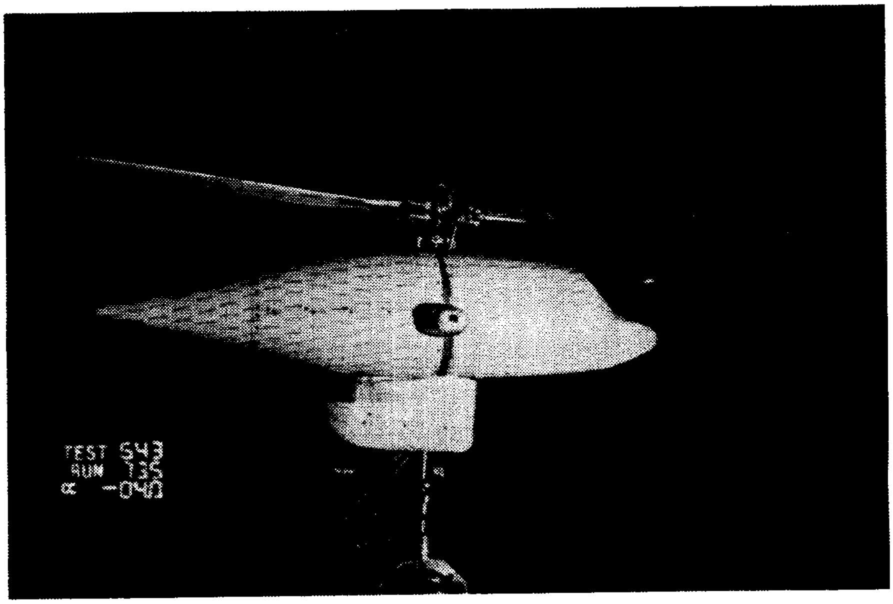


Figure 143. Effect of body pitch attitude on BHRF2L wake trajectory, $\mu = 0.10$, $C_T = 0.0048$.

a)



b)

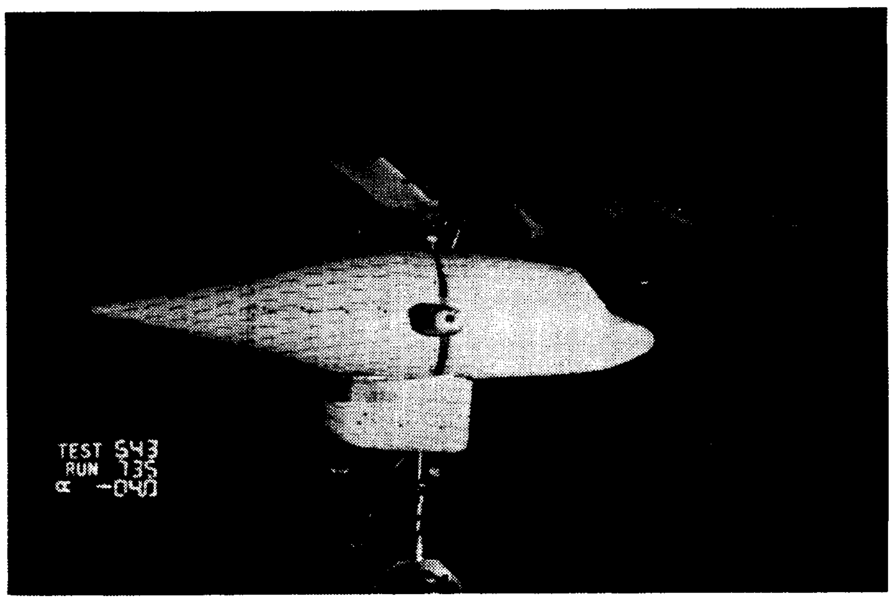
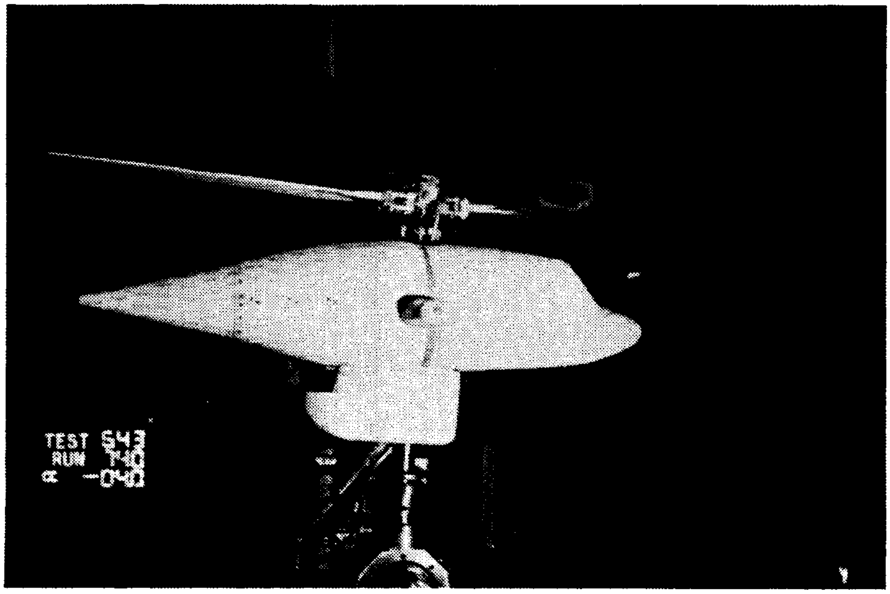


Figure 144. Effect of rotor azimuth on BHRF2L tip vortex trajectory, $\mu = 0.10$, $C_T = 0.00644$, $\theta_B = 0$.

a)



b)

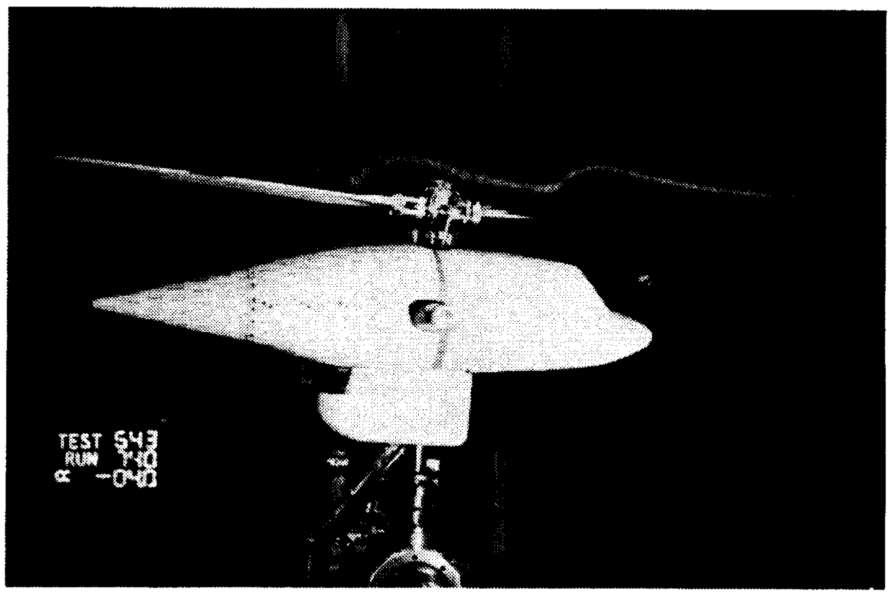
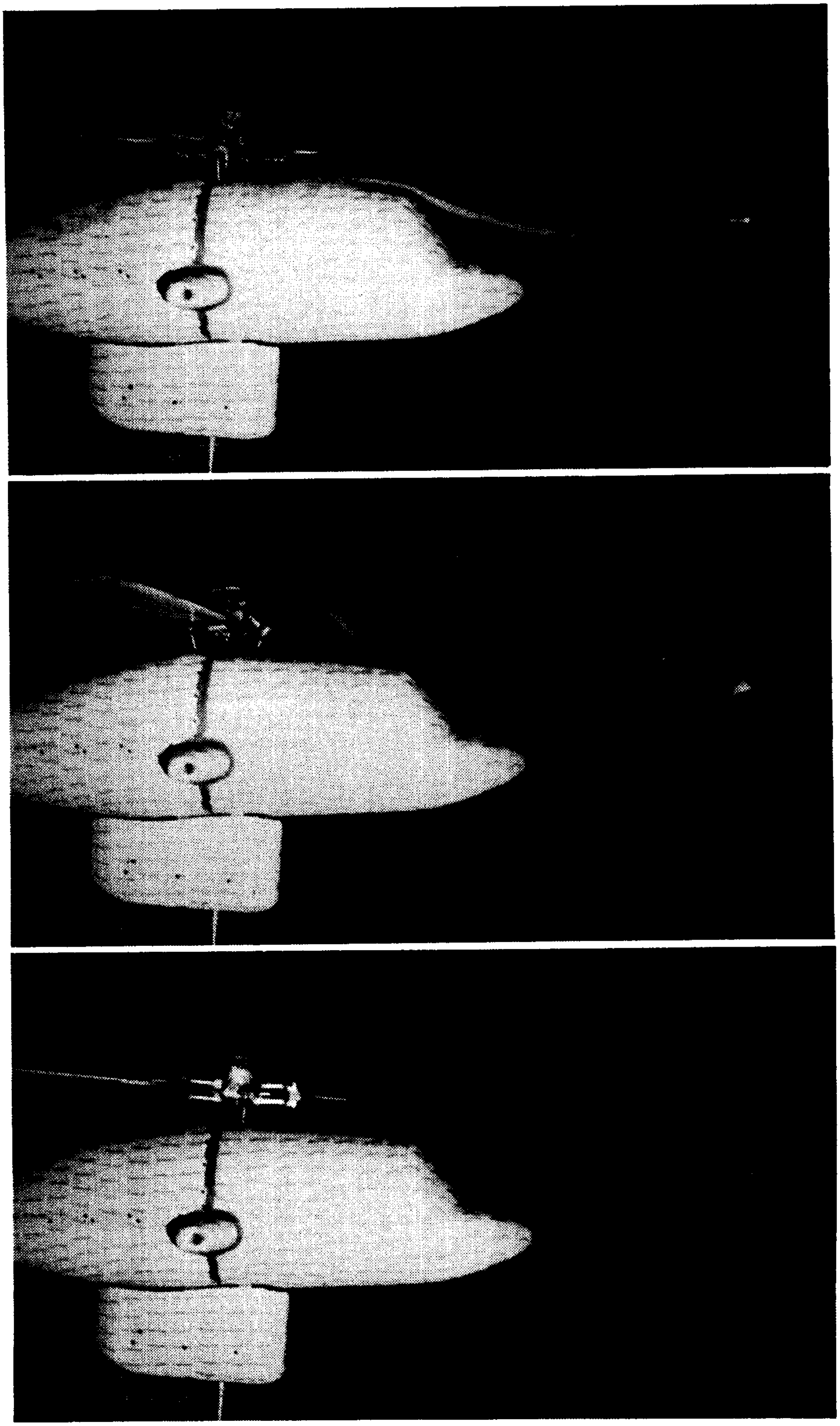


Figure 145. Configuration BHRF2L flow visualization at $\mu = 0.15$, $C_T = 0.0047$, $\theta_B = 0$.



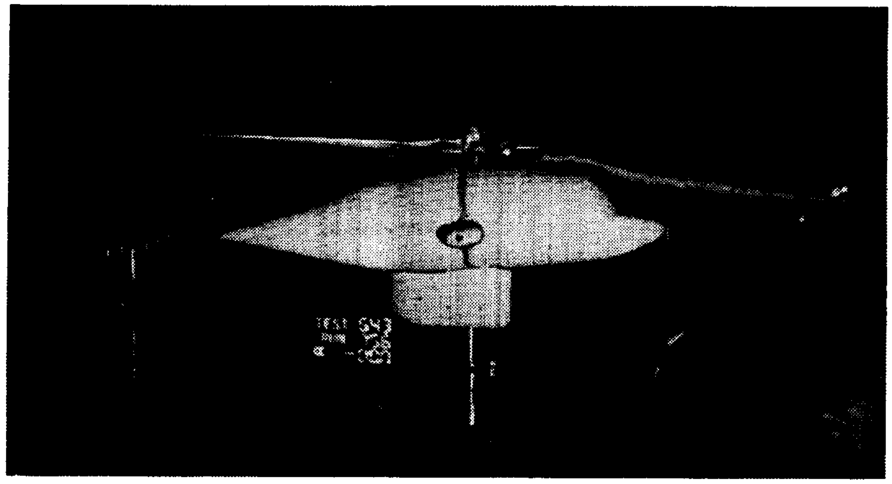
a)

b)

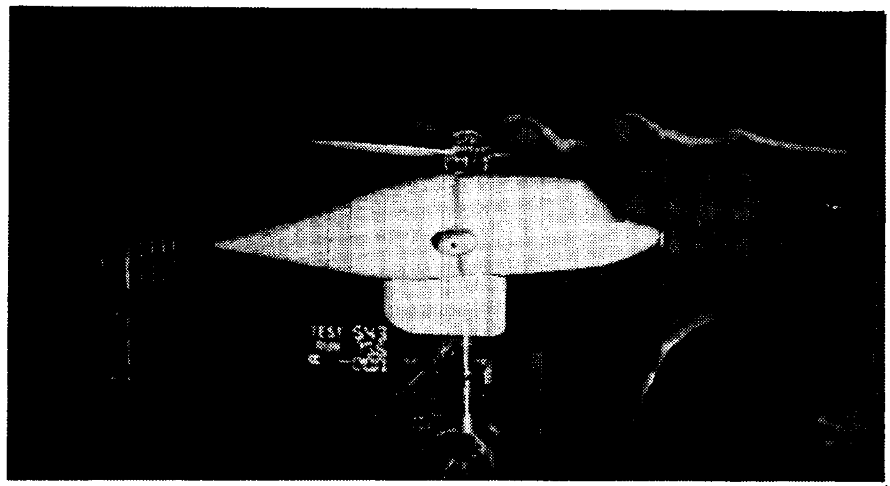
c)

Figure 146. Vertical smoke scan of BHRF2U to illustrate visual limits of discrete circulation, $\mu = 0.10$, $\theta_B = 0$.

a)



b)



c)

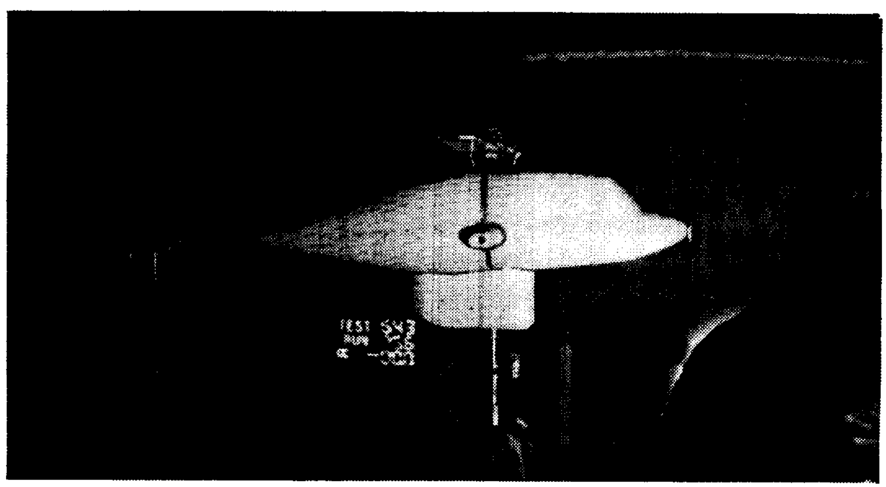


Figure 147. Vertical smoke scan of BHRF2U at $\mu = 0.10$, $C_T = 0.00457$, $\theta_B = +4$.

a)

b)

c)

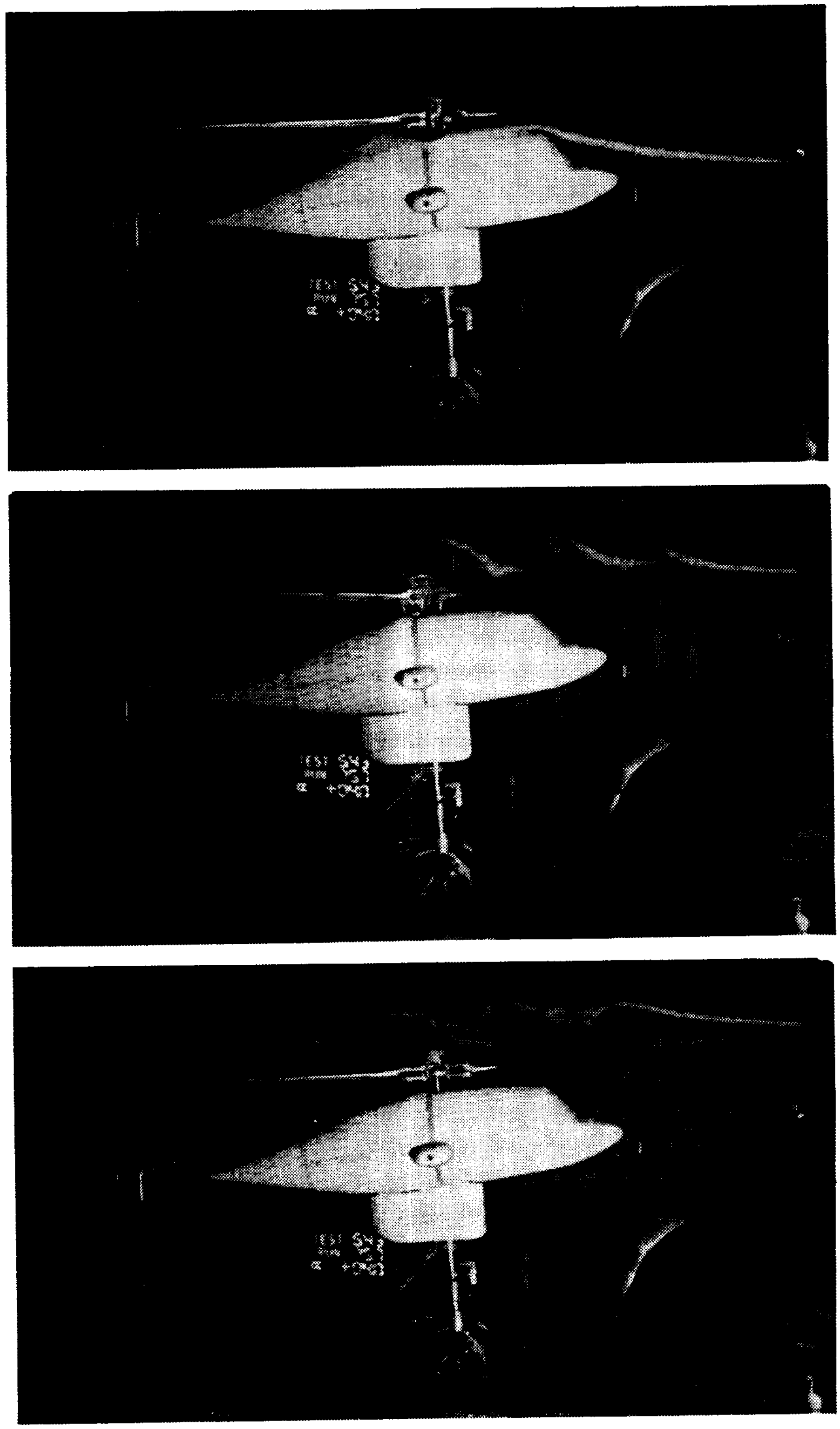
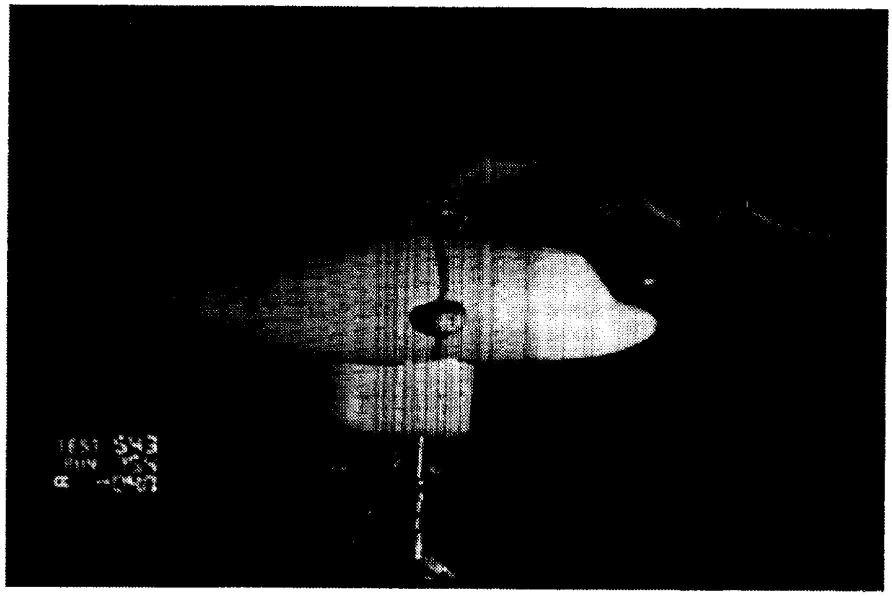


Figure 148. Vertical smoke scan of BHRF2U at $\mu = 0.10$, $C_T = 0.00457$, $\theta_B = +8$.

a)



b)

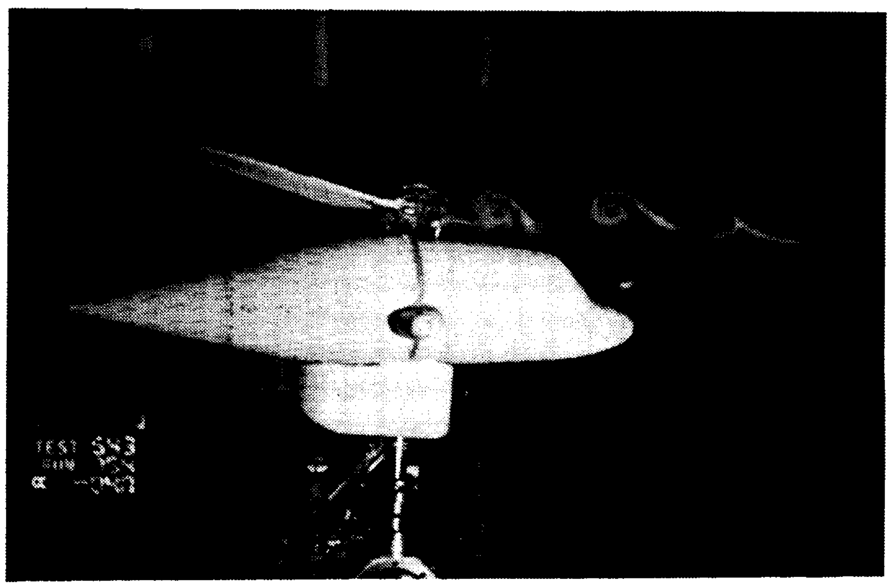
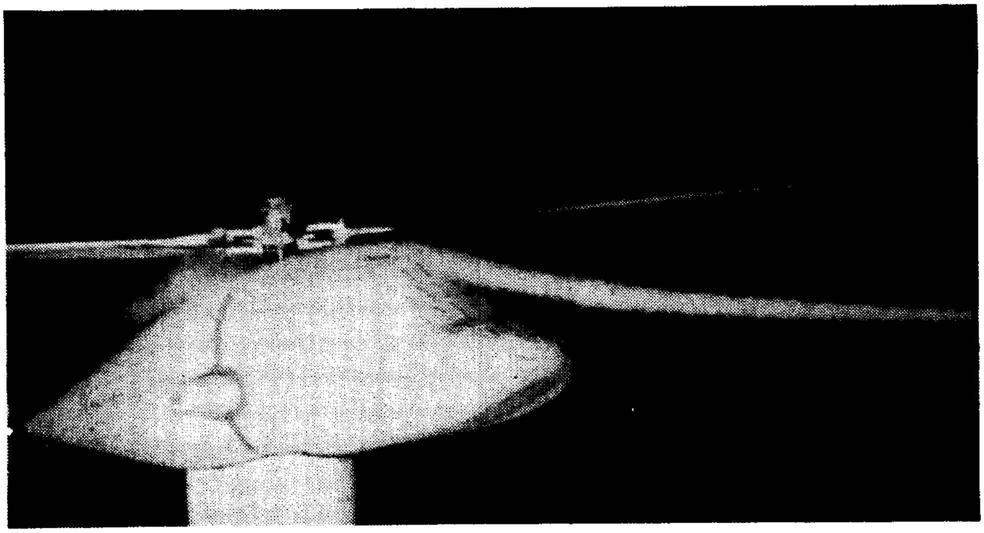
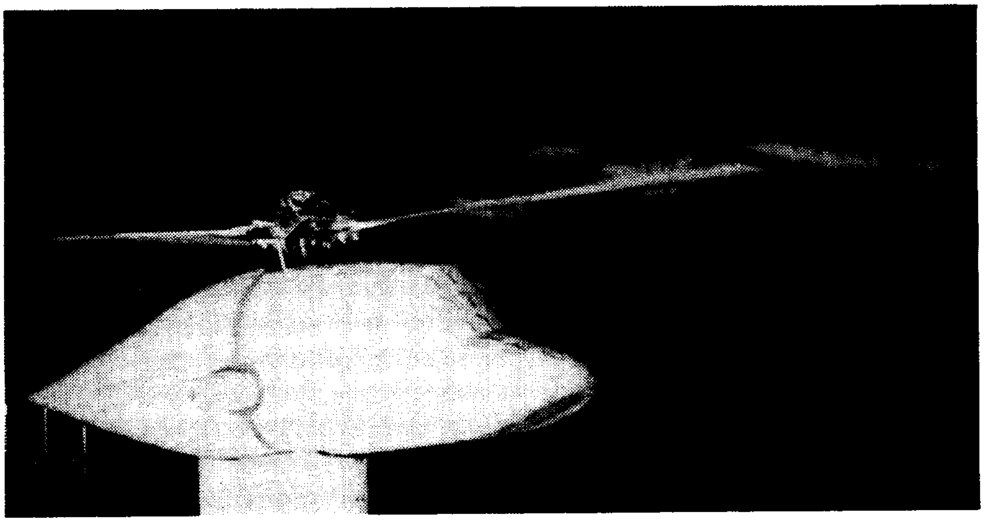


Figure 149. Effect of rotor azimuth on BHRF2U tip vortex trajectory, μ = 0.10, C_T = 0.00645, Θ_B = 0.

a) $\theta_B = +8$



b) $\theta_B = +4$



c) $\theta_B = +8$

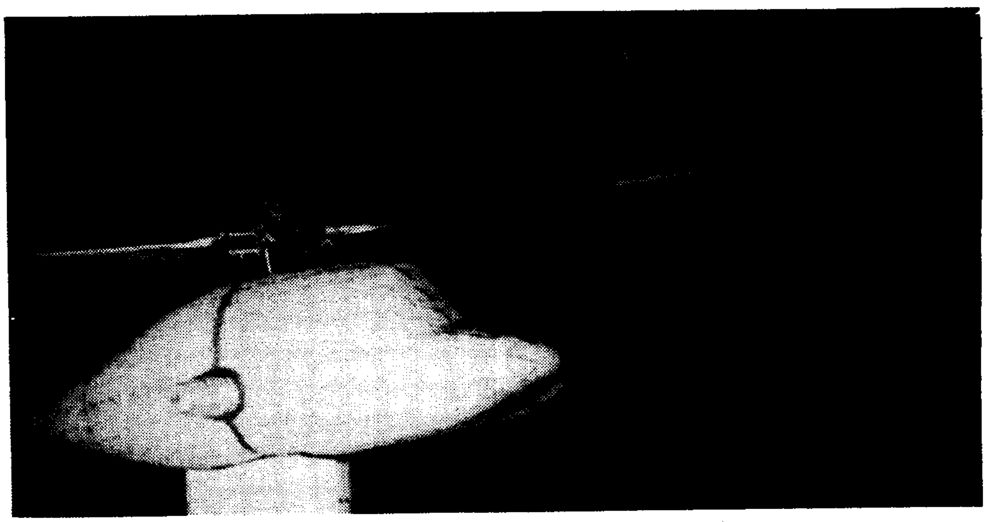
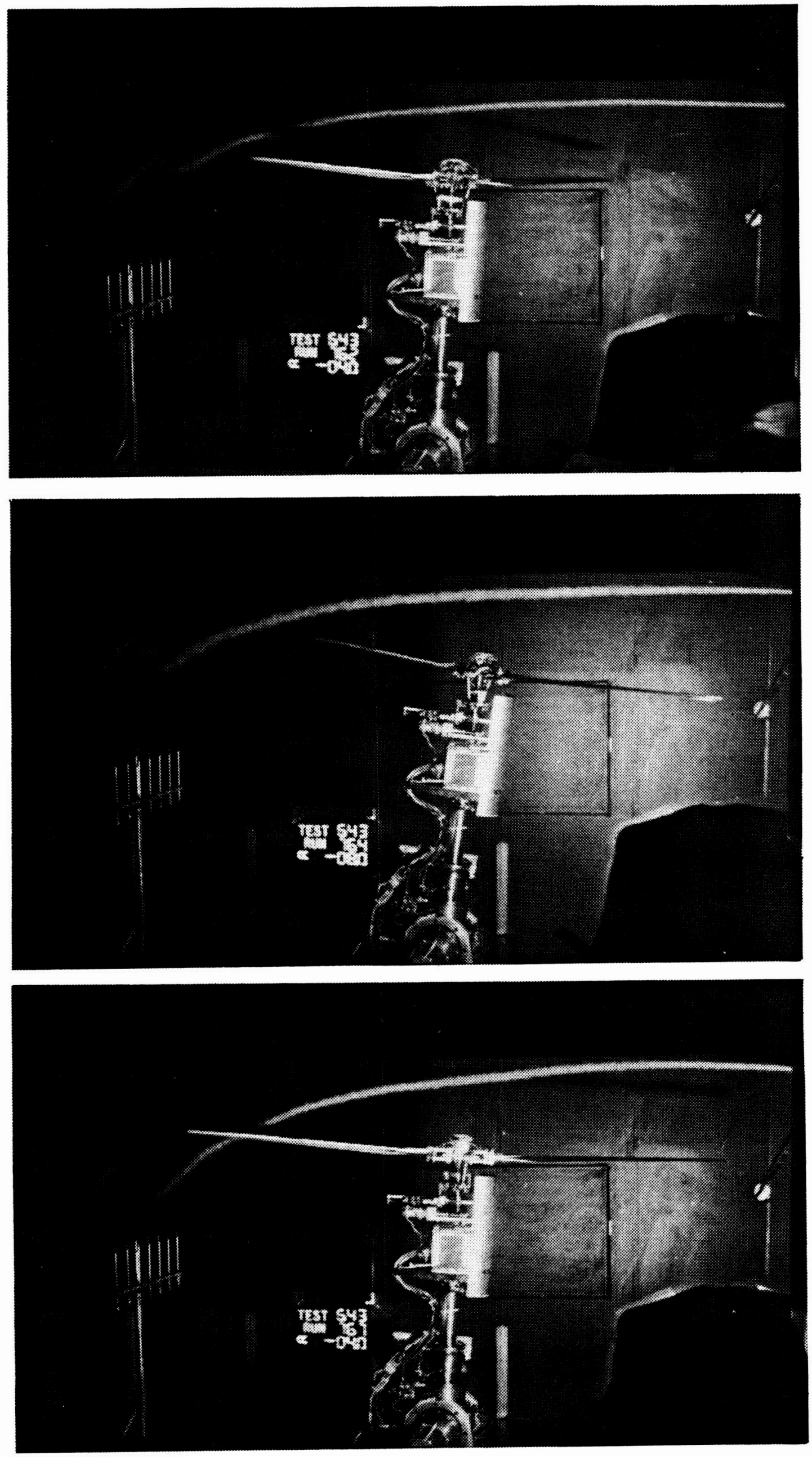


Figure 150. Vertical smoke scan of BHRF2U from a frontal view, $\mu = 0.10$, $C_T = 0.00457$,



a) μ = 0.10
α_S = 0

b) μ = 0.10
α_S = -4

c) μ = 0.086
α_S = 0

Figure 151. An illustration of the trailing blade tip vortex, configuration HR.

introduce themselves into future main rotor-fuselage interaction studies should be considered. There are two observations worth discussing at this time. In Figure 143a there appears to be a secondary flow just to the left of and below the vortex over the nose. This is most pronounced at the higher thrust levels and clearly seen in all the videotapes for all configurations including the isolated rotor. The second observation is related to flow visualization technique. Figure 141b does not show as intense a vortex as observed in a and c. This is simply due to the probe location. In the case of extreme position error one would obtain flow visualization similar to Figure 141b. The point to be made here is that probe positioning is not only critical but may be prohibitive to certain quantitative testing.

Figure 144 illustrates the effect of blade azimuth. In Figure 144a the blade over the nose is advanced slightly past the nose and shows the beginning of the tip vortex roll-up. In Figure 144b the vortex is well defined and shows downstream movement. This figure also shows the secondary flow previously mentioned. Because the test rotor has two blades, every other vortex is generated by the same blade. Consequently, the vortex nearest the hub in Figure 144a is approximately one revolution old.

Figure 145 presents two photographs at a speed ratio of 0.15.. The tunnel velocity is approximately the same as in previous photographs and only the rotor rpm has been decreased. The thrust coefficient is 0.0047 and the body geometric angle of attack is zero. The net result as one would expect is a greater separation distance between the individual tip vortices.

Figure 146 shows a scan of configuration BHRF2U similar to Figures 140 and 141 for configuration BHRF2L. In comparing the photos for these two configurations only the slightest difference in wake trajectory could be noticed. That may be due partly to the integral effect of the body on the wake trajectory not being discernable until after the tip vortex has impacted on the hub and the smoke has become diffused.

Figures 147 and 148 show an increase in body geometric angle of attack relative to Figure 146. These photographs were also taken at a further distance than Figure 146 in order to capture the wake over the entire body. Both figures show results similar to those presented for configuration BHRF2L. Note the diffused flow behind the hub in Figures 147a and b. The trajectory of the diffused smoke is mostly the result of the time-averaged flow induced by the main rotor, although, some entrainment is sure to be present. The hub region definitely diffuses the smoke, however, closeups using the videotape zoom lens showed that the circulation was still there. Figure 147c also shows evidence of a tip vortex coming off the trailing blade. As many as five discrete vortices from the trailing blade could be seen downstream of the model. With the proper lighting tail rotor and main rotor interactions should also be observable.

Figure 149 is similar to Figure 144 in that it shows the effect of rotor azimuth. It was very interesting to observe the rotor blade/vortex interaction as the strobe was used to sweep the blade back and forth through the vortex. The vortex at best showed a slight distortion in close proximity to the blade and showed a measurable vertical displacement with blade passage. Unfortunately the sequence of events was only captured on videotape.

Figures 150 and 151 are presented only for general observation. Figure 150 presents configuration BHRF2U from a frontal view. Good resolution of the vortex core is impossible from this angle; however, it may be useful in future studies by adding a three-dimensional effect. The final flow visualization figure is of the isolated rotor configuration. Figure 151 shows several examples of the trailing blade tip vortex.

The effect of separation distance was not clearly observable from this test. Much stricter control of the test conditions would have to be maintained in order to obtain any useful quantitative data. Speed ratios below 0.10 were not possible during this test; however, a greater configuration effect might be observable below this speed because of decreases in wake skew angle. A definite problem is the maintenance of good smoke quality over a wide speed range. If rpm is used to simulate speed ratio, angle of attack would have to be corrected for wall effects. It was also difficult to maintain blade track at rpm. Consequently, multiple filaments were observed.

CORRELATION

The following section presents correlation with measured hover and forward flight data. This includes hover download, isolated body moments and pressures and rotor performance. Simplified as well as advanced methods are used for correlation to aid in establishing trends as well as levels of sophistication required to analyze aerodynamic interactions.

Hover

Only fuselage downloads were calculated for OGE hover. Download was calculated for configurations BHR, BHRF2L, and BHRF2U using BHTI Hover Performance Methodology Program AR7906, reference 31. Each configuration planform was segmented into rectangular strips and drag coefficients were assigned to each segment based on its cross-sectional shape. Program AR7906 then calculated the time-averaged induced velocity to be applied to each segment. The velocities were calculated at a distance below the rotor equivalent to the distance between the tip path plane and the vertical center of each segment. Figure 152 shows the time-averaged downwash distribution for configurations BHR and BHRF2L produced by the rotor at a thrust coefficient of 0.005.

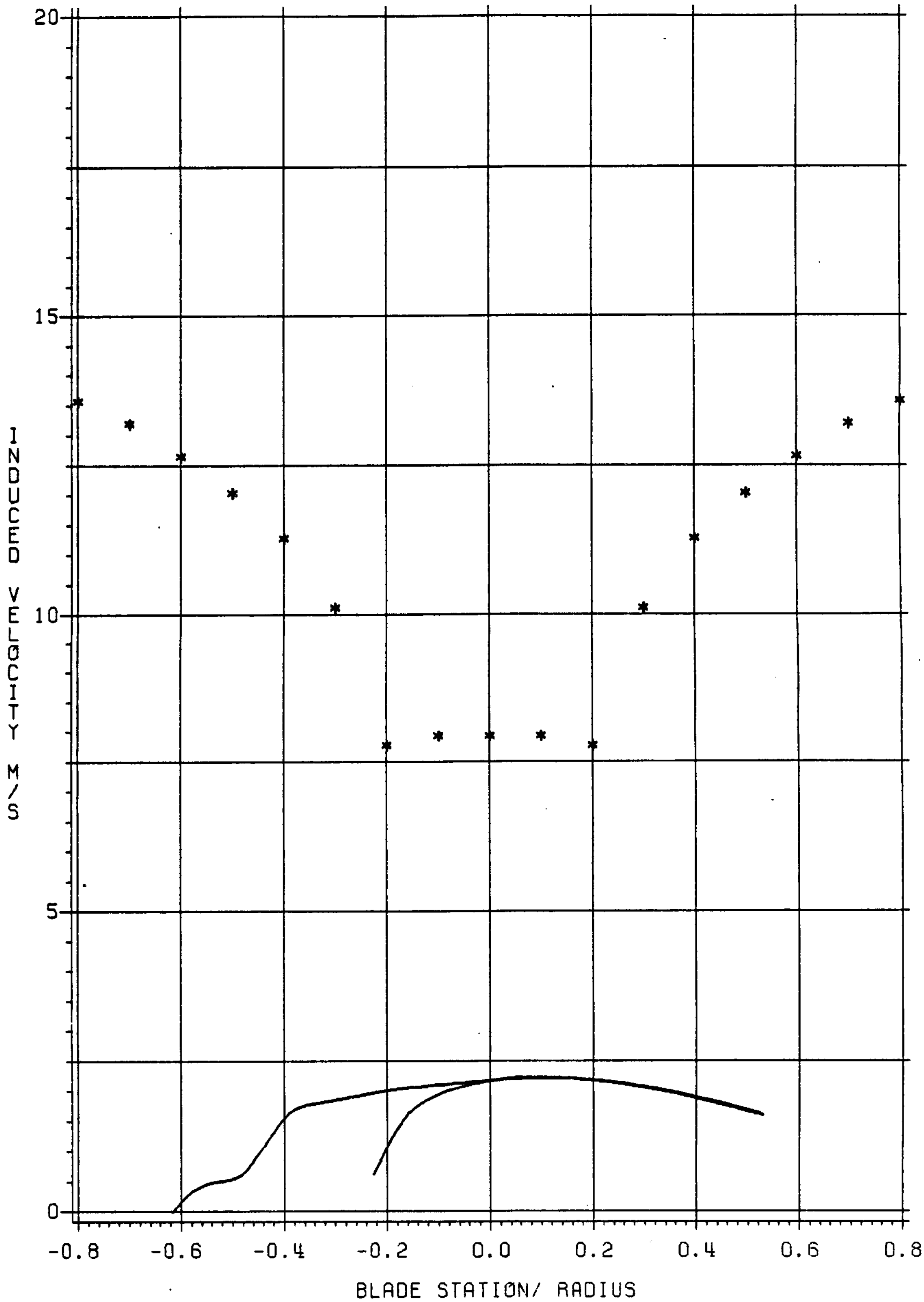


Figure 152. Calculated main rotor time-averaged induced velocity distribution for BHR and BHRF2L, C_T = .005.

Initially segment drag coefficients were selected from Reference 54 in accordance with local Reynolds number. However, the resultant downloads were too high. It was then assumed that due to rotor wake turbulence the bodies were experiencing super-critical flow conditions; hence, experiencing lower drag coefficients. The results of these calculations are presented in Figure 153 for configurations BHR and BHRF2L. Correlation with BHR appears to be fairly good; however, the measured download of BHRF2L is considerably higher than the calculated value. At a thrust coefficient of 0.005, BHR and BHRF2L calculated downloads are respectively 80 and 60 percent of the measured data. The trend with thrust is quite good for both configurations. Download for BHRF2U is not presented; however, it was calculated to be less than BHRF2L by approximately 0.3 percent of thrust. Figure 18 of the hover test results section indicates a similar difference.

Forward Flight

The forward flight calculations consist primarily of body pitching moment characteristics, body pressure data, and rotor performance. The pitching moment characteristics are particularly important since errors in trim due to errors in pitching moment have significant effect on download and drag,

A method for calculating the inherent pitching moments of airship hulls was presented by M. Munk, Reference 55. This method was used to calculate the isolated body pitching moments of configurations BHR and BHRF2L. The results are compared to measured data in Figure 154. The difference between the measured and calculated data is considerable and to a large extent may be due to viscous effects and the presence of the test stand fairing below the models tested. Note that the measured and calculated curves cross at approximately the same body angle of attack. If the difference between BHR and BHRF2L is taken for the measured and calculated data, very good correlation can be obtained as shown in Figure 155. Calculations for a variety of BHTI fuselages have been performed in the past and demonstrated that Munk's method works quite well for rotor-off configurations. This method can be of value at preliminary design levels and may be of use in conjunction with classical momentum methods for calculating rotor-on effects.

In Reference 56 a method defined by Multhopp is given for fixed wing aircraft which calculates body pitching moment in the presence of a lifting wing. This method is a variation on Munk's method and has been modified for application to helicopter fuselages. The application to high speed flight, however, did not fair well and will not be presented. In a previous BHTI study the method did correlate well with AH-1G data from Reference 3 at a speed ratio of 0.05. This was thought to be primarily due to the fact that Multhopp's method accounts for variations in the

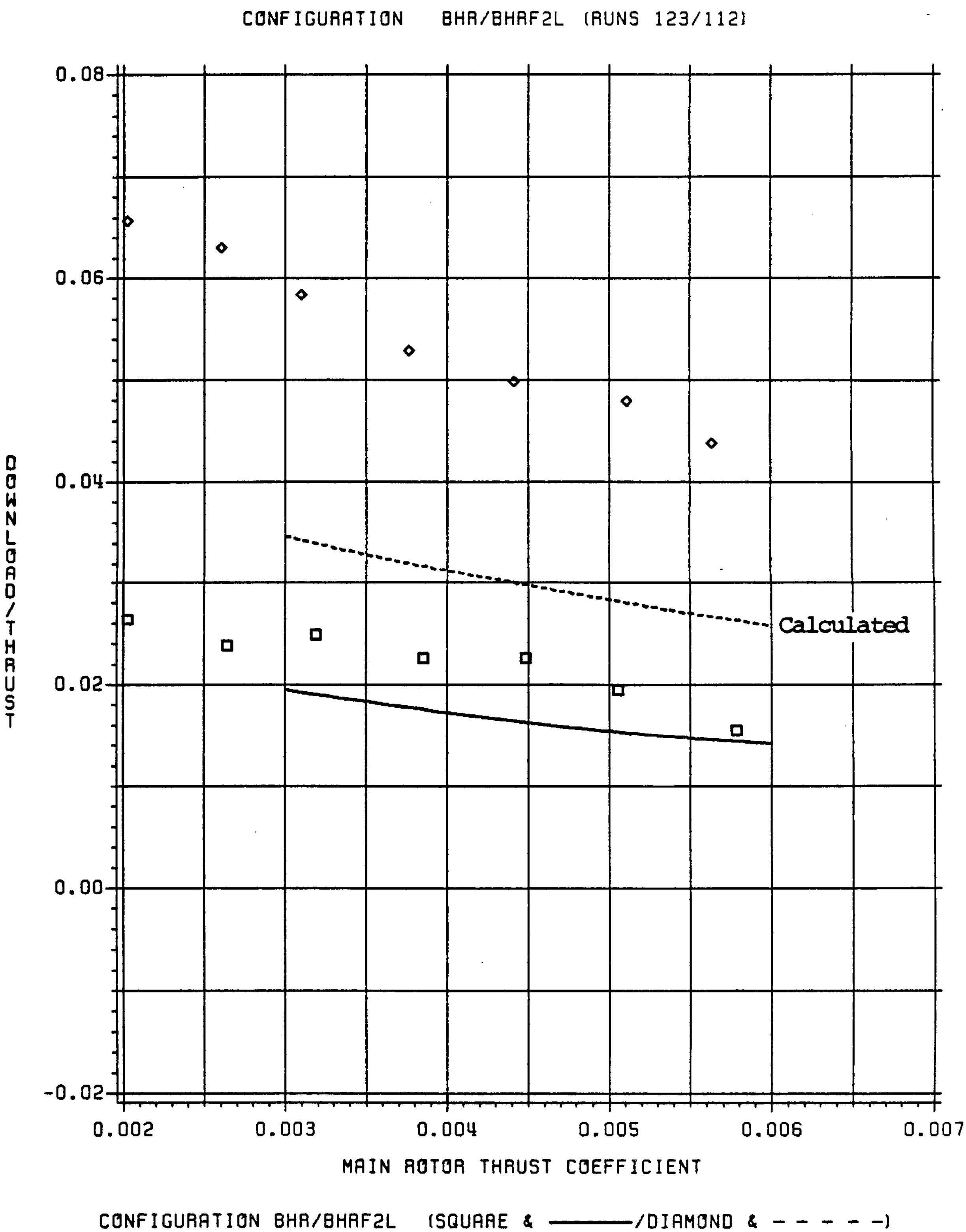


Figure 153. Comparison of measured and calculated download data for BHR and BHRF2L.

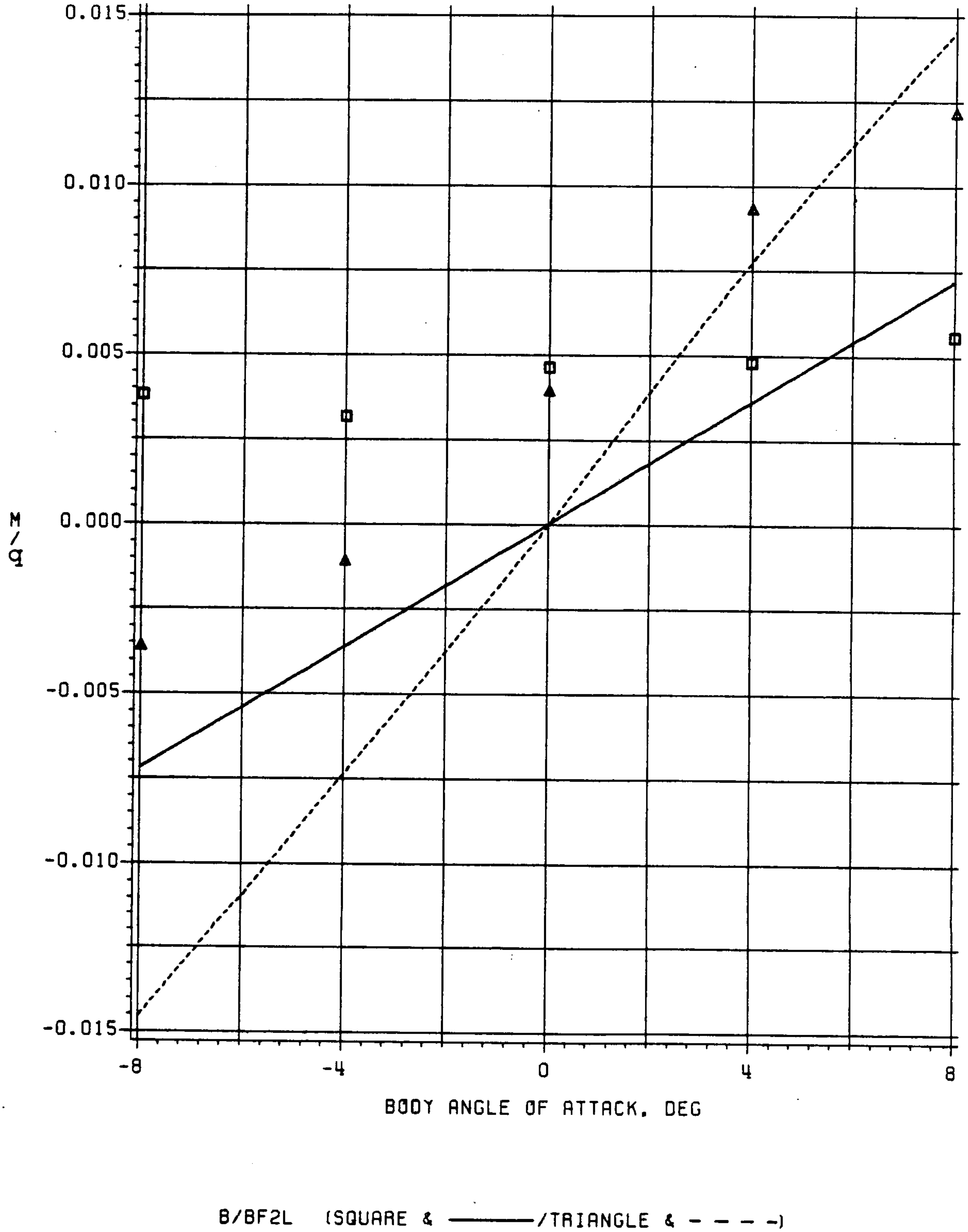


Figure 154. Comparison of measured and calculated isolated body pitching moments for configurations B and BF2L.

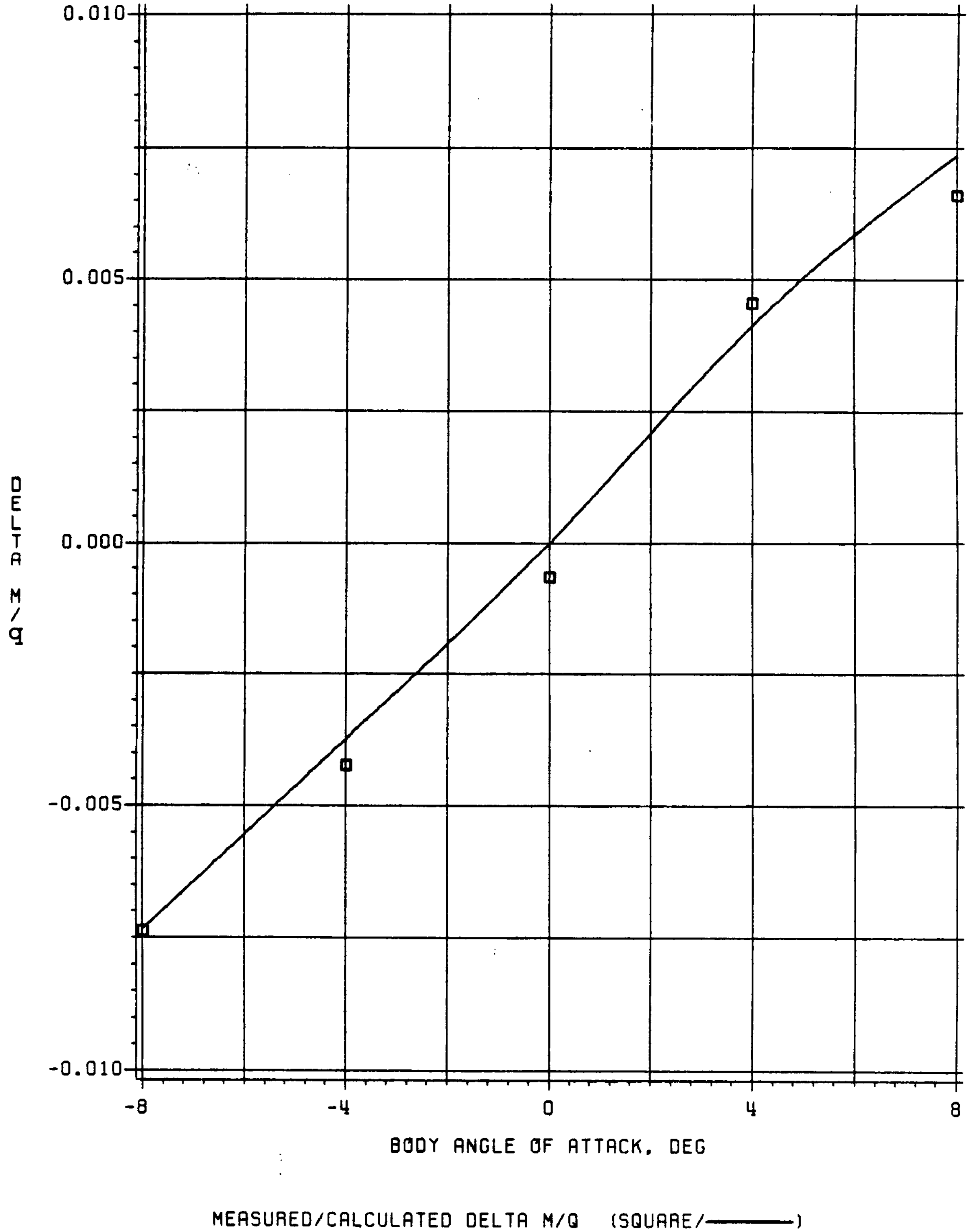


Figure 155. Comparison of difference in B and BF2L pitching moment for measured and calculated data.

time-averaged rotor induced velocity along the longitudinal body axis which become quite pronounced at speed ratios below 0.10.

Many classical analyses utilize momentum theory to calculate rotor induced changes in angle of attack and, hence, the rotors effect on the fuselage aerodynamic characteristics. Given the fuselage characteristics of the isolated bodies, the Forward Flight Performance Methodology Program ARAM45, Reference 30, was used to calculate the rotors effect on lift, drag, and pitching moment. The results are compared to measured rotor induced effects in Figures 156 through 158. The effect of configuration on lift is correct; however, the magnitude for BHR with speed does not agree well with the measured data. The correlation with drag is nonexistent. Correlation with pitching moment in general is good. The effect of configuration and the magnitude of the rotors effect is correct; however, the trend with speed is only fair.

Correlation with pressure data was accomplished with a panel method analysis, Reference 57. Figure 159 shows the panel models used for the analysis of BHR and BHRF2L isolated body pressure distributions. The basic geometry, as defined in Appendix C, was input into the program's preprocessor and then repaneled for better definition. A model of the underbody fairing was developed; however, analysis showed little impact on the calculated upper surface pressure. In the presence of the tunnel walls, the fairings impact might be somewhat more significant.

Figures 160 and 161 present the calculated pressure distributions along the longitudinal axis for BHR and BHRF2L respectively over a range of 16 degrees. These results are compared to measured data in Figures 162 and 163. Although there is an apparent shift between the calculated and measured results, it appears from Figures 164 and 165 that the change in pressure coefficient over a 16 degree range in angle of attack is in good agreement. The exception to this is the region where the afterbody wake is influencing the pressure distribution.

This concludes the correlation with fuselage data. Further work with coupled rotor/body analyses are warranted and should be conducted. However, this is beyond the scope of this report. The remainder of the forward flight correlation section will address rotor performance.

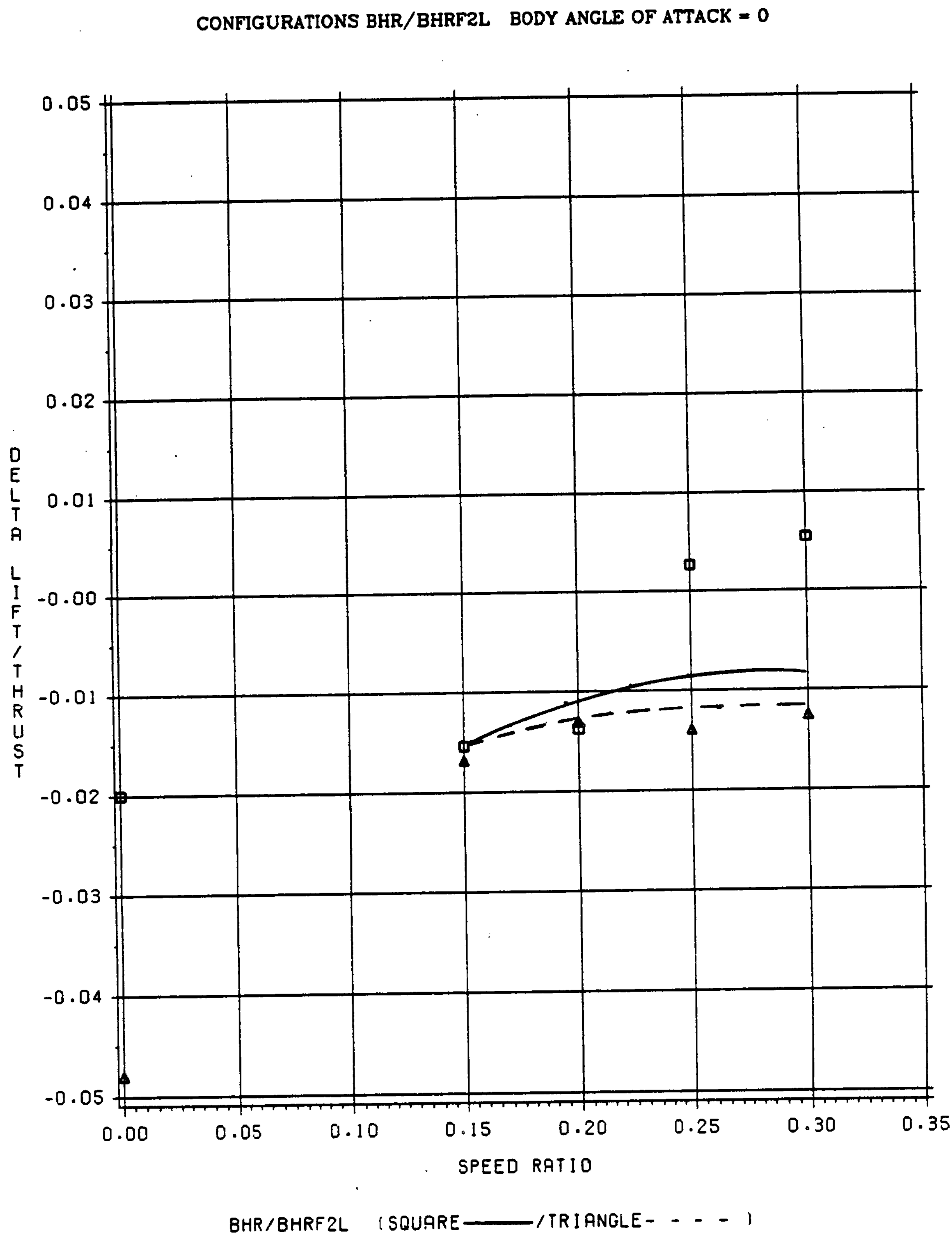


Figure 156. Comparison of measured rotor induced body lift with momentum theory.

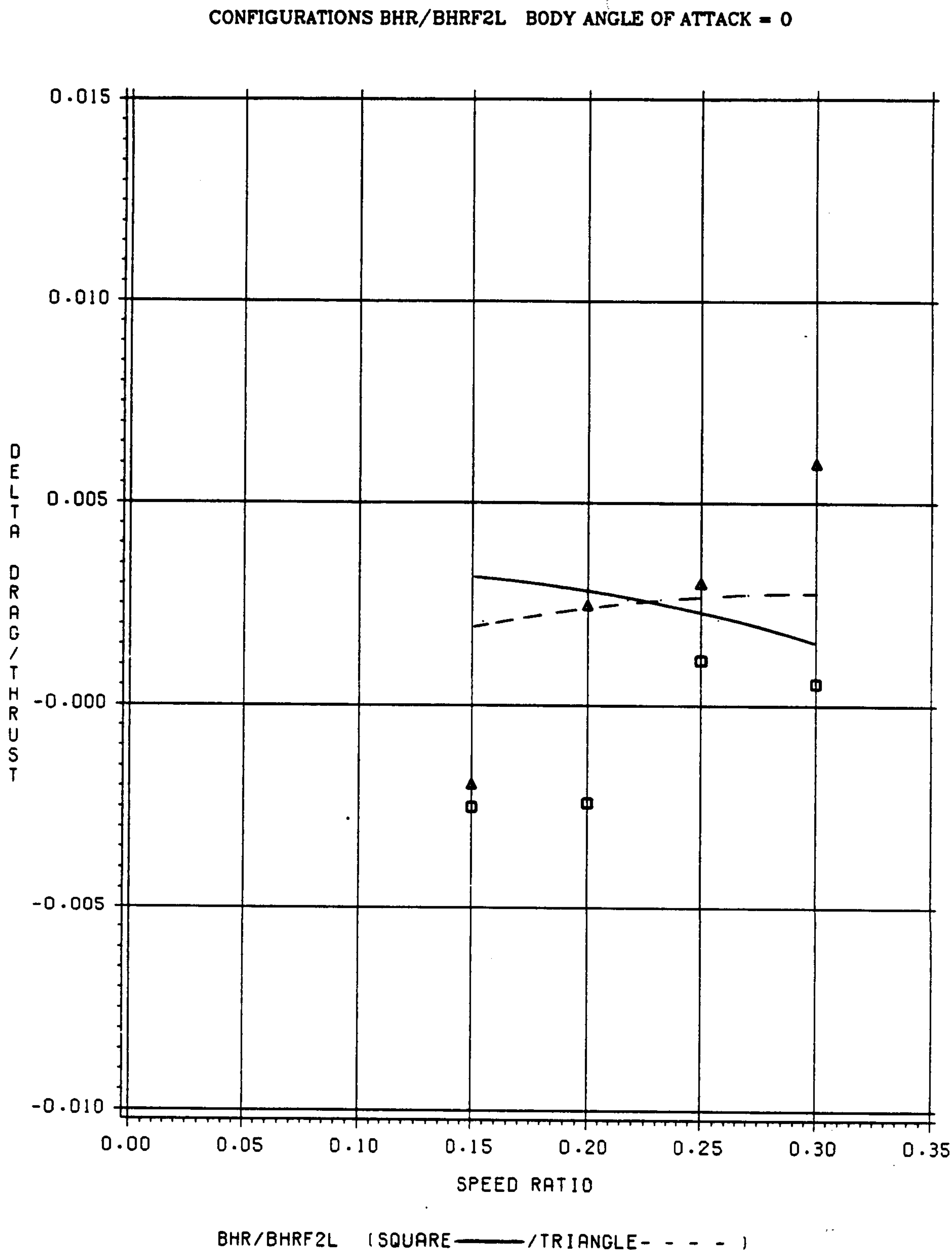


Figure 157. Comparison of measured rotor induced body drag with momentum theory.

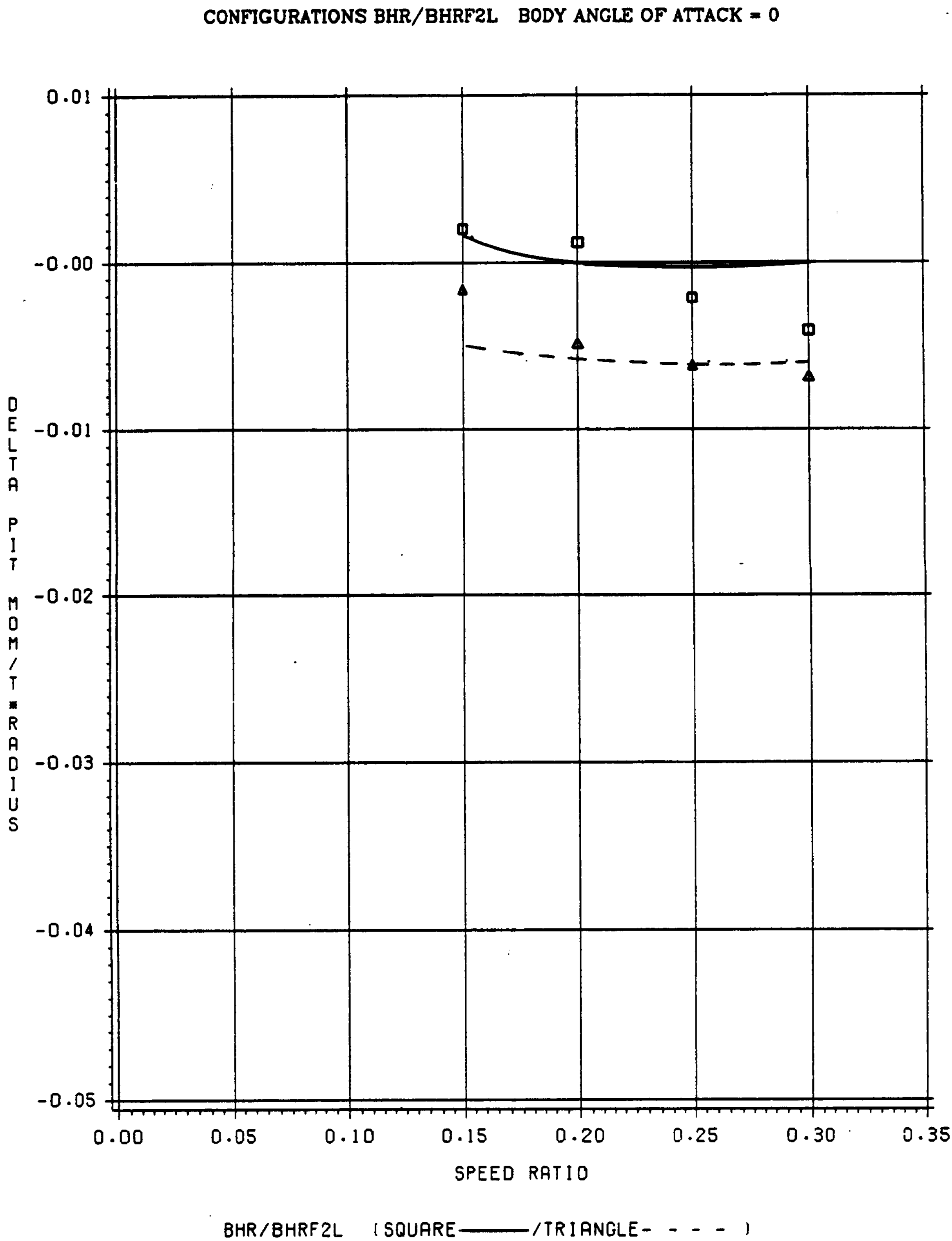


Figure 158. Comparison of measured rotor induced body pitching moment with momentum theory.

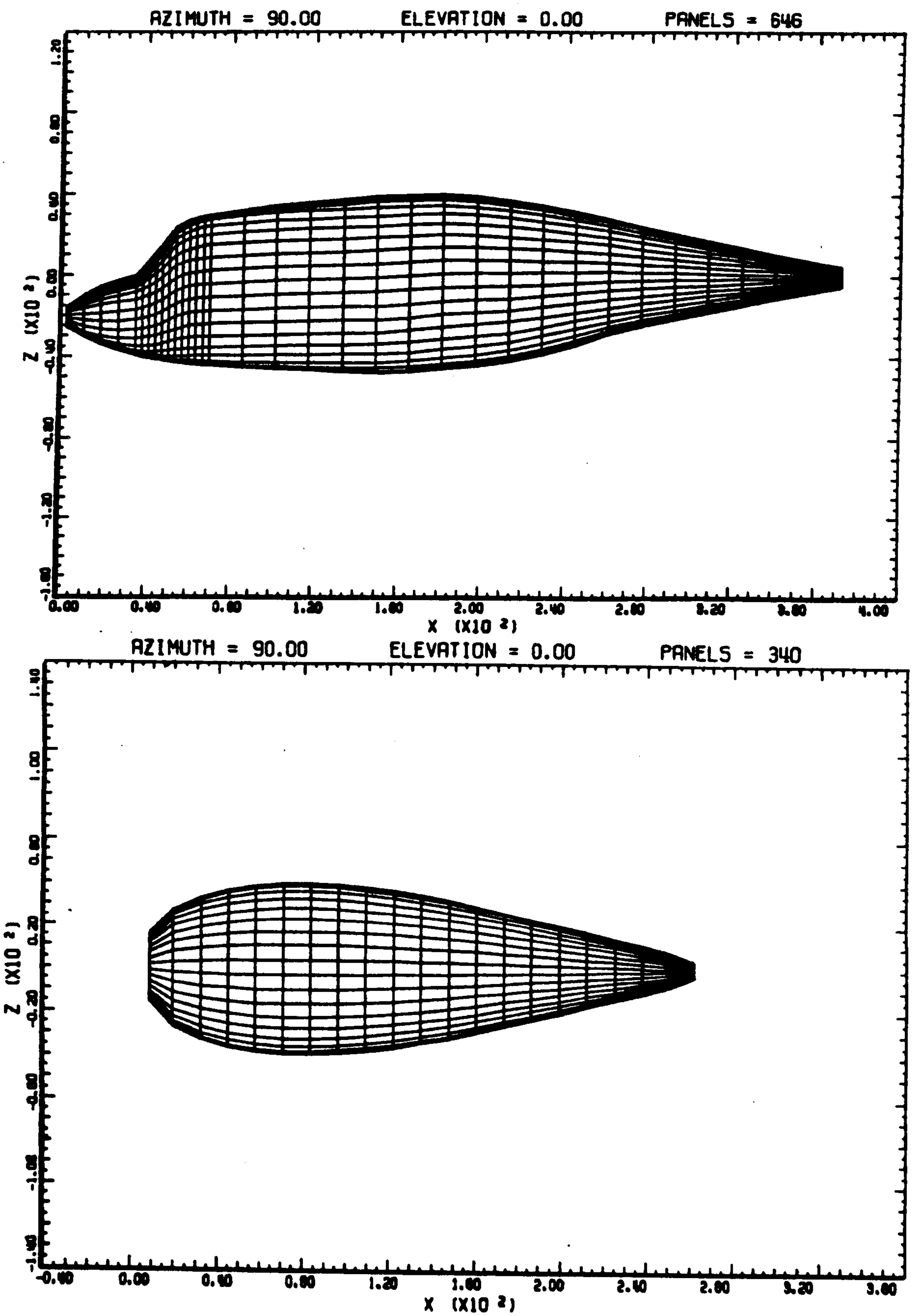


Figure 159. Panel models used to calculate B and BF2L pressure distributions.

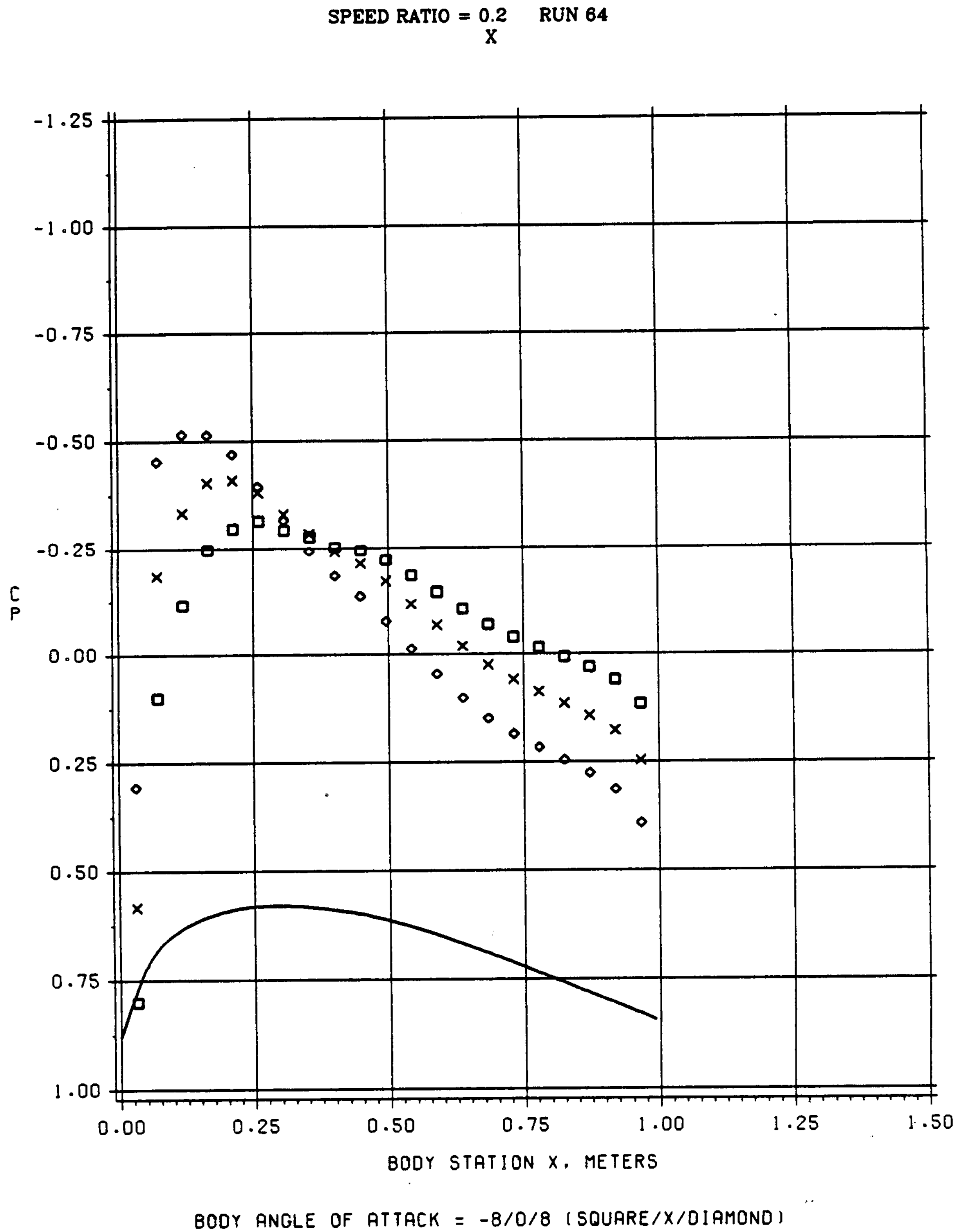


Figure 160. Calculated longitudinal pressure distribution for configuration B.

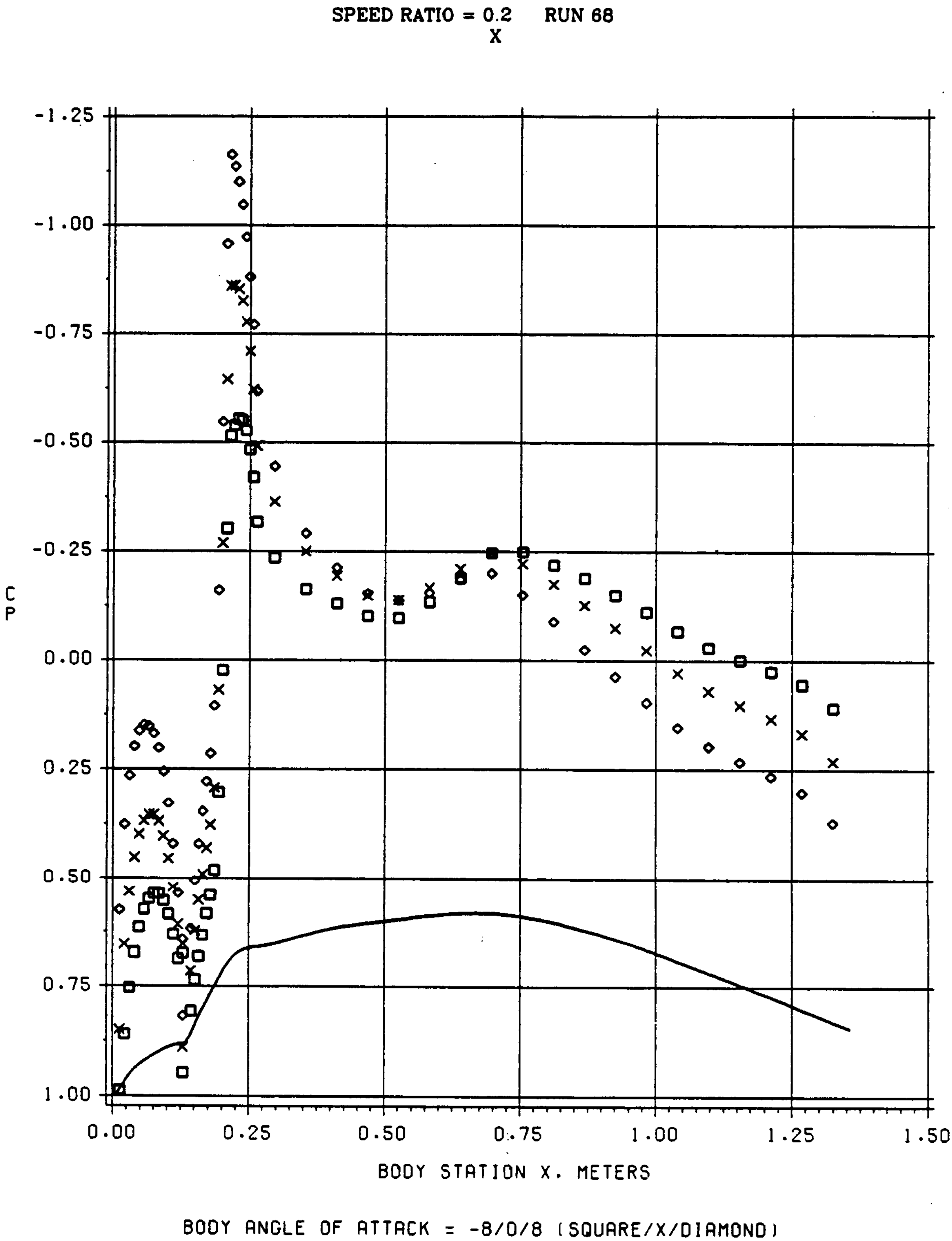


Figure 161. Calculated longitudinal pressure distribution for configuration BF2L.

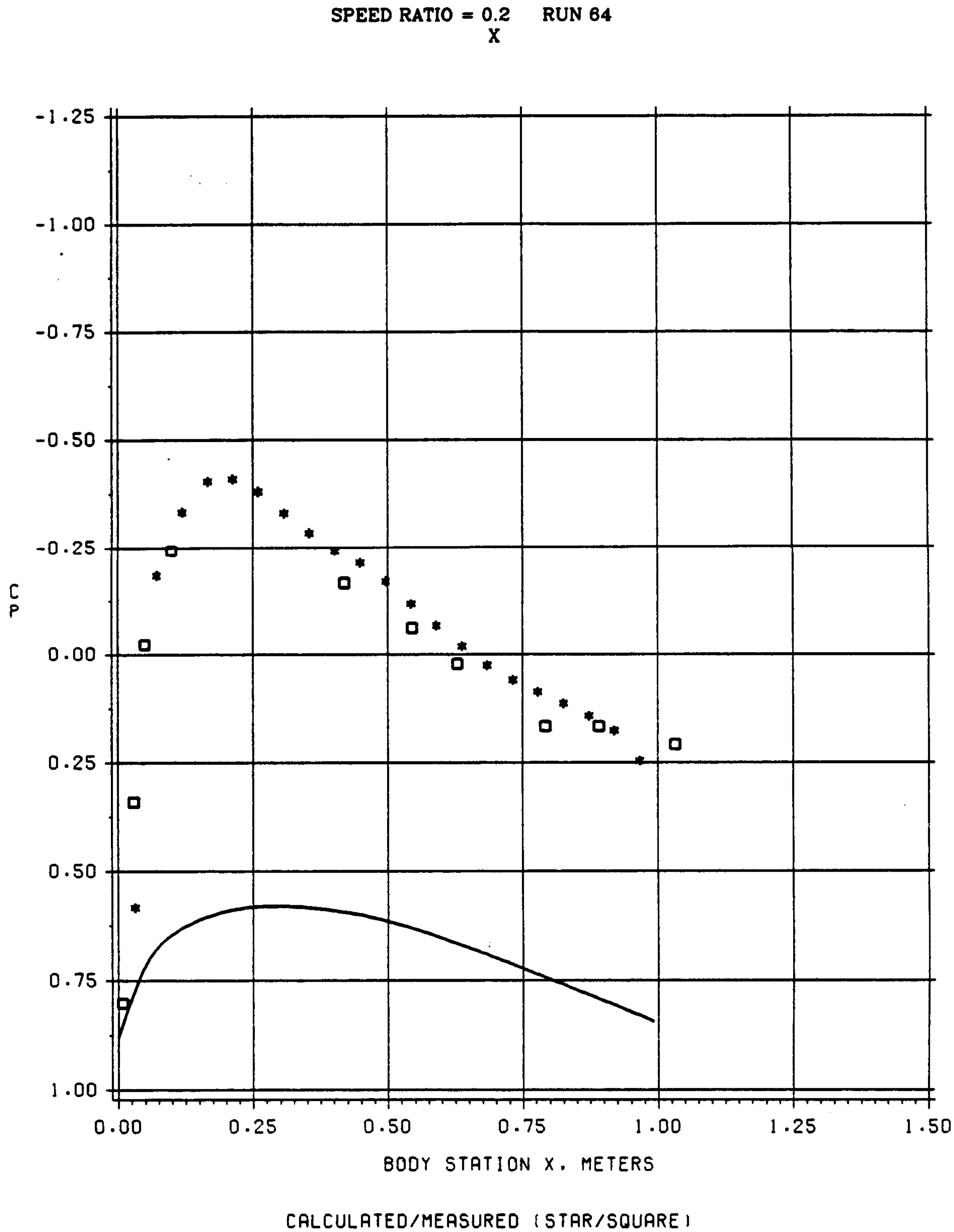


Figure 162. Comparison of calculated and measured pressure distributions for configuration B, $\theta_B = 0$.

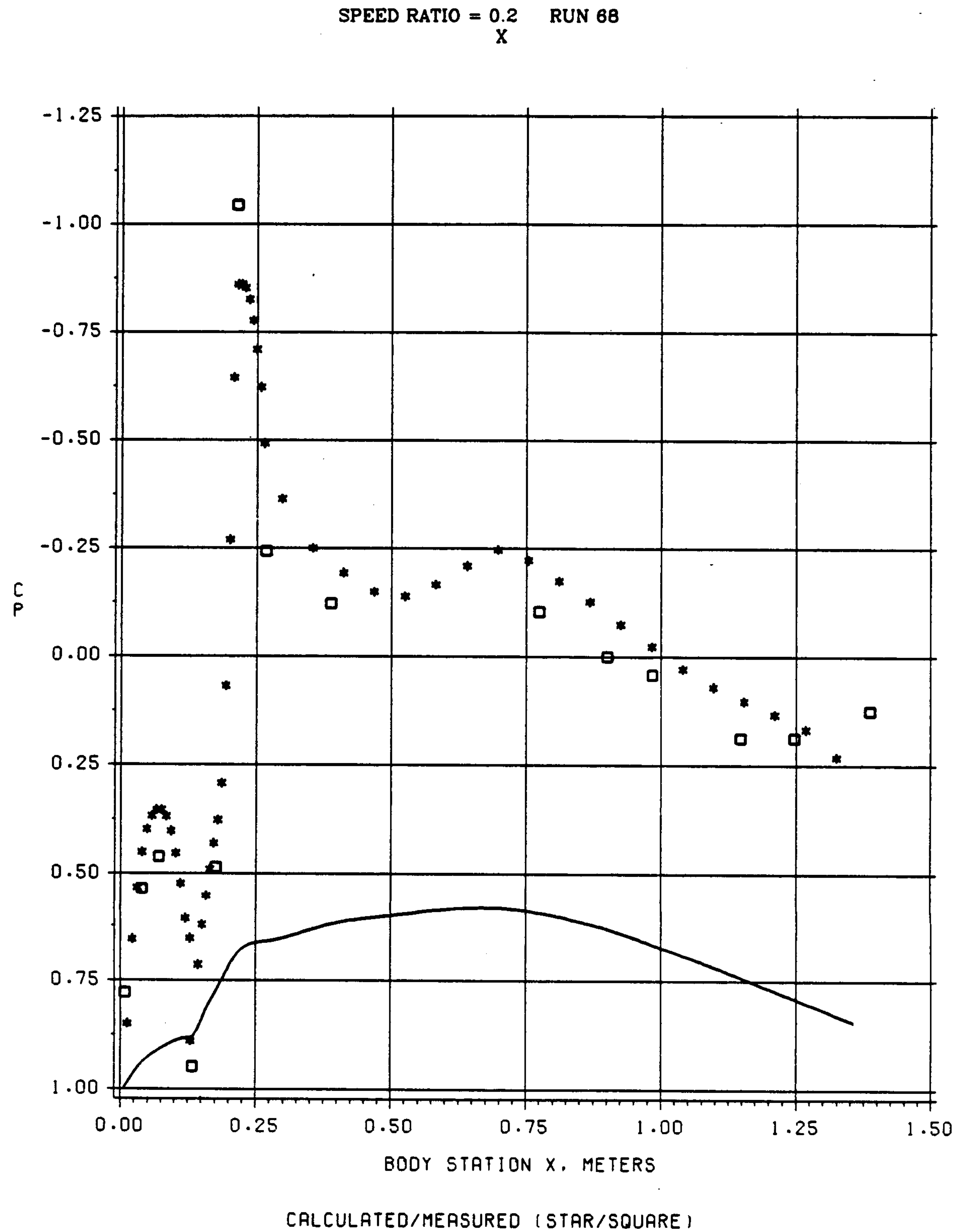


Figure 163. Comparison of calculated and measured pressure distributions for configuration BF2L, $\theta_B = 0$.

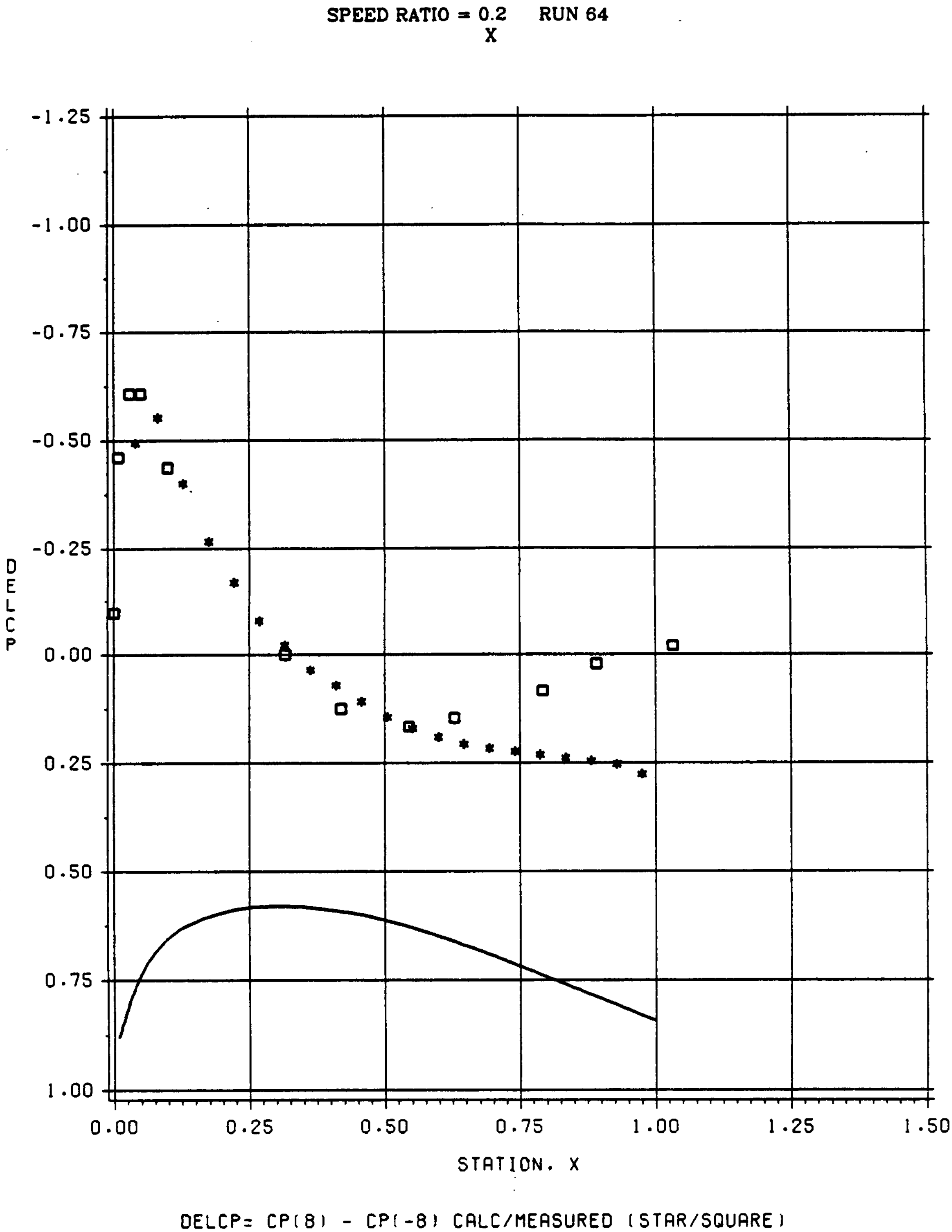


Figure 164. Comparison of measured and calculated difference in pressure coefficient for B over a 16 degree angle of attack range.

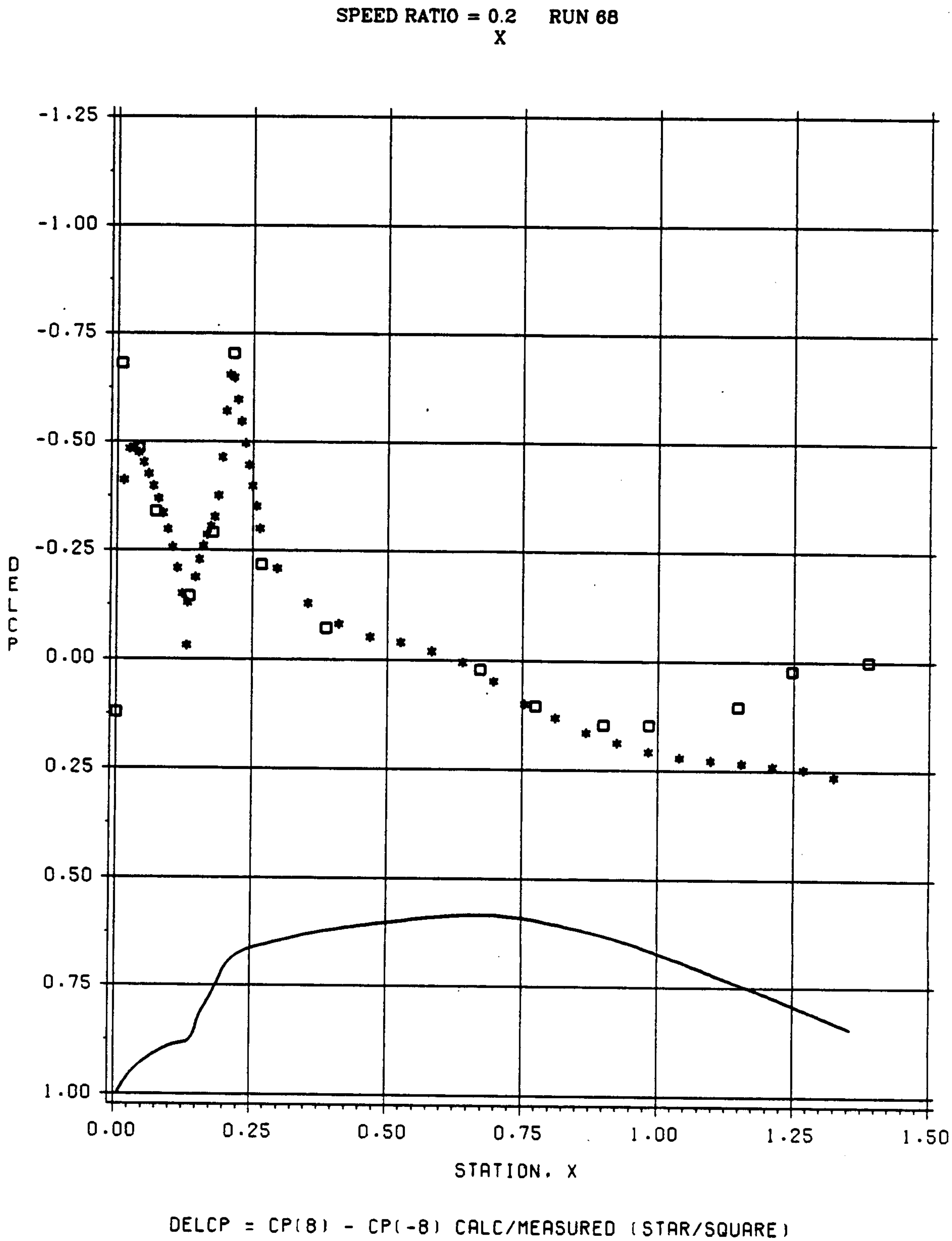


Figure 165. Comparison of measured and calculated difference in pressure coefficient for BF2L over a 16 degree angle of attack range.

Isolated rotor correlation was established before proceeding with calculating fuselage effects on the rotor. An rpm sweep in hover was conducted using ARAM45 and compared to the measured data of Figure 16. The mean profile drag coefficient based on the ARAM45 calculations was lower by 0.0003. Applying this correction and correcting for wall effects provided poor correlation. The control axis variation with thrust was in poor agreement with measured values. The calculated performance was then compared to the data in the control axis system. Figures 166 and 167 present the results. The correlation is quite good at a speed ratio of 0.20; however, at a speed ratio of 0.30 it begins to deviate.

With the isolated rotor analysis completed, fuselage effects on the rotor were calculated using ARAM45. The velocities induced by the fuselage in the rotor plane were calculated by a panel method analysis. The induced velocities were then reduced to a third harmonic Fourier series for input into ARAM45. The induced velocities are nondimensionalized by the free stream velocity and presented in Table 9 for BHR and BHRF2L as Fourier coefficients. The fuselage induced effects on the rotor are presented only for zero body angle of attack. Figures 168 and 169 present calculated thrust coefficient versus power coefficient for configurations HR, BHR, and BHRF2L. The body effect is to reduce the power required for a constant thrust coefficient relative to the isolated rotor. This does not completely agree with the test data shown in Figures 104 and 106; however, the larger body (BHRF2L) effects relative to BHR are the same. At a thrust coefficient of 0.005 the calculated reduction in power amounts to approximately 2.4 percent for BHR and 6.0 percent for BHRF2L at a speed ratio of 0.20. At a speed ratio of 0.30 the effect increases to 3.8 and 6.6 percent respectively for BHR and BHRF2L. The body effect as presented in Figures 111 and 112 is less than calculated and somewhat mixed; however, a propulsive force and control axis calculation is required for a fair comparison. A fully coupled rotor/fuselage analysis may reduce the effect shown in Figures 168 and 169 as was discussed in Reference 21; consequently, results based on superposition may tend to be optimistic.

Rotor control positions corresponding to Figures 168 and 169 were calculated. The effect of the fuselage on lateral cyclic required to trim the rotor to zero flapping was generally consistent with the trends of Figures 113 and 114. Configuration BHRF2L requires more left lateral cyclic than the isolated rotor or BHR. At a thrust coefficient of 0.005 and speed ratio of 0.20, BHRF2L required 0.5 degrees more left lateral cyclic than HR. The calculated longitudinal cyclic required for zero flapping was not effected by the body. This does not agree with the measured longitudinal control axis results presented in the test results section.

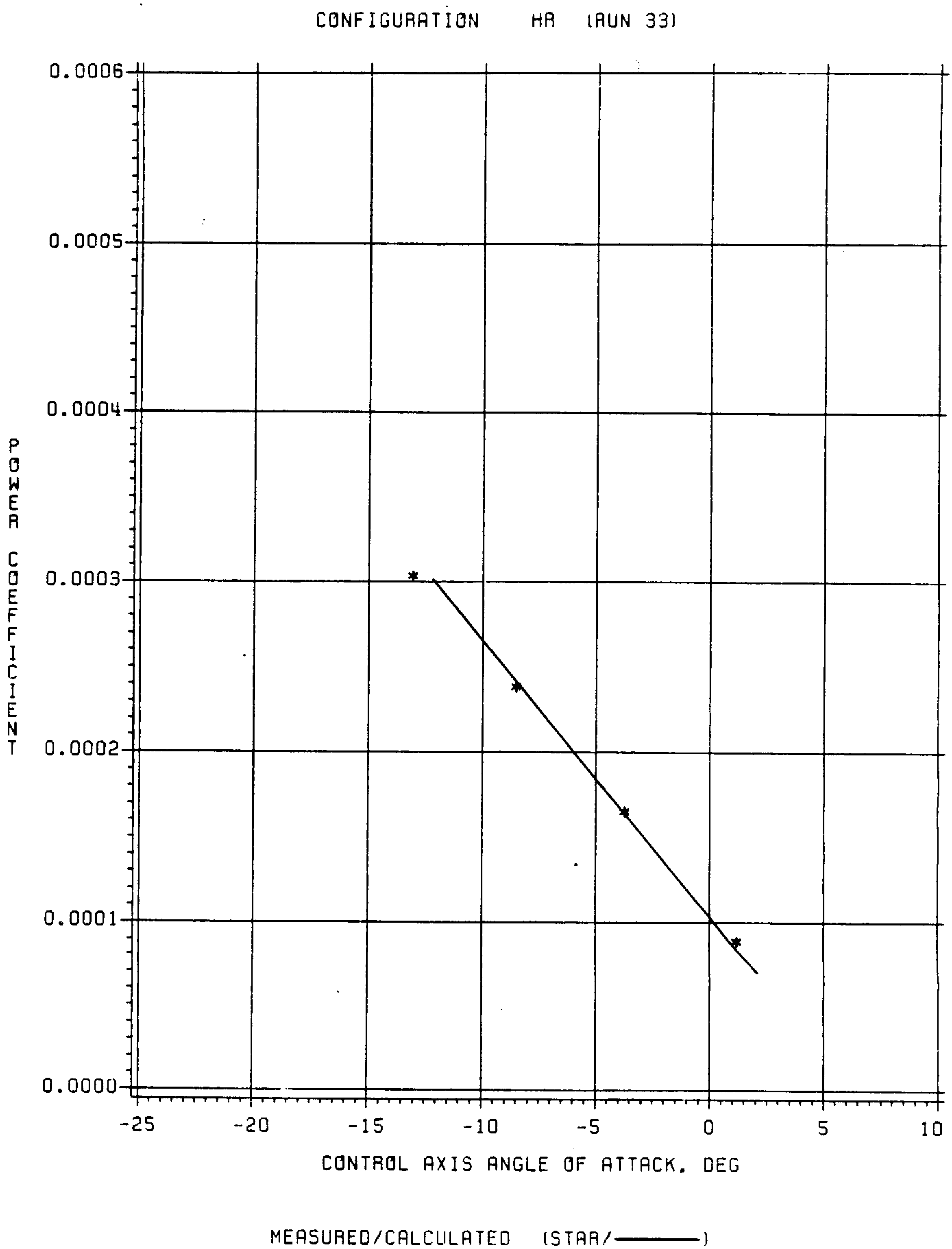


Figure 166. Comparison of measured and calculated main rotor C_P versus α_c for the isolated rotor, $\mu = 0.20$.

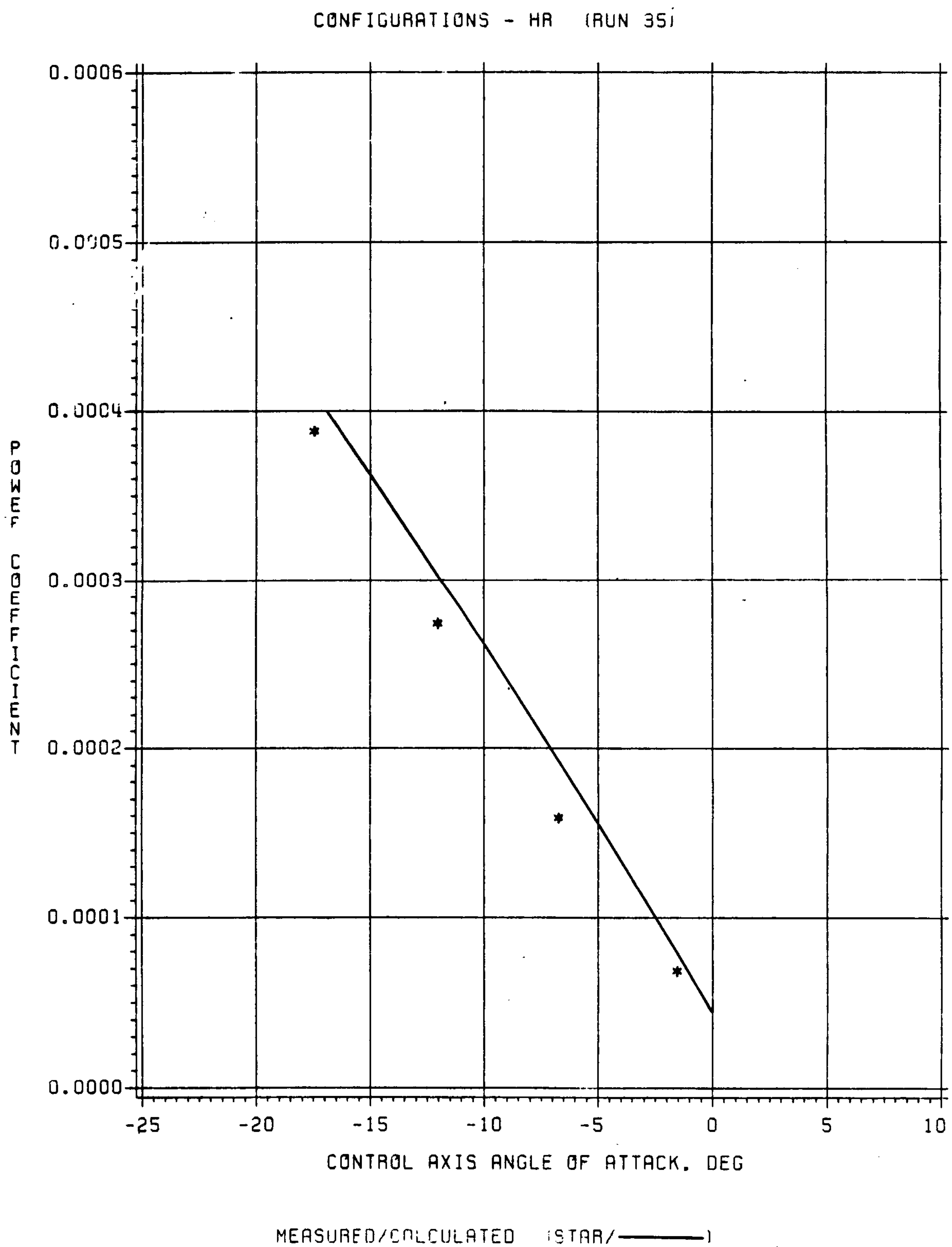


Figure 163. Comparison of measured and calculated main rotor C_P versus α_c for the isolated rotor, $\mu = 0.30$.

Table 9. Fourier* analysis of ratio of fuselage induced velocity to true airspeed.

Configuration BF2L

Blade Station r/R	Fourier Coefficients a_o	a_1	a_2	a_3
.12	.0127	-.0246	.0015	-.0026
.192	.0078	-.0378	.0025	-.0072
.262	.0072	-.0484	.0053	-.0129
.331	.0096	-.0563	.0098	-.0189
.40	.0121	-.0592	.0135	-.0228
.464	.0123	-.0554	.0131	-.0225
.527	.0109	-.0475	.0101	-.0194
.588	.0093	-.0393	.0069	-.0158
.645	.0080	-.0320	.0044	-.0125
.70	.0071	-.0260	.0027	-.0099
.748	.0064	-.0213	.0015	-.0079
.794	.0061	-.0178	.0008	-.0063
.836	.0059	-.0150	.0004	-.0051
.874	.0058	-.0129	.0001	-.0042
.907	.0057	-.0113	.0000	-.0036
.935	.0057	-.0102	-.0001	-.0031
.958	.0057	-.0093	-.0002	-.0028
.970	.0057	-.0089	-.0002	-.0026

*Positive series

Table 9. (Concluded)

Configuration B

Blade Station r/R	Fourier Coefficients a_o	a_1	a_2	a_3
.12	.0633	-.0599	.0046	-.0027
.192	.0457	-.0661	.0038	-.0057
.262	.0291	-.0586	-.0011	-.0073
.331	.0170	-.0481	-.0060	-.0077
.400	.0097	-.0389	-.0087	-.0076
.464	.0058	-.0315	-.0097	-.0072
.527	.0039	-.0256	-.0095	-.0065
.588	.0032	-.0210	-.0087	-.0058
.645	.0031	-.0173	-.0077	-.0050
.700	.0033	-.0144	-.0067	-.0043
.748	.0035	-.0120	-.0057	-.0036
.794	.0038	-.0102	-.0049	-.0030
.836	.0041	-.0088	-.0042	-.0026
.874	.0044	-.0076	-.0037	-.0022
.907	.0045	-.0068	-.0032	-.0019
.935	.0047	-.0061	-.0029	-.0017
.958	.0048	-.0056	-.0027	-.0015
.970	.0049	-.0054	-.0025	-.0014

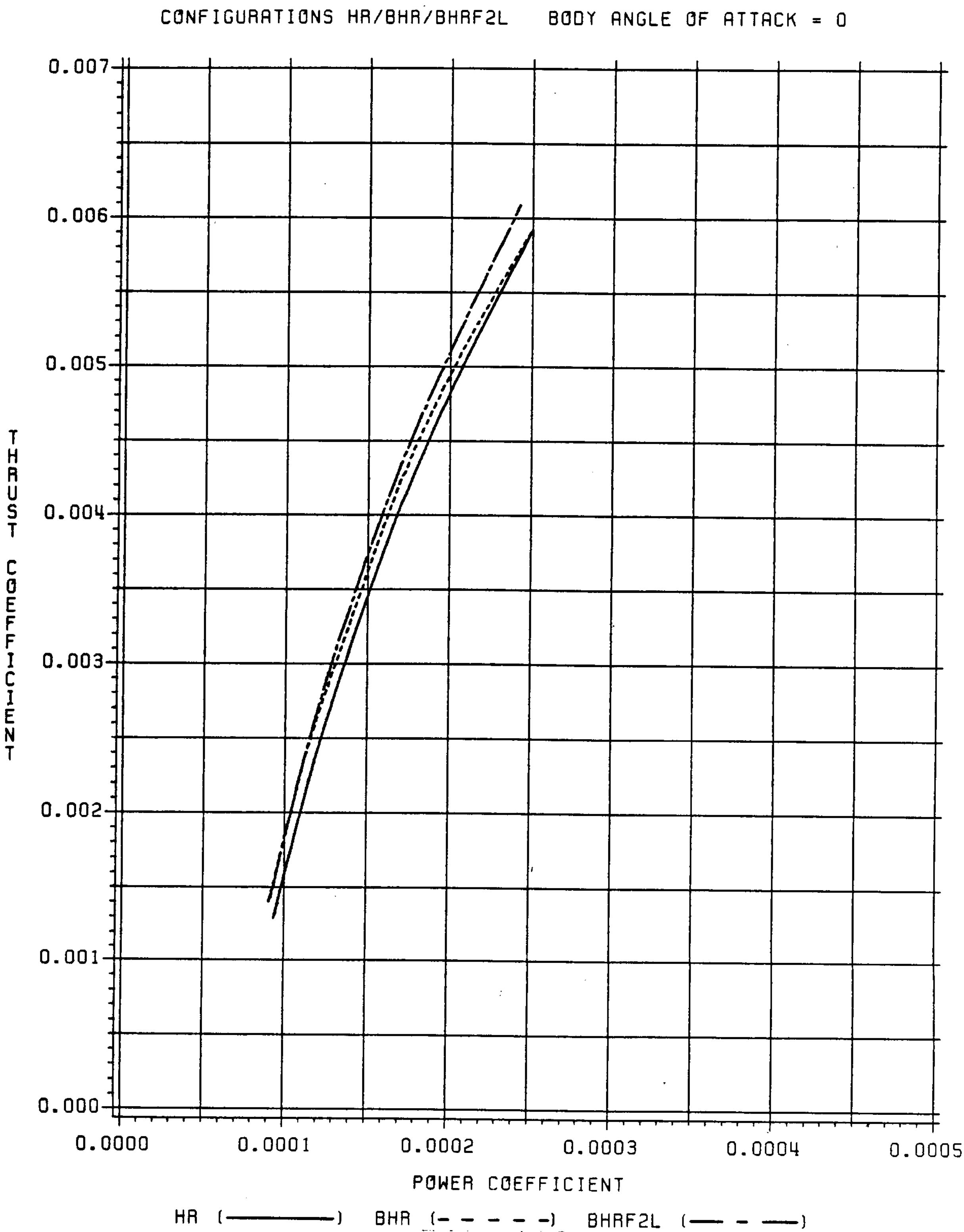


Figure 168. Calculated main rotor C_T versus C_P for configurations HR, BHR, and BHRF2L, $\mu = 0.20$, $\Theta_B = 0$.

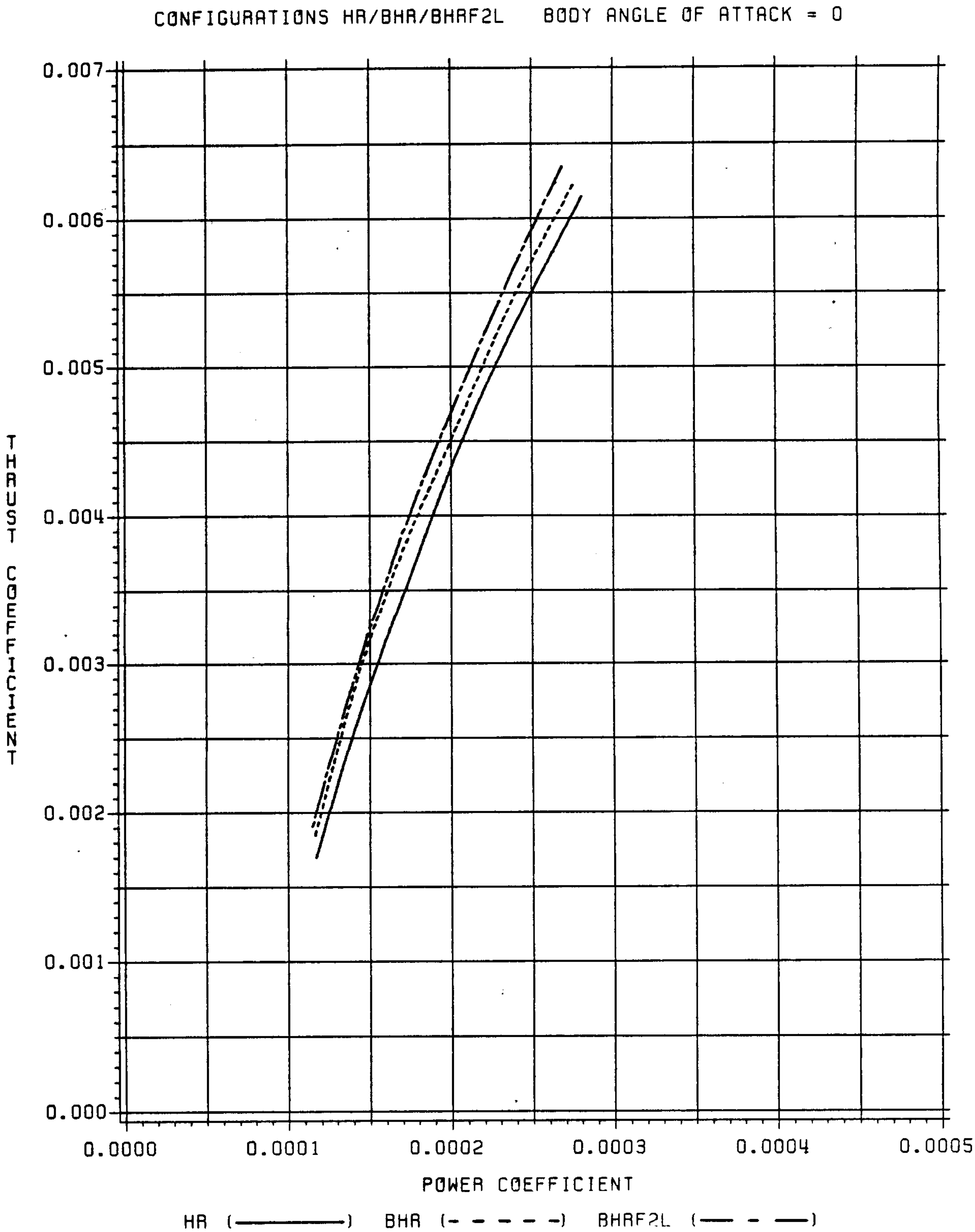


Figure 169. Calculated main rotor C_T versus C_P for configurations HR, BHR, and BHRF2L, $\mu = 0.30$, $\Theta_B = 0$.

Although Figures 170 and 171 do not present correlation with data, they demonstrate the value of utilizing simple theory in establishing basic aerodynamic design characteristics. Figure 170 compares the calculation of fuselage induced angle of attack using a single source in a free stream versus a panel analysis for BHR and BHRF2L. The single source analysis captures the major characteristics of the flow field. Both analyses show that as the nose is moved aft relative to the rotor the maximum fuselage induced upwash velocity moves into a lower blade rotational velocity region; consequently, the effect on local angle of attack is more severe. Figure 171 presents the effect of configuration and separation distance using the single source model. The decreased separation distance increased the fuselage induced angle of attack. Closure could be accomplished by adding a sink to form a simple Rankine body which would enhance the simplified model and possibly render it useful for quick design and pretest analysis.

CONCLUSIONS AND RECOMMENDATIONS

The following will present some general conclusions that were drawn as a result of this study of main rotor/fuselage interactional aerodyanmics.

1) Very limited analysis of existing test data is available in the literature.

2) Limited parametric data is available for design purposes.

3) No data is available on the effects of tunnel walls, tunnel size, mounting structure, or main rotor hubs on main rotor/fuselage interaction.

4) Interactions are multidisciplined problems and should be treated as such.

The following conclusions were drawn from the hover test results.

1) Decreasing separation distance decreased the download slightly which is consistent with wake theory (See Figure 16).

2) Increased main rotor thrust tends to increase dimensional download; and decrease download in terms of percent of thrust. Under IGE conditions the above trend diminishes as the fuselage moves closer to the ground. (See Figure 19)

3) Moving closer to the ground under IGE conditions decreases rotor induced fuselage download. At normal

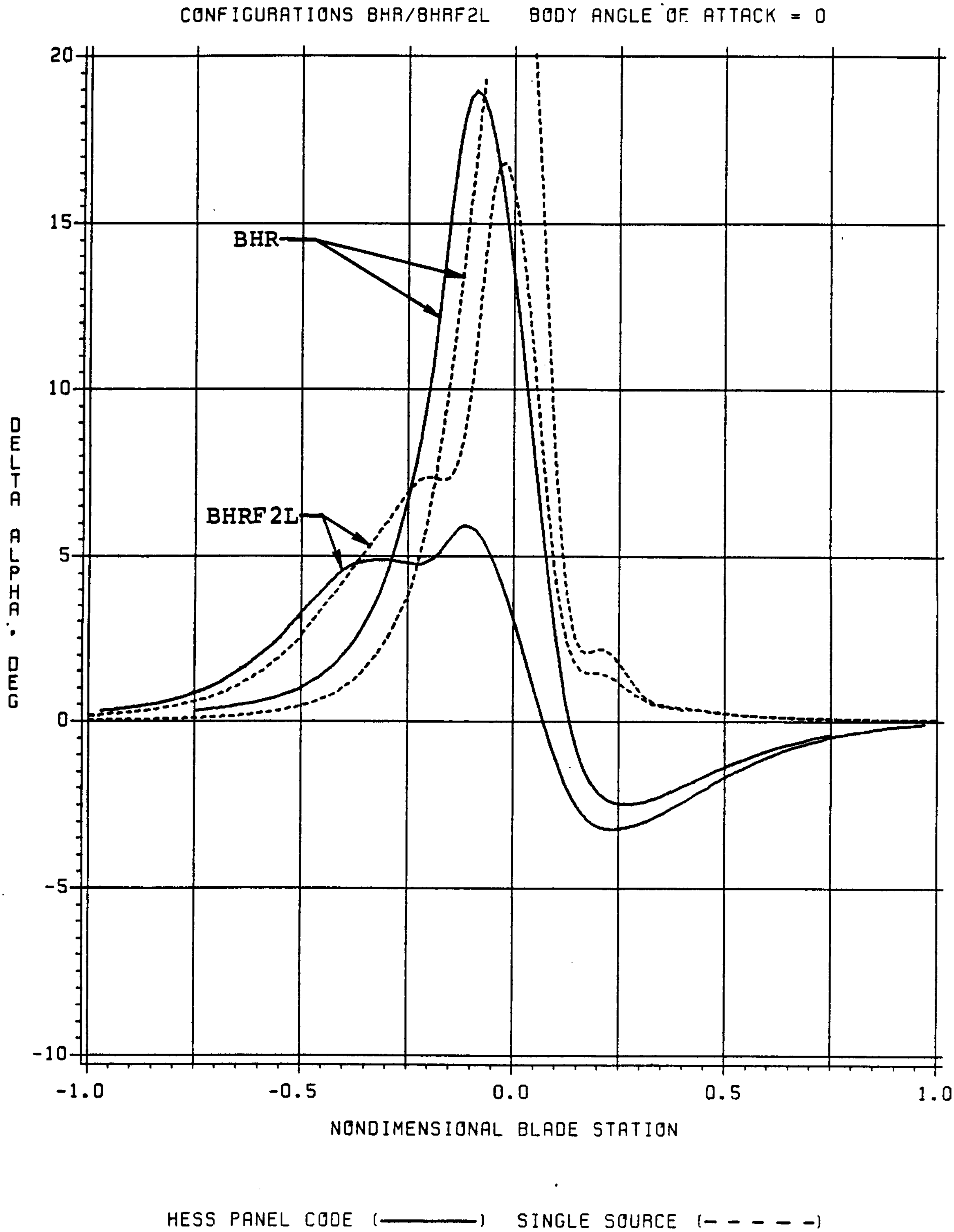


Figure 170. The effect of fuselage modeling methodology on the calculation of fuselage induced blade angle of attack.

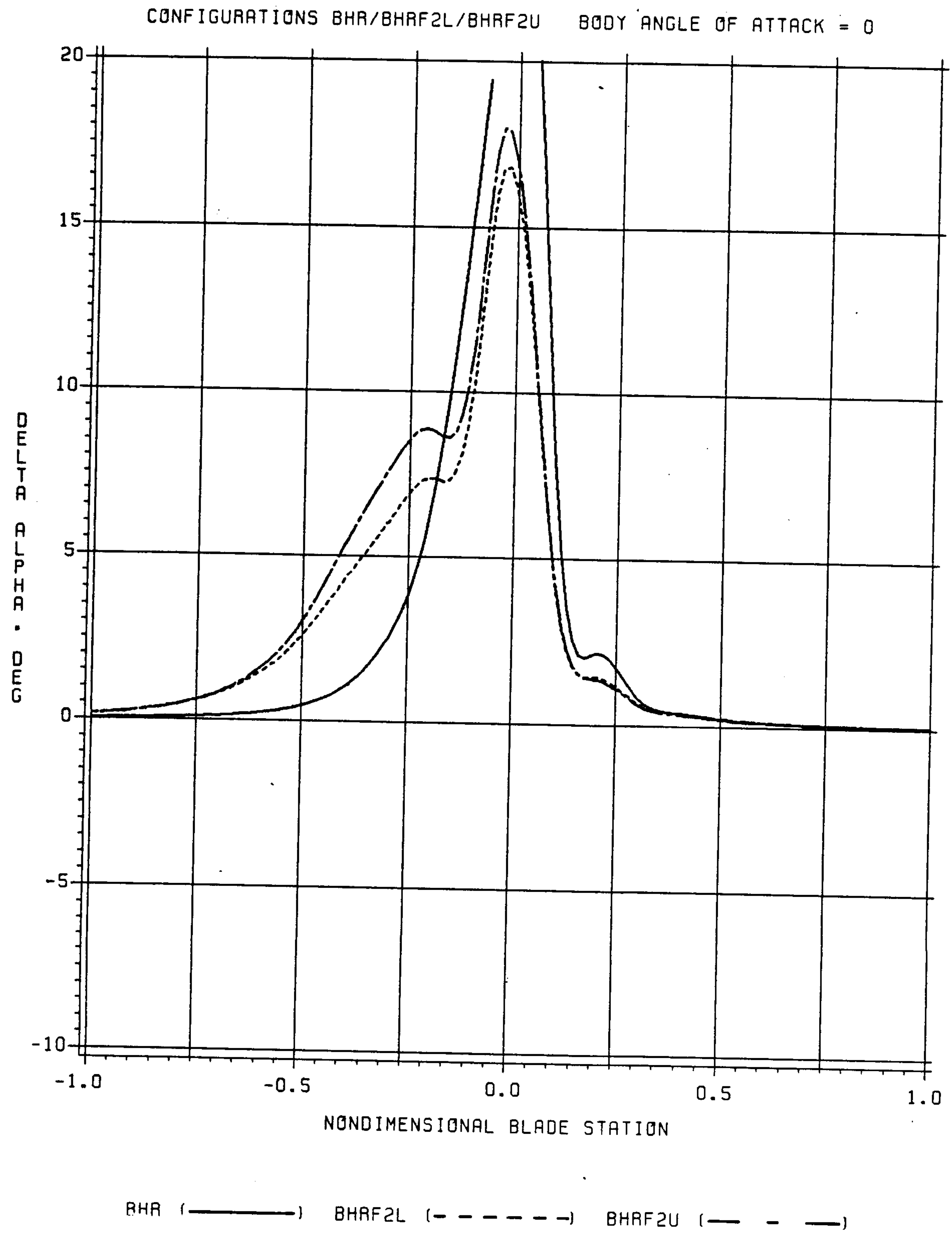


Figure 171. Calculated effect of B, BF2L, and BF2U on fuselage induced blade angle of attack.

helicopter touchdown heights the fuselage can experience lift equivalent to 1 percent of main rotor thrust. (see Figure 20)

4) The influence of the main rotor was observed to be minimal on fuselage drag, roll, sideforce, and pitching moment in terms of performance impact. However, significant effect on yawing moment occurs and may mean as much as a 5 to 10 percent impact on required tail rotor thrust. In addition, at a Z/R between 0.5 and 0.75 a significant yawing moment gradient with Z/R exists which was measured for all configurations tested. This may be important in simulation studies. (See Figure 22)

5) Increasing tip speed decreased the measured fuselage download in terms of percent of thrust for a constant thrust coefficient. Consequently,the rotor effects on the fuselage in hover may be somewhat larger for this test and may not nondimensionalize (See Figure 23).

6) Download for configurations BHR and BHRF2L do not follow any simple area rule.

7) For the most part the fuselage configurations tested degraded rotor performance. The effect becomes more pronounced as the rotor-fuselage configurations are moved closer to the ground (See Figures 24 - 27).

8) Decreasing the rotor-body separation distance improved rotor performance, (See Figures 28 - 31).

9) The IGE/OGE power ratios at a constant Z/R were higher for the rotor-body configurations than for the isolated rotor, (See Figure 38).

10) The influence of the fuselage on rotor performance showed the same trends with tip speed; however, somewhat modified at the higher tip speeds (See Figure 39 and 41).

11) The smaller body, BHR, did not degrade rotor performance as much as BHRF2L. It was not determined if this was due to position, size, or shape.

The following conclusions were drawn from the forward flight test results.

1) The rotors effect on the fuselage was one of increasing the download and drag (See Figures 44 - 49). Increasing the thrust increases the fuselage download except with the winglets removed then the trend reverses (Compare Figures 45 and 57). Pitching moment became more nose down (See Figures 50 - 52).

2) Winglet lift and drag characteristics change significantly with speed ratio for the rotor-off configuration (See Figures 53 and 54). Under rotor-on conditions, increased thrust was observed to increase the download on the winglets (See Figure 55). The winglets had a significant impact on the fuselage forces and moments under rotor-on and rotor-off conditions (See Figures 60, 62, 64, 66 and Appendix B).

3) The rotor induced lift, drag, and pitching moment showed definite trends with body angle of attack and speed ratio (See Figures 68 - 77). At a speed ratio = 0.20, increasing body size and decreasing separation distance showed a general trend to increase rotor induced download, drag, and nose down pitching moment. The effect of body angle of attack varies somewhat and is related to wake skew angle. At a speed ratio of 0.30, minimums for lift, drag, and pitching moment occurred at various body angles of attack and configuration effects were dependent upon angle of attack.

4) Favorable interference effects can be achieved (BHR drag at a speed ratio of 0.20) for specific flight conditions; however, in the integral or mission sense they may not be desirable as drag increases with speed ratio, see Figures 75 and 76.

5) Pressure distributions over the fuselage were effected by the hub and rotating controls almost as much as by the rotor. The hub induced an increased pressure upstream of the shaft and reduced the pressure downstream of the shaft. The main rotor effect on the afterbody appeared to vary with configuration and should be checked with further data reduction; however, for BHRF2L it created suction over the nose (See Figures 91 and 92). Decreasing separation distance and increasing thrust increased the pressure over the entire fuselage (See Figures 91 and 92). (Note: The pressure data was only evaluated at a speed ratio of 0.20.)

6) There appears to be a configuration effect on control axis angle of attack and performance (See Figures 107 - 110; however, given that the control axis angle of attack and thrust coefficient are held constant fuselage effects on rotor performance fall within a band of approximately ±2 percent (See Figures 111 and 112).

7) Decreasing separation distance appeared to slightly improve the rotor performance at higher speeds (See Figure 112).

8) The fuselage induced flow field sufficiently alters the rotor inflow to require additional left lateral cyclic control for trim when compared to the isolated rotor (See Figures 113 and 114).

9) Calculated equivalent rotor L/D was found to be sensitive to measured propulsive force. No definite conclusions should be drawn, however, since the data also indicated a hub tare sensitivity to the main rotor wake and rotor-off hub tares are used to calculate L/D.

The following conclusions were drawn based on correlation studies.

1) Hover download calculations indicated that for the models tested drag coefficients for classical strip theory analysis require values normally associated with supercritical Reynolds numbers.

2) Simple theory can be used to correct fuselage rotor-off pitching moments and momentum theory can be used to calculate rotor induced pitching moments. (See Figures 155 and 158). However, lift and drag for the configurations tested cannot be adequately calculated by momentum theory corrections to rotor-off fuselage force and moment data (See Figures 156 and 157).

3) Panel methods worked quite well in predicting isolated body pressure distributions over large angles of attack (See Figures 164 and 165).

4) Calculated rotor C_T versus C_p, including fuselage induced flow effects, is consistent with measured data relative to configuraton effects (See Figures 104, 168, and 169).

5) Fuselage effects on calculated laterial cyclic agreed with the measured data of Figures 113 and 114; however, this was not the case for the longitudinal cyclic.

6) Simplified fluid bodies can capture the major effects of the forebody on rotor blade angle of attack.

The following recommendations are made as a result of the literature survey and analysis of the data reported in this text.

1) Perform further analysis of available data in the literature and assess the potential impact of main rotor/fuselage interaction on helicopter design from a multidisciplined and trim point of view.

2) Establish tunnel effects on interaction test results and data correction procedures.

3) Develop a method to evaluate the influence of the rotor on hub tares.

4) Test with scaled hubs if possible.

5) Do not rely on momentum theory corrections to obtain desired flight conditions.

6) Establish a data base which contains parametric and trim data for use by analyst and designer as well.

7) Test full configurations including component buildup to assure that trends are correctly understood and applied to aircraft development.

8) A comprehensive comparison of pressure and aerodynamic forces should be made to establish the relationship between local geometry and measured aerodynamic interaction.

9) A parametric rotor/fuselage geometry study should be conducted in hover to address rotor twist and planform and fuselage shape effects on rotor performance.

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APPENDIX A

HOVER DATA

This appendix is a tabulation of the digitized and corrected hover performance data. The tables are ordered by run number and the data is ordered by prime data record number in each table. The tables include dimensional and nondimensional rotor and fuselage data. The dimensional data is not scaled to full-scale values. Reference axes for data reduction can be found in Figure 11. Configuration and test condition data is included for each run. Table A-1 provides a key which defines the tabulated output labels.

Figure A-1 presents sketches which define the configurations tested. A summary of all test conditions is presented in Table A-2.

Table A-1. Definition of tabulated output data labels.

Label	Definition
RECORD	Prime data record number
TEMP	Temperature
SIGPRM	Air density ratio
TP	Tip speed
THETA	Root collective pitch (at x = 0.07)
THRUST	Thrust
H-FORCE	H-force
MRHP	Shaft horsepower
CTR	Thrust coefficient
CHR	H-force coefficient
CPR	Power coefficient
LIFT	Lift
DRAG	Drag
SIDE	Sideforce
PM	Pitching moment
YM	Yawing moment
RM	Rolling moment

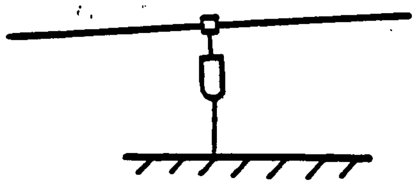
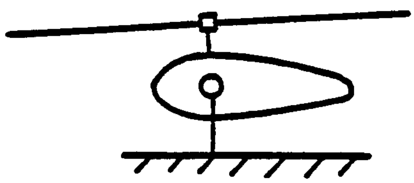
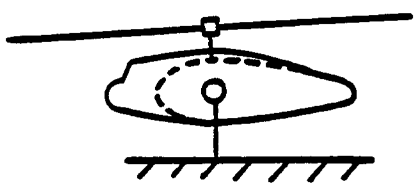
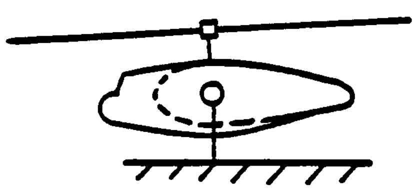
Configuration		Test Sequence
HR		Test Stand With Rotor Only
BHR		Add Fairing
BHRF2U		Add Nose Modification in High Position
BHRF2L		Lower Nose Modification

Figure A-1. Hover test configurations.

Table A-2. Summary of hover test conditions.

Configuration	Run No.	TP[1]	Z/R
BHRF2L	108	520	0.50
	109		0.75
	110		0.8681
	111	724	0.50
	112	520	3.00
	113	724	3.00
BHRF2U	114	520	0.50
	115		0.75
	116		0.8681
	117		3.00
BHR	120		0.50
	121		0.75
	122		0.8681
	123		3.0
HR	124		0.50
	125	724	0.50
	126	520	0.75
	127		0.8681
	128	Sweep	0.50
	129	520	3.00
	130	724	3.00
	131	Sweep	3.00
BHRF2L	133	520	2.00
	135		1.625
	136		1.2639
	139	724	0.8681

(1)Tip speed indicated is the reference tip speed at sea level standard day conditions.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 108 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
862	58.0	0.9788	519.30
863	58.0	0.9788	519.30
864	58.0	0.9788	519.30
865	58.0	0.9788	519.30
866	58.0	0.9788	519.30
867	58.0	0.9788	519.30
868	58.0	0.9788	519.30

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
862	8.0	44.28	-0.01	2.548	.00250	-.00000	.0001521
863	9.0	55.75	-0.14	3.070	.00314	-.00001	.0001832
864	10.0	67.11	-0.09	3.715	.00378	-.00001	.0002217
865	11.0	80.13	-0.06	4.541	.00451	-.00000	.0002710
866	12.0	92.90	-0.07	5.495	.00523	-.00000	.0003279
867	13.0	107.19	-0.25	6.579	.00604	-.00001	.0003926
868	14.1	119.00	-0.03	7.727	.00670	-.00000	.0004611

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
862	0.579	0.181	0.570	-0.212	-1.668	-0.055
863	0.846	0.089	-0.330	0.122	-0.123	-0.021
864	0.658	0.196	0.230	-0.166	-1.283	-0.051
865	1.232	0.297	-0.080	0.014	-1.327	-0.036
866	0.894	0.403	0.220	-0.375	-1.314	-0.043
867	1.255	-0.033	0.330	-0.353	-1.507	-0.033
868	1.673	0.297	0.050	-0.302	-1.630	-0.002

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 109 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.7500

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
871	58.0	0.9788	519.30
872	58.0	0.9788	519.30
873	58.0	0.9788	519.30
874	59.0	0.9769	519.93
875	59.0	0.9769	519.93
876	59.0	0.9769	519.93
877	59.0	0.9769	519.93

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
871	8.0	39.40	-0.15	2.505	.00222	-.00001	.0001495
872	9.0	51.29	-0.13	3.098	.00289	-.00001	.0001849
873	10.0	62.06	-0.14	3.748	.00350	-.00001	.0002237
874	11.0	74.56	-0.05	4.584	.00420	-.00000	.0002731
875	12.0	86.74	-0.05	5.526	.00488	-.00000	.0003292
876	13.0	100.05	-0.02	6.628	.00563	-.00000	.0003948
877	14.1	113.27	-0.10	7.861	.00638	-.00001	.0004683

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
871	-0.582	0.009	-0.300	-0.275	0.966	0.056
872	-0.394	0.193	-0.420	-0.286	0.631	-0.002
873	-0.261	0.152	-0.400	-0.155	0.822	0.002
874	0.111	0.278	-0.040	-0.001	0.345	0.043
875	0.239	0.307	0.200	-0.302	0.113	0.026
876	0.799	0.467	-0.110	0.076	0.150	0.026
877	0.556	0.360	-0.470	0.021	0.903	0.065

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 110 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.8681

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
880	58.0	0.9788	519.30
881	58.0	0.9788	519.30
882	58.0	0.9788	519.30
883	58.0	0.9788	519.30
884	58.0	0.9788	519.30
885	58.0	0.9788	519.30
886	58.0	0.9788	519.30

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
880	8.0	38.31	-0.19	2.488	.00216	-.00001	.0001485
881	9.0	49.89	-0.19	3.082	.00281	-.00001	.0001839
882	10.0	61.07	-0.13	3.765	.00344	-.00001	.0002247
883	11.0	72.61	-0.15	4.586	.00409	-.00001	.0002737
884	12.0	84.45	-0.15	5.504	.00476	-.00001	.0003285
885	13.0	97.51	-0.08	6.598	.00549	-.00000	.0003937
886	14.1	110.23	-0.15	7.786	.00621	-.00001	.0004647

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
880	-0.532	0.153	0.090	-0.126	-0.053	-0.000
881	-0.503	0.316	0.080	0.111	-0.254	-0.005
882	-0.553	0.312	-0.020	-0.012	0.126	0.038
883	-0.499	0.256	0.300	-0.346	-0.130	0.032
884	-0.412	0.442	0.260	-0.046	0.005	0.060
885	0.118	0.459	0.100	-0.136	-0.006	0.053
886	-0.003	0.611	0.260	0.220	-0.256	0.062

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 111 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
889	59.0	0.9769	724.14
890	59.0	0.9769	724.14
891	59.0	0.9769	724.14
892	59.0	0.9769	724.14
893	59.0	0.9769	724.14
894	59.0	0.9769	724.14

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
889	9.0	100.82	-0.21	8.127	.00293	-.00001	.0001792
890	10.0	122.54	-0.31	9.727	.00356	-.00001	.0002145
891	11.0	146.12	-0.25	11.718	.00424	-.00001	.0002584
892	12.0	171.44	-0.15	14.068	.00498	-.00000	.0003102
893	13.0	195.33	-0.28	16.618	.00567	-.00001	.0003665
894	14.0	221.69	-0.34	19.747	.00644	-.00001	.0004354

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
889	1.177	0.233	0.620	-0.288	-2.614	-0.099
890	1.447	0.242	0.580	-0.588	-2.450	-0.049
891	1.912	0.465	1.010	-0.619	-3.478	-0.085
892	2.106	0.558	0.710	-0.948	-3.070	-0.078
893	2.936	0.596	0.520	-0.726	-2.875	-0.051
894	3.583	0.230	0.440	-0.094	-3.123	-0.031

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 112 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
897	58.0	0.9792	519.30
898	59.0	0.9773	519.93
899	59.0	0.9773	519.93
900	58.0	0.9792	519.30
901	58.0	0.9792	519.30
902	58.0	0.9792	519.30
903	58.0	0.9792	519.30

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
897	8.0	35.84	-0.44	2.432	.00202	-.00002	.0001451
898	9.0	46.24	-0.40	3.026	.00260	-.00002	.0001802
899	10.0	54.96	-0.42	3.629	.00309	-.00002	.0002161
900	11.0	66.74	-0.38	4.490	.00376	-.00002	.0002678
901	12.0	78.25	-0.41	5.453	.00441	-.00002	.0003253
902	13.0	90.64	-0.38	6.579	.00511	-.00002	.0003924
903	14.0	100.05	-0.41	7.612	.00564	-.00002	.0004541

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
897	-2.387	0.304	0.140	0.128	-0.277	-0.054
898	-2.952	0.355	0.230	0.274	-0.252	-0.029
899	-3.261	0.474	0.270	0.376	-0.539	-0.028
900	-3.580	0.451	0.330	0.373	-0.584	-0.038
901	-3.962	0.605	0.250	0.388	-0.461	-0.023
902	-4.418	0.683	0.160	0.461	-0.149	0.006
903	-4.455	0.631	0.230	0.630	-0.614	-0.014

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 113 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
906	58.0	0.9792	724.14
907	59.0	0.9773	724.14
908	59.0	0.9773	724.14
909	59.0	0.9773	724.14
910	59.0	0.9773	724.14
911	59.0	0.9773	724.14

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
906	9.0	83.29	-0.43	7.813	.00241	-.00001	.0001719
907	10.0	102.81	-0.50	9.523	.00298	-.00001	.0002099
908	11.0	124.12	-0.50	11.670	.00360	-.00001	.0002572
909	12.0	144.13	-0.60	13.981	.00418	-.00002	.0003082
910	13.0	166.88	-0.53	16.827	.00484	-.00002	.0003709
911	14.0	192.82	-0.30	20.059	.00560	-.00001	.0004422

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
906	-4.974	0.745	0.210	0.217	-0.254	-0.020
907	-5.658	0.918	0.180	0.499	-0.388	-0.000
908	-6.112	0.816	-0.370	0.448	-0.551	0.028
909	-6.965	0.977	0.430	0.378	-0.842	0.028
910	-7.192	1.061	0.760	0.998	-1.912	0.045
911	-7.362	1.350	-0.050	1.845	-0.633	0.114

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 114 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
916	59.0	0.9776	519.93
917	59.0	0.9776	519.93
918	59.0	0.9776	519.93
919	59.0	0.9776	519.93
920	59.0	0.9776	519.93
921	60.0	0.9757	519.93
922	60.0	0.9757	520.25

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
916	8.0	44.89	-0.16	2.484	.00253	-.00001	.0001479
917	9.0	56.35	-0.25	3.017	.00317	-.00001	.0001796
918	10.0	67.39	-0.31	3.668	.00379	-.00002	.0002184
919	11.0	80.98	-0.44	4.495	.00456	-.00002	.0002676
920	12.0	93.36	-0.21	5.412	.00525	-.00001	.0003222
921	13.1	106.74	-0.49	6.493	.00602	-.00003	.0003873
922	14.1	118.66	-0.50	7.613	.00668	-.00003	.0004533

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
916	0.450	-0.129	-0.200	-0.122	-0.977	-0.146
917	0.512	-0.014	0.240	-0.121	-1.061	-0.055
918	0.780	0.024	0.350	-0.191	-1.323	-0.059
919	0.878	0.061	0.630	0.175	-2.044	-0.069
920	0.628	0.054	-0.330	-0.304	0.233	0.044
921	1.286	-0.040	0.170	-0.151	-0.946	-0.050
922	1.430	0.190	0.150	0.283	-1.356	-0.089

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 115 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 0.7500

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
925	59.0	0.9776	519.93
926	59.0	0.9776	519.93
927	59.0	0.9776	519.93
928	59.0	0.9776	519.93
929	59.0	0.9776	519.93
930	59.0	0.9776	519.93
931	60.0	0.9757	520.25

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
925	8.0	40.85	-0.35	2.445	.00230	-.00002	.0001456
926	9.0	52.00	-0.40	2.984	.00293	-.00002	.0001776
927	10.0	63.69	-0.38	3.736	.00358	-.00002	.0002224
928	11.0	75.02	-0.42	4.486	.00422	-.00002	.0002671
929	12.1	87.24	-0.41	5.460	.00491	-.00002	.0003250
930	13.1	99.92	-0.41	6.605	.00562	-.00002	.0003932
931	14.1	110.97	-0.41	7.626	.00625	-.00002	.0004540

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
925	-0.603	0.018	0.010	-0.017	0.238	0.047
926	-0.419	0.121	0.130	0.104	0.056	0.049
927	-0.323	0.028	-0.260	-0.105	0.670	0.037
928	-0.146	0.080	0.140	-0.174	0.058	0.039
929	0.361	0.136	0.170	-0.287	-0.081	0.051
930	0.599	0.182	0.000	-0.080	0.197	0.044
931	0.548	0.329	0.110	0.181	-0.025	0.043

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 116 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 0.8681

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
934	59.0	0.9776	519.93
935	59.0	0.9776	519.93
936	59.0	0.9776	519.93
937	59.0	0.9776	519.93
938	59.0	0.9776	519.93
939	59.0	0.9776	519.93
940	59.0	0.9776	519.93

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
934	8.0	39.83	-0.42	2.456	.00224	-.00002	.0001462
935	9.0	51.17	-0.46	3.036	.00288	-.00003	.0001807
936	10.0	62.37	-0.39	3.695	.00351	-.00002	.0002200
937	11.1	74.01	-0.33	4.545	.00416	-.00002	.0002706
938	12.1	85.19	-0.42	5.449	.00479	-.00002	.0003244
939	13.1	96.61	-0.36	6.442	.00544	-.00002	.0003835
940	14.1	109.36	-0.43	7.640	.00615	-.00002	.0004548

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
934	-0.855	0.040	-0.060	0.084	-0.155	-0.003
935	-0.860	0.261	0.170	0.296	-0.171	0.045
936	-0.761	0.127	0.140	-0.082	0.086	0.061
937	-0.655	0.195	0.140	-0.286	0.118	0.034
938	-0.489	0.257	0.050	-0.106	-0.028	0.030
939	-0.337	0.377	0.050	0.052	0.011	0.043
940	-0.323	0.469	0.380	-0.180	-0.267	0.056

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 117 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
945	51.0	0.9929	515.85
946	51.0	0.9929	515.85
947	51.0	0.9929	515.85
948	51.0	0.9929	515.85
949	51.0	0.9929	515.85
950	51.0	0.9929	515.85
951	51.0	0.9929	515.85

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
945	8.0	37.51	-0.34	2.448	.00211	-.00002	.0001469
946	9.0	47.91	-0.46	3.083	.00270	-.00003	.0001851
947	10.0	58.40	-0.46	3.735	.00329	-.00003	.0002242
948	11.1	69.60	-0.51	4.473	.00392	-.00003	.0002685
949	12.1	79.81	-0.57	5.432	.00449	-.00003	.0003260
950	13.1	92.16	-0.64	6.490	.00519	-.00004	.0003895
951	14.1	103.56	-0.67	7.657	.00583	-.00004	.0004596

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
945	-2.394	0.264	-0.090	0.229	-0.026	-0.005
946	-2.819	0.324	0.000	0.305	-0.151	0.009
947	-3.265	0.383	0.020	0.369	-0.120	0.022
948	-3.585	0.371	-0.320	0.315	0.306	0.009
949	-3.784	0.497	0.080	0.686	-0.429	0.053
950	-4.070	0.437	-0.290	0.206	-0.283	0.009
951	-4.494	0.618	-0.070	0.957	-0.700	0.049

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 120 CONFIGURATION BHR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
972	51.0	0.9929	515.85
973	51.0	0.9929	515.85
974	51.0	0.9929	515.85
975	51.0	0.9929	515.85
976	51.0	0.9929	515.85
977	51.0	0.9929	515.85
978	51.0	0.9929	515.85

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
972	8.0	45.43	0.07	2.488	.00256	0.00000	.0001493
973	9.0	57.25	0.11	3.045	.00322	0.00001	.0001828
974	10.0	68.22	0.05	3.709	.00384	0.00000	.0002226
975	11.0	81.30	0.03	4.517	.00458	0.00000	.0002711
976	12.0	93.51	-0.05	5.434	.00526	-.00000	.0003261
977	13.0	107.80	0.03	6.544	.00607	0.00000	.0003928
978	14.0	118.14	-0.24	7.620	.00665	-.00001	.0004573

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
972	0.407	-0.082	0.540	-0.156	-1.350	-0.054
973	0.452	-0.159	0.420	-0.160	-0.980	-0.023
974	0.657	-0.215	0.340	-0.273	-0.715	-0.027
975	0.644	-0.316	0.480	-0.181	-1.096	-0.018
976	0.922	-0.276	0.600	-0.381	-1.705	-0.066
977	0.835	-0.473	0.580	-0.281	-1.449	-0.029
978	1.151	-0.832	0.190	-0.315	-1.001	-0.113

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 121 CONFIGURATION BHR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.7500

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
981	51.0	0.9929	515.85
982	51.0	0.9929	515.85
983	51.0	0.9929	515.85
984	51.0	0.9929	515.85
985	51.0	0.9929	515.85
986	51.0	0.9929	515.85
987	51.0	0.9929	515.85

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
981	8.0	41.34	-0.21	2.451	.00233	-.00001	.0001471
982	9.0	53.21	-0.16	3.047	.00300	-.00001	.0001829
983	10.0	64.36	-0.14	3.698	.00362	-.00001	.0002220
984	11.0	75.83	-0.09	4.489	.00427	-.00001	.0002694
985	12.0	87.63	-0.11	5.444	.00493	-.00001	.0003267
986	13.0	101.68	-0.05	6.558	.00572	-.00000	.0003936
987	14.0	114.41	-0.10	7.724	.00644	-.00001	.0004636

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
981	0.054	0.084	-0.040	0.481	0.195	0.032
982	0.244	0.097	-0.060	0.325	0.234	0.024
983	0.164	0.092	-0.150	0.480	0.439	0.015
984	0.242	0.117	0.010	0.495	0.041	0.003
985	0.478	0.043	0.080	0.415	-0.085	0.007
986	0.631	0.004	0.070	0.288	-0.055	-0.001
987	0.607	0.063	0.040	0.424	0.083	0.007

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 122 CONFIGURATION BHR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.8681

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
990	52.0	0.9910	516.48
991	51.0	0.9929	515.85
992	51.0	0.9929	515.85
993	51.0	0.9929	515.85
994	51.0	0.9929	515.85
995	51.0	0.9929	515.85
996	51.0	0.9929	515.85

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
990	8.0	39.82	-0.23	2.419	.00224	-.00001	.0001450
991	9.0	51.84	-0.19	3.021	.00292	-.00001	.0001813
992	10.0	62.06	-0.22	3.664	.00349	-.00001	.0002199
993	11.0	74.40	-0.18	4.483	.00419	-.00001	.0002690
994	12.0	87.40	-0.18	5.476	.00492	-.00001	.0003286
995	13.0	99.64	-0.19	6.559	.00561	-.00001	.0003937
996	14.0	112.66	-0.12	7.748	.00634	-.00001	.0004650

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
990	-0.070	0.145	-0.100	0.560	0.404	-0.006
991	-0.056	0.086	-0.060	0.553	0.186	0.001
992	0.049	0.164	0.010	0.658	0.020	0.012
993	0.159	0.161	0.120	0.647	-0.263	0.016
994	0.463	0.123	0.040	0.401	-0.106	-0.016
995	0.391	0.148	0.040	0.605	-0.076	-0.024
996	0.575	0.090	0.000	0.541	0.001	-0.020

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 123 CONFIGURATION BHR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
999	52.0	0.9910	516.48
1001	52.0	0.9910	516.48
1002	52.0	0.9910	516.48
1003	52.0	0.9910	516.48
1004	52.0	0.9910	516.48
1006	52.0	0.9910	516.48
1007	52.0	0.9910	516.48

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
999	7.9	35.95	-0.38	2.360	.00202	-.00002	.0001414
1001	9.0	46.90	-0.29	2.991	.00264	-.00002	.0001792
1002	10.0	56.64	-0.31	3.635	.00319	-.00002	.0002178
1003	11.0	68.48	-0.20	4.478	.00385	-.00001	.0002683
1004	12.0	79.65	-0.15	5.418	.00448	-.00001	.0003246
1006	13.0	89.79	-0.60	6.457	.00505	-.00003	.0003869
1007	14.0	102.71	-0.46	7.655	.00578	-.00003	.0004587

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
999	-0.960	0.113	0.030	1.353	-0.080	0.026
1001	-1.138	0.211	0.110	1.716	-0.224	0.029
1002	-1.433	0.281	0.140	2.062	-0.272	0.026
1003	-1.580	0.371	-0.110	2.448	0.327	0.079
1004	-1.832	0.393	0.150	2.818	-0.274	0.057
1006	-1.790	0.506	0.280	2.907	-0.614	0.048
1007	-1.626	0.458	0.100	2.831	-0.145	0.034

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 124 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1012	54.0	0.9902	517.42
1013	54.0	0.9902	517.42
1014	54.0	0.9902	517.42
1015	54.0	0.9902	517.42
1016	54.0	0.9902	517.42
1017	55.0	0.9882	518.05
1018	55.0	0.9882	518.05

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1012	8.0	47.28	-0.44	2.546	.00265	-.00002	.0001519
1013	9.0	58.88	-0.53	3.047	.00330	-.00003	.0001817
1014	10.0	70.27	-0.71	3.680	.00394	-.00004	.0002195
1015	11.0	83.16	-0.73	4.511	.00467	-.00004	.0002691
1016	12.0	95.51	-1.18	5.453	.00536	-.00007	.0003252
1017	13.0	109.13	-1.04	6.591	.00612	-.00006	.0003924
1018	14.0	119.47	-1.08	7.583	.00670	-.00006	.0004515

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1012	.	.	.	.	.	.
1013	.	.	.	.	.	.
1014	.	.	.	.	.	.
1015	.	.	.	.	.	.
1016	.	.	.	.	.	.
1017	.	.	.	.	.	.
1018	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 125 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1021	56.0	0.9863	724.14
1022	56.0	0.9863	724.14
1023	56.0	0.9863	724.14
1024	56.0	0.9863	724.14
1025	56.0	0.9863	724.14
1026	56.0	0.9863	724.14

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1021	9.0	105.37	-0.86	8.056	.00303	-.00002	.0001759
1022	10.0	127.71	-0.93	9.645	.00367	-.00003	.0002107
1023	11.0	150.90	-1.18	11.610	.00434	-.00003	.0002536
1024	12.0	173.35	-1.50	13.851	.00499	-.00004	.0003025
1025	13.0	199.89	-1.49	16.733	.00575	-.00004	.0003655
1026	14.0	221.68	-1.77	19.418	.00637	-.00005	.0004241

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1021	.	.	.	.	.	.
1022	.	.	.	.	.	.
1023	.	.	.	.	.	.
1024	.	.	.	.	.	.
1025	.	.	.	.	.	.
1026	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 126   CONFIGURATION HR   BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0   ROTOR-BODY H/R = 100   ROTOR-GROUND Z/R = 0.7500

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1029	55.0	0.9882	518.05
1030	55.0	0.9882	518.05
1031	55.0	0.9882	518.05
1032	55.0	0.9882	518.05
1033	55.0	0.9882	518.05
1034	55.0	0.9882	518.05
1035	56.0	0.9863	518.68

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1029	8.0	41.73	-0.44	2.487	.00234	-.00002	.0001480
1030	9.0	52.90	-0.42	3.046	.00297	-.00002	.0001813
1031	10.0	64.65	-0.49	3.680	.00363	-.00003	.0002191
1032	11.0	77.72	-0.63	4.550	.00436	-.00004	.0002709
1033	12.0	88.78	-0.63	5.454	.00498	-.00004	.0003247
1034	13.0	102.60	-0.69	6.598	.00575	-.00004	.0003928
1035	14.1	112.44	-0.74	7.625	.00630	-.00004	.0004532

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1029	.	.	.	.	.	.
1030	.	.	.	.	.	.
1031	.	.	.	.	.	.
1032	.	.	.	.	.	.
1033	.	.	.	.	.	.
1034	.	.	.	.	.	.
1035	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 127 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 0.8681

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1040	44.0	1.0115	512.08
1041	44.0	1.0115	512.08
1042	44.0	1.0115	512.08
1043	44.0	1.0115	512.08
1044	44.0	1.0115	512.08
1045	44.0	1.0115	512.08
1046	44.0	1.0115	512.08

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1040	8.0	40.44	0.08	2.446	.00227	0.00000	.0001473
1041	8.9	52.54	0.16	3.069	.00295	0.00001	.0001849
1042	10.0	61.46	0.04	3.590	.00345	0.00000	.0002162
1043	11.0	73.85	0.02	4.476	.00414	0.00000	.0002696
1044	12.0	86.25	0.11	5.420	.00484	0.00001	.0003264
1045	13.0	99.49	0.12	6.507	.00558	0.00001	.0003919
1046	14.0	109.88	0.16	7.591	.00616	0.00001	.0004572

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1040	.	.	.	.	.	.
1041	.	.	.	.	.	.
1042	.	.	.	.	.	.
1043	.	.	.	.	.	.
1044	.	.	.	.	.	.
1045	.	.	.	.	.	.
1046	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 128 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 0.5000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1049	44.0	1.0115	62.83
1050	44.0	1.0115	94.25
1051	44.0	1.0115	125.66
1052	44.0	1.0115	157.08
1053	44.0	1.0115	188.50
1054	44.0	1.0115	251.33
1055	44.0	1.0115	314.16

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1049	5.5	-0.05	-0.07	0.004	-.0002	-.00026	.0001320
1050	4.9	-0.12	0.04	0.013	-.0002	0.00007	.0001219
1051	4.6	-0.10	0.05	0.026	-94E-6	0.00005	.0001054
1052	4.3	-0.14	0.05	0.046	-83E-6	0.00003	.0000967
1053	4.0	-0.23	0.05	0.077	-93E-6	0.00002	.0000925
1054	3.7	-0.34	0.02	0.178	-80E-6	0.00000	.0000908
1055	3.6	-0.38	0.05	0.343	-57E-6	0.00001	.0000896

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1049	.	.	.	.	.	.
1050	.	.	.	.	.	.
1051	.	.	.	.	.	.
1052	.	.	.	.	.	.
1053	.	.	.	.	.	.
1054	.	.	.	.	.	.
1055	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 129 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1058	45.0	1.0095	512.71
1059	45.0	1.0095	512.71
1060	45.0	1.0095	512.71
1061	45.0	1.0095	512.71
1062	45.0	1.0095	512.71
1063	45.0	1.0095	512.71
1064	45.0	1.0095	512.71

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1058	8.0	36.80	-0.28	2.416	.00206	-.00002	.0001453
1059	9.0	46.67	-0.42	2.939	.00262	-.00002	.0001767
1060	10.0	57.14	-0.47	3.630	.00320	-.00003	.0002182
1061	11.0	68.37	-0.53	4.457	.00383	-.00003	.0002680
1062	12.0	79.28	-0.46	5.370	.00444	-.00003	.0003229
1063	13.0	92.90	-0.41	6.546	.00521	-.00002	.0003935
1064	14.0	103.73	-0.50	7.645	.00581	-.00003	.0004596

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1058	.	.	.	.	.	.
1059	.	.	.	.	.	.
1060	.	.	.	.	.	.
1061	.	.	.	.	.	.
1062	.	.	.	.	.	.
1063	.	.	.	.	.	.
1064	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 130 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1067	45.0	1.0095	724.14
1068	45.0	1.0095	724.14
1069	45.0	1.0095	724.14
1070	45.0	1.0095	724.14
1071	45.0	1.0095	724.14
1072	45.0	1.0095	724.14
1073	45.0	1.0095	724.14

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1067	9.0	88.79	-0.80	8.347	.00249	-.00002	.0001781
1068	10.0	106.70	-1.09	9.891	.00300	-.00003	.0002111
1069	11.0	128.68	-1.13	12.094	.00362	-.00003	.0002581
1070	12.0	149.26	-1.25	14.372	.00419	-.00004	.0003067
1071	13.0	174.58	-1.30	17.384	.00491	-.00004	.0003710
1072	14.0	198.14	-1.16	20.518	.00557	-.00003	.0004378
1073	15.0	223.54	-1.13	24.031	.00628	-.00003	.0005128

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1067	.	.	.	.	.	.
1068	.	.	.	.	.	.
1069	.	.	.	.	.	.
1070	.	.	.	.	.	.
1071	.	.	.	.	.	.
1072	.	.	.	.	.	.
1073	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 131 CONFIGURATION HR BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 3.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1076	46.0	1.0075	62.83
1077	46.0	1.0075	94.25
1078	46.0	1.0075	125.66
1079	46.0	1.0075	157.08
1080	46.0	1.0075	188.50
1081	46.0	1.0075	251.33
1082	46.0	1.0075	314.16

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1076	10.0	0.76	-0.26	0.007	.00285	-.00097	.0002345
1077	7.4	0.86	-0.26	0.015	.00143	-.00043	.0001473
1078	6.5	1.00	-0.09	0.027	.00094	-.00008	.0001109
1079	5.6	1.05	-0.11	0.048	.00063	-.00007	.0001003
1080	5.1	1.23	-0.14	0.077	.00051	-.00006	.0000935
1081	4.3	1.22	-0.19	0.173	.00028	-.00004	.0000883
1082	4.0	1.52	-0.30	0.334	.00023	-.00004	.0000875

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1076	.	.	.	.	.	.
1077	.	.	.	.	.	.
1078	.	.	.	.	.	.
1079	.	.	.	.	.	.
1080	.	.	.	.	.	.
1081	.	.	.	.	.	.
1082	.	.	.	.	.	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 133 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 2.0000

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1096	55.0	0.9869	517.73
1097	55.0	0.9869	517.73
1098	55.0	0.9869	517.73
1099	55.0	0.9869	517.73
1100	55.0	0.9869	517.73
1101	55.0	0.9869	517.73
1102	55.0	0.9869	517.73

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1096	8.0	36.34	-0.25	2.455	.00204	-.00001	.0001466
1097	9.0	45.68	-0.28	2.981	.00257	-.00002	.0001780
1098	10.0	55.19	-0.23	3.585	.00310	-.00001	.0002141
1099	11.0	65.78	-0.20	4.363	.00370	-.00001	.0002606
1100	12.0	77.58	-0.20	5.321	.00436	-.00001	.0003178
1101	13.1	88.34	-0.21	6.352	.00497	-.00001	.0003794
1102	14.1	101.97	-0.07	7.608	.00573	-.00000	.0004544

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1096	-2.193	0.258	0.190	-0.056	-0.425	-0.023
1097	-2.606	0.429	0.340	0.447	-0.777	-0.001
1098	-2.898	0.449	0.290	0.345	-0.480	0.007
1099	-3.443	0.491	0.190	0.582	-0.396	-0.010
1100	-3.600	0.590	0.210	0.336	-0.756	-0.005
1101	-3.741	0.741	0.530	0.951	-1.264	0.002
1102	-4.046	0.659	0.000	0.570	-0.772	0.006

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 135 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.6250

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1114	55.0	0.9869	517.73
1115	55.0	0.9869	517.73
1116	55.0	0.9869	517.73
1117	55.0	0.9869	517.73
1118	55.0	0.9869	517.73
1119	55.0	0.9869	517.73
1120	55.0	0.9869	517.73

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1114	8.0	37.99	0.09	2.505	.00214	0.00001	.0001496
1115	9.0	47.67	0.08	3.049	.00268	0.00000	.0001821
1116	10.0	56.64	0.05	3.666	.00318	0.00000	.0002189
1117	11.1	67.87	0.07	4.505	.00382	0.00000	.0002691
1118	12.1	78.93	0.17	5.415	.00444	0.00001	.0003234
1119	13.1	91.07	0.21	6.522	.00512	0.00001	.0003896
1120	14.1	103.05	0.18	7.695	.00579	0.00001	.0004596

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1114	-1.936	0.306	0.230	0.003	-0.374	0.003
1115	-2.246	0.434	0.240	0.355	-0.473	-0.004
1116	-2.582	0.371	0.350	0.191	-0.696	-0.005
1117	-2.705	0.402	0.270	0.001	-0.380	-0.016
1118	-2.985	0.683	0.570	0.680	-1.042	0.019
1119	-3.109	0.595	0.300	0.084	-0.510	0.016
1120	-3.303	0.651	0.250	0.327	-0.494	0.015

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 136 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.2639

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1123	55.0	0.9869	517.73
1124	55.0	0.9869	517.73
1125	55.0	0.9869	517.73
1126	55.0	0.9869	517.73
1127	55.0	0.9869	517.73
1128	55.0	0.9869	517.73
1129	55.0	0.9869	517.73

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1123	8.0	37.96	0.05	2.510	.00213	0.00000	.0001499
1124	9.0	49.02	0.12	3.099	.00276	0.00001	.0001851
1125	10.0	59.38	0.11	3.767	.00334	0.00001	.0002250
1126	11.1	69.87	0.14	4.547	.00393	0.00001	.0002716
1127	12.1	81.92	0.12	5.500	.00461	0.00001	.0003285
1128	13.1	92.94	0.11	6.544	.00523	0.00001	.0003909
1129	14.1	105.72	0.33	7.728	.00594	0.00002	.0004616

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1123	-1.318	0.359	0.370	-0.112	-0.524	-0.003
1124	-1.606	0.319	0.200	-0.263	-0.185	-0.005
1125	-1.889	0.499	0.140	0.280	-0.291	0.005
1126	-2.041	0.659	0.440	0.423	-0.558	-0.012
1127	-1.954	0.274	0.130	-0.408	-0.172	0.013
1128	-1.882	0.540	-0.040	0.149	0.006	0.009
1129	-2.124	0.984	0.550	1.166	-0.953	0.024

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
HOVER

RUN 139 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = +4 DEG
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 0.8681

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)
1152	56.0	0.9904	724.14
1153	56.0	0.9904	724.14
1154	56.0	0.9904	724.14
1155	56.0	0.9904	724.14
1156	56.0	0.9904	724.14
1157	56.0	0.9904	724.14
1158	56.0	0.9904	724.14

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	THETA (DEG)	THRUST (LB)	H-FORCE (LB)	MRHP (HP)	CTR (-)	CHR (-)	CPR (-)
1152	9.0	92.30	-0.30	8.274	.00264	-.00001	.0001800
1153	10.0	112.40	-0.20	9.786	.00322	-.00001	.0002129
1154	11.0	135.31	-0.23	11.853	.00388	-.00001	.0002578
1155	12.0	158.16	-0.11	14.169	.00453	-.00000	.0003082
1156	13.0	183.54	-0.21	17.024	.00526	-.00001	.0003703
1157	14.0	202.44	-0.18	19.600	.00580	-.00001	.0004263
1158	15.0	227.64	-0.10	22.838	.00652	-.00000	.0004968

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(SHAFT AND WIND AXIS)

RECORD	LIFT (LB)	DRAG (LB)	SIDE (LB)	PM (FT-LB)	YM (FT-LB)	RM (FT-LB)
1152	-0.905	0.328	-0.160	-0.640	0.569	0.014
1153	-0.809	0.675	0.560	-0.444	-0.421	0.012
1154	-0.813	0.725	0.160	-0.315	-0.279	0.007
1155	-0.405	0.924	0.280	-0.071	-0.141	0.021
1156	-0.033	0.760	0.010	-0.437	-0.070	0.006
1157	0.194	0.946	0.410	-0.526	0.057	0.050
1158	0.321	1.286	0.630	-0.147	-0.158	0.063

APPENDIX B

FORWARD FLIGHT DATA

This appendix is primarily a tabulation of the digitized and corrected forward flight performance data. The tables are ordered by run number and the data is ordered by prime data record number in each table. The tables include dimensional and nondimensional rotor and fuselage data. The dimensional data is not scaled to full-scale values. Reference axes for data reduction can be found in Figure 11. Configuration and test condition data is included for each run. Table B-1 provides a key which defines the tabluated output labels not defined in Table A-1.

Figure B-1 presents sketches which define the configurations tested. A summary of all test conditions is presented in Table B-2.

Graphical presentation of select data is included following the tabulated data. Table B-2 entries with an asterisk denote test conditions for which graphical data is not presented. Figure B-2 shows configurations BHR installed in the Vought Low Speed 7x 10-ft Wind Tunnel Facility.

NOTE: For configurations BF2L, BHF2L, BHRF2L, BHF2U, and BHRF2U Appendix B graphical and tabulated data for CLB, CDB, CYB, CMYB, CMXB, and CMZB should be corrected by 0.95367. This error was the result of having reduced the data by the incorrect cross-sectional area, S_B.

Table B-1*. Definition of tabulated output data labels.

Label	Definition
VEL	Tunnel speed at the model
Q	Dynamic pressure at the model
MU	Speed ratio
ALPHS	Shaft angle of attack (geometric)
B1	Longitudinal cyclic
A1	Lateral cyclic
Y-Force	Main rotor Y-force
ALPHW	Angle of attack (corrected to free stream wind axis system)
LIFT	Lift
X-Force	Propulsive force
L/D	Equivalent lift/drag
CLR	Lift coefficient
CXR	Propulsive force coefficient
CPR	Power coefficient
CPRO	Profile power coefficient
NF	Normal force
AF	Axial force
SF, SFB	Side force
PMB	Pitching Moment
RMB	Rolling moment
YMB	Yawing moment
CLB	Lift coefficient
CDB	Drag coefficient
CYB	Sideforce coefficient
CMYB	Pitching moment coefficient
CMXB	Rolling moment coefficient
CMZB	Yawing moment coefficient

*Definitions provided in Table A-1 will not be repeated.

Configuration		Test Sequence
1	BHR	Test Stand with Baseline Fairing, Mast, Hub, and Blades
2	BHRF2L	Add Nose Modification In Lower Position
3	BHRFWO	Remove Wings
4	BHRF2U	Raise Nose
5	HR	Isolated Rotor
6	H	Remove Blades
7	BHF2U	Add Nose Modification In Upper Position
8	BHF2L	Lower Nose
9	BHRFWO	Remove Wings
10	BH	Remove Nose Modification, Add Wings
11	B	Remove Hub and Controls
12	BF2L	Add Nose Modification In Lower Position

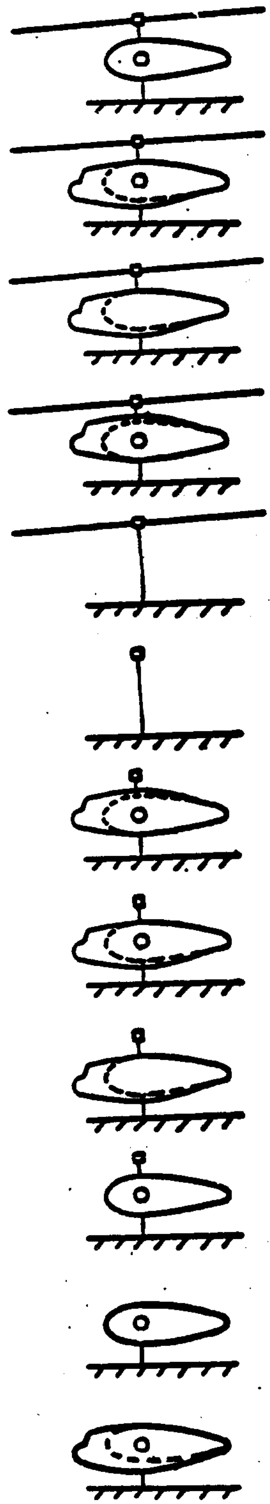


Figure B-1. Forward flight test configurations.

Table B-2. Summary of forward flight test conditions.

Configuration	Run No.	Shaft Angle	Speed Ratio
BHR	14*(1)	4,0,-4,-8	0.10
	15	4,0,-4,-8	0.20
	16	4,0,-4,-8,-12	0.30
	17	-4	0.25
	18	-4	0.15
BHRF2L	19*	4,0,-4,-8	0.10
	20	-4	0.15
	21	4,0,-4,-8	0.20
	22	-4	0.25
	23	4,0,-4,-8,12	0.30
BHRFWO	24*	-4	0.10
	25	-0,-4,-8	0.20
	26*	-4	0.30
BHRF2U	27*	4,0,-4,-8	0.15
	28	-4	0.15
	29	4,0,-4,-8	0.20
	30	4,0,-4,-8,-12	0.30
HR	31*	4,0,-4,-8,-12	0.10
	32	4,-4,-12	0.15
	33	4,0,-4,-8,-12	0.20
	34	4,-4,-12	0.25
	35	4,-0,-4,-8,-12	0.30
H	40*	4 to -12	0.10
	41*		0.15
	42*		0.20
	45*		0.30
BHF2U	46	8 to -16	0.10
	47		0.15
	48		0.20
	49		0.25
	50		0.30
BHF2L	51	8 to -16	0.10
	52		0.15
	53		0.20
	54		0.25
	55		0.30

Table B-2 (Concluded)

Configuration	Run No.	Shaft Angle	Speed Ratio
BHFWO	56	4 to -12	0.10
	57		0.20
	58		0.30
BH	59	8 to -16	0.10
	60		0.15
	61		0.20
	62		0.25
	63		0.30
B[2]	64	4 to -12	0.10
	65		0.20
	66		0.30
BF2L[2]	67	4 to -12	0.10
	68		0.20
	69		0.30

(1) An asterisk indicates that graphical data is not presented

(2) Although the rotor shaft was removed, test stand pitch attitude was calibrated to the shaft axis. The shaft is tilted forward 4 degrees relative to the body waterline; consequently, the shaft angles of (4 to -12 listed correspond to (8 to -8) degrees body pitch attitude.

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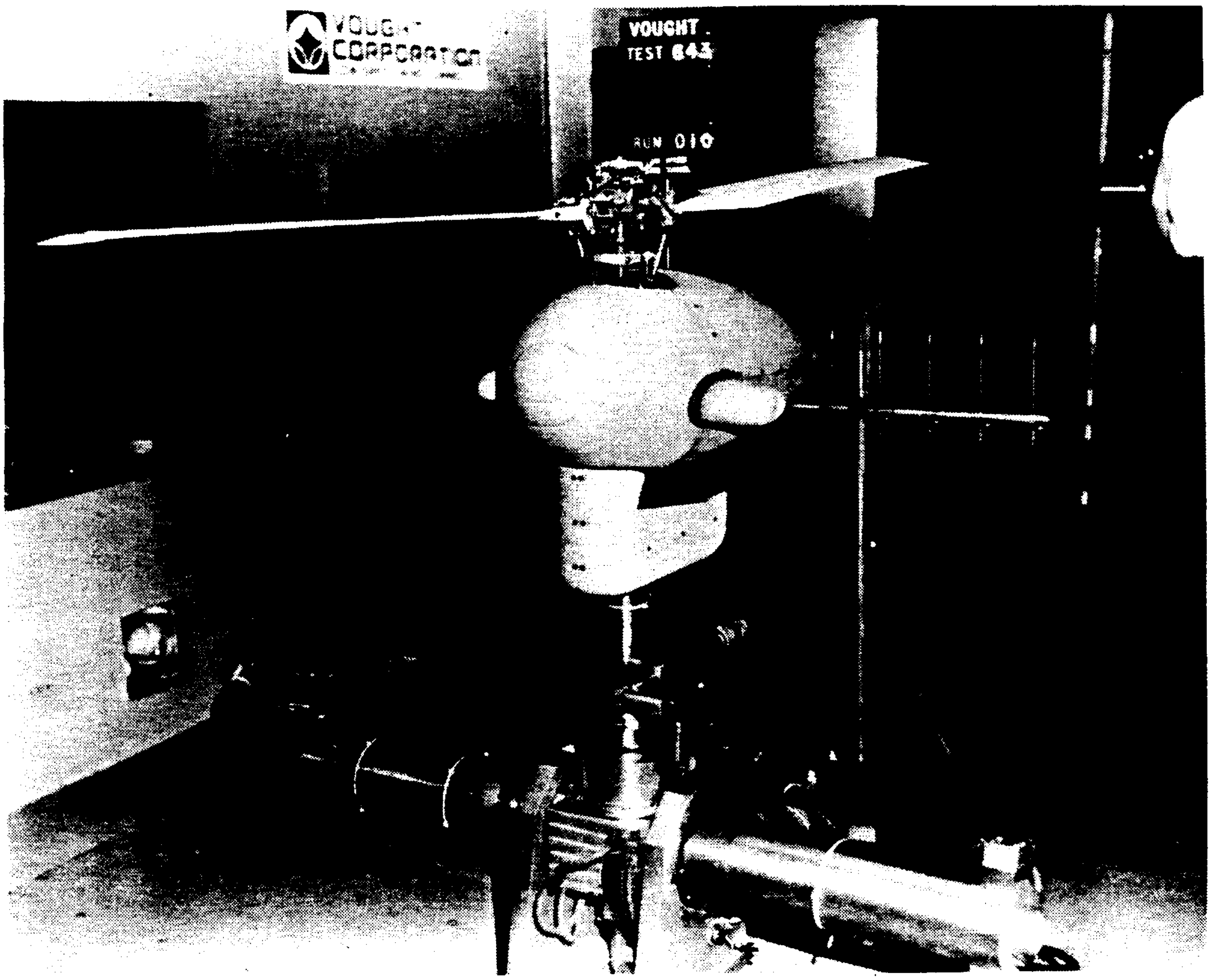


Figure B-2. Configuration BHR installed in the LTV 7x10-foot Low Speed Wind Tunnel.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 3.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
92	55.0	0.9933	517.89	52.05	3.2	0.101
93	55.0	0.9933	517.89	52.05	3.2	0.101
94	55.0	0.9933	517.89	52.05	3.2	0.101
95	55.0	0.9933	517.89	52.05	3.2	0.101
96	55.0	0.9933	517.89	52.05	3.2	0.101
97	55.0	0.9933	517.89	52.05	3.2	0.101
98	55.0	0.9933	517.89	52.05	3.2	0.101

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
92	6.1	4.0	0.1	-3.3	49.89	0.37	-1.00	1.52
93	7.1	4.0	0.5	-3.7	63.19	0.29	-1.24	1.76
94	8.1	4.0	0.7	-4.2	76.05	0.20	-1.54	2.16
95	9.1	4.0	1.3	-4.6	89.95	0.15	-1.86	2.68
96	10.2	4.0	1.9	-5.2	101.80	-0.10	-2.29	3.28
97	11.1	4.0	2.3	-5.8	114.15	-0.59	-2.78	4.10
98	6.0	4.0	0.9	-3.0	51.58	0.16	-0.88	1.55

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
92	5.57	49.62	-5.21	2.3	.00277	-.00029	.000090	.000081
93	5.99	62.82	-6.88	2.5	.00351	-.00038	.000104	.000082
94	6.39	75.55	-8.67	2.4	.00422	-.00048	.000128	.000086
95	6.83	89.29	-10.84	2.3	.00498	-.00061	.000159	.000096
96	7.20	101.01	-12.67	2.1	.00564	-.00071	.000195	.000108
97	7.59	113.23	-14.50	2.0	.00632	-.00081	.000243	.000125
98	5.62	51.32	-5.21	2.4	.00287	-.00029	.000092	.000080

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
92	0.340	0.590	-0.230	0.473	-0.019	0.093
93	0.300	0.520	-0.200	0.513	0.002	0.065
94	0.190	0.430	-0.250	0.608	-0.019	0.092
95	0.210	0.430	-0.230	0.619	-0.009	0.043
96	0.080	0.370	-0.270	0.772	-0.020	0.010
97	0.040	0.300	-0.380	0.642	-0.074	0.082
98	0.020	0.510	-0.260	0.722	-0.070	0.121

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
92	9.57	0.237	0.638	-0.230	0.473	-0.003	0.095
93	9.99	0.205	0.564	-0.200	0.513	0.014	0.064
94	10.39	0.109	0.457	-0.250	0.608	-0.003	0.094
95	10.83	0.125	0.462	-0.230	0.619	-0.000	0.044
96	11.20	0.007	0.378	-0.270	0.772	-0.018	0.014
97	11.59	-0.021	0.302	-0.380	0.642	-0.056	0.095
98	9.62	-0.066	0.506	-0.260	0.722	-0.049	0.131

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
92	9.57	0.09437	0.25397	-.09151	0.18812	-.00117	0.03774
93	9.99	0.08167	0.22446	-.07958	0.20392	0.00546	0.02540
94	10.39	0.04349	0.16192	-.09947	0.24183	-.00103	0.03723
95	10.83	0.04992	0.18374	-.09151	0.24639	-.00017	0.01747
96	11.20	0.00262	0.15059	-.10743	0.30714	-.00710	0.00550
97	11.59	-.00839	0.12013	-.15119	0.25529	-.02242	0.03789
98	9.62	-.02607	0.20139	-.10345	0.28736	-.01935	0.05204

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
99	55.0	0.9933	517.89	52.05	3.2	0.101
100	55.0	0.9933	517.89	52.05	3.2	0.101
101	55.0	0.9933	517.89	52.05	3.2	0.101
102	55.0	0.9933	517.89	52.05	3.2	0.101
103	55.0	0.9933	517.89	52.05	3.2	0.101
104	55.0	0.9933	517.89	52.05	3.2	0.101

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
99	7.0	0.0	0.7	-3.4	55.89	0.42	-1.10	1.97
100	8.1	0.0	1.2	-3.9	69.16	0.39	-1.42	2.39
101	9.1	0.0	1.6	-4.5	81.37	0.25	-1.70	2.93
102	10.1	0.0	2.1	-4.9	93.19	0.12	-2.03	3.56
103	11.1	0.0	2.4	-5.6	105.35	0.05	-2.47	4.28
104	7.1	0.0	0.8	-3.6	56.78	0.44	-1.14	2.00

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
99	1.76	55.85	-2.14	2.4	.00312	-.00012	.000117	.000081
100	2.18	69.09	-3.02	2.4	.00386	-.00017	.000142	.000085
101	2.56	81.27	-3.88	2.3	.00454	-.00022	.000174	.000093
102	2.93	93.06	-4.68	2.2	.00520	-.00027	.000211	.000104
103	3.31	105.17	-6.14	2.0	.00587	-.00034	.000254	.000117
104	1.79	56.74	-2.21	2.4	.00317	-.00012	.000118	.000081

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11263
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
99	-0.003	0.666	-0.171	0.504	-0.035	0.009
100	-0.013	0.616	-0.231	0.555	-0.058	0.035
101	0.017	0.606	-0.251	0.547	-0.048	-0.026
102	-0.183	0.566	-0.283	0.674	-0.070	-0.027
103	-0.173	0.536	-0.393	0.576	-0.114	0.016
104	-0.013	0.676	-0.131	0.493	-0.054	-0.048

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
99	5.76	-0.070	0.662	-0.171	0.504	-0.034	0.013
100	6.18	-0.079	0.611	-0.231	0.555	-0.054	0.041
101	6.56	-0.052	0.604	-0.251	0.547	-0.051	-0.020
102	6.93	-0.250	0.540	-0.283	0.674	-0.072	-0.018
103	7.31	-0.240	0.510	-0.393	0.576	-0.111	0.030
104	5.79	-0.081	0.671	-0.131	0.493	-0.058	-0.042

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
99	5.76	-.02778	0.26353	-.06804	0.20039	-.01366	0.00513
100	6.18	-.03151	0.24311	-.09191	0.22074	-.02133	0.01630
101	6.56	-.02083	0.24031	-.09987	0.21780	-.02032	-.00788
102	6.93	-.09946	0.21477	-.11260	0.26823	-.02881	-.00727
103	7.31	-.09543	0.20276	-.15637	0.22919	-.04411	0.01209
104	5.79	-.03226	0.26707	-.05212	0.19597	-.02326	-.01670

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
105	56.0	0.9917	518.36	52.09	3.2	0.100
106	56.0	0.9917	518.36	52.09	3.2	0.100
107	56.0	0.9917	518.36	52.90	3.3	0.102
108	56.0	0.9917	518.36	52.90	3.3	0.102
109	56.0	0.9917	518.36	53.70	3.4	0.104
110	56.0	0.9917	518.36	53.70	3.4	0.104
111	56.0	0.9917	518.36	53.70	3.4	0.104

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
105	7.1	-4.0	0.9	-3.2	48.08	0.51	-1.03	2.09
106	8.0	-4.0	1.3	-3.4	60.07	0.47	-1.17	2.51
107	9.1	-4.0	1.6	-4.0	72.85	0.43	-1.53	3.05
108	10.1	-4.0	2.1	-4.4	85.12	0.34	-1.79	3.69
109	11.1	-4.0	2.6	-4.8	97.21	0.15	-1.86	4.44
110	12.1	-4.0	3.0	-5.3	109.26	-0.13	-2.17	5.30
111	7.1	-4.0	0.9	-3.0	48.70	0.51	-1.01	2.09

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
105	-2.49	48.06	1.58	2.4	.00268	0.00009	.000124	.000079
106	-2.11	60.05	1.74	2.4	.00335	0.00010	.000149	.000083
107	-1.78	72.83	1.83	2.4	.00406	0.00010	.000180	.000089
108	-1.40	85.11	1.74	2.3	.00475	0.00010	.000219	.000096
109	-1.12	97.19	1.75	2.2	.00542	0.00010	.000263	.000111
110	-0.76	109.24	1.59	2.1	.00610	0.00009	.000314	.000125
111	-2.56	48.68	1.66	2.5	.00272	0.00009	.000124	.000078

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
105	-0.836	0.762	-0.170	0.857	-0.132	-0.039
106	-0.756	0.712	-0.226	0.754	-0.145	-0.045
107	-0.686	0.712	-0.226	0.660	-0.115	-0.088
108	-0.696	0.722	-0.234	0.678	-0.095	-0.147
109	-0.876	0.662	-0.393	0.667	-0.161	-0.107
110	-0.866	0.652	-0.464	0.729	-0.144	-0.106
111	-0.746	0.852	-0.190	0.760	-0.143	-0.040

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
105	1.51	-0.856	0.740	-0.170	0.857	-0.133	-0.035
106	1.89	-0.779	0.687	-0.226	0.754	-0.146	-0.040
107	2.22	-0.713	0.685	-0.226	0.660	-0.118	-0.083
108	2.60	-0.728	0.690	-0.234	0.678	-0.101	-0.143
109	2.88	-0.908	0.617	-0.393	0.667	-0.166	-0.099
110	3.24	-0.901	0.602	-0.464	0.729	-0.149	-0.100
111	1.44	-0.767	0.833	-0.190	0.760	-0.144	-0.036

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
105	1.51	-.34051	0.29430	-.06764	0.34082	-.05307	-.01394
106	1.89	-.30998	0.27321	-.08992	0.30015	-.05806	-.01587
107	2.22	-.27513	0.26423	-.08720	0.25447	-.04546	-.03208
108	2.60	-.28088	0.26611	-.09028	0.26175	-.03912	-.05510
109	2.88	-.34007	0.23111	-.14717	0.24993	-.06216	-.03699
110	3.24	-.33756	0.22547	-.17376	0.27282	-.05594	-.03743
111	1.44	-.28730	0.31192	-.07115	0.28454	-.05397	-.01363

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
112	56.0	0.9917	518.36	53.70	3.4	0.104
113	56.0	0.9917	518.36	55.25	3.6	0.107
114	56.0	0.9917	518.36	55.25	3.6	0.107
115	56.0	0.9917	518.36	56.77	3.8	0.110
116	56.0	0.9917	518.36	56.77	3.8	0.110
117	56.0	0.9917	518.36	57.51	3.9	0.111
118	56.0	0.9917	518.36	57.51	3.9	0.111

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
112	8.1	-8.0	1.2	-3.0	51.89	0.54	-1.06	2.58
113	9.1	-8.0	1.8	-3.5	63.91	0.43	-1.31	3.13
114	10.1	-8.0	1.8	-3.8	75.71	0.41	-1.63	3.77
115	11.1	-8.0	2.3	-4.2	88.05	0.23	-1.76	4.53
116	12.2	-8.0	2.8	-4.7	100.95	0.10	-1.96	5.40
117	13.2	-8.0	3.3	-5.1	113.44	-0.07	-2.18	6.38
118	8.1	-8.0	1.5	-2.9	51.81	0.37	-1.05	2.60

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
112	-6.46	51.62	5.31	2.4	.00288	0.00030	.000153	.000082
113	-6.21	63.58	6.49	2.6	.00355	0.00036	.000185	.000088
114	-5.86	75.35	7.35	2.5	.00421	0.00041	.000223	.000096
115	-5.67	87.64	8.47	2.5	.00489	0.00047	.000266	.000107
116	-5.33	100.52	9.27	2.3	.00561	0.00052	.000320	.000120
117	-5.07	112.99	10.10	2.2	.00631	0.00056	.000378	.000136
118	-6.66	51.50	5.65	2.7	.00287	0.00032	.000154	.000081

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 14 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
112	-0.920	0.850	-0.110	0.530	-0.094	-0.168
113	-0.900	0.850	-0.120	0.482	-0.105	-0.199
114	-0.970	0.850	-0.100	0.556	-0.074	-0.277
115	-0.950	0.860	-0.210	0.497	-0.058	-0.285
116	-1.160	0.790	-0.390	0.545	-0.155	-0.229
117	-0.900	0.770	-0.440	0.405	-0.127	-0.252
118	-1.180	0.930	-0.220	0.818	-0.108	-0.096

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
112	-2.46	-0.883	0.889	-0.110	0.530	-0.087	-0.172
113	-2.21	-0.867	0.884	-0.120	0.482	-0.097	-0.203
114	-1.88	-0.942	0.881	-0.100	0.556	-0.065	-0.280
115	-1.67	-0.925	0.887	-0.210	0.497	-0.050	-0.287
116	-1.33	-1.141	0.817	-0.390	0.545	-0.149	-0.232
117	-1.07	-0.885	0.787	-0.440	0.405	-0.122	-0.255
118	-2.66	-1.136	0.984	-0.220	0.818	-0.104	-0.101

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
112	-2.46	-.33052	0.33282	-.04119	0.19850	-.03252	-.06441
113	-2.21	-.30646	0.31268	-.04244	0.17031	-.03423	-.07170
114	-1.88	-.33300	0.31173	-.03537	0.19678	-.02285	-.09890
115	-1.67	-.30978	0.29729	-.07036	0.16669	-.01662	-.09618
116	-1.33	-.38244	0.27361	-.13067	0.18249	-.05005	-.07783
117	-1.07	-.28907	0.25683	-.14364	0.13208	-.03978	-.08317
118	-2.66	-.37071	0.32118	-.07182	0.26701	-.03386	-.03302

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
119	56.0	0.9917	518.36	103.78	12.7	0.200
120	56.0	0.9917	518.36	103.78	12.7	0.200
121	56.0	0.9917	518.36	103.78	12.7	0.200
122	56.0	0.9917	518.36	103.78	12.7	0.200
123	56.0	0.9917	518.36	103.78	12.7	0.200
124	57.0	0.9898	518.99	103.88	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
119	6.0	4.0	2.3	-2.5	64.42	0.78	-1.85	1.17
120	7.1	4.0	3.0	-3.1	79.56	0.54	-2.16	1.37
121	8.1	4.0	3.7	-3.5	92.83	0.15	-2.37	1.70
122	9.1	4.0	4.6	-4.2	105.63	-0.30	-2.75	2.19
123	10.1	4.0	5.3	-4.5	118.11	-0.62	-2.82	2.82
124	6.0	4.0	2.5	-2.6	65.87	0.72	-1.92	1.18

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
119	4.51	64.16	-5.85	5.3	.00358	-.00033	.000069	.000102
120	4.63	79.26	-6.96	5.6	.00442	-.00039	.000081	.000110
121	4.74	92.50	-7.81	5.5	.00516	-.00044	.000101	.000121
122	4.84	105.28	-8.61	5.2	.00588	-.00046	.000130	.000140
123	4.94	117.72	-9.55	4.8	.00657	-.00053	.000167	.000166
124	4.52	65.61	-5.91	5.4	.00366	-.00033	.000070	.000103

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
119	1.703	2.492	-0.946	1.444	-0.206	0.496
120	1.503	2.352	-0.876	1.494	-0.213	0.491
121	1.363	2.352	-1.006	1.624	-0.198	0.582
122	1.473	2.372	-1.146	1.561	-0.173	0.721
123	1.313	2.272	-1.216	1.713	-0.186	0.686
124	1.603	2.322	-0.936	1.403	-0.235	0.537

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
119	8.51	1.315	2.717	-0.946	1.444	-0.130	0.521
120	8.63	1.133	2.551	-0.876	1.494	-0.137	0.518
121	8.74	0.990	2.532	-1.006	1.624	-0.107	0.605
122	8.84	1.091	2.570	-1.146	1.561	-0.060	0.740
123	8.94	0.944	2.448	-1.216	1.713	-0.077	0.707
124	8.52	1.241	2.534	-0.936	1.403	-0.153	0.566

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
119	8.51	0.13188	0.27235	-.09484	0.14472	-.01303	0.05225
120	8.63	0.11359	0.25574	-.08782	0.14979	-.01372	0.05191
121	8.74	0.09925	0.25381	-.10085	0.16279	-.01076	0.06067
122	8.84	0.10939	0.25766	-.11489	0.15651	-.00605	0.07414
123	8.94	0.09465	0.24546	-.12191	0.17175	-.00772	0.07086
124	8.52	0.12443	0.25403	-.09384	0.14062	-.01535	0.05673

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
125	57.0	0.9898	518.99	103.68	12.7	0.200
126	57.0	0.9898	518.99	103.88	12.7	0.200
127	57.0	0.9898	518.99	103.88	12.7	0.200
128	57.0	0.9898	518.99	103.88	12.7	0.200
129	57.0	0.9898	518.99	103.88	12.7	0.200
130	57.0	0.9898	518.99	103.88	12.7	0.200
131	57.0	0.9898	518.99	103.88	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
125	6.0	0.0	2.2	-2.1	46.96	0.88	-1.48	1.65
126	7.0	0.0	2.7	-2.7	61.46	0.86	-1.70	1.85
127	8.1	0.0	3.6	-3.2	75.07	0.39	-1.94	2.23
128	9.1	0.0	4.2	-3.8	87.29	-0.02	-2.26	2.66
129	10.1	0.0	5.3	-3.9	99.03	-0.65	-2.25	3.25
130	11.1	0.0	6.0	-4.4	111.56	-0.96	-2.33	3.96
131	6.0	0.0	2.2	-2.3	47.13	0.91	-1.51	1.64

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
125	0.37	46.95	-1.19	4.7	.00262	-.00007	.000098	.000094
126	0.49	61.45	-1.38	5.5	.00343	-.00008	.000109	.000095
127	0.60	75.06	-1.17	5.8	.00419	-.00007	.000132	.000101
128	0.69	87.28	-1.03	5.8	.00487	-.00006	.000157	.000110
129	0.79	99.03	-0.71	5.5	.00552	-.00004	.000192	.000124
130	0.88	111.57	-0.76	5.1	.00622	-.00004	.000234	.000146
131	0.37	47.12	-1.22	4.7	.00263	-.00007	.000097	.000094

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
125	1.147	2.763	-0.741	0.943	-0.158	0.382
126	1.047	2.693	-0.821	1.019	-0.191	0.386
127	0.847	2.613	-0.831	1.157	-0.191	0.396
128	0.977	2.633	-0.811	1.066	-0.171	0.347
129	0.867	2.623	-0.951	1.088	-0.176	0.467
130	0.867	2.633	-0.941	1.118	-0.175	0.378
131	1.097	2.733	-0.611	0.921	-0.153	0.252

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
125	4.37	0.933	2.642	-0.741	0.943	-0.128	0.393
126	4.49	0.833	2.767	-0.821	1.019	-0.160	0.400
127	4.60	0.635	2.672	-0.831	1.157	-0.159	0.410
128	4.69	0.758	2.704	-0.811	1.066	-0.142	0.360
129	4.79	0.645	2.686	-0.951	1.088	-0.136	0.480
130	4.88	0.640	2.697	-0.941	1.118	-0.143	0.391
131	4.37	0.885	2.809	-0.611	0.921	-0.133	0.263

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
125	4.37	0.09354	0.28496	-.07429	0.09457	-.01287	0.03943
126	4.49	0.08352	0.27737	-.08231	0.10212	-.01606	0.04012
127	4.60	0.06365	0.26792	-.08331	0.11598	-.01594	0.04108
128	4.69	0.07603	0.27109	-.08130	0.10684	-.01420	0.03609
129	4.79	0.06468	0.26930	-.09534	0.10907	-.01367	0.04811
130	4.88	0.06413	0.27041	-.09434	0.11204	-.01431	0.03922
131	4.37	0.08876	0.28158	-.06125	0.09231	-.01337	0.02635

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
132	57.0	0.9898	518.99	103.88	12.7	0.200
133	57.0	0.9898	518.99	103.88	12.7	0.200
134	57.0	0.9898	518.99	103.88	12.7	0.200
135	57.0	0.9898	518.99	103.68	12.7	0.200
136	57.0	0.9898	518.99	103.88	12.7	0.200
137	57.0	0.9898	518.99	103.88	12.7	0.200
138	58.0	0.9879	519.30	103.98	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
132	7.1	-4.0	2.5	-2.2	43.13	0.87	-1.33	2.14
133	8.1	-4.0	3.0	-2.7	56.09	0.76	-1.59	2.50
134	9.1	-4.0	3.8	-3.1	69.40	0.48	-1.77	2.98
135	10.1	-4.0	4.7	-3.4	82.20	0.07	-1.83	3.59
136	11.1	-4.0	5.5	-4.2	93.79	-0.45	-2.29	4.28
137	12.1	-4.0	6.2	-4.7	107.03	-0.70	-2.59	5.15
138	7.1	-4.0	2.4	-2.2	43.13	0.92	-1.34	2.14

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
132	-3.66	43.09	1.88	4.6	.00240	0.00010	.000127	.000091
133	-3.56	56.02	2.72	5.3	.00313	0.00015	.000148	.000093
134	-3.45	69.31	3.70	5.7	.00387	0.00021	.000176	.000098
135	-3.35	82.07	4.73	5.7	.00458	0.00026	.000212	.000107
136	-3.26	93.61	5.78	5.6	.00522	0.00032	.000253	.000120
137	-3.15	106.83	6.58	5.2	.00596	0.00037	.000305	.000143
138	-3.66	43.10	1.83	4.5	.00241	0.00010	.000127	.000092

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
132	0.273	3.035	-0.147	0.782	-0.176	-0.222
133	0.103	3.025	-0.187	0.969	-0.167	-0.205
134	-0.068	2.955	-0.337	1.041	-0.133	-0.086
135	-0.208	2.925	-0.477	1.021	-0.148	0.034
136	-0.398	2.965	-0.447	1.136	-0.117	-0.064
137	-0.648	2.985	-0.537	1.327	-0.130	-0.051
138	0.433	3.075	-0.197	0.692	-0.167	-0.176

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
132	0.34	0.255	3.037	-0.147	0.782	-0.177	-0.221
133	0.44	0.080	3.026	-0.187	0.969	-0.169	-0.203
134	0.55	-0.096	2.954	-0.337	1.041	-0.134	-0.085
135	0.65	-0.241	2.922	-0.477	1.021	-0.148	0.036
136	0.74	-0.436	2.960	-0.447	1.136	-0.118	-0.062
137	0.85	-0.692	2.975	-0.537	1.327	-0.131	-0.049
138	0.34	0.415	3.078	-0.197	0.692	-0.168	-0.175

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
132	0.34	0.02555	0.30442	-.01474	0.07836	-.01773	-.02213
133	0.44	0.00797	0.30334	-.01875	0.09719	-.01691	-.02040
134	0.55	-.00966	0.29617	-.03379	0.10431	-.01339	-.00848
135	0.65	-.02419	0.29298	-.04782	0.10239	-.01480	0.00356
136	0.74	-.04375	0.29671	-.04481	0.11387	-.01180	-.00626
137	0.85	-.06939	0.29826	-.05384	0.13300	-.01313	-.00488
138	0.34	0.04157	0.30853	-.01975	0.06937	-.01689	-.01750

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
148	71.0	0.9653	525.90	105.19	12.7	0.200
149	71.0	0.9650	525.90	105.21	12.7	0.200
150	71.0	0.9650	525.90	105.21	12.7	0.200
151	71.0	0.9650	525.90	105.21	12.7	0.200
152	71.0	0.9650	525.90	105.21	12.7	0.200
153	72.0	0.9632	526.22	105.31	12.7	0.200
154	72.0	0.9632	526.22	105.31	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
148	9.0	-8.0	3.3	-2.0	43.77	0.77	-1.02	2.79
149	10.0	-8.0	4.0	-2.4	56.33	0.70	-1.35	3.37
150	11.0	-8.0	5.1	-2.9	69.27	0.37	-1.72	4.08
151	12.0	-8.0	5.8	-3.3	82.84	0.16	-1.87	4.90
152	13.1	-8.0	6.8	-3.9	94.63	-0.19	-2.27	5.81
153	14.1	-8.0	7.9	-4.2	105.58	-0.95	-2.35	6.83
154	9.0	-8.0	3.6	-1.8	43.76	0.75	-1.22	2.79

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
148	-7.65	43.48	5.06	4.6	.00242	0.00028	.000163	.000092
149	-7.55	55.93	6.71	5.1	.00312	0.00037	.000196	.000097
150	-7.45	68.73	8.61	5.4	.00383	0.00048	.000238	.000105
151	-7.34	82.18	10.43	5.4	.00458	0.00058	.000285	.000117
152	-7.25	93.85	12.13	5.1	.00523	0.00068	.000338	.000135
153	-7.16	104.64	14.10	4.9	.00584	0.00079	.000398	.000155
154	-7.65	43.47	5.08	4.6	.00242	0.00028	.000163	.000091

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
148	-2.640	3.190	-0.200	1.845	0.002	0.045
149	-2.560	3.230	-0.280	1.749	0.049	0.079
150	-2.550	3.180	-0.270	1.712	0.060	0.030
151	-2.640	3.120	-0.400	1.778	0.035	0.060
152	-2.720	3.200	-0.510	1.889	0.031	0.112
153	-2.680	3.160	-0.630	1.793	-0.014	0.144
154	-2.710	3.240	-0.300	1.968	0.039	0.128

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
148	-3.65	-2.431	3.352	-0.200	1.845	-0.000	0.045
149	-3.55	-2.355	3.382	-0.280	1.749	0.044	0.062
150	-3.45	-2.354	3.328	-0.270	1.712	0.058	0.034
151	-3.34	-2.454	3.269	-0.400	1.778	0.031	0.062
152	-3.25	-2.534	3.349	-0.510	1.889	0.024	0.114
153	-3.16	-2.502	3.303	-0.630	1.793	-0.022	0.143
154	-3.65	-2.498	3.406	-0.300	1.968	0.030	0.130

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
148	-3.65	-.24375	0.33602	-.02005	0.18496	-.00004	0.00454
149	-3.55	-.23608	0.33910	-.02807	0.17538	0.00445	0.00825
150	-3.45	-.23599	0.33361	-.02707	0.17163	0.00580	0.00337
151	-3.34	-.24598	0.32769	-.04010	0.17821	0.00314	0.00626
152	-3.25	-.25406	0.33575	-.05113	0.18935	0.00244	0.01142
153	-3.16	-.25079	0.33114	-.06316	0.17977	-.00217	0.01429
154	-3.65	-.25044	0.34147	-.03008	0.19729	0.00305	0.01304

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
155	74.0	0.9592	527.47	157.52	28.3	0.299
156	74.0	0.9592	527.47	157.52	28.3	0.299
157	74.0	0.9592	527.47	157.52	28.3	0.299
158	74.0	0.9592	527.79	157.52	28.3	0.298
159	75.0	0.9574	527.79	157.67	28.3	0.299
160	75.0	0.9574	527.79	157.67	28.3	0.299
161	75.0	0.9571	527.79	157.70	26.3	0.299

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
155	4.9	4.0	2.9	-1.4	48.61	1.51	-2.00	0.90
156	5.9	4.0	4.0	-1.8	62.73	1.33	-2.26	0.86
157	7.0	4.0	5.0	-2.4	75.00	1.01	-2.65	0.99
158	8.0	4.0	6.3	-3.0	86.16	0.64	-2.97	1.24
159	9.0	4.0	7.6	-3.4	96.68	-0.05	-3.11	1.69
160	10.0	4.0	8.8	-4.0	107.86	-0.85	-3.36	2.34
161	4.9	4.0	3.1	-1.5	47.86	1.38	-2.01	0.90

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
155	4.17	48.37	-5.05	5.9	.00270	-.00028	.000052	.000124
156	4.22	62.46	-5.94	7.0	.00348	-.00033	.000050	.000128
157	4.27	74.71	-6.58	7.5	.00416	-.00037	.000057	.000138
158	4.31	85.86	-7.11	7.5	.00478	-.00040	.000072	.000152
159	4.34	96.41	-7.28	7.3	.00538	-.00041	.000098	.000171
160	4.38	107.61	-7.40	6.9	.00600	-.00041	.000136	.000199
161	4.17	47.63	-4.86	6.0	.00266	-.00027	.000052	.000121

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
155	4.660	5.160	-1.510	1.859	-0.067	0.979
156	4.710	5.020	-1.580	1.748	-0.110	1.013
157	4.410	5.010	-1.650	2.166	-0.102	1.038
158	4.740	5.010	-1.930	1.831	-0.133	1.378
159	4.760	5.070	-2.030	2.090	-0.127	1.390
160	4.420	4.920	-2.060	2.150	-0.128	1.398
161	4.810	5.060	-1.470	1.584	-0.035	0.902

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
155	8.17	3.879	5.770	-1.510	1.859	0.073	0.978
156	8.22	3.944	5.642	-1.580	1.748	0.036	1.019
157	8.27	3.644	5.592	-1.650	2.166	0.048	1.042
158	8.31	3.966	5.642	-1.930	1.831	0.068	1.382
159	8.34	3.974	5.707	-2.030	2.090	0.077	1.394
160	8.38	3.655	5.512	-2.060	2.150	0.077	1.402
161	8.17	4.042	5.692	-1.470	1.584	0.093	0.897

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
155	8.17	0.17452	0.25959	-.06793	0.08364	0.00328	0.04401
156	8.22	0.17742	0.25383	-.07108	0.07864	0.00164	0.04583
157	8.27	0.16393	0.25158	-.07423	0.09746	0.00216	0.04689
158	8.31	0.17845	0.25384	-.08683	0.08236	0.00304	0.06219
159	8.34	0.17878	0.25676	-.09133	0.09402	0.00344	0.06271
160	8.38	0.16446	0.24798	-.09268	0.09674	0.00349	0.06306
161	8.17	0.18185	0.25609	-.06613	0.07126	0.00419	0.04038

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
162	75.0	0.9571	527.79	157.70	28.3	0.299
163	75.0	0.9571	527.79	157.70	28.3	0.299
164	75.0	0.9571	527.79	157.70	28.3	0.299
165	76.0	0.9553	528.42	157.84	28.3	0.299
166	76.0	0.9553	528.42	157.84	28.3	0.299
167	76.0	0.9553	528.42	157.84	28.3	0.299
168	76.0	0.9557	528.42	157.82	28.3	0.299

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
162	6.9	0.0	4.3	-1.7	48.58	1.21	-1.62	1.79
163	8.0	0.0	5.5	-2.1	60.43	0.69	-1.97	2.02
164	9.0	0.0	6.7	-2.6	73.13	0.42	-2.23	2.40
165	10.0	0.0	7.7	-3.1	84.42	0.02	-2.37	2.87
166	11.0	0.0	8.9	-3.8	96.20	-0.34	-2.67	3.56
167	12.0	0.0	10.2	-4.1	105.85	-1.37	-2.71	4.50
168	7.0	0.0	4.4	-1.6	49.74	1.13	-1.62	1.82

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
162	0.17	48.58	-1.36	6.4	.00271	-.00006	.000104	.000114
163	0.21	60.43	-0.92	7.6	.00337	-.00005	.000118	.000114
164	0.26	73.12	-0.75	8.0	.00408	-.00004	.000140	.000124
165	0.30	84.42	-0.47	8.1	.00471	-.00003	.000167	.000137
166	0.34	96.20	-0.23	7.6	.00536	-.00001	.000206	.000162
167	0.38	105.86	0.68	7.1	.00590	0.00004	.000261	.000191
168	0.18	49.74	-1.28	6.5	.00277	-.00007	.000105	.000114

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
162	3.940	6.100	-0.930	1.070	0.005	0.221
163	3.790	5.950	-1.100	1.215	-0.001	0.329
164	3.880	5.980	-1.050	1.211	0.030	0.223
165	3.870	5.970	-1.200	1.260	0.015	0.361
166	3.730	5.960	-1.240	1.390	0.023	0.359
167	3.740	5.910	-1.250	1.413	0.003	0.208
168	3.770	6.020	-1.100	1.191	0.009	0.299

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
162	4.17	3.486	6.371	-0.930	1.070	0.021	0.220
163	4.21	3.342	6.212	-1.100	1.215	0.023	0.328
164	4.26	3.425	6.252	-1.050	1.211	0.047	0.220
165	4.30	3.411	6.243	-1.200	1.260	0.042	0.359
166	4.34	3.268	6.225	-1.240	1.390	0.050	0.356
167	4.38	3.278	6.178	-1.250	1.413	0.019	0.207
168	4.18	3.322	6.279	-1.100	1.191	0.030	0.297

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
162	4.17	0.15682	0.28661	-.04184	0.04816	0.00095	0.00992
163	4.21	0.15036	0.27950	-.04949	0.05466	0.00102	0.01476
164	4.26	0.15409	0.28126	-.04724	0.05446	0.00211	0.00988
165	4.30	0.15348	0.28089	-.05399	0.05670	0.00188	0.01617
166	4.34	0.14703	0.28007	-.05579	0.06255	0.00226	0.01601
167	4.38	0.14748	0.27795	-.05624	0.06356	0.00084	0.00931
168	4.18	0.14943	0.28247	-.04949	0.05358	0.00136	0.01338

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
169	76.0	0.9557	528.42	157.82	28.3	0.299
170	76.0	0.9557	528.42	157.82	28.3	0.299
171	76.0	0.9557	528.42	157.82	28.3	0.299
172	77.0	0.9542	528.73	157.94	28.3	0.299
173	77.0	0.9542	528.73	157.94	28.3	0.299
174	77.0	0.9542	528.73	157.94	28.3	0.299
175	77.0	0.9542	528.73	157.94	28.3	0.299

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
169	8.9	-4.0	5.6	-2.1	48.31	1.19	-1.25	2.77
170	10.0	-4.0	7.1	-2.6	61.60	0.99	-1.57	3.30
171	11.0	-4.0	8.2	-2.9	73.80	0.75	-1.65	3.89
172	12.0	-4.0	9.3	-3.4	84.70	0.40	-1.74	4.61
173	13.0	-4.0	10.3	-4.2	95.80	-0.09	-2.25	5.53
174	14.0	-4.0	12.0	-4.4	104.74	-1.30	-2.08	6.69
175	9.0	-4.0	6.0	-2.0	49.65	1.16	-1.19	2.81

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
169	-3.83	48.28	2.04	6.4	.00269	0.00011	.000161	.000114
170	-3.78	61.53	3.08	7.3	.00343	0.00017	.000192	.000121
171	-3.74	73.69	4.06	7.8	.00411	0.00023	.000226	.000130
172	-3.70	84.55	5.07	7.7	.00471	0.00028	.000267	.000146
173	-3.66	95.60	6.20	7.3	.00533	0.00035	.000320	.000170
174	-3.63	104.45	7.92	6.8	.00582	0.00044	.000388	.000199
175	-3.82	49.62	2.16	6.5	.00277	0.00012	.000163	.000114

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
169	3.100	6.960	-0.220	0.576	0.242	-0.406
170	2.910	6.990	-0.370	0.781	0.246	-0.257
171	3.070	6.940	-0.380	0.565	0.246	-0.328
172	3.130	6.970	-0.490	0.578	0.232	-0.246
173	2.860	6.910	-0.540	0.660	0.180	-0.290
174	2.870	6.950	-0.700	0.709	0.174	-0.242
175	2.900	6.920	-0.380	0.753	0.216	-0.228

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
169	0.17	3.079	6.969	-0.220	0.576	0.240	-0.407
170	0.22	2.883	7.001	-0.370	0.781	0.245	-0.258
171	0.26	3.038	6.954	-0.380	0.565	0.244	-0.329
172	0.30	3.093	6.986	-0.490	0.578	0.230	-0.247
173	0.34	2.819	6.927	-0.540	0.660	0.178	-0.291
174	0.37	2.825	6.969	-0.700	0.709	0.172	-0.243
175	0.18	2.879	6.929	-0.380	0.753	0.215	-0.229

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
169	0.17	0.13853	0.31355	-.00990	0.02592	0.01082	-.01831
170	0.22	0.12972	0.31498	-.01665	0.03513	0.01102	-.01162
171	0.26	0.13669	0.31286	-.01710	0.02540	0.01098	-.01481
172	0.30	0.13917	0.31431	-.02204	0.02600	0.01036	-.01113
173	0.34	0.12682	0.31164	-.02429	0.02970	0.00800	-.01309
174	0.37	0.12708	0.31351	-.03149	0.03192	0.00774	-.01092
175	0.18	0.12951	0.31173	-.01710	0.03387	0.00967	-.01029

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
176	77.0	0.9542	528.73	157.94	28.3	0.299
177	77.0	0.9542	528.73	157.94	28.3	0.299
178	77.0	0.9542	528.73	157.94	28.3	0.299
179	77.0	0.9542	528.73	157.94	28.3	0.299
180	77.0	0.9542	528.73	157.94	28.3	0.299
181	77.0	0.9542	528.73	157.94	28.3	0.299

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
176	11.0	-8.0	7.2	-2.4	48.68	1.13	-0.81	3.64
177	12.0	-8.0	8.3	-2.9	59.55	0.71	-0.94	4.58
178	13.1	-8.0	9.3	-3.2	71.93	0.40	-1.00	5.45
179	14.1	-8.0	10.6	-3.7	82.57	-0.05	-1.07	6.37
180	15.1	-8.0	11.5	-4.2	94.52	-0.31	-1.27	7.47
181	11.0	-8.0	7.2	-2.4	49.66	1.16	-0.67	3.86

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
176	-7.83	48.38	5.51	6.1	.00270	0.00031	.000223	.000119
177	-7.79	59.10	7.36	6.9	.00330	0.00041	.000266	.000125
178	-7.74	71.33	9.29	7.4	.00398	0.00052	.000316	.000135
179	-7.71	81.81	11.12	7.4	.00456	0.00062	.000370	.000150
180	-7.66	93.64	12.91	7.1	.00522	0.00072	.000433	.000173
181	-7.82	49.36	5.61	6.3	.00275	0.00031	.000224	.000118

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
176	-0.570	7.200	-1.260	0.866	0.432	1.037
177	-0.750	7.240	-1.370	0.992	0.458	1.169
178	-1.020	7.250	-1.430	1.001	0.466	1.175
179	-1.290	7.280	-1.400	1.120	0.467	1.017
180	-1.420	7.260	-1.410	1.191	0.447	0.986
181	-0.500	7.100	-1.260	0.735	0.442	1.077

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
176	-3.83	-0.088	7.222	-1.260	0.866	0.362	1.064
177	-3.79	-0.270	7.274	-1.370	0.992	0.380	1.197
178	-3.74	-0.544	7.301	-1.430	1.001	0.388	1.202
179	-3.71	-0.817	7.348	-1.400	1.120	0.400	1.045
180	-3.66	-0.953	7.336	-1.410	1.191	0.383	1.013
181	-3.82	-0.025	7.118	-1.260	0.735	0.370	1.104

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
176	-3.83	-.00397	0.32492	-.05669	0.03898	0.01630	0.04785
177	-3.79	-.01215	0.32724	-.06164	0.04461	0.01710	0.05384
178	-3.74	-.02449	0.32848	-.06434	0.04505	0.01747	0.05410
179	-3.71	-.03674	0.33059	-.06299	0.05040	0.01802	0.04701
180	-3.66	-.04288	0.33004	-.06344	0.05360	0.01723	0.04555
181	-3.82	-.00115	0.32022	-.05669	0.03308	0.01663	0.04968

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
182	77.0	0.9545	528.73	157.91	28.3	0.299
183	77.0	0.9545	528.73	157.91	28.3	0.299
184	77.0	0.9545	528.73	157.91	28.3	0.299
185	77.0	0.9545	528.73	157.91	28.3	0.299
186	77.0	0.9545	528.73	157.91	28.3	0.299

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
182	13.0	-12.0	8.5	-2.5	49.25	0.84	-0.43	4.96
183	14.0	-12.0	9.5	-3.1	59.96	0.47	-0.55	5.92
184	15.1	-12.0	10.4	-3.4	73.05	0.28	-0.46	7.08
185	16.1	-12.0	11.5	-3.7	84.31	-0.15	-0.56	8.32
186	13.1	-12.0	8.2	-2.5	49.68	0.97	-0.30	4.94

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
182	-11.82	48.38	9.27	6.0	.00270	0.00052	.000288	.000121
183	-11.79	58.79	11.79	6.6	.00328	0.00066	.000344	.000129
184	-11.74	71.58	14.59	7.1	.00399	0.00081	.000411	.000141
185	-11.70	82.53	17.24	7.0	.00460	0.00096	.000483	.000160
186	-11.82	48.83	9.23	6.1	.00272	0.00051	.000287	.000121

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 16 CONFIGURATION BHR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
182	-6.370	7.400	-0.290	2.961	0.259	0.169
183	-6.220	7.380	-0.350	2.763	0.247	0.164
184	-6.200	7.420	-0.500	2.743	0.201	0.123
185	-5.910	7.520	-0.510	2.260	0.201	0.022
186	-6.420	7.310	-0.040	2.871	0.308	0.047

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
182	-7.82	-5.303	8.198	-0.290	2.961	0.234	0.202
183	-7.79	-5.163	8.155	-0.350	2.763	0.222	0.196
184	-7.74	-5.144	8.187	-0.500	2.743	0.183	0.149
185	-7.70	-4.849	8.244	-0.510	2.260	0.196	0.049
186	-7.82	-5.365	8.116	-0.040	2.871	0.299	0.089

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
182	-7.82	-.23859	0.36884	-.01305	0.13322	0.01051	0.00910
183	-7.79	-.23227	0.36688	-.01575	0.12430	0.01000	0.00882
184	-7.74	-.23144	0.36835	-.02249	0.12340	0.00822	0.00671
185	-7.70	-.21816	0.37090	-.02294	0.10170	0.00882	0.00221
186	-7.82	-.24138	0.36513	-.00180	0.12915	0.01346	0.00399

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 17 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
191	63.0	0.9867	521.82	130.57	20.0	0.250
192	64.0	0.9848	522.45	130.69	20.0	0.250
193	64.0	0.9848	522.45	130.69	20.0	0.250
194	65.0	0.9830	522.76	130.81	20.0	0.250
195	65.0	0.9830	522.76	130.81	20.0	0.250
196	66.0	0.9811	523.39	130.94	20.0	0.250
197	67.0	0.9792	524.02	131.06	20.0	0.250

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
191	8.0	-4.0	3.6	-2.1	46.44	1.19	-1.01	2.45
192	9.0	-4.0	4.7	-2.6	60.04	1.07	-1.39	2.93
193	10.0	-4.0	5.7	-3.1	72.29	0.71	-1.92	3.51
194	11.0	-4.0	6.8	-3.6	84.19	0.34	-2.22	4.19
195	12.1	-4.0	7.9	-4.3	96.97	-0.23	-2.69	5.09
196	13.1	-4.0	9.0	-4.9	108.39	-0.88	-3.12	6.15
197	8.0	-4.0	4.1	-2.0	46.79	1.21	-1.39	2.47

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
191	-3.77	46.42	1.86	5.5	.00257	0.00010	.000143	.000104
192	-3.70	59.98	2.80	6.3	.00332	0.00016	.000171	.000110
193	-3.64	72.19	3.87	6.6	.00399	0.00021	.000204	.000119
194	-3.58	84.04	4.91	6.6	.00465	0.00027	.000244	.000133
195	-3.51	96.77	6.17	6.4	.00536	0.00034	.000296	.000154
196	-3.45	108.14	7.41	5.9	.00598	0.00041	.000357	.000183
197	-3.76	46.77	1.86	5.5	.00259	0.00010	.000144	.000104

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 17 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
191	1.880	4.890	-0.130	0.424	0.065	-0.370
192	1.770	4.940	-0.190	0.554	0.073	-0.314
193	1.680	4.880	-0.340	0.670	0.067	-0.175
194	1.660	4.870	-0.420	0.579	0.054	-0.141
195	1.560	4.830	-0.420	0.653	0.054	-0.161
196	1.420	4.870	-0.540	0.821	0.060	-0.080
197	1.930	4.920	-0.190	0.467	0.043	-0.274

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
191	0.23	1.860	4.898	-0.130	0.424	0.064	-0.370
192	0.30	1.744	4.949	-0.190	0.554	0.071	-0.314
193	0.36	1.649	4.891	-0.340	0.670	0.066	-0.175
194	0.42	1.624	4.882	-0.420	0.579	0.053	-0.141
195	0.49	1.519	4.843	-0.420	0.653	0.053	-0.161
196	0.55	1.374	4.883	-0.540	0.821	0.079	-0.081
197	0.24	1.910	4.928	-0.190	0.467	0.042	-0.274

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
191	0.23	0.11841	0.31179	-.00828	0.02700	0.00405	-.02354
192	0.30	0.11102	0.31507	-.01210	0.03528	0.00453	-.02001
193	0.36	0.10497	0.31134	-.02164	0.04264	0.00421	-.01117
194	0.42	0.10338	0.31080	-.02674	0.03684	0.00338	-.00900
195	0.49	0.09669	0.30831	-.02674	0.04156	0.00336	-.01028
196	0.55	0.08744	0.31087	-.03438	0.05227	0.00502	-.00513
197	0.24	0.12158	0.31371	-.01210	0.02971	0.00265	-.01745

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 18 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BUDY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
198	66.0	0.9811	523.39	79.11	7.3	0.151
199	66.0	0.9811	523.39	79.11	7.3	0.151
200	65.0	0.9833	522.76	79.02	7.3	0.151
201	65.0	0.9833	522.76	80.09	7.5	0.153
202	65.0	0.9833	522.76	80.63	7.6	0.154
203	65.0	0.9833	522.76	81.15	7.7	0.155
204	65.0	0.9833	522.76	80.09	7.5	0.153

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
198	7.0	-4.0	2.0	-2.2	43.15	0.73	-1.29	2.03
199	8.0	-4.0	2.6	-2.7	57.46	0.68	-1.53	2.42
200	9.0	-4.0	3.1	-3.2	70.84	0.59	-1.86	2.90
201	10.0	-4.0	3.9	-3.6	83.29	0.42	-2.23	3.46
202	11.1	-4.0	4.6	-4.1	96.05	0.23	-2.60	4.14
203	12.1	-4.0	5.4	-4.4	108.98	-0.20	-2.98	5.00
204	7.0	-4.0	2.1	-2.2	44.06	0.77	-1.23	2.05

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
198	-3.40	43.12	1.83	3.5	.00239	0.00010	.000118	.000084
199	-3.21	57.41	2.53	4.0	.00318	0.00014	.000140	.000086
200	-3.02	70.77	3.14	4.2	.00392	0.00017	.000169	.000092
201	-2.88	83.21	3.77	4.2	.00461	0.00021	.000202	.000100
202	-2.73	95.95	4.34	4.0	.00531	0.00024	.000241	.000112
203	-2.58	108.86	5.10	3.8	.00603	0.00028	.000291	.000130
204	-3.41	44.03	1.85	3.6	.00244	0.00010	.000119	.000084

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 18 CONFIGURATION BHR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
198	-0.340	1.810	-0.510	0.757	0.071	0.322
199	-0.350	1.810	-0.650	0.756	0.085	0.422
200	-0.560	1.730	-0.540	0.823	0.070	0.230
201	-0.820	1.700	-0.570	1.045	0.028	0.248
202	-1.230	1.680	-0.540	1.316	-0.040	0.080
203	-1.340	1.640	-0.620	1.289	-0.083	0.084
204	-0.290	1.840	-0.510	0.719	0.061	0.332

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
198	0.60	-0.359	1.806	-0.510	0.757	0.074	0.322
199	0.79	-0.375	1.805	-0.650	0.756	0.091	0.421
200	0.98	-0.589	1.720	-0.540	0.823	0.074	0.229
201	1.12	-0.853	1.684	-0.570	1.045	0.033	0.247
202	1.27	-1.267	1.652	-0.540	1.316	-0.039	0.081
203	1.42	-1.380	1.606	-0.620	1.289	-0.081	0.086
204	0.59	-0.309	1.837	-0.510	0.719	0.064	0.332

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
198	0.60	-.06258	0.31505	-.08895	0.13197	0.01292	0.05610
199	0.79	-.06540	0.31481	-.11337	0.13184	0.01593	0.07340
200	0.98	-.10280	0.30002	-.09418	0.14362	0.01283	0.03993
201	1.12	-.14481	0.28582	-.09676	0.17747	0.00566	0.04199
202	1.27	-.21226	0.27680	-.09046	0.22045	-.00646	0.01358
203	1.42	-.22825	0.26558	-.10252	0.21319	-.01344	0.01427
204	0.59	-.05245	0.31184	-.08658	0.12209	0.01090	0.05632

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
210	55.0	1.0031	520.56	51.80	3.2	0.100
211	55.0	1.0031	518.05	51.80	3.2	0.100
212	55.0	1.0031	518.05	51.80	3.2	0.100
213	55.0	1.0031	518.05	51.80	3.2	0.100
214	56.0	1.0011	518.36	53.45	3.4	0.103
215	56.0	1.0011	518.36	54.99	3.6	0.106
216	57.0	0.9992	518.99	55.81	3.7	0.108

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
210	6.0	4.0	0.4	-3.2	46.17	0.22	-0.57	1.50
211	7.0	4.0	0.5	-3.6	62.02	0.29	-0.82	1.69
212	8.1	4.0	0.8	-4.5	75.77	0.25	-1.42	2.04
213	9.0	4.0	1.0	-5.1	86.96	0.29	-1.89	2.44
214	10.0	4.0	1.5	-5.5	99.76	0.01	-2.34	2.98
215	11.0	4.0	2.2	-5.8	112.23	-0.34	-2.65	3.63
216	5.9	4.0	0.5	-3.3	47.99	0.32	-0.60	1.47

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
210	5.45	45.93	-4.61	2.2	.00251	-.00025	.000087	.000080
211	5.95	61.66	-6.72	2.5	.00341	-.00037	.000099	.000078
212	6.38	75.27	-8.67	2.5	.00416	-.00048	.000120	.000081
213	6.74	86.32	-10.49	2.4	.00477	-.00056	.000143	.000087
214	6.95	99.02	-12.08	2.3	.00548	-.00067	.000175	.000098
215	7.14	111.40	-13.61	2.2	.00616	-.00075	.000213	.000114
216	5.31	47.76	-4.76	2.5	.00264	-.00026	.000086	.000082

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
210	0.470	0.960	-0.180	0.758	0.003	-0.033
211	0.450	0.920	-0.190	0.738	0.003	-0.084
212	0.390	0.900	-0.250	0.795	0.011	-0.038
213	0.420	0.880	-0.190	0.698	0.003	-0.104
214	0.340	0.870	-0.250	0.862	0.021	-0.108
215	0.410	0.900	-0.270	0.846	0.020	-0.120
216	0.410	1.100	-0.270	1.109	-0.000	-0.010

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
210	9.45	0.306	1.024	-0.180	0.758	-0.002	-0.033
211	9.95	0.284	0.984	-0.190	0.738	-0.012	-0.083
212	10.38	0.221	0.956	-0.250	0.795	0.003	-0.040
213	10.74	0.249	0.943	-0.190	0.698	-0.017	-0.103
214	10.95	0.168	0.919	-0.250	0.862	-0.000	-0.110
215	11.14	0.228	0.962	-0.270	0.846	-0.004	-0.121
216	9.31	0.227	1.152	-0.270	1.109	-0.002	-0.010

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
210	9.45	0.11165	0.37375	-.06569	0.24879	-.00075	-.01094
211	9.95	0.10373	0.35907	-.06934	0.24224	-.00385	-.02730
212	10.38	0.08079	0.34871	-.09123	0.26072	0.00114	-.01303
213	10.74	0.09077	0.34407	-.06934	0.22889	-.00544	-.03370
214	10.95	0.05787	0.31556	-.08587	0.26621	-.00013	-.03408
215	11.14	0.07409	0.31214	-.08758	0.24676	-.00109	-.03542
216	9.31	0.07156	0.36354	-.08522	0.31455	-.00051	-.00277

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
217	58.0	0.9976	519.30	57.34	3.9	0.110
218	58.0	0.9976	519.30	58.07	4.0	0.112
219	59.0	0.9957	519.93	58.13	4.0	0.112
220	59.0	0.9957	519.93	58.85	4.1	0.113
221	59.0	0.9953	519.93	58.86	4.1	0.113
222	59.0	0.9953	519.93	59.57	4.2	0.115
223	60.0	0.9934	520.25	58.92	4.1	0.113

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
217	7.0	0.0	0.8	-3.3	53.23	0.27	-0.42	1.66
218	8.0	0.0	1.3	-4.0	66.03	0.25	-0.86	2.18
219	9.0	0.0	1.7	-4.1	79.31	0.31	-1.21	2.65
220	10.0	0.0	2.1	-4.9	91.72	0.22	-1.52	3.20
221	11.1	0.0	2.8	-5.5	103.63	-0.01	-2.00	3.87
222	12.1	0.0	3.1	-6.0	116.09	-0.08	-2.69	4.66
223	7.0	0.0	1.1	-3.7	53.98	0.51	-0.66	1.87

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
217	1.37	53.21	-1.55	2.7	.00294	-.00009	.000109	.000079
218	1.66	65.99	-2.16	2.9	.00365	-.00012	.000128	.000082
219	2.00	79.25	-3.07	2.8	.00438	-.00017	.000155	.000088
220	2.25	91.65	-3.83	2.7	.00506	-.00021	.000187	.000098
221	2.54	103.53	-4.59	2.5	.00572	-.00025	.000226	.000110
222	2.78	115.96	-5.56	2.4	.00641	-.00031	.000272	.000128
223	1.33	53.95	-1.76	2.8	.00298	-.00010	.000109	.000081

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
217	0.300	1.230	-0.250	0.326	0.021	-0.098
218	0.150	1.240	-0.280	0.454	0.019	-0.091
219	0.260	1.230	-0.220	0.293	0.022	-0.186
220	0.260	1.220	-0.250	0.303	0.031	-0.228
221	0.130	1.210	-0.290	0.414	0.039	-0.241
222	0.270	1.210	-0.260	0.284	0.040	-0.319
223	0.250	1.330	-0.220	0.498	0.042	-0.106

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
217	5.37	0.183	1.253	-0.250	0.326	0.011	-0.100
218	5.66	0.027	1.249	-0.280	0.454	0.010	-0.092
219	6.00	0.130	1.250	-0.220	0.293	0.002	-0.187
220	6.25	0.126	1.241	-0.250	0.303	0.006	-0.230
221	6.54	-0.009	1.217	-0.290	0.414	0.011	-0.244
222	6.78	0.125	1.233	-0.260	0.284	0.002	-0.322
223	5.33	0.125	1.347	-0.220	0.498	0.032	-0.110

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
217	5.37	0.05494	0.37510	-.07486	0.08767	0.00303	-.02690
218	5.66	0.00786	0.36457	-.08175	0.11922	0.00273	-.02418
219	6.00	0.03798	0.36506	-.06423	0.07683	0.00056	-.04920
220	6.25	0.03577	0.35349	-.07121	0.07761	0.00141	-.05899
221	6.54	-.00250	0.34661	-.08260	0.10598	0.00289	-.06254
222	6.78	0.03481	0.34295	-.07229	0.07105	0.00055	-.08040
223	5.33	0.03574	0.38379	-.06266	0.12757	0.00811	-.02807

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
224	62.0	0.9896	521.50	52.15	3.2	0.100
225	62.0	0.9896	521.50	53.75	3.4	0.103
226	63.0	0.9877	521.82	55.37	3.6	0.106
227	63.0	0.9880	521.82	57.62	3.9	0.110
228	63.0	0.9880	521.82	59.08	4.1	0.113
229	64.0	0.9862	522.45	60.56	4.3	0.116
230	64.0	0.9862	522.45	60.56	4.3	0.116

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
224	8.0	-4.0	0.9	-3.8	52.82	0.68	-0.94	2.30
225	9.0	-4.0	1.3	-4.1	65.20	0.68	-1.27	2.77
226	10.1	-4.0	1.8	-4.5	78.22	0.71	-1.59	3.34
227	11.1	-4.0	2.3	-5.1	91.49	0.64	-2.02	4.04
228	12.1	-4.0	2.9	-5.8	103.87	0.52	-2.64	4.83
229	13.1	-4.0	3.8	-6.0	116.56	-0.00	-3.00	5.78
230	8.1	-4.0	1.5	-3.6	54.73	0.82	-1.04	2.34

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
224	-2.34	52.80	1.47	2.3	.00292	0.00008	.000134	.000083
225	-2.07	65.18	1.67	2.4	.00360	0.00009	.000161	.000089
226	-1.81	78.20	1.77	2.5	.00432	0.00010	.000195	.000096
227	-1.64	91.48	1.98	2.5	.00506	0.00011	.000235	.000107
228	-1.45	103.84	2.11	2.4	.00574	0.00012	.000281	.000123
229	-1.27	116.53	2.59	2.3	.00644	0.00014	.000336	.000141
230	-2.72	54.71	1.77	2.8	.00302	0.00010	.000136	.000085

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
224	-0.160	1.060	-0.180	-0.162	0.053	-0.173
225	-0.340	1.110	-0.210	-0.077	0.052	-0.195
226	-0.360	1.160	-0.230	-0.130	0.061	-0.257
227	-0.200	1.220	-0.270	-0.321	0.060	-0.310
228	-0.290	1.280	-0.340	-0.220	0.057	-0.295
229	-0.240	1.340	-0.360	-0.318	0.056	-0.357
230	-0.190	1.450	-0.180	-0.039	0.043	-0.263

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
224	1.66	-0.191	1.055	-0.180	-0.162	0.048	-0.175
225	1.93	-0.377	1.098	-0.210	-0.077	0.045	-0.197
226	2.19	-0.404	1.145	-0.230	-0.130	0.051	-0.259
227	2.36	-0.250	1.211	-0.270	-0.321	0.047	-0.312
228	2.55	-0.347	1.266	-0.340	-0.220	0.044	-0.297
229	2.73	-0.304	1.327	-0.360	-0.318	0.039	-0.359
230	1.28	-0.222	1.445	-0.180	-0.039	0.037	-0.264

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
224	1.66	-.06958	0.38497	-.06569	-.05307	0.01580	-.05732
225	1.93	-.12956	0.37710	-.07213	-.02376	0.01404	-.06086
226	2.19	-.13106	0.37156	-.07461	-.03800	0.01501	-.07555
227	2.36	-.07489	0.36253	-.08085	-.08634	0.01265	-.08401
228	2.55	-.09874	0.36054	-.09684	-.05624	0.01126	-.07612
229	2.73	-.08243	0.36040	-.09777	-.07769	0.00961	-.08760
230	1.28	-.06039	0.39254	-.04888	-.00945	0.00911	-.06449

MAIN ROTOR—FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
231	65.0	0.9839	522.76	62.02	4.5	0.119
232	65.0	0.9839	522.76	62.71	4.6	0.120
233	66.0	0.9821	523.39	63.44	4.7	0.121
234	66.0	0.9821	523.39	63.44	4.7	0.121
235	66.0	0.9821	523.39	63.44	4.7	0.121
236	66.0	0.9821	523.39	63.44	4.7	0.121
237	67.0	0.9802	524.02	63.50	4.7	0.121

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
231	9.1	-8.0	1.9	-3.6	57.27	0.69	-1.05	2.86
232	10.0	-8.0	2.3	-4.0	70.01	0.60	-1.39	3.48
233	11.1	-8.0	2.9	-4.4	82.48	0.29	-1.69	4.20
234	12.1	-8.0	3.3	-4.8	95.51	0.19	-2.08	5.04
235	13.1	-8.0	3.8	-5.3	106.95	0.13	-2.49	5.86
236	14.2	-8.0	4.7	-5.7	119.64	-0.27	-2.88	6.94
237	9.0	-8.0	2.0	-3.5	57.22	0.50	-1.07	2.91

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
231	-6.72	56.96	6.01	2.9	.00315	0.00033	.000166	.000085
232	-6.47	69.63	7.29	3.0	.00385	0.00040	.000203	.000093
233	-6.23	82.02	8.66	3.0	.00453	0.00048	.000244	.000101
234	-5.95	95.02	9.71	2.8	.00525	0.00054	.000293	.000114
235	-5.71	106.43	10.51	2.6	.00588	0.00058	.000341	.000127
236	-5.44	119.08	11.60	2.5	.00658	0.00064	.000403	.000147
237	-6.77	56.88	6.26	3.0	.00314	0.00035	.000169	.000086

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 19 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
231	-0.850	1.490	-0.320	-0.549	0.048	-0.164
232	-0.800	1.520	-0.340	-0.666	0.047	-0.235
233	-0.860	1.520	-0.410	-0.711	0.055	-0.280
234	-0.760	1.560	-0.470	-0.815	0.072	-0.335
235	-0.680	1.590	-0.430	-0.880	0.074	-0.442
236	-0.580	1.590	-0.470	-0.933	0.092	-0.505
237	-0.780	1.570	-0.360	-0.667	0.066	-0.127

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
231	-2.72	-0.778	1.529	-0.320	-0.549	0.056	-0.161
232	-2.47	-0.734	1.553	-0.340	-0.666	0.057	-0.233
233	-2.23	-0.800	1.552	-0.410	-0.711	0.065	-0.278
234	-1.95	-0.706	1.585	-0.470	-0.815	0.084	-0.332
235	-1.71	-0.632	1.610	-0.430	-0.880	0.087	-0.439
236	-1.44	-0.540	1.604	-0.470	-0.933	0.105	-0.502
237	-2.77	-0.703	1.606	-0.360	-0.667	0.072	-0.123

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
231	-2.72	-.20199	0.39669	-.08304	-.12804	0.01298	-.03759
232	-2.47	-.18629	0.39426	-.08631	-.15206	0.01306	-.05313
233	-2.23	-.19880	0.38571	-.10187	-.15874	0.01461	-.06207
234	-1.95	-.17551	0.39382	-.11678	-.18200	0.01868	-.07415
235	-1.71	-.15710	0.39992	-.10684	-.19657	0.01941	-.09812
236	-1.44	-.13416	0.39855	-.11678	-.20832	0.02343	-.11216
237	-2.77	-.17470	0.39901	-.08945	-.14891	0.01618	-.02751

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 20 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
239	68.0	0.9784	524.33	77.57	7.0	0.148
240	69.0	0.9765	524.96	77.65	7.0	0.148
241	69.0	0.9765	524.96	77.65	7.0	0.146
242	69.0	0.9765	524.96	77.65	7.0	0.148
243	70.0	0.9747	525.27	77.72	7.0	0.148
244	70.0	0.9747	525.27	77.72	7.0	0.148
245	70.0	0.9743	525.27	77.73	7.0	0.148

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
239	8.0	-4.0	2.3	-3.3	54.12	0.70	-1.03	2.34
240	9.1	-4.0	2.8	-3.5	68.54	0.61	-1.26	2.83
241	10.0	-4.0	3.2	-4.1	80.06	0.61	-1.59	3.32
242	11.1	-4.0	4.0	-4.5	94.26	0.45	-1.97	4.03
243	12.1	-4.0	4.6	-5.2	106.81	0.24	-2.50	4.82
244	13.1	-4.0	5.3	-5.6	118.83	-0.05	-2.93	5.74
245	8.0	-4.0	2.3	-3.2	54.37	0.83	-1.03	2.40

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
239	-3.22	54.07	2.34	3.8	.00299	0.00013	.000136	.000086
240	-3.01	68.47	3.00	4.0	.00378	0.00017	.000164	.000091
241	-2.85	79.99	3.37	4.0	.00442	0.00019	.000192	.000099
242	-2.64	94.18	3.90	3.8	.00521	0.00022	.000233	.000110
243	-2.46	106.73	4.35	3.6	.00590	0.00024	.000279	.000126
244	-2.29	118.73	4.80	3.3	.00657	0.00027	.000332	.000147
245	-3.22	54.33	2.23	3.7	.00301	0.00012	.000139	.000090

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 20 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
239	-0.200	2.360	-0.260	-0.044	0.010	-0.319
240	-0.200	2.290	-0.350	-0.101	0.017	-0.276
241	-0.280	2.280	-0.450	-0.187	0.033	-0.253
242	-0.530	2.300	-0.430	-0.086	0.044	-0.302
243	-0.460	2.250	-0.460	-0.239	0.063	-0.384
244	-0.270	2.350	-0.590	-0.459	0.068	-0.364
245	-0.150	2.350	-0.300	-0.150	0.009	-0.222

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
239	0.78	-0.232	2.357	-0.260	-0.044	0.006	-0.319
240	0.99	-0.239	2.286	-0.350	-0.101	0.012	-0.276
241	1.15	-0.326	2.274	-0.450	-0.187	0.026	-0.254
242	1.36	-0.584	2.287	-0.430	-0.086	0.037	-0.303
243	1.54	-0.520	2.237	-0.460	-0.239	0.052	-0.385
244	1.71	-0.340	2.341	-0.590	-0.459	0.057	-0.365
245	0.78	-0.182	2.348	-0.300	-0.150	0.006	-0.222

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
239	0.78	-.03871	0.39322	-.04337	-.00657	0.00088	-.04788
240	0.99	-.03993	0.38140	-.05839	-.01517	0.00181	-.04140
241	1.15	-.05435	0.37935	-.07507	-.02799	0.00419	-.03806
242	1.36	-.09747	0.38150	-.07174	-.01287	0.00549	-.04539
243	1.54	-.08678	0.37317	-.07674	-.03581	0.00785	-.05780
244	1.71	-.05672	0.39053	-.09843	-.06877	0.00853	-.05479
245	0.78	-.03037	0.39167	-.05005	-.02245	0.00035	-.03332

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
246	71.0	0.9722	525.90	105.23	12.8	0.200
247	71.0	0.9722	525.90	105.23	12.8	0.200
248	72.0	0.9703	526.53	105.33	12.8	0.200
249	72.0	0.9703	526.53	105.33	12.8	0.200
250	72.0	0.9703	526.53	105.33	12.8	0.200
251	72.0	0.9703	526.53	105.33	12.8	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
246	6.0	4.0	2.1	-2.9	57.26	1.55	-1.41	1.17
247	7.0	4.0	2.6	-3.2	71.83	1.41	-1.69	1.27
248	8.0	4.0	3.6	-3.8	85.78	0.91	-2.15	1.55
249	9.0	4.0	4.5	-4.4	98.97	0.42	-2.58	1.93
250	10.0	4.0	5.4	-4.9	111.67	-0.01	-2.67	2.52
251	6.0	4.0	2.0	-3.0	58.26	1.55	-1.69	1.13

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
246	4.45	56.97	-5.98	4.7	.00315	-.00033	.000068	.000109
247	4.56	71.49	-7.12	5.2	.00395	-.00039	.000073	.000113
248	4.67	85.42	-7.90	5.3	.00472	-.00044	.000090	.000121
249	4.78	98.59	-8.66	5.3	.00545	-.00048	.000111	.000133
250	4.68	111.47	-9.51	4.9	.00616	-.00053	.000146	.000156
251	4.46	57.97	-6.07	4.8	.00320	-.00034	.000065	.000107

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
246	3.330	3.660	-0.980	2.998	0.063	0.118
247	3.090	3.680	-1.020	3.039	0.062	0.095
248	3.170	3.700	-1.070	2.874	0.050	0.081
249	3.060	3.750	-1.130	3.014	0.067	0.117
250	3.020	3.770	-1.070	2.781	0.060	0.001
251	3.350	3.680	-0.960	3.008	0.084	0.019

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
246	8.45	2.756	4.110	-0.980	2.998	0.080	0.107
247	8.56	2.507	4.099	-1.020	3.039	0.075	0.085
248	8.67	2.576	4.136	-1.070	2.874	0.061	0.073
249	8.78	2.452	4.173	-1.130	3.014	0.084	0.105
250	8.88	2.402	4.191	-1.070	2.781	0.059	-0.008
251	8.46	2.772	4.133	-0.960	3.008	0.086	0.007

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
246	8.45	0.25144	0.37493	-.08941	0.24582	0.00653	0.00879
247	8.56	0.22877	0.37398	-.09306	0.24923	0.00615	0.00693
248	8.67	0.23499	0.37732	-.09762	0.23571	0.00503	0.00596
249	8.78	0.22369	0.38072	-.10309	0.24719	0.00692	0.00861
250	8.88	0.21913	0.38236	-.09762	0.22802	0.00485	-.00067
251	8.46	0.25292	0.37704	-.08758	0.24670	0.00703	0.00055

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
252	73.0	0.9685	526.84	105.43	12.8	0.200
253	73.0	0.9685	526.84	105.43	12.8	0.200
254	73.0	0.9685	526.84	105.43	12.8	0.200
255	73.0	0.9685	526.84	105.43	12.8	0.200
256	74.0	0.9664	527.47	105.55	12.8	0.200
257	74.0	0.9664	527.47	105.55	12.8	0.200
258	74.0	0.9664	527.47	105.55	12.8	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
252	7.0	0.0	2.5	-3.0	54.01	1.42	-1.46	1.76
253	8.0	0.0	3.2	-3.3	67.92	1.20	-1.66	2.06
254	9.0	0.0	4.1	-3.7	81.39	0.82	-1.85	2.47
255	10.0	0.0	5.1	-4.3	94.21	0.25	-2.17	3.02
256	11.0	0.0	6.0	-4.8	106.69	-0.25	-2.50	3.71
257	12.1	0.0	7.0	-5.5	119.60	-0.92	-2.89	4.62
258	7.0	0.0	2.8	-3.0	55.07	1.16	-1.38	1.86

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
252	0.42	54.00	-1.82	4.9	.00299	-.00010	.000102	.000100
253	0.53	67.90	-1.83	5.4	.00376	-.00010	.000119	.000104
254	0.64	81.38	-1.73	5.6	.00450	-.00010	.000143	.000111
255	0.74	94.20	-1.47	5.5	.00521	-.00008	.000174	.000123
256	0.84	106.68	-1.31	5.2	.00590	-.00007	.000214	.000141
257	0.94	119.59	-1.04	4.8	.00662	-.00006	.000266	.000169
258	0.43	55.06	-1.57	4.9	.00305	-.00009	.000107	.000102

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
252	1.850	3.960	-0.840	1.557	0.038	0.098
253	1.760	3.990	-0.890	1.519	0.056	0.064
254	1.730	3.980	-0.880	1.417	0.087	0.015
255	1.600	3.980	-0.930	1.298	0.085	0.091
256	1.610	3.980	-0.910	1.229	0.096	0.043
257	1.590	4.010	-1.070	1.096	0.090	0.151
258	2.070	3.950	-0.780	1.274	0.051	-0.048

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
252	4.42	1.539	4.091	-0.840	1.557	0.046	0.095
253	4.53	1.439	4.117	-0.890	1.519	0.061	0.060
254	4.64	1.402	4.107	-0.880	1.417	0.088	0.008
255	4.74	1.266	4.099	-0.930	1.298	0.092	0.084
256	4.84	1.269	4.102	-0.910	1.229	0.099	0.035
257	4.94	1.239	4.132	-1.070	1.096	0.102	0.143
258	4.43	1.758	4.098	-0.780	1.274	0.047	-0.051

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
252	4.42	0.14041	0.37323	-.07664	0.12769	0.00375	0.00777
253	4.53	0.13129	0.37558	-.08120	0.12459	0.00503	0.00490
254	4.64	0.12794	0.37469	-.08029	0.11624	0.00720	0.00066
255	4.74	0.11546	0.37393	-.08485	0.10643	0.00756	0.00690
256	4.84	0.11573	0.37421	-.08302	0.10075	0.00811	0.00284
257	4.94	0.11301	0.37698	-.09762	0.08988	0.00839	0.01171
258	4.43	0.16043	0.37389	-.07116	0.10445	0.00383	-.00421

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
259	74.0	0.9661	527.47	105.56	12.8	0.200
260	74.0	0.9661	527.47	105.56	12.8	0.200
261	74.0	0.9661	527.47	105.56	12.8	0.200
262	75.0	0.9643	527.79	105.66	12.8	0.200
263	75.0	0.9643	527.79	105.66	12.8	0.200
264	75.0	0.9643	527.79	105.66	12.8	0.200
265	75.0	0.9643	527.79	105.66	12.8	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
259	8.0	-4.0	3.1	-3.0	49.68	1.28	-1.20	2.47
260	9.0	-4.0	3.7	-3.4	63.39	1.15	-1.39	2.86
261	10.0	-4.0	4.8	-4.0	76.24	0.95	-1.78	3.38
262	11.0	-4.0	5.8	-4.4	89.47	0.50	-1.93	4.12
263	12.1	-4.0	6.7	-5.1	101.93	0.03	-2.37	4.96
264	13.1	-4.0	7.5	-5.4	113.39	-0.56	-2.55	5.87
265	8.0	-4.0	3.3	-3.0	50.77	1.39	-1.21	2.41

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
259	-3.61	49.66	1.85	4.5	.00275	0.00010	.000142	.000103
260	-3.50	63.34	2.72	5.2	.00350	0.00015	.000165	.000104
261	-3.40	76.17	3.57	5.4	.00421	0.00020	.000195	.000111
262	-3.30	89.35	4.64	5.3	.00495	0.00026	.000238	.000125
263	-3.20	101.77	5.65	5.1	.00564	0.00031	.000286	.000144
264	-3.11	113.19	6.70	4.7	.00627	0.00037	.000339	.000166
265	-3.60	50.76	1.80	4.7	.00281	0.00010	.000139	.000100

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
259	0.300	4.210	-0.570	0.123	0.048	-0.092
260	-0.050	4.180	-0.550	0.119	0.029	-0.181
261	-0.270	4.270	-0.620	0.199	0.037	-0.226
262	-0.260	4.280	-0.650	-0.001	0.035	-0.168
263	-0.410	4.350	-0.710	-0.054	0.023	-0.192
264	-0.520	4.310	-0.790	-0.081	0.020	-0.178
265	0.150	4.210	-0.480	0.122	0.042	-0.195

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
259	0.39	0.271	4.212	-0.570	0.123	0.048	-0.092
260	0.50	-0.086	4.179	-0.550	0.119	0.028	-0.181
261	0.60	-0.315	4.267	-0.620	0.199	0.034	-0.226
262	0.70	-0.313	4.276	-0.650	-0.001	0.033	-0.168
263	0.80	-0.471	4.344	-0.710	-0.054	0.021	-0.193
264	0.89	-0.587	4.301	-0.790	-0.081	0.017	-0.179
265	0.40	0.121	4.211	-0.480	0.122	0.041	-0.196

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
259	0.39	0.02475	0.38427	-.05200	0.01011	0.00393	-.00757
260	0.50	-.00788	0.38130	-.05018	0.00973	0.00227	-.01483
261	0.60	-.02871	0.38929	-.05656	0.01632	0.00281	-.01854
262	0.70	-.02851	0.39016	-.05930	-.00005	0.00274	-.01381
263	0.80	-.04296	0.39630	-.06478	-.00446	0.00168	-.01580
264	0.89	-.05356	0.39243	-.07207	-.00664	0.00143	-.01464
265	0.40	0.01101	0.38418	-.04379	0.01002	0.00332	-.01605

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
266	75.0	0.9623	527.79	105.77	12.8	0.200
267	74.0	0.9641	527.47	105.67	12.8	0.200
268	74.0	0.9641	527.47	105.67	12.8	0.200
269	74.0	0.9641	527.47	105.67	12.8	0.200
270	74.0	0.9641	527.47	105.67	12.8	0.200
271	74.0	0.9641	527.47	105.67	12.8	0.200
272	73.0	0.9659	526.84	105.57	12.8	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
266	9.0	-8.0	3.5	-3.0	44.02	1.29	-0.68	2.97
267	10.1	-8.0	4.1	-3.4	58.61	1.16	-0.91	3.61
268	11.0	-8.0	5.0	-3.9	71.06	0.83	-1.25	4.25
269	12.0	-8.0	6.0	-4.4	84.15	0.50	-1.53	5.08
270	13.0	-8.0	6.8	-4.8	96.64	0.00	-1.84	6.00
271	14.0	-8.0	7.6	-5.1	108.51	-0.49	-1.87	7.05
272	9.0	-8.0	3.5	-3.1	45.76	1.07	-0.67	3.01

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
266	-7.65	43.80	4.58	4.0	.00243	0.00025	.000172	.000106
267	-7.54	58.26	6.54	4.8	.00323	0.00036	.000209	.000110
268	-7.44	70.57	8.38	5.1	.00391	0.00046	.000246	.000115
269	-7.34	83.52	10.25	5.2	.00463	0.00057	.000294	.000126
270	-7.24	95.87	12.18	5.0	.00532	0.00068	.000347	.000141
271	-7.15	107.61	13.98	4.7	.00597	0.00078	.000407	.000163
272	-7.64	45.49	5.02	4.3	.00252	0.00028	.000174	.000102

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
266	-1.260	4.380	-0.180	-1.588	-0.097	-0.413
267	-1.450	4.380	-0.210	-1.482	-0.058	-0.475
268	-1.420	4.350	-0.290	-1.599	-0.041	-0.371
269	-1.550	4.390	-0.360	-1.630	-0.034	-0.447
270	-1.590	4.310	-0.470	-1.700	-0.048	-0.375
271	-1.480	4.330	-0.600	-1.782	-0.053	-0.374
272	-1.410	4.330	-0.160	-1.387	-0.096	-0.382

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
266	-3.65	-0.978	4.451	-0.180	-1.588	-0.070	-0.419
267	-3.54	-1.177	4.461	-0.210	-1.482	-0.028	-0.478
268	-3.44	-1.156	4.427	-0.290	-1.599	-0.019	-0.373
269	-3.34	-1.292	4.473	-0.360	-1.630	-0.008	-0.448
270	-3.24	-1.344	4.393	-0.470	-1.700	-0.026	-0.377
271	-3.15	-1.240	4.405	-0.600	-1.782	-0.032	-0.377
272	-3.64	-1.132	4.411	-0.160	-1.387	-0.072	-0.387

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
266	-3.65	-.08925	0.40612	-.01642	-.13024	-.00576	-.03433
267	-3.54	-.10737	0.40701	-.01916	-.12155	-.00233	-.03921
268	-3.44	-.10550	0.40393	-.02646	-.13112	-.00152	-.03060
269	-3.34	-.11785	0.40807	-.03284	-.13367	-.00062	-.03672
270	-3.24	-.12261	0.40079	-.04288	-.13940	-.00217	-.03090
271	-3.15	-.11314	0.40186	-.05474	-.14618	-.00263	-.03088
272	-3.64	-.10330	0.40241	-.01460	-.11377	-.00587	-.03175

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 22 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
273	73.0	0.9656	526.84	131.99	20.0	0.251
274	73.0	0.9656	526.84	131.99	20.0	0.251
275	73.0	0.9656	526.84	131.99	20.0	0.251
276	72.0	0.9671	526.22	131.88	20.0	0.251
277	73.0	0.9653	526.84	132.01	20.0	0.251
278	72.0	0.9671	526.22	131.88	20.0	0.251
279	72.0	0.9671	526.22	131.88	20.0	0.251

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
273	8.0	-4.0	4.1	-2.9	45.29	1.53	-0.59	2.51
274	9.1	-4.0	4.9	-3.1	59.56	1.53	-0.68	2.97
275	10.0	-4.0	6.0	-3.8	70.66	1.24	-1.01	3.45
276	11.0	-4.0	6.9	-4.4	82.41	0.83	-1.45	4.11
277	12.1	-4.0	8.0	-4.9	94.99	0.36	-1.69	4.95
278	13.0	-4.0	9.0	-5.3	106.31	-0.28	-2.00	5.94
279	8.0	-4.0	3.9	-2.8	45.87	1.71	-0.57	2.53

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
273	-3.77	45.29	1.46	5.0	.00251	0.00008	.000145	.000113
274	-3.70	59.53	2.32	5.9	.00330	0.00013	.000172	.000118
275	-3.64	70.59	3.26	6.3	.00392	0.00018	.000200	.000124
276	-3.59	82.30	4.33	6.4	.00457	0.00024	.000239	.000137
277	-3.52	94.84	5.48	6.3	.00526	0.00030	.000287	.000155
278	-3.46	106.10	6.71	5.9	.00589	0.00037	.000345	.000182
279	-3.77	45.89	1.31	5.0	.00255	0.00007	.000147	.000116

MAIN ROTOR–FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 22 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
273	1.360	6.260	-0.450	-0.186	0.023	-0.153
274	1.040	6.320	-0.480	-0.252	0.052	-0.245
275	0.970	6.320	-0.540	-0.367	0.030	-0.220
276	1.100	6.380	-0.560	-0.640	0.029	-0.281
277	0.860	6.400	-0.790	-0.608	0.030	-0.308
278	0.660	6.420	-0.690	-0.544	0.034	-0.431
279	1.240	6.250	-0.480	-0.224	0.032	-0.145

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
273	0.23	1.335	6.265	-0.450	-0.186	0.022	-0.153
274	0.30	1.007	6.325	-0.480	-0.252	0.051	-0.246
275	0.36	0.931	6.326	-0.540	-0.367	0.028	-0.220
276	0.41	1.054	6.388	-0.560	-0.640	0.027	-0.262
277	0.48	0.807	6.407	-0.790	-0.608	0.028	-0.309
278	0.54	0.600	6.426	-0.690	-0.544	0.030	-0.431
279	0.23	1.215	6.255	-0.480	-0.224	0.031	-0.146

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
273	0.23	0.07795	0.36583	-.02628	-.00975	0.00118	-.00804
274	0.30	0.05879	0.36933	-.02803	-.01321	0.00266	-.01289
275	0.36	0.05435	0.36937	-.03153	-.01926	0.00148	-.01155
276	0.41	0.06153	0.37298	-.03270	-.03357	0.00141	-.01477
277	0.48	0.04709	0.37410	-.04613	-.03191	0.00145	-.01619
278	0.54	0.03503	0.37520	-.04029	-.02853	0.00157	-.02263
279	0.23	0.07093	0.36522	-.02803	-.01177	0.00164	-.00764

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
280	75.0	0.9604	527.79	158.26	28.6	0.300
281	74.0	0.9622	527.47	158.11	28.6	0.300
282	74.0	0.9622	527.47	158.11	28.6	0.300
283	74.0	0.9622	527.47	158.11	28.6	0.300
284	74.0	0.9622	527.47	158.11	28.6	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
280	6.0	4.0	3.2	-2.4	62.33	2.03	-1.86	0.94
281	6.9	4.0	4.0	-3.0	75.45	1.69	-2.24	1.03
282	8.0	4.0	5.3	-3.4	87.91	1.23	-2.41	1.23
283	9.0	4.0	6.5	-3.8	99.48	0.55	-2.46	1.70
284	10.0	4.0	7.8	-4.5	110.39	-0.20	-2.90	2.35

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
280	4.22	62.01	-6.61	6.3	.00345	-.00037	.000055	.000145
281	4.27	75.11	-7.30	6.9	.00417	-.00041	.000060	.000152
282	4.31	87.57	-7.83	7.2	.00487	-.00043	.000071	.000162
283	4.35	99.15	-8.09	7.1	.00551	-.00045	.000098	.000182
284	4.39	110.09	-8.25	6.7	.00612	-.00046	.000136	.000211

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
280	5.640	7.960	-1.940	8.616	-0.103	0.317
281	5.430	7.920	-1.890	8.612	-0.101	0.081
282	5.370	7.970	-1.990	8.455	-0.105	0.143
283	5.340	7.860	-1.930	7.917	-0.083	-0.062
284	5.220	7.910	-1.940	7.797	-0.063	-0.163

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
280	8.22	4.444	8.685	-1.940	8.616	-0.057	0.328
281	8.27	4.235	8.618	-1.890	8.612	-0.089	0.094
282	8.31	4.162	8.662	-1.990	8.455	-0.083	0.157
283	8.35	4.142	8.552	-1.930	7.917	-0.091	-0.050
284	8.39	4.010	8.587	-1.940	7.797	-0.086	-0.152

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
280	8.22	0.18146	0.35461	-.07921	0.31622	-.00209	0.01205
281	8.27	0.17292	0.35190	-.07717	0.31607	-.00325	0.00346
282	8.31	0.16993	0.35370	-.08126	0.31033	-.00306	0.00576
283	8.35	0.16912	0.34920	-.07881	0.29059	-.00334	-.00182
284	8.39	0.16374	0.35062	-.07921	0.28616	-.00317	-.00558

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
291	55.0	1.0014	518.05	155.26	28.7	0.300
292	56.0	0.9994	518.36	155.41	28.7	0.300
293	57.0	0.9975	518.99	155.56	28.7	0.300
294	57.0	0.9975	518.99	155.56	28.7	0.300
295	57.0	0.9975	518.99	155.56	28.7	0.300
296	58.0	0.9956	519.30	155.71	28.7	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
291	7.0	0.0	3.7	-2.0	57.79	2.11	0.09	1.83
292	8.0	0.0	4.7	-2.8	70.39	1.99	-0.32	2.07
293	9.1	0.0	5.9	-3.3	81.93	1.50	-0.60	2.44
294	10.1	0.0	7.1	-3.7	92.80	1.04	-0.81	2.95
295	11.1	0.0	8.3	-4.1	103.79	0.44	-1.06	3.69
296	7.0	0.0	3.8	-2.3	57.59	2.06	-0.34	1.85

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
291	0.20	57.78	-2.32	6.6	.00320	-.00013	.000108	.000129
292	0.25	70.38	-2.29	7.3	.00390	-.00013	.000122	.000134
293	0.29	81.93	-1.91	7.8	.00454	-.00011	.000143	.000140
294	0.33	92.80	-1.56	7.7	.00514	-.00009	.000173	.000155
295	0.36	103.79	-1.10	7.3	.00575	-.00006	.000217	.000180
296	0.20	57.58	-2.27	6.5	.00319	-.00013	.000109	.000129

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
291	4.080	8.590	-1.740	4.347	-0.176	0.382
292	3.870	8.660	-1.770	4.339	-0.157	0.189
293	4.110	8.650	-1.810	4.107	-0.148	0.107
294	4.130	8.660	-1.860	4.158	-0.160	0.053
295	4.000	8.720	-1.870	3.946	-0.161	-0.148
296	3.960	8.570	-1.900	4.439	-0.172	0.580

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
291	4.20	3.440	8.866	-1.740	4.347	-0.147	0.394
292	4.25	3.218	8.923	-1.770	4.339	-0.142	0.201
293	4.29	3.452	8.933	-1.810	4.107	-0.140	0.117
294	4.33	3.465	8.947	-1.860	4.158	-0.156	0.065
295	4.36	3.325	8.999	-1.870	3.946	-0.171	-0.135
296	4.20	3.321	8.837	-1.900	4.439	-0.129	0.591

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
291	4.20	0.13995	0.36075	-.07080	0.15898	-.00538	0.01439
292	4.25	0.13094	0.36306	-.07202	0.15869	-.00521	0.00734
293	4.29	0.14045	0.36348	-.07365	0.15021	-.00512	0.00429
294	4.33	0.14099	0.36404	-.07568	0.15207	-.00570	0.00237
295	4.36	0.13529	0.36617	-.07609	0.14433	-.00627	-.00495
296	4.20	0.13515	0.35958	-.07731	0.16235	-.00471	0.02161

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
297	58.0	0.9952	519.30	155.74	28.7	0.300
298	59.0	0.9933	519.93	155.89	28.7	0.300
299	59.0	0.9933	519.93	155.89	28.7	0.300
300	59.0	0.9933	519.93	155.89	28.7	0.300
301	59.0	0.9933	519.93	155.89	28.7	0.300
302	60.0	0.9914	520.25	156.04	28.7	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
297	9.1	-4.0	5.2	-2.5	57.03	1.81	-0.34	2.96
298	10.1	-4.0	6.3	-3.0	68.76	1.63	-0.63	3.47
299	11.1	-4.0	7.3	-3.7	80.28	1.28	-0.96	4.05
300	12.1	-4.0	8.3	-4.4	91.51	0.89	-1.47	4.78
301	13.1	-4.0	9.5	-4.8	102.83	0.31	-1.56	5.73
302	9.0	-4.0	5.0	-2.7	57.23	1.97	-0.24	2.96

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
297	-3.80	57.02	1.97	6.7	.00316	0.00011	.000174	.000124
298	-3.76	68.72	2.88	7.3	.00381	0.00016	.000203	.000131
299	-3.72	80.19	3.93	7.7	.00444	0.00022	.000237	.000139
300	-3.68	91.38	4.98	7.7	.00506	0.00028	.000280	.000154
301	-3.64	102.64	6.22	7.3	.00569	0.00034	.000336	.000178
302	-3.80	57.23	1.83	6.6	.00317	0.00010	.000174	.000127

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
297	0.910	8.780	-0.780	0.566	-0.209	-0.448
298	0.670	8.860	-1.100	0.555	-0.211	-0.311
299	0.730	8.870	-1.210	0.419	-0.196	-0.379
300	0.810	8.940	-1.370	0.092	-0.162	-0.331
301	0.610	8.990	-1.400	0.156	-0.183	-0.423
302	1.030	8.900	-0.770	0.830	-0.179	-0.177

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
297	0.20	0.879	8.783	-0.780	0.566	-0.211	-0.447
298	0.24	0.633	8.863	-1.100	0.555	-0.213	-0.310
299	0.28	0.686	8.873	-1.210	0.419	-0.198	-0.378
300	0.32	0.760	8.944	-1.370	0.092	-0.164	-0.330
301	0.36	0.553	8.994	-1.400	0.156	-0.185	-0.422
302	0.20	0.999	8.904	-0.770	0.830	-0.180	-0.176

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
297	0.20	0.03578	0.35738	-.03174	0.02070	-.00772	-.01634
298	0.24	0.02574	0.36062	-.04476	0.02031	-.00778	-.01135
299	0.28	0.02793	0.36106	-.04923	0.01533	-.00722	-.01364
300	0.32	0.03092	0.36394	-.05574	0.00338	-.00598	-.01207
301	0.36	0.02252	0.36595	-.05697	0.00570	-.00678	-.01544
302	0.20	0.04064	0.36228	-.03133	0.03036	-.00657	-.00644

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
303	57.0	0.9962	518.99	155.66	28.7	0.300
304	57.0	0.9962	518.99	155.66	28.7	0.300
305	57.0	0.9962	518.99	155.66	28.7	0.300
306	58.0	0.9939	519.30	155.84	28.7	0.300
307	58.0	0.9939	519.30	155.84	28.7	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
303	11.1	-8.0	6.3	-3.0	56.99	1.66	0.29	4.09
304	12.1	-8.0	7.3	-3.5	68.90	1.33	0.11	4.86
305	13.1	-8.0	8.3	-4.2	80.50	1.07	-0.24	5.70
306	14.1	-8.0	9.6	-4.8	92.33	0.55	-0.46	6.69
307	11.0	-8.0	6.0	-3.3	56.64	1.84	0.23	4.08

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
303	-7.80	56.69	6.09	6.8	.00314	0.00034	.000240	.000123
304	-7.76	68.44	7.98	7.5	.00379	0.00044	.000285	.000129
305	-7.72	79.92	9.75	7.7	.00443	0.00054	.000335	.000140
306	-7.68	91.58	11.79	7.7	.00508	0.00065	.000393	.000154
307	-7.80	56.36	5.87	6.6	.00313	0.00033	.000240	.000126

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
303	-2.880	9.200	-0.770	-2.639	0.011	0.063
304	-2.900	9.230	-0.910	-2.732	0.016	0.013
305	-2.980	9.320	-1.120	-2.941	0.028	0.097
306	-2.930	9.220	-1.130	-3.194	0.037	0.017
307	-2.850	9.190	-0.780	-2.687	0.051	0.142

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
303	-3.80	-2.264	9.371	-0.770	-2.639	0.007	0.064
304	-3.76	-2.289	9.400	-0.910	-2.732	0.015	0.014
305	-3.72	-2.369	9.494	-1.120	-2.941	0.021	0.099
306	-3.68	-2.333	9.389	-1.130	-3.194	0.036	0.019
307	-3.80	-2.234	9.359	-0.780	-2.687	0.041	0.146

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
303	-3.80	-.09212	0.38129	-.03133	-.09654	0.00025	0.00233
304	-3.76	-.09313	0.38249	-.03703	-.09993	0.00054	0.00051
305	-3.72	-.09641	0.38629	-.04557	-.10758	0.00078	0.00362
306	-3.68	-.09492	0.38203	-.04598	-.11682	0.00132	0.00070
307	-3.80	-.09092	0.38080	-.03174	-.09827	0.00150	0.00532

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
308	58.0	0.9939	519.30	155.84	28.7	0.300
309	58.0	0.9939	519.30	155.84	28.7	0.300
310	59.0	0.9916	519.93	156.02	28.7	0.300
311	59.0	0.9916	519.93	156.02	28.7	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
308	13.1	-12.0	7.5	-3.4	56.91	1.71	0.20	5.28
309	14.1	-12.0	8.6	-4.0	68.74	1.35	-0.15	6.33
310	15.1	-12.0	9.6	-4.7	81.54	0.89	-0.55	7.52
311	13.1	-12.0	7.4	-3.7	57.16	1.59	-0.07	5.31

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
308	-11.80	56.06	9.96	6.5	.00311	0.00055	.000311	.000128
309	-11.76	67.57	12.69	7.0	.00375	0.00070	.000372	.000137
310	-11.71	80.02	15.68	7.4	.00444	0.00087	.000442	.000148
311	-11.80	56.28	10.13	6.6	.00312	0.00056	.000311	.000127

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 23 CONFIGURATION BHRF2L BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
308	-6.160	9.130	-0.960	-5.959	-0.146	0.589
309	-6.150	9.180	-1.180	-6.060	-0.165	0.543
310	-5.900	9.050	-1.390	-6.347	-0.142	0.607
311	-5.910	8.980	-1.080	-5.965	-0.161	0.510

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
308	-7.80	-4.864	9.882	-0.960	-5.959	-0.225	0.564
309	-7.76	-4.854	9.926	-1.180	-6.060	-0.236	0.516
310	-7.71	-4.632	9.760	-1.390	-6.347	-0.223	0.583
311	-7.80	-4.637	9.699	-1.080	-5.965	-0.229	0.484

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
308	-7.80	-.19791	0.40208	-.03906	-.21794	-.00822	0.02062
309	-7.76	-.19752	0.40389	-.04801	-.22164	-.00864	0.01887
310	-7.71	-.18847	0.39713	-.05656	-.23212	-.00814	0.02132
311	-7.80	-.18866	0.39465	-.04394	-.21816	-.00836	0.01770

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 24 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
316	54.0	1.0010	517.42	51.85	3.2	0.100
317	55.0	0.9990	518.05	51.90	3.2	0.100
318	55.0	0.9990	518.05	51.90	3.2	0.100
319	54.0	1.0010	517.42	51.85	3.2	0.100

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
316	8.9	-4.0	1.3	-4.1	68.70	0.51	-0.97	3.00
317	9.8	-4.0	1.7	-4.4	80.82	0.32	-1.14	3.58
318	10.9	-4.0	2.2	-4.8	93.31	0.17	-1.41	4.30
319	11.9	-4.0	2.2	-5.4	105.53	0.12	-1.98	5.11

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
316	-1.84	68.68	1.69	2.3	.00381	0.00009	.000177	.000095
317	-1.46	80.80	1.73	2.2	.00448	0.00010	.000211	.000101
318	-1.06	93.30	1.56	2.1	.00518	0.00009	.000253	.000111
319	-0.68	105.53	1.13	2.0	.00586	0.00006	.000301	.000124

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 24 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
316	-0.080	0.880	0.070	-0.229	0.133	-0.155
317	-0.120	0.890	0.070	-0.232	0.143	-0.225
318	-0.070	0.880	0.010	-0.248	0.130	-0.259
319	0.030	0.850	0.050	-0.350	0.172	-0.346

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
316	2.16	-0.113	0.876	0.070	-0.229	0.127	-0.160
317	2.54	-0.159	0.884	0.070	-0.232	0.133	-0.231
318	2.94	-0.115	0.675	0.010	-0.248	0.117	-0.266
319	3.32	-0.019	0.850	0.050	-0.350	0.152	-0.356

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
316	2.16	-.04129	0.31981	0.02555	-.07515	0.04156	-.05240
317	2.54	-.05816	0.32253	0.02555	-.07624	0.04347	-.07576
318	2.94	-.04196	0.31941	0.00365	-.08147	0.03836	-.08712
319	3.32	-.00704	0.31031	0.01825	-.11476	0.04971	-.11668

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 25 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
326	55.0	0.9990	518.05	103.40	12.7	0.200
327	55.0	0.9990	518.05	103.40	12.7	0.200
328	55.0	0.9990	518.05	103.40	12.7	0.200
329	55.0	0.9990	518.05	103.40	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
326	8.8	0.0	4.1	-3.8	88.44	0.30	-0.80	2.60
327	9.8	0.0	5.0	-4.2	100.80	-0.31	-1.05	3.18
328	10.9	0.0	5.6	-4.8	113.67	-0.79	-1.42	3.90
329	7.8	0.0	3.5	-3.3	75.17	0.47	-0.55	2.21

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
326	0.70	88.43	-1.39	5.8	.00491	-.00008	.000153	.000108
327	0.80	100.79	-1.09	5.6	.00559	-.00006	.000187	.000121
328	0.90	113.67	-0.99	5.2	.00631	-.00006	.000230	.000141
329	0.60	75.16	-1.25	5.8	.00417	-.00007	.000130	.000100

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 25 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
326	-0.230	3.380	-0.520	2.446	0.090	-0.048
327	-0.270	3.360	-0.540	2.373	0.050	-0.040
328	-0.160	3.380	-0.550	2.211	0.029	0.019
329	-0.350	3.370	-0.510	2.597	0.091	0.042

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
326	4.70	-0.506	3.350	-0.520	2.446	0.086	-0.056
327	4.80	-0.550	3.326	-0.540	2.373	0.046	-0.044
328	4.90	-0.448	3.354	-0.550	2.211	0.031	0.017
329	4.60	-0.619	3.331	-0.510	2.597	0.094	0.035

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
326	4.70	-.04655	0.30802	-.04781	0.20213	0.00712	-.00460
327	4.80	-.05059	0.30580	-.04965	0.19616	0.00381	-.00362
328	4.90	-.04121	0.30840	-.05057	0.18272	0.00255	0.00139
329	4.60	-.05691	0.30630	-.04690	0.21466	0.00776	0.00289

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 25   CONFIGURATION BHRFWO   BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4   ROTOR-BODY H/R = .0833   ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
320	55.0	0.9990	518.05	103.40	12.7	0.200
321	55.0	0.9990	518.05	103.40	12.7	0.200
322	55.0	0.9990	518.05	103.40	12.7	0.200
323	55.0	0.9990	518.05	103.40	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
320	9.9	-4.0	4.4	-3.8	81.91	0.79	-0.70	3.53
321	10.9	-4.0	5.4	-4.3	93.93	0.28	-0.99	4.22
322	11.9	-4.0	6.1	-4.8	107.00	-0.28	-1.30	5.06
323	12.9	-4.0	7.1	-5.5	119.14	-1.18	-1.68	6.08

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
320	-3.35	81.82	3.99	5.5	.00454	0.00022	.000208	.000112
321	-3.26	93.79	5.06	5.4	.00520	0.00028	.000248	.000125
322	-3.15	106.82	6.17	5.1	.00593	0.00034	.000298	.000142
323	-3.06	118.91	7.53	4.8	.00660	0.00042	.000356	.000166

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11266
FORWARD FLIGHT

RUN 25 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
320	-0.290	3.500	-0.330	0.137	0.088	0.086
321	-0.240	3.500	-0.300	0.000	0.069	0.036
322	-0.120	3.500	-0.340	-0.201	0.077	0.045
323	-0.020	3.580	-0.490	-0.337	0.062	0.174

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
320	0.65	-0.330	3.496	-0.330	0.137	0.089	0.085
321	0.74	-0.285	3.497	-0.300	0.000	0.089	0.037
322	0.85	-0.172	3.498	-0.340	-0.201	0.078	0.044
323	0.94	-0.079	3.579	-0.490	-0.337	0.064	0.173

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
320	0.65	-.03031	0.32151	-.03034	0.01129	0.00732	0.00700
321	0.74	-.02625	0.32152	-.02759	0.00002	0.00737	0.00303
322	0.85	-.01580	0.32163	-.03126	-.01660	0.00643	0.00362
323	0.94	-.00727	0.32911	-.04506	-.02782	0.00532	0.01428

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 25 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
330	55.0	0.9990	518.05	103.40	12.7	0.200
331	55.0	0.9990	518.05	103.40	12.7	0.200
332	55.0	0.9990	518.05	103.40	12.7	0.200
333	55.0	0.9990	516.05	103.40	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
330	10.9	-8.0	5.0	-3.7	77.88	0.52	-0.64	4.41
331	11.9	-8.0	5.8	-4.3	90.36	0.29	-1.04	5.22
332	12.9	-8.0	6.5	-4.9	102.33	-0.10	-1.44	6.16
333	13.9	-8.0	7.5	-5.4	114.29	-0.84	-1.69	7.27

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRU (-)
330	-7.38	77.30	9.49	5.5	.00429	0.00053	.000260	.000106
331	-7.28	89.67	11.17	5.4	.00497	0.00062	.000308	.000122
332	-7.19	101.51	12.90	5.1	.00563	0.00072	.000363	.000140
333	-7.09	113.31	14.95	4.8	.00629	0.00083	.000428	.000164

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 25 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
330	-0.110	3.570	-0.030	-2.163	0.129	-0.162
331	-0.170	3.590	-0.130	-2.128	0.115	-0.130
332	-0.010	3.690	-0.220	-2.360	0.092	-0.016
333	0.070	3.710	-0.170	-2.375	0.094	-0.163

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
330	-3.38	0.101	3.570	-0.030	-2.163	0.138	-0.154
331	-3.28	0.036	3.594	-0.130	-2.128	0.122	-0.123
332	-3.19	0.195	3.685	-0.220	-2.360	0.092	-0.011
333	-3.09	0.270	3.701	-0.170	-2.375	0.102	-0.157

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
330	-3.38	0.00927	0.32829	-.00276	-.17876	0.01142	-.01276
331	-3.28	0.00330	0.33046	-.01195	-.17588	0.01011	-.01015
332	-3.19	0.01796	0.33883	-.02023	-.19506	0.00764	-.00092
333	-3.09	0.02484	0.34030	-.01563	-.19628	0.00845	-.01300

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 26 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
334	57.0	0.9951	518.99	155.74	28.7	0.300
335	57.0	0.9951	518.99	155.74	28.7	0.300
336	58.0	0.9932	519.30	155.89	28.7	0.300
337	58.0	0.9932	519.30	155.89	28.7	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
334	10.9	-4.0	7.5	-3.7	81.47	1.00	-0.38	4.10
335	11.9	-4.0	8.7	-4.4	92.72	0.62	-0.79	4.84
336	12.9	-4.0	9.9	-5.3	103.21	-0.16	-1.41	5.82
337	13.9	-4.0	10.9	-5.5	113.89	-0.95	-1.48	7.23

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
334	-3.71	81.37	4.28	8.0	.00451	0.00024	.000241	.000136
335	-3.67	92.57	5.32	7.9	.00514	0.00030	.000285	.000152
336	-3.64	102.99	6.71	7.4	.00572	0.00037	.000342	.000176
337	-3.60	113.60	8.10	6.5	.00631	0.00045	.000425	.000224

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 26 CONFIGURATION BHRFWO BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
334	0.430	7.580	-1.200	0.516	0.015	0.041
335	0.560	7.700	-1.240	0.351	0.023	0.029
336	0.510	7.760	-1.360	0.285	0.009	0.020
337	0.630	7.750	-1.370	0.004	0.008	0.029

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
334	0.29	0.392	7.582	-1.200	0.516	0.015	0.041
335	0.33	0.516	7.703	-1.240	0.351	0.023	0.028
336	0.36	0.461	7.763	-1.360	0.285	0.009	0.020
337	0.40	0.576	7.754	-1.370	0.004	0.009	0.029

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
334	0.29	0.01596	0.30851	-.04883	0.01886	0.00055	0.00152
335	0.33	0.02101	0.31343	-.05045	0.01283	0.00086	0.00104
336	0.36	0.01876	0.31588	-.05534	0.01042	0.00032	0.00072
337	0.40	0.02343	0.31551	-.05574	0.00015	0.00031	0.00106

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
341	43.0	1.0235	511.77	51.28	3.2	0.100
342	43.0	1.0235	511.77	51.28	3.2	0.100
343	43.0	1.0235	511.77	51.28	3.2	0.100
344	43.0	1.0235	511.77	51.28	3.2	0.100
345	43.0	1.0235	511.77	52.86	3.4	0.103
346	43.0	1.0235	511.77	54.39	3.6	0.106
347	43.0	1.0235	511.77	55.14	3.7	0.108

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
341	6.0	4.0	0.3	-3.3	51.07	0.29	3.03	1.66
342	7.0	4.0	0.6	-3.7	64.84	0.24	2.95	1.88
343	8.1	4.0	1.0	-4.2	78.70	0.06	2.77	2.23
344	9.1	4.0	1.4	-4.6	91.73	-0.09	2.56	2.68
345	10.1	4.0	1.9	-5.2	104.41	-0.56	2.13	3.28
346	10.6	4.0	2.1	-5.5	111.21	-0.69	1.81	3.60
347	6.0	4.0	0.4	-3.3	53.50	0.31	3.42	1.65

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
341	5.61	50.80	-5.26	2.2	.00282	-.00029	.000099	.000086
342	6.04	64.46	-7.07	2.4	.00358	-.00039	.000112	.000087
343	6.48	78.19	-8.93	2.4	.00434	-.00050	.000133	.000089
344	6.89	91.08	-10.91	2.3	.00505	-.00061	.000160	.000093
345	7.09	103.68	-12.33	2.2	.00575	-.00068	.000196	.000106
346	7.11	110.44	-13.09	2.2	.00613	-.00073	.000215	.000115
347	5.46	53.23	-5.39	2.4	.00295	-.00030	.000099	.000090

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
341	0.260	0.910	-0.170	1.145	-0.066	-0.133
342	0.380	0.880	-0.170	1.095	-0.096	-0.203
343	0.330	0.850	-0.200	1.122	-0.118	-0.205
344	0.330	0.860	-0.240	1.192	-0.139	-0.188
345	0.260	0.820	-0.240	1.288	-0.139	-0.218
346	0.430	0.860	-0.250	1.159	-0.169	-0.228
347	0.250	1.010	-0.220	1.360	-0.168	-0.136

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
341	9.61	0.104	0.941	-0.170	1.145	-0.088	-0.120
342	10.04	0.221	0.933	-0.170	1.095	-0.130	-0.183
343	10.48	0.170	0.896	-0.200	1.122	-0.153	-0.160
344	10.89	0.162	0.907	-0.240	1.192	-0.172	-0.158
345	11.09	0.097	0.855	-0.240	1.288	-0.178	-0.187
346	11.11	0.256	0.927	-0.250	1.159	-0.210	-0.192
347	9.46	0.081	1.037	-0.220	1.360	-0.188	-0.107

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
341	9.61	0.03813	0.34327	-.06204	0.37554	-.02874	-.03923
342	10.04	0.08056	0.34040	-.06204	0.35914	-.04272	-.05991
343	10.48	0.06202	0.32692	-.07299	0.36814	-.05013	-.05903
344	10.89	0.05899	0.33094	-.08758	0.39098	-.05642	-.05185
345	11.09	0.03345	0.29356	-.08243	0.39772	-.05506	-.05770
346	11.11	0.08311	0.30062	-.08110	0.33802	-.06131	-.05584
347	9.46	0.02546	0.32741	-.06944	0.38593	-.05345	-.03028

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
348	43.0	1.0235	511.77	58.04	4.1	0.113
349	43.0	1.0235	511.77	59.44	4.3	0.116
350	43.0	1.0235	511.77	59.44	4.3	0.116
351	43.0	1.0235	511.77	59.44	4.3	0.116
352	43.0	1.0235	511.77	60.81	4.5	0.119
353	43.0	1.0235	511.77	60.81	4.5	0.119

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
348	7.1	0.0	1.1	-3.5	58.48	0.41	3.35	2.11
349	8.1	0.0	1.5	-3.8	71.00	0.25	3.17	2.42
350	9.1	0.0	2.0	-4.3	84.02	0.12	2.80	2.88
351	10.1	0.0	2.4	-4.8	97.39	0.02	2.41	3.47
352	11.1	0.0	3.1	-5.4	109.78	-0.25	1.91	4.17
353	7.0	0.0	1.2	-3.4	58.74	0.45	3.35	2.07

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
348	1.44	58.45	-1.88	2.7	.00324	-.00010	.000126	.000091
349	1.66	70.96	-2.31	2.9	.00394	-.00013	.000144	.000093
350	1.97	83.96	-3.00	2.8	.00466	-.00017	.000172	.000098
351	2.28	97.31	-3.90	2.7	.00540	-.00022	.000207	.000107
352	2.46	109.69	-4.45	2.6	.00609	-.00025	.000249	.000122
353	1.31	58.72	-1.79	2.9	.00326	-.00010	.000123	.000090

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
348	0.030	1.250	-0.120	0.865	-0.155	-0.229
349	0.040	1.280	-0.110	0.905	-0.154	-0.348
350	0.020	1.260	-0.090	0.874	-0.163	-0.387
351	0.060	1.270	-0.210	0.927	-0.178	-0.375
352	0.090	1.280	-0.230	0.858	-0.189	-0.407
353	0.120	1.380	-0.150	0.887	-0.196	-0.251

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
348	5.44	-0.089	1.247	-0.120	0.865	-0.176	-0.213
349	5.66	-0.086	1.278	-0.110	0.905	-0.186	-0.331
350	5.97	-0.111	1.255	-0.090	0.874	-0.203	-0.368
351	6.28	-0.079	1.269	-0.210	0.927	-0.218	-0.354
352	6.46	-0.054	1.282	-0.230	0.858	-0.233	-0.383
353	5.31	-0.008	1.385	-0.150	0.887	-0.218	-0.232

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
348	5.44	-.02522	0.35524	-.03418	0.22147	-.04494	-.05458
349	5.66	-.02349	0.34700	-.02987	0.22064	-.04583	-.08085
350	5.97	-.03017	0.34090	-.02444	0.21334	-.04948	-.08973
351	6.28	-.02153	0.34462	-.05703	0.22618	-.05320	-.08636
352	6.46	-.01414	0.33269	-.05969	0.20022	-.05441	-.08938
353	5.31	-.00216	0.35947	-.03893	0.20686	-.05087	-.05409

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
358	43.0	1.0235	511.77	51.28	3.2	0.100
359	42.0	1.0256	511.45	51.23	3.2	0.100
360	43.0	1.0232	511.77	51.29	3.2	0.100
361	43.0	1.0232	511.77	54.40	3.6	0.106
362	43.0	1.0232	511.77	56.62	3.9	0.111
363	43.0	1.0228	511.77	58.06	4.1	0.113

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
358	8.1	-4.0	1.1	-3.6	58.38	0.67	2.41	2.57
359	9.1	-4.0	1.4	-4.2	70.68	0.38	1.94	3.07
360	10.0	-4.0	1.7	-4.5	83.22	0.45	2.07	3.66
361	11.1	-4.0	2.1	-5.2	96.18	0.26	1.95	4.34
362	12.1	-4.0	2.9	-5.6	109.12	-0.03	1.68	5.14
363	8.0	-4.0	1.3	-3.5	60.73	0.57	3.03	2.57

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
358	-2.16	58.37	1.53	2.2	.00324	0.00009	.000153	.000092
359	-1.78	70.66	1.81	2.3	.00392	0.00010	.000183	.000096
360	-1.38	83.21	1.56	2.2	.00462	0.00009	.000218	.000103
361	-1.31	96.16	1.94	2.3	.00534	0.00011	.000259	.000113
362	-1.18	109.09	2.29	2.3	.00605	0.00013	.000306	.000127
363	-2.51	60.69	2.09	2.7	.00337	0.00012	.000153	.000090

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
358	-0.550	1.070	-0.250	0.309	-0.179	-0.248
359	-0.460	0.960	-0.260	0.210	-0.200	-0.249
360	-0.610	1.010	-0.240	0.337	-0.199	-0.358
361	-0.490	1.060	-0.280	0.174	-0.221	-0.421
362	-0.450	1.180	-0.330	0.172	-0.232	-0.434
363	-0.540	1.250	-0.150	0.303	-0.216	-0.291

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
358	1.84	-0.584	1.052	-0.250	0.309	-0.187	-0.243
359	2.22	-0.497	0.941	-0.260	0.210	-0.209	-0.241
360	2.62	-0.656	0.981	-0.240	0.337	-0.215	-0.348
361	2.69	-0.539	1.036	-0.280	0.174	-0.240	-0.410
362	2.82	-0.507	1.156	-0.330	0.172	-0.254	-0.422
363	1.49	-0.572	1.236	-0.150	0.303	-0.223	-0.285

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
358	1.84	-.21313	0.38384	-.09123	0.10138	-.06144	-.07957
359	2.22	-.18134	0.34356	-.09488	0.06864	-.06867	-.07913
360	2.62	-.23922	0.35803	-.08758	0.11052	-.07059	-.11423
361	2.69	-.17491	0.33601	-.09083	0.05070	-.07000	-.11950
362	2.82	-.15195	0.34628	-.09881	0.04637	-.06823	-.11369
363	1.49	-.16302	0.35191	-.04272	0.07758	-.05713	-.07306

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
364	43.0	1.0228	511.77	60.83	4.5	0.119
365	43.0	1.0228	511.77	62.17	4.7	0.121
366	43.0	1.0225	511.77	63.49	4.9	0.124
367	43.0	1.0225	511.77	64.13	5.0	0.125
368	43.0	1.0225	511.77	64.77	5.1	0.127
369	43.0	1.0225	511.77	63.49	4.9	0.124

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
364	9.0	-8.0	1.6	-3.2	64.12	0.70	3.17	3.13
365	10.0	-8.0	2.1	-3.9	76.67	0.64	2.89	3.72
366	11.1	-8.0	2.6	-4.3	89.41	0.48	2.66	4.43
367	12.1	-8.0	3.2	-4.8	102.39	0.33	2.28	5.24
368	13.1	-8.0	3.9	-5.3	114.64	-0.11	1.81	6.17
369	9.0	-8.0	1.9	-3.3	63.98	0.71	3.28	3.13

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
364	-6.57	63.78	6.64	2.9	.00354	0.00037	.000187	.000090
365	-6.36	76.27	7.85	3.0	.00423	0.00044	.000222	.000095
366	-6.16	88.95	9.12	3.0	.00494	0.00051	.000264	.000103
367	-5.94	101.87	10.26	2.9	.00566	0.00057	.000313	.000114
368	-5.74	114.05	11.57	2.8	.00633	0.00064	.000368	.000128
369	-6.69	63.62	6.74	3.1	.00353	0.00037	.000187	.000090

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 27 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
364	-1.140	1.470	-0.280	-0.210	-0.241	-0.311
365	-1.260	1.550	-0.290	-0.141	-0.241	-0.421
366	-1.300	1.580	-0.270	-0.135	-0.240	-0.570
367	-1.050	1.610	-0.320	-0.348	-0.242	-0.634
368	-0.890	1.640	-0.360	-0.558	-0.254	-0.667
369	-1.300	1.620	-0.270	-0.137	-0.250	-0.340

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
364	-2.57	-1.073	1.520	-0.280	-0.210	-0.226	-0.321
365	-2.36	-1.195	1.601	-0.290	-0.141	-0.223	-0.431
366	-2.16	-1.239	1.628	-0.270	-0.135	-0.219	-0.579
367	-1.94	-0.995	1.645	-0.320	-0.348	-0.221	-0.641
368	-1.74	-0.840	1.666	-0.360	-0.558	-0.233	-0.674
369	-2.69	-1.223	1.679	-0.270	-0.137	-0.234	-0.351

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
364	-2.57	-.27847	0.39434	-.07266	-.04888	-.05282	-.07490
365	-2.36	-.29696	0.39767	-.07206	-.03158	-.04989	-.09625
366	-2.16	-.29539	0.38798	-.06435	-.02902	-.04681	-.12394
367	-1.94	-.23238	0.38411	-.07474	-.07310	-.04629	-.13466
368	-1.74	-.19231	0.38153	-.08243	-.11475	-.04801	-.13871
369	-2.69	-.29139	0.40018	-.06435	-.02935	-.05013	-.07525

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 28 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0456 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
372	43.0	1.0208	511.77	77.02	7.2	0.151
373	44.0	1.0184	512.39	77.11	7.2	0.150
374	44.0	1.0184	512.39	77.11	7.2	0.150
375	44.0	1.0184	512.39	77.11	7.2	0.150
376	44.0	1.0184	512.39	77.11	7.2	0.150
377	44.0	1.0184	512.39	77.11	7.2	0.150

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
372	8.0	-4.0	2.1	-3.1	61.56	0.01	3.18	2.51
373	9.1	-4.0	2.6	-3.6	75.03	-0.07	3.07	2.98
374	10.1	-4.0	3.1	-4.1	88.61	-0.23	2.75	3.53
375	11.1	-4.0	3.7	-4.8	101.08	-0.40	2.24	4.18
376	12.1	-4.0	4.4	-5.1	114.01	-0.68	2.24	4.98
377	6.1	-4.0	1.9	-3.3	62.37	-0.01	3.53	2.52

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
372	-3.14	61.47	3.36	4.2	.00342	0.00019	.000150	.000083
373	-2.95	74.93	3.94	4.3	.00417	0.00022	.000178	.000087
374	-2.76	88.50	4.49	4.3	.00492	0.00025	.000211	.000093
375	-2.59	100.96	4.96	4.1	.00562	0.00028	.000250	.000103
376	-2.41	113.88	5.47	3.8	.00633	0.00030	.000297	.000118
377	-3.13	62.28	3.41	4.3	.00346	0.00019	.000151	.000082

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 28 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
372	0.020	2.360	-0.190	0.322	-0.197	-0.374
373	0.010	2.330	-0.270	0.213	-0.190	-0.390
374	-0.060	2.330	-0.390	0.108	-0.185	-0.319
375	-0.090	2.330	-0.500	0.015	-0.199	-0.307
376	-0.020	2.330	-0.520	-0.119	-0.200	-0.378
377	-0.030	2.360	-0.180	0.269	-0.197	-0.393

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
372	0.86	-0.015	2.360	-0.190	0.322	-0.203	-0.371
373	1.05	-0.033	2.330	-0.270	0.213	-0.197	-0.386
374	1.24	-0.110	2.328	-0.390	0.108	-0.192	-0.315
375	1.41	-0.147	2.327	-0.500	0.015	-0.206	-0.302
376	1.59	-0.085	2.329	-0.520	-0.119	-0.210	-0.373
377	0.87	-0.066	2.359	-0.180	0.269	-0.203	-0.390

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
372	0.86	-.00251	0.38278	-.03082	0.04701	-.02956	-.05409
373	1.05	-.00530	0.37788	-.04379	0.03103	-.02876	-.05633
374	1.24	-.01790	0.37761	-.06326	0.01570	-.02793	-.04588
375	1.41	-.02391	0.37743	-.08110	0.00225	-.03009	-.04401
376	1.59	-.01376	0.37767	-.08434	-.01740	-.03063	-.05433
377	0.87	-.01069	0.38266	-.02919	0.03918	-.02956	-.05689

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
378	44.0	1.0181	512.39	102.43	12.7	0.200
379	44.0	1.0181	512.39	102.43	12.7	0.200
380	44.0	1.0181	512.39	102.43	12.7	0.200
381	44.0	1.0181	512.39	102.43	12.7	0.200
382	44.0	1.0181	512.39	102.43	12.7	0.200
383	44.0	1.0181	512.39	102.43	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
378	6.0	4.0	2.0	-3.2	66.28	-0.14	3.39	1.16
379	7.1	4.0	2.7	-3.6	82.52	-0.31	3.21	1.31
380	8.0	4.0	3.5	-4.0	95.21	-0.66	3.11	1.59
381	9.1	4.0	4.5	-4.5	107.81	-1.14	2.85	2.06
382	10.1	4.0	5.4	-5.0	120.23	-1.82	2.59	2.70
383	6.0	4.0	2.0	-3.2	68.64	0.03	3.53	1.16

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
378	4.53	66.09	-5.09	5.8	.00368	-.00028	.000069	.000092
379	4.65	82.28	-6.38	6.1	.00458	-.00036	.000079	.000097
380	4.75	94.94	-7.23	6.0	.00528	-.00040	.000095	.000106
381	4.85	107.52	-7.99	5.6	.00598	-.00044	.000123	.000123
382	4.95	119.94	-8.57	5.2	.00667	-.00048	.000161	.000145
383	4.54	68.43	-5.46	5.9	.00381	-.00030	.000069	.000094

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
378	2.940	3.370	-0.860	3.480	-0.352	-0.183
379	2.790	3.420	-0.940	3.527	-0.375	-0.229
380	2.770	3.450	-0.980	3.544	-0.377	-0.222
381	2.920	3.590	-1.030	3.500	-0.379	-0.236
382	2.730	3.510	-1.040	3.479	-0.409	-0.267
383	3.120	3.580	-0.990	3.605	-0.397	-0.143

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
378	8.53	2.408	3.769	-0.860	3.480	-0.376	-0.129
379	8.65	2.244	3.801	-0.940	3.527	-0.406	-0.170
360	8.75	2.213	3.831	-0.980	3.544	-0.406	-0.162
381	8.85	2.333	3.997	-1.030	3.500	-0.411	-0.175
382	8.95	2.150	3.892	-1.040	3.479	-0.446	-0.200
383	8.54	2.553	4.004	-0.990	3.605	-0.414	-0.082

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
378	8.53	0.22141	0.34653	-.07908	0.28761	-.03106	-.01067
379	8.65	0.20631	0.34950	-.08643	0.29150	-.03353	-.01407
380	8.75	0.20345	0.35231	-.09011	0.29293	-.03359	-.01342
381	8.85	0.21449	0.36750	-.09471	0.28928	-.03394	-.01445
382	8.95	0.19774	0.35789	-.09563	0.28754	-.03684	-.01651
383	8.54	0.23480	0.36816	-.09103	0.29797	-.03423	-.00681

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
384	44.0	1.0181	512.39	102.43	12.7	0.200
385	44.0	1.0181	512.39	102.43	12.7	0.200
386	45.0	1.0160	512.71	102.53	12.7	0.200
387	45.0	1.0160	512.71	102.53	12.7	0.200
388	45.0	1.0160	512.71	102.53	12.7	0.200
389	45.0	1.0160	512.71	102.53	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
384	7.0	0.0	2.6	-3.2	63.96	-0.34	3.58	1.88
385	8.1	0.0	3.3	-3.6	77.53	-0.68	3.31	2.19
386	9.1	0.0	4.1	-4.1	90.46	-0.96	3.03	2.60
387	10.1	0.0	4.9	-4.6	103.47	-1.36	2.73	3.17
388	11.1	0.0	5.9	-5.3	115.15	-2.04	2.33	3.90
389	7.0	0.0	2.6	-3.1	64.36	-0.29	3.57	1.87

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
384	0.51	63.96	-0.23	6.2	.00356	-.00001	.000112	.000083
385	0.61	77.54	-0.15	6.5	.00431	-.00001	.000131	.000086
386	0.72	90.47	-0.17	6.4	.00504	-.00001	.000156	.000094
387	0.82	103.48	-0.12	6.0	.00576	-.00001	.000190	.000108
388	0.91	115.17	0.21	5.6	.00641	0.00001	.000233	.000128
389	0.51	64.36	-0.28	6.2	.00358	-.00002	.000112	.000083

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
384	1.290	3.690	-0.600	2.296	-0.353	-0.264
385	1.160	3.670	-0.740	2.287	-0.358	-0.225
386	1.240	3.680	-0.720	2.133	-0.367	-0.273
387	1.110	3.690	-0.750	2.203	-0.358	-0.275
388	1.200	3.670	-0.850	1.940	-0.372	-0.153
389	1.230	3.710	-0.650	2.331	-0.355	-0.208

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
384	4.51	0.996	3.780	-0.600	2.296	-0.372	-0.236
385	4.61	0.861	3.751	-0.740	2.287	-0.375	-0.195
386	4.72	0.933	3.770	-0.720	2.133	-0.386	-0.242
387	4.82	0.796	3.770	-0.750	2.203	-0.380	-0.244
388	4.91	0.881	3.759	-0.850	1.940	-0.384	-0.120
389	4.51	0.934	3.795	-0.650	2.331	-0.370	-0.179

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
384	4.51	0.09159	0.34757	-.05517	0.18977	-.03077	-.01948
385	4.61	0.07917	0.34495	-.06804	0.18904	-.03098	-.01612
386	4.72	0.08581	0.34661	-.06621	0.17627	-.03210	-.02000
387	4.82	0.07319	0.34668	-.06896	0.18206	-.03142	-.02019
388	4.91	0.08104	0.34567	-.07816	0.16035	-.03172	-.00994
389	4.51	0.08592	0.34898	-.05977	0.19264	-.03056	-.01483

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
390	44.0	1.0181	512.39	102.43	12.7	0.200
391	44.0	1.0181	512.39	102.43	12.7	0.200
392	45.0	1.0160	512.71	102.53	12.7	0.200
393	45.0	1.0160	512.71	102.53	12.7	0.200
394	45.0	1.0160	512.71	102.53	12.7	0.200
395	45.0	1.0157	512.71	102.55	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
390	8.0	-4.0	2.9	-3.2	58.84	0.13	3.38	2.48
391	9.1	-4.0	3.6	-3.5	72.29	-0.26	3.31	2.93
392	10.1	-4.0	4.6	-4.1	85.55	-0.71	3.06	3.52
393	11.1	-4.0	5.3	-4.7	98.50	-1.01	2.80	4.21
394	12.1	-4.0	6.2	-5.5	111.07	-1.68	2.34	5.05
395	6.0	-4.0	3.0	-3.1	59.93	-0.26	3.75	2.52

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
390	-3.53	58.74	3.50	6.0	.00327	0.00019	.000146	.000082
391	-3.43	72.15	4.58	6.5	.00401	0.00025	.000175	.000084
392	-3.32	85.37	5.67	6.4	.00475	0.00032	.000211	.000091
393	-3.22	98.29	6.54	6.1	.00547	0.00036	.000251	.000104
394	-3.12	110.81	7.72	5.7	.00617	0.00043	.000302	.000121
395	-3.52	59.80	3.94	6.3	.00333	0.00022	.000151	.000079

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
390	0.510	3.880	-0.570	0.361	-0.262	-0.092
391	0.450	3.900	-0.450	0.436	-0.267	-0.383
392	0.380	3.890	-0.340	0.361	-0.263	-0.555
393	0.300	3.920	-0.520	0.284	-0.290	-0.448
394	0.200	3.920	-0.560	0.227	-0.271	-0.491
395	0.360	3.790	-0.590	0.494	-0.272	-0.174

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
390	0.47	0.478	3.884	-0.570	0.361	-0.262	-0.090
391	0.57	0.411	3.904	-0.450	0.436	-0.271	-0.380
392	0.68	0.334	3.894	-0.340	0.361	-0.269	-0.552
393	0.78	0.247	3.924	-0.520	0.284	-0.296	-0.444
394	0.88	0.140	3.923	-0.560	0.227	-0.279	-0.487
395	0.48	0.329	3.793	-0.590	0.494	-0.274	-0.171

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
390	0.47	0.04399	0.35714	-.05241	0.02986	-.02168	-.00743
391	0.57	0.03779	0.35901	-.04138	0.03604	-.02238	-.03145
392	0.66	0.03071	0.35808	-.03126	0.02986	-.02227	-.04562
393	0.78	0.02267	0.36079	-.04781	0.02349	-.02444	-.03673
394	0.88	0.01285	0.36069	-.05149	0.01875	-.02303	-.04026
395	0.48	0.03021	0.34876	-.05425	0.04080	-.02262	-.01415

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
396	45.0	1.0157	512.71	102.55	12.7	0.200
397	45.0	1.0157	512.71	102.55	12.7	0.200
398	45.0	1.0157	512.71	102.55	12.7	0.200
399	45.0	1.0157	512.71	102.55	12.7	0.200
400	45.0	1.0157	512.71	102.55	12.7	0.200
401	45.0	1.0157	512.71	102.55	12.7	0.200
402	45.0	1.0157	512.71	102.55	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
396	9.0	-8.0	3.3	-3.1	55.37	0.04	3.95	3.05
397	10.1	-8.0	3.9	-3.4	69.11	-0.17	3.78	3.66
398	11.1	-8.0	4.7	-3.9	81.55	-0.47	3.53	4.34
399	12.1	-8.0	5.7	-4.5	94.70	-0.82	3.14	5.20
400	13.1	-8.0	6.5	-5.1	106.66	-1.22	2.83	6.14
401	14.1	-8.0	7.5	-5.6	118.60	-1.94	2.43	7.23
402	9.0	-8.0	3.4	-2.8	55.25	-0.07	4.02	3.06

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
396	-7.56	54.89	7.25	6.0	.00306	0.00040	.000182	.000078
397	-7.45	68.50	9.13	6.5	.00382	0.00051	.000218	.000080
398	-7.35	80.81	10.91	6.5	.00450	0.00061	.000259	.000087
399	-7.25	93.84	12.77	6.2	.00523	0.00071	.000311	.000100
400	-7.15	105.68	14.50	5.7	.00589	0.00081	.000367	.000119
401	-7.06	117.46	16.50	5.3	.00654	0.00092	.000432	.000141
402	-7.56	54.76	7.34	6.0	.00305	0.00041	.000183	.000078

C-5 C-5

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
396	-1.950	4.070	-0.120	-0.377	-0.345	-0.529
397	-2.040	4.000	-0.260	-0.431	-0.340	-0.499
398	-1.900	4.000	-0.330	-0.591	-0.342	-0.524
399	-2.030	4.030	-0.380	-0.632	-0.334	-0.528
400	-2.020	4.080	-0.400	-0.723	-0.325	-0.590
401	-1.970	3.960	-0.630	-0.805	-0.334	-0.426
402	-1.960	3.970	-0.130	-0.374	-0.335	-0.460

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
396	-3.56	-1.693	4.183	-0.120	-0.377	-0.311	-0.549
397	-3.45	-1.795	4.116	-0.260	-0.431	-0.309	-0.519
398	-3.35	-1.663	4.104	-0.330	-0.591	-0.311	-0.543
399	-3.25	-1.798	4.139	-0.380	-0.632	-0.304	-0.546
400	-3.15	-1.792	4.185	-0.400	-0.723	-0.292	-0.606
401	-3.06	-1.756	4.060	-0.630	-0.805	-0.311	-0.444
402	-3.56	-1.710	4.084	-0.130	-0.374	-0.306	-0.480

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
396	-3.56	-.15571	0.38466	-.01103	-.03119	-.02571	-.04540
397	-3.45	-.16509	0.37844	-.02391	-.03565	-.02555	-.04287
398	-3.35	-.15289	0.37740	-.03034	-.04885	-.02572	-.04492
399	-3.25	-.16536	0.38055	-.03494	-.05222	-.02512	-.04514
400	-3.15	-.16482	0.38482	-.03678	-.05975	-.02415	-.05013
401	-3.06	-.16145	0.37328	-.05793	-.06651	-.02567	-.03667
402	-3.56	-.15720	0.37554	-.01195	-.03094	-.02527	-.03963

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
403	46.0	1.0134	513.34	154.07	28.6	0.300
404	47.0	1.0114	513.96	154.22	28.6	0.300
405	47.0	1.0114	513.96	154.22	28.6	0.300
406	47.0	1.0114	513.96	154.22	28.6	0.300
407	47.0	1.0114	513.96	154.22	28.6	0.300
408	48.0	1.0094	514.59	154.64	28.7	0.301

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
403	6.0	4.0	3.8	-3.0	70.95	0.70	1.68	0.90
404	7.0	4.0	5.1	-3.6	83.34	0.28	1.43	1.05
405	8.0	4.0	6.2	-4.1	94.75	-0.26	1.25	1.35
406	9.1	4.0	7.3	-4.6	106.38	-0.89	0.96	1.87
407	10.0	4.0	8.5	-5.0	116.60	-1.81	0.71	2.64
408	6.0	4.0	4.0	-3.1	70.76	0.49	1.52	0.95

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
403	4.25	70.70	-5.96	7.7	.00394	-.00033	.000054	.000127
404	4.29	83.09	-6.52	8.1	.00463	-.00036	.000062	.000136
405	4.33	94.50	-6.90	8.1	.00526	-.00038	.000080	.000150
406	4.37	106.14	-7.23	7.6	.00591	-.00040	.000112	.000174
407	4.41	116.39	-7.17	7.0	.00648	-.00040	.000157	.000207
408	4.25	70.53	-5.73	7.8	.00392	-.00032	.000056	.000126

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
403	4.970	7.290	-2.540	10.152	-0.646	0.263
404	5.070	7.350	-2.610	9.927	-0.658	0.238
405	5.000	7.410	-2.660	9.909	-0.660	0.044
406	4.990	7.440	-2.690	9.807	-0.651	-0.188
407	4.810	7.500	-2.630	9.882	-0.639	-0.384
408	5.130	7.370	-2.470	10.220	-0.643	0.168

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
403	8.25	3.873	7.928	-2.540	10.152	-0.601	0.353
404	8.29	3.957	8.004	-2.610	9.927	-0.617	0.330
405	8.33	3.873	8.056	-2.660	9.909	-0.647	0.139
406	8.37	3.853	8.087	-2.690	9.807	-0.672	-0.091
407	8.41	3.661	8.123	-2.630	9.882	-0.689	-0.286
408	8.25	4.020	8.030	-2.470	10.220	-0.612	0.258

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
403	8.25	0.15812	0.32370	-.10371	0.37259	-.02207	0.01294
404	8.29	0.16156	0.32684	-.10657	0.36433	-.02266	0.01211
405	8.33	0.15815	0.32896	-.10861	0.36369	-.02375	0.00510
406	8.37	0.15733	0.33022	-.10984	0.35996	-.02466	-.00336
407	8.41	0.14950	0.33167	-.10739	0.36269	-.02527	-.01051
408	8.25	0.16356	0.32673	-.10050	0.37381	-.02240	0.00945

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
409	49.0	1.0074	514.91	154.79	28.7	0.301
410	49.0	1.0074	514.91	154.79	28.7	0.301
411	49.0	1.0074	514.91	154.79	28.7	0.301
412	49.0	1.0074	514.91	154.79	28.7	0.301
413	49.0	1.0074	514.91	154.79	28.7	0.301
414	49.0	1.0074	514.91	154.79	28.7	0.301

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
409	7.0	0.0	4.1	-2.9	60.15	0.80	1.75	1.89
410	8.0	0.0	5.0	-3.3	72.94	0.63	1.58	2.10
411	9.0	0.0	6.3	-3.8	84.29	0.17	1.47	2.47
412	10.0	0.0	7.4	-4.2	96.06	-0.37	1.32	3.01
413	11.0	0.0	8.6	-5.0	106.47	-1.25	0.86	3.79
414	7.0	0.0	4.2	-2.9	60.60	0.88	2.05	1.87

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
409	0.21	60.15	-1.02	7.8	.00335	-.00006	.000112	.000111
410	0.26	72.94	-0.96	8.7	.00406	-.00005	.000125	.000113
411	0.30	84.29	-0.61	9.0	.00469	-.00003	.000147	.000120
412	0.34	96.06	-0.20	8.8	.00535	-.00001	.000179	.000135
413	0.37	106.48	0.55	8.2	.00593	0.00003	.000225	.000158
414	0.21	60.60	-1.11	7.8	.00337	-.00006	.000111	.000111

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
409	3.330	7.860	-1.940	6.299	-0.503	0.167
410	3.170	7.850	-1.930	6.188	-0.503	-0.032
411	3.400	7.960	-2.050	6.090	-0.507	-0.241
412	3.480	7.990	-2.090	5.625	-0.509	-0.334
413	3.300	7.950	-2.300	5.653	-0.527	-0.160
414	3.360	7.890	-1.930	6.370	-0.493	0.068

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
409	4.21	2.744	8.083	-1.940	6.299	-0.490	0.203
410	4.26	2.579	8.064	-1.930	6.188	-0.504	0.005
411	4.30	2.794	8.192	-2.050	6.090	-0.524	-0.203
412	4.34	2.866	8.230	-2.090	5.625	-0.533	-0.295
413	4.37	2.684	8.179	-2.300	5.653	-0.539	-0.139
414	4.21	2.771	8.116	-1.930	6.370	-0.487	0.104

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
409	4.21	0.11165	0.32891	-.07894	0.23039	-.01791	0.00744
410	4.26	0.10493	0.32810	-.07853	0.22631	-.01843	0.00019
411	4.30	0.11370	0.33334	-.08341	0.22276	-.01916	-.00741
412	4.34	0.11661	0.33489	-.08504	0.20574	-.01946	-.01078
413	4.37	0.10922	0.33278	-.09359	0.20677	-.01971	-.00508
414	4.21	0.11276	0.33022	-.07853	0.23299	-.01779	0.00379

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
415	48.0	1.0094	514.28	154.64	28.7	0.301
416	49.0	1.0074	514.91	154.79	28.7	0.301
417	49.0	1.0074	514.91	154.79	28.7	0.301
418	49.0	1.0074	514.91	154.79	28.7	0.301
419	49.0	1.0074	514.91	154.79	28.7	0.301
420	49.0	1.0074	514.91	154.79	28.7	0.301
421	50.0	1.0054	515.22	154.95	28.7	0.301

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
415	9.0	-4.0	5.3	-3.4	57.72	1.28	3.09	2.92
416	10.0	-4.0	6.4	-3.8	70.14	0.61	3.12	3.40
417	11.0	-4.0	7.5	-4.1	82.03	0.32	3.10	4.00
418	12.1	-4.0	8.9	-4.7	92.95	-0.43	2.91	4.74
419	13.1	-4.0	10.0	-5.3	104.76	-1.26	2.50	5.75
420	13.6	-4.0	10.6	-5.5	110.58	-1.65	2.33	6.40
421	9.0	-4.0	5.4	-3.4	59.45	0.68	3.21	2.93

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
415	-3.80	57.68	2.55	7.3	.00321	0.00014	.000174	.000114
416	-3.75	70.03	3.98	8.7	.00390	0.00022	.000202	.000110
417	-3.71	81.88	4.99	8.9	.00456	0.00028	.000238	.000120
418	-3.67	92.73	6.39	8.9	.00516	0.00036	.000282	.000131
419	-3.63	104.47	7.89	8.3	.00582	0.00044	.000342	.000153
420	-3.61	110.25	8.61	7.8	.00614	0.00048	.000381	.000174
421	-3.79	59.37	3.25	8.3	.00331	0.00018	.000174	.000101

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
415	3.530	9.210	-0.850	1.293	-0.392	-0.693
416	3.430	8.860	-0.950	0.988	-0.396	-0.810
417	3.450	9.040	-1.070	0.873	-0.440	-0.919
418	3.390	8.990	-1.250	0.731	-0.467	-0.832
419	3.450	9.040	-1.170	0.583	-0.484	-1.036
420	3.420	9.120	-1.190	0.498	-0.485	-1.068
421	3.250	8.880	-0.850	1.315	-0.372	-0.723

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
415	0.20	3.497	9.222	-0.850	1.293	-0.395	-0.691
416	0.25	3.392	8.895	-0.950	0.988	-0.399	-0.808
417	0.29	3.405	9.057	-1.070	0.873	-0.445	-0.917
418	0.33	3.339	9.009	-1.250	0.731	-0.472	-0.830
419	0.37	3.392	9.062	-1.170	0.583	-0.491	-1.033
420	0.39	3.358	9.143	-1.190	0.498	-0.492	-1.064
421	0.21	3.218	8.892	-0.850	1.315	-0.375	-0.721

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
415	0.20	0.14231	0.37526	-.03459	0.04729	-.01443	-.02528
416	0.25	0.13801	0.36192	-.03866	0.03613	-.01460	-.02957
417	0.29	0.13853	0.36853	-.04354	0.03194	-.01627	-.03353
418	0.33	0.13585	0.36658	-.05086	0.02673	-.01726	-.03034
419	0.37	0.13802	0.36873	-.04761	0.02134	-.01795	-.03779
420	0.39	0.13664	0.37202	-.04842	0.01822	-.01800	-.03893
421	0.21	0.13092	0.36180	-.03459	0.04808	-.01370	-.02638

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
422	50.0	1.0054	515.22	154.95	28.7	0.301
423	50.0	1.0054	515.22	154.95	28.7	0.301
424	50.0	1.0054	515.22	154.95	28.7	0.301
425	50.0	1.0054	515.22	154.95	28.7	0.301
426	51.0	1.0034	515.65	155.10	28.7	0.301
427	51.0	1.0034	515.85	155.10	28.7	0.301

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
422	11.1	-8.0	6.6	-3.6	58.77	0.57	3.36	4.06
423	12.1	-8.0	7.7	-4.0	71.08	0.13	3.22	4.85
424	13.1	-8.0	8.9	-4.6	82.02	-0.33	2.78	5.67
425	14.1	-8.0	10.1	-5.0	94.01	-0.81	2.46	6.65
426	14.6	-8.0	10.5	-5.5	101.04	-0.91	1.94	7.25
427	11.1	-8.0	6.8	-3.8	58.70	0.15	2.63	4.09

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
422	-7.79	58.30	7.40	8.3	.00325	0.00041	.000242	.000100
423	-7.75	70.45	9.45	9.1	.00393	0.00053	.000288	.000104
424	-7.71	81.24	11.34	9.2	.00453	0.00063	.000337	.000113
425	-7.67	93.06	13.36	9.1	.00519	0.00074	.000395	.000127
426	-7.65	100.02	14.35	6.8	.00557	0.00080	.000431	.000139
427	-7.79	58.17	7.81	8.7	.00324	0.00043	.000243	.000095

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
422	0.070	8.940	-0.220	-2.092	-0.408	-1.186
423	-0.040	8.890	-0.410	-2.348	-0.375	-1.130
424	-0.220	8.940	-0.690	-2.493	-0.396	-1.041
425	-0.190	9.010	-0.880	-2.614	-0.383	-1.085
426	-0.180	8.970	-1.090	-2.752	-0.381	-0.840
427	0.160	8.920	-0.150	-2.235	-0.356	-1.111

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
422	-3.79	0.661	8.916	-0.220	-2.092	-0.329	-1.211
423	-3.75	0.542	8.874	-0.410	-2.348	-0.301	-1.152
424	-3.71	0.359	8.935	-0.690	-2.493	-0.328	-1.064
425	-3.67	0.387	9.004	-0.880	-2.614	-0.313	-1.107
426	-3.65	0.391	8.963	-1.090	-2.752	-0.327	-0.863
427	-3.79	0.750	8.890	-0.150	-2.235	-0.281	-1.132

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
422	-3.79	0.02691	0.36278	-.00895	-.07652	-.01203	-.04428
423	-3.75	0.02204	0.36106	-.01668	-.08589	-.01100	-.04215
424	-3.71	0.01462	0.36358	-.02808	-.09120	-.01199	-.03893
425	-3.67	0.01575	0.36636	-.03581	-.09560	-.01145	-.04050
426	-3.65	0.01590	0.36471	-.04435	-.10064	-.01196	-.03156
427	-3.79	0.03051	0.36172	-.00610	-.08173	-.01029	-.04141

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
428	51.0	1.0034	515.85	155.10	28.7	0.301
429	51.0	1.0041	515.85	155.05	28.7	0.301
430	51.0	1.0041	515.85	155.05	28.7	0.301
431	51.0	1.0041	515.85	155.05	28.7	0.301
432	51.0	1.0041	515.85	155.05	28.7	0.301
433	51.0	1.0041	515.85	155.05	28.7	0.301

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
428	12.2	-12.0	6.9	-3.5	48.72	0.63	2.30	4.44
429	13.1	-12.0	7.9	-3.9	59.20	0.47	1.30	5.28
430	14.1	-12.0	9.2	-4.3	70.55	-0.05	0.90	6.34
431	14.6	-12.0	9.7	-4.5	77.44	-0.13	0.67	6.94
432	13.6	-12.0	8.4	-4.4	65.59	0.40	0.72	5.85
433	12.2	-12.0	6.6	-3.8	49.17	0.94	1.08	4.47

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
428	-11.83	47.81	9.37	7.5	.00266	0.00052	.000264	.000095
429	-11.79	58.04	11.64	8.2	.00323	0.00065	.000313	.000101
430	-11.75	69.06	14.42	8.6	.00384	0.00080	.000376	.000110
431	-11.73	75.80	15.67	8.7	.00422	0.00088	.000412	.000117
432	-11.77	64.29	12.99	8.3	.00358	0.00072	.000347	.000108
433	-11.83	48.32	9.16	7.2	.00269	0.00051	.000266	.000100

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 30 CONFIGURATION BHRF2U BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
428	-4.370	8.540	-0.470	-4.744	-0.228	-0.095
429	-4.550	8.510	-0.700	-4.647	-0.246	-0.222
430	-4.530	8.560	-0.910	-4.877	-0.234	-0.117
431	-4.430	8.580	-1.100	-5.070	-0.261	0.049
432	-4.400	8.550	-0.900	-4.877	-0.244	-0.026
433	-4.450	8.500	-0.370	-4.489	-0.204	-0.267

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
428	-7.83	-3.166	9.056	-0.470	-4.744	-0.213	-0.125
429	-7.79	-3.354	9.048	-0.700	-4.647	-0.214	-0.253
430	-7.75	-3.334	9.093	-0.910	-4.877	-0.216	-0.148
431	-7.73	-3.236	9.098	-1.100	-5.070	-0.266	0.013
432	-7.77	-3.204	9.066	-0.900	-4.877	-0.238	-0.059
433	-7.83	-3.251	9.027	-0.370	-4.489	-0.166	-0.293

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
428	-7.83	-.12882	0.36847	-.01912	-.17353	-.00778	-.00456
429	-7.79	-.13648	0.36817	-.02848	-.16995	-.00783	-.00925
430	-7.75	-.13565	0.36998	-.03703	-.17838	-.00791	-.00540
431	-7.73	-.13167	0.37018	-.04476	-.18545	-.00972	0.00049
432	-7.77	-.13036	0.36891	-.03662	-.17838	-.00871	-.00216
433	-7.83	-.13228	0.36730	-.01506	-.16418	-.00606	-.01070

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 31 CONFIGURATION HR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
437	45.0	1.0119	512.71	51.57	3.2	0.101
438	45.0	1.0119	512.71	51.57	3.2	0.101
439	45.0	1.0119	512.71	51.57	3.2	0.101
440	45.0	1.0119	512.71	51.57	3.2	0.101
441	45.0	1.0119	512.71	53.93	3.5	0.105
442	45.0	1.0119	512.71	56.20	3.8	0.110

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
437	7.0	4.0	0.7	-3.5	56.83	1.70	-2.26	1.59
438	8.0	4.0	0.9	-3.9	70.92	1.67	-2.65	1.87
439	9.1	4.0	1.3	-4.4	84.31	1.48	-3.14	2.28
440	10.0	4.0	1.7	-5.0	97.36	1.35	-3.75	2.79
441	11.0	4.0	2.2	-5.6	108.16	0.93	-4.44	3.45
442	7.0	4.0	0.6	-3.5	59.13	1.93	-2.68	1.57

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
437	5.79	56.37	-7.42	2.3	.00315	-.00041	.000095	.000088
438	6.23	70.32	-9.36	2.4	.00393	-.00052	.000112	.000088
439	6.65	83.57	-11.24	2.3	.00467	-.00063	.000137	.000091
440	7.06	96.45	-13.31	2.2	.00539	-.00074	.000168	.000098
441	7.11	107.22	-14.31	2.2	.00599	-.00080	.000207	.000120
442	5.57	58.67	-7.66	2.5	.00328	-.00043	.000094	.000092

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 31 CONFIGURATION HR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
443	46.0	1.0099	513.34	59.14	4.2	0.115
444	46.0	1.0099	513.34	61.22	4.5	0.119
445	46.0	1.0099	513.34	62.56	4.7	0.122
446	46.0	1.0099	513.34	63.22	4.8	0.123
447	46.0	1.0103	513.34	63.21	4.8	0.123
448	46.0	1.0103	513.34	64.52	5.0	0.126

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
443	7.0	0.0	1.1	-3.0	49.27	2.06	-2.54	1.81
444	8.0	0.0	1.5	-3.5	63.42	1.91	-2.91	2.12
445	9.0	0.0	1.9	-3.9	76.57	1.83	-3.22	2.51
446	10.0	0.0	2.4	-4.5	88.88	1.55	-3.62	3.00
447	11.1	0.0	3.0	-4.9	101.71	1.36	-3.92	3.62
448	7.0	0.0	1.1	-3.0	51.06	2.15	-2.59	1.79

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
443	1.18	49.22	-3.08	2.5	.00275	-.00017	.000108	.000095
444	1.42	63.35	-3.48	2.8	.00354	-.00019	.000127	.000097
445	1.64	76.49	-4.02	2.9	.00427	-.00022	.000150	.000103
446	1.86	88.78	-4.44	2.9	.00496	-.00025	.000180	.000110
447	2.13	101.59	-5.14	2.8	.00568	-.00029	.000217	.000121
448	1.03	51.01	-3.07	2.8	.00285	-.00017	.000107	.000096

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 31 CONFIGURATION HR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
449	47.0	1.0083	513.96	65.86	5.2	0.128
450	47.0	1.0083	513.96	65.86	5.2	0.128
451	47.0	1.0083	513.96	66.49	5.3	0.129
452	47.0	1.0083	513.96	66.49	5.3	0.129
453	47.0	1.0083	513.96	67.11	5.4	0.131
454	47.0	1.0083	513.96	67.11	5.4	0.131
455	47.0	1.0083	513.96	66.49	5.3	0.129

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
449	8.0	-4.0	1.7	-3.0	52.08	2.24	-2.58	2.27
450	9.0	-4.0	2.1	-3.3	64.89	2.15	-2.81	2.70
451	10.0	-4.0	2.6	-3.9	77.67	1.94	-3.13	3.23
452	11.0	-4.0	3.4	-4.4	90.44	1.53	-3.53	3.90
453	12.1	-4.0	3.8	-4.8	102.94	1.38	-3.87	4.62
454	13.1	-4.0	4.5	-5.5	115.54	0.96	-4.42	5.52
455	8.0	-4.0	1.7	-3.1	52.71	2.29	-2.53	2.28

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
449	-2.99	52.13	0.48	2.8	.00291	0.00003	.000135	.000099
450	-2.74	64.92	0.96	3.0	.00363	0.00005	.000161	.000103
451	-2.52	77.68	1.48	3.1	.00434	0.00008	.000193	.000110
452	-2.28	90.43	2.07	3.0	.00505	0.00012	.000233	.000119
453	-2.08	102.92	2.36	2.9	.00575	0.00013	.000276	.000132
454	-1.85	115.51	2.76	2.7	.00645	0.00015	.000330	.000150
455	-3.00	52.76	0.47	2.9	.00295	0.00003	.000136	.000099

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 31 CONFIGURATION HR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
456	47.0	1.0083	513.96	51.66	3.2	0.101
457	47.0	1.0083	513.96	51.66	3.2	0.101
458	47.0	1.0083	513.96	54.03	3.5	0.105
459	47.0	1.0083	513.96	57.04	3.9	0.111
460	47.0	1.0083	513.96	59.19	4.2	0.115
461	43.0	1.0163	514.28	61.02	4.5	0.119
462	48.0	1.0063	514.28	62.01	4.6	0.121

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
456	9.0	-8.0	1.3	-3.4	54.50	1.58	-1.90	2.75
457	10.1	-8.0	1.8	-3.7	66.56	1.41	-2.27	3.36
458	11.0	-8.0	2.2	-4.1	78.60	1.36	-2.69	4.02
459	12.1	-8.0	2.7	-4.5	91.68	1.34	-3.07	4.81
460	13.1	-8.0	3.1	-5.0	103.71	1.13	-3.62	5.65
461	14.1	-8.0	3.9	-5.5	116.88	0.95	-4.19	6.67
462	9.0	-8.0	1.7	-3.1	54.07	1.94	-2.34	2.79

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
456	-6.29	54.35	4.40	2.2	.00303	0.00025	.000165	.000094
457	-5.91	66.35	5.45	2.2	.00371	0.00030	.000201	.000102
458	-5.74	78.35	6.50	2.3	.00437	0.00036	.000240	.000111
459	-5.63	91.37	7.66	2.4	.00510	0.00043	.000288	.000123
460	-5.51	103.34	8.84	2.4	.00577	0.00049	.000338	.000136
461	-5.39	116.45	10.02	2.3	.00644	0.00055	.000395	.000154
462	-6.82	53.91	4.49	2.7	.00301	0.00025	.000166	.000099

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 31 CONFIGURATION HR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
463	48.0	1.0063	514.28	64.64	5.0	0.126
464	48.0	1.0063	514.28	64.64	5.0	0.126
465	48.0	1.0063	514.28	65.92	5.2	0.128
466	48.0	1.0063	514.28	67.18	5.4	0.131

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
463	11.0	-12.0	2.5	-3.4	69.54	1.65	-2.53	4.09
464	12.1	-12.0	3.2	-3.9	82.09	1.52	-2.77	4.90
465	13.1	-12.0	3.8	-4.2	95.01	1.25	-2.88	5.84
466	14.1	-12.0	4.3	-4.8	107.83	1.10	-3.28	6.88

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
463	-10.60	68.66	11.17	2.9	.00384	0.00062	.000244	.000107
464	-10.35	81.03	13.24	2.8	.00453	0.00074	.000293	.000118
465	-10.16	93.74	15.53	2.8	.00524	0.00087	.000349	.000131
466	-9.99	106.39	17.62	2.7	.00595	0.00096	.000411	.000147

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 32 CONFIGURATION HR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
467	49.0	1.0043	514.91	77.11	7.1	0.150
468	49.0	1.0043	514.91	77.11	7.1	0.150
469	49.0	1.0043	514.91	77.11	7.1	0.150

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
467	8.0	4.0	2.2	-3.6	81.65	1.84	-3.00	1.55
468	9.0	4.0	2.6	-3.9	95.21	1.57	-3.35	1.90
469	7.0	4.0	1.4	-3.2	68.06	2.08	-2.75	1.34

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
467	5.16	81.15	-9.18	4.0	.00453	-.00051	.000093	.000101
468	5.35	94.65	-10.44	3.9	.00529	-.00058	.000113	.000107
469	4.97	67.63	-7.96	3.9	.00378	-.00044	.000080	.000099

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 32 CONFIGURATION HR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
470	49.0	1.0043	514.91	77.11	7.1	0.150
471	50.0	1.0023	515.22	77.18	7.1	0.150
472	50.0	1.0023	515.22	77.18	7.1	0.150
473	50.0	1.0023	515.22	77.18	7.1	0.150
474	50.0	1.0023	515.22	77.18	7.1	0.150

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
470	9.0	-4.0	2.5	-3.1	65.67	2.16	-2.91	2.72
471	10.1	-4.0	3.1	-3.7	78.89	2.00	-3.22	3.25
472	11.1	-4.0	3.8	-4.1	91.67	1.77	-3.62	3.86
473	12.1	-4.0	4.6	-4.7	104.53	1.23	-4.06	4.62
474	13.1	-4.0	4.9	-5.4	117.29	0.94	-4.72	5.56

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
470	-3.07	65.69	1.36	3.6	.00367	0.00008	.000163	.000106
471	-2.88	78.90	1.97	3.7	.00441	0.00011	.000194	.000112
472	-2.70	91.65	2.55	3.7	.00512	0.00014	.000230	.000121
473	-2.52	104.48	3.36	3.5	.00584	0.00019	.000276	.000134
474	-2.34	117.23	3.84	3.3	.00655	0.00021	.000332	.000156

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 32 CONFIGURATION HR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
475	50.0	1.0023	515.22	77.18	7.1	0.150
476	50.0	1.0023	515.22	77.18	7.1	0.150
477	50.0	1.0023	515.22	77.18	7.1	0.150
478	50.0	1.0023	515.22	77.18	7.1	0.150

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
475	11.1	-12.0	3.2	-2.9	66.15	1.80	-2.54	4.11
476	12.1	-12.0	4.0	-3.4	78.87	1.51	-2.73	4.94
477	13.1	-12.0	4.7	-3.8	91.54	1.24	-2.90	5.87
478	14.1	-12.0	5.2	-4.4	104.07	1.14	-3.21	6.87

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
475	-11.06	65.26	10.92	3.5	.00365	0.00061	.000245	.000110
476	-10.88	77.74	13.41	3.6	.00435	0.00075	.000295	.000119
477	-10.70	90.18	15.78	3.5	.00504	0.00088	.000350	.000133
478	-10.52	102.53	17.89	3.3	.00573	0.00100	.000410	.000151

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 33 CONFIGURATION HR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
479	50.0	1.0020	515.22	103.25	12.7	0.200
480	50.0	1.0020	515.22	103.25	12.7	0.200
481	50.0	1.0020	515.22	103.25	12.7	0.200
482	50.0	1.0020	515.22	103.25	12.7	0.200
483	51.0	1.0000	515.85	103.35	12.7	0.200
484	51.0	1.0000	515.85	103.35	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
479	6.0	4.0	1.8	-2.2	56.66	2.76	-2.43	1.10
480	7.0	4.0	2.5	-2.8	72.76	2.53	-2.75	1.18
481	8.1	4.0	3.5	-3.1	86.60	2.18	-2.90	1.44
482	9.2	4.0	4.2	-3.9	99.88	1.81	-3.45	1.79
483	10.2	4.0	5.1	-4.4	112.91	1.15	-3.74	2.35
484	6.1	4.0	2.0	-2.2	56.70	2.68	-2.51	1.10

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
479	4.45	56.27	-7.14	4.3	.00315	-.00040	.000066	.000121
480	4.58	72.32	-8.32	4.9	.00404	-.00047	.000071	.000123
481	4.69	86.13	-9.25	5.1	.00482	-.00052	.000086	.000131
482	4.79	99.38	-10.15	5.0	.00556	-.00057	.000107	.000144
483	4.90	112.40	-10.78	4.8	.00628	-.00060	.000140	.000162
484	4.45	56.32	-7.07	4.4	.00315	-.00039	.000066	.000120

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 33 CONFIGURATION HR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
485	51.0	1.0000	515.85	103.35	12.7	0.200
486	51.0	1.0000	515.85	103.35	12.7	0.200
487	51.0	1.0000	515.85	103.35	12.7	0.200
488	51.0	1.0000	515.85	103.35	12.7	0.200
489	51.0	0.9997	515.85	103.37	12.7	0.200
490	51.0	0.9997	515.85	103.37	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
485	8.2	0.0	3.1	-2.6	66.94	2.33	-2.69	2.05
486	9.1	0.0	3.9	-3.4	80.90	1.86	-3.03	2.45
487	10.1	0.0	4.7	-4.0	93.29	1.42	-3.38	2.94
488	11.1	0.0	5.6	-4.6	105.48	0.87	-3.75	3.57
489	12.1	0.0	6.5	-5.1	117.88	0.20	-3.97	4.40
490	8.0	0.0	3.1	-2.9	67.11	2.19	-2.74	2.05

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
485	0.53	66.92	-2.95	4.8	.00374	-.00016	.000122	.000120
486	0.64	80.88	-2.77	5.1	.00452	-.00015	.000146	.000126
487	0.74	93.26	-2.63	5.1	.00521	-.00015	.000175	.000137
488	0.84	105.46	-2.41	4.9	.00589	-.00013	.000213	.000153
489	0.93	117.86	-2.13	4.6	.00659	-.00012	.000262	.000178
490	0.53	67.09	-2.81	4.9	.00375	-.00016	.000122	.000119

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 33 CONFIGURATION HR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
491	52.0	0.9977	516.48	103.47	12.7	0.200
492	52.0	0.9977	516.48	103.47	12.7	0.200
493	52.0	0.9977	516.48	103.47	12.7	0.200
494	52.0	0.9977	516.48	103.47	12.7	0.200
495	52.0	0.9977	516.48	103.47	12.7	0.200
496	52.0	0.9977	516.48	103.47	12.7	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
491	9.0	-4.0	3.7	-2.9	62.01	2.43	-2.73	2.78
492	10.1	-4.0	4.2	-3.4	75.52	2.27	-2.99	3.29
493	11.1	-4.0	5.2	-4.0	88.00	1.89	-3.29	3.92
494	12.1	-4.0	6.1	-4.5	100.38	1.38	-3.49	4.68
495	13.1	-4.0	7.1	-5.3	112.86	0.78	-3.99	5.61
496	9.0	-4.0	3.6	-2.9	61.97	2.51	-2.61	2.75

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
491	-3.51	62.05	1.37	4.6	.00347	0.00008	.000166	.000120
492	-3.40	75.52	2.22	5.0	.00422	0.00012	.000196	.000126
493	-3.30	87.97	3.18	5.0	.00492	0.00018	.000234	.000138
494	-3.20	100.30	4.23	4.9	.00560	0.00024	.000276	.000153
495	-3.11	112.74	5.33	4.6	.00630	0.00030	.000334	.000175
496	-3.51	62.01	1.29	4.6	.00347	0.00007	.000164	.000120

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 33 CONFIGURATION HR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
497	51.0	0.9980	515.85	103.05	12.6	0.200
498	51.0	0.9980	515.85	103.05	12.6	0.200
499	51.0	0.9980	515.85	103.05	12.6	0.200
500	51.0	0.9980	515.85	103.05	12.6	0.200
501	52.0	0.9961	516.48	103.15	12.6	0.200
502	52.0	0.9961	516.48	103.15	12.6	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
497	11.0	-8.0	4.6	-3.5	69.86	2.31	-2.75	3.92
498	12.0	-8.0	5.5	-3.8	82.41	2.02	-3.05	4.67
499	13.1	-8.0	6.2	-4.4	95.71	1.68	-3.45	5.53
500	14.1	-8.0	7.2	-5.0	108.16	1.01	-3.77	6.58
501	15.1	-8.0	8.3	-5.5	120.30	0.22	-4.19	7.76
502	11.0	-8.0	4.5	-3.4	71.54	2.38	-2.90	3.96

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
497	-7.44	69.57	6.76	4.9	.00390	0.00038	.000234	.000120
498	-7.34	81.99	8.53	5.0	.00459	0.00048	.000279	.000130
499	-7.24	95.16	10.39	5.0	.00533	0.00058	.000330	.000143
500	-7.14	107.45	12.43	4.7	.00602	0.00070	.000393	.000163
501	-7.04	119.42	14.52	4.4	.00668	0.00081	.000463	.000188
502	-7.43	71.24	6.89	5.0	.00399	0.00039	.000236	.000119

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 33 CONFIGURATION HR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
503	52.0	0.9961	516.48	103.15	12.6	0.200
504	52.0	0.9961	516.48	103.15	12.6	0.200
505	52.0	0.9961	516.48	103.15	12.6	0.200
506	52.0	0.9961	516.48	103.15	12.6	0.200

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
503	13.1	-12.0	5.6	-3.8	81.38	2.08	-3.05	5.65
504	14.1	-12.0	6.8	-4.2	93.34	1.52	-3.22	6.66
505	15.1	-12.0	7.6	-4.7	106.17	1.12	-3.52	7.81
506	15.6	-12.0	7.8	-4.9	112.77	0.95	-3.64	8.39

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
503	-11.35	80.19	13.97	5.0	.00449	0.00078	.000337	.000130
504	-11.25	91.84	16.72	4.9	.00514	0.00094	.000397	.000144
505	-11.15	104.38	19.43	4.7	.00584	0.00109	.000465	.000163
506	-11.10	110.85	20.77	4.6	.00621	0.00116	.000500	.000172

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 34 CONFIGURATION HR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
507	53.0	0.9941	516.79	129.10	19.7	0.250
508	53.0	0.9941	516.79	129.10	19.7	0.250
509	53.0	0.9941	516.79	129.10	19.7	0.250
510	53.0	0.9941	516.79	129.10	19.7	0.250

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
507	6.0	4.0	2.9	-2.0	63.37	2.72	-2.43	0.88
508	7.1	4.0	3.8	-2.6	77.11	2.45	-2.75	0.99
509	8.0	4.0	4.9	-3.1	89.10	1.80	-2.90	1.28
510	9.0	4.0	5.6	-3.7	102.06	1.46	-3.16	1.66

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
507	4.32	62.99	-7.49	5.6	.00353	-.00042	.000052	.000132
508	4.39	76.70	-8.35	6.1	.00430	-.00047	.000059	.000139
509	4.46	88.69	-8.72	6.3	.00497	-.00049	.000076	.000149
510	4.52	101.62	-9.50	6.1	.00569	-.00053	.000099	.000167

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 34 CONFIGURATION HR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
511	53.0	0.9941	516.79	129.10	19.7	0.250
512	53.0	0.9941	516.79	129.10	19.7	0.250
513	53.0	0.9941	516.79	129.10	19.7	0.250
514	53.0	0.9941	516.79	129.10	19.7	0.250

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
511	10.0	-4.0	5.3	-3.1	70.97	2.32	-2.82	3.19
512	11.0	-4.0	6.4	-3.7	82.82	1.92	-3.09	3.89
513	12.1	-4.0	7.3	-4.4	95.47	1.53	-3.51	4.70
514	13.1	-4.0	8.5	-5.0	106.46	0.76	-3.85	5.65

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
511	-3.64	70.97	2.18	6.2	.00398	0.00012	.000190	.000128
512	-3.58	82.77	3.25	6.2	.00464	0.00018	.000232	.000144
513	-3.51	95.38	4.33	6.1	.00534	0.00024	.000280	.000163
514	-3.46	106.31	5.66	5.8	.00596	0.00032	.000337	.000187

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 34 CONFIGURATION HR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
515	53.0	0.9938	516.79	129.12	19.7	0.250
516	53.0	0.9938	516.79	129.12	19.7	0.250
517	53.0	0.9938	516.79	129.12	19.7	0.250
518	53.0	0.9938	516.79	129.12	19.7	0.250

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
515	13.1	-12.0	7.0	-3.4	65.73	1.72	-2.68	5.44
516	14.1	-12.0	7.6	-3.9	78.50	1.55	-2.88	6.44
517	15.1	-12.0	8.7	-4.7	91.05	1.19	-3.26	7.59
518	15.6	-12.0	9.2	-4.9	97.20	0.86	-3.36	6.19

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
515	-11.66	64.72	11.60	5.6	.00363	0.00065	.000324	.000136
516	-11.60	77.21	14.26	5.9	.00433	0.00080	.000384	.000147
517	-11.53	89.45	17.04	5.8	.00501	0.00095	.000453	.000164
518	-11.50	95.42	18.54	5.8	.00535	0.00104	.000489	.000172

MAIN ROTOR—FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 35 CONFIGURATION HR BODY PITCH ATTITUDE = 8.0
SHAFT ANGLE = 4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
519	54.0	0.9915	517.42	155.21	28.4	0.300
520	55.0	0.9896	518.05	155.36	28.4	0.300
521	55.0	0.9896	518.05	155.36	28.4	0.300
522	55.0	0.9896	518.05	155.36	26.4	0.300
523	55.0	0.9896	518.05	155.36	28.4	0.300
524	55.0	0.9896	518.05	155.36	28.4	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
519	6.0	4.0	3.4	-2.1	65.37	2.44	-2.54	0.87
520	7.1	4.0	4.9	-2.4	78.26	2.01	-2.60	0.96
521	8.1	4.0	6.1	-2.9	90.64	1.58	-2.83	1.20
522	9.0	4.0	6.9	-3.7	102.50	1.06	-3.16	1.65
523	10.0	4.0	8.5	-4.3	112.41	0.01	-3.56	2.38
524	6.0	4.0	3.3	-2.1	66.01	2.35	-2.49	0.89

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
519	4.23	65.01	-7.26	6.3	.00364	-.00041	.000052	.000152
520	4.28	77.89	-7.84	6.9	.00436	-.00044	.000057	.000157
521	4.32	90.26	-8.40	7.1	.00505	-.00047	.000071	.000170
522	4.36	102.13	-8.86	7.0	.00572	-.00050	.000096	.000192
523	4.40	112.08	-8.63	6.6	.00628	-.00048	.000142	.000221
524	4.23	65.66	-7.22	6.3	.00368	-.00040	.000053	.000152

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 35 CONFIGURATION HR BODY PITCH ATTITUDE = 4.0
SHAFT ANGLE = 0 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
525	56.0	0.9877	518.36	155.51	28.4	0.300
526	56.0	0.9877	518.36	155.51	28.4	0.300
527	56.0	0.9877	518.36	155.51	28.4	0.300
528	56.0	0.9877	518.36	155.51	28.4	0.300
529	57.0	0.9858	518.99	155.66	28.4	0.300
530	57.0	0.9858	518.99	155.66	28.4	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
525	8.0	0.0	5.0	-2.3	66.83	2.05	-2.53	2.02
526	9.0	0.0	6.0	-2.9	79.24	1.74	-2.81	2.35
527	10.0	0.0	7.3	-3.4	90.47	1.23	-2.91	2.67
528	11.0	0.0	8.3	-4.2	101.68	0.72	-3.41	3.52
529	12.1	0.0	9.7	-4.6	112.72	-0.23	-3.70	4.64
530	8.0	0.0	4.9	-2.4	66.65	2.06	-2.53	2.02

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
525	0.24	66.82	-2.33	7.0	.00374	-.00013	.000120	.000136
526	0.28	79.23	-2.13	7.6	.00444	-.00012	.000140	.000143
527	0.32	90.46	-1.74	8.1	.00507	-.00010	.000159	.000145
528	0.36	101.66	-1.36	7.4	.00570	-.00008	.000210	.000178
529	0.40	112.72	-0.56	6.6	.00631	-.00003	.000276	.000219
530	0.24	66.64	-2.33	7.0	.00373	-.00013	.000120	.000136

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 35 CONFIGURATION HR BODY PITCH ATTITUDE = 0.0
SHAFT ANGLE = -4 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
531	55.0	0.9896	518.05	155.36	28.4	0.300
532	55.0	0.9896	518.05	155.36	26.4	0.300
533	56.0	0.9877	518.36	155.51	28.4	0.300
534	56.0	0.9877	518.36	155.51	28.4	0.300
535	56.0	0.9877	518.36	155.51	28.4	0.300
536	56.0	0.9877	518.36	155.51	28.4	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
531	10.1	-4.0	6.0	-2.8	65.17	2.00	-2.29	3.32
532	11.1	-4.0	7.2	-3.3	77.34	1.73	-2.44	3.88
533	12.1	-4.0	8.3	-3.8	88.89	1.31	-2.63	4.59
534	13.1	-4.0	9.5	-4.4	100.60	0.77	-2.95	5.52
535	14.1	-4.0	10.8	-4.7	110.72	-0.07	-3.10	6.80
536	10.1	-4.0	6.0	-2.9	66.46	2.11	-2.30	3.33

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
531	-3.77	65.16	2.29	6.9	.00365	0.00013	.000197	.000137
532	-3.73	77.29	3.30	7.4	.00433	0.00018	.000231	.000144
533	-3.68	88.79	4.40	7.5	.00498	0.00025	.000273	.000156
534	-3.64	100.44	5.63	7.2	.00563	0.00032	.000328	.000181
535	-3.61	110.50	7.04	6.5	.00619	0.00039	.000404	.000222
536	-3.76	66.46	2.26	7.0	.00372	0.00013	.000198	.000137

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 35 CONFIGURATION HR BODY PITCH ATTITUDE = -4.0
SHAFT ANGLE = -8 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
537	57.0	0.9858	518.99	155.66	28.4	0.300
538	57.0	0.9858	518.99	155.66	28.4	0.300
539	57.0	0.9858	518.99	155.66	28.4	0.300
540	57.0	0.9858	518.99	155.66	28.4	0.300
541	57.0	0.9858	518.99	155.66	28.4	0.300
542	57.0	0.9858	518.99	155.66	28.4	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
537	12.1	-8.0	7.3	-3.2	65.31	1.81	-2.09	4.69
538	13.1	-8.0	8.5	-3.8	76.38	1.42	-2.33	5.51
539	14.1	-8.0	9.7	-4.2	88.39	1.05	-2.47	6.44
540	14.6	-8.0	10.3	-4.4	94.55	0.76	-2.61	7.01
541	13.8	-8.0	9.4	-4.1	84.95	1.26	-2.44	6.16
542	12.1	-8.0	7.5	-3.3	64.48	1.70	-2.11	4.66

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
537	-7.77	64.95	7.04	6.8	.00364	0.00039	.000278	.000138
538	-7.73	75.88	8.87	7.2	.00425	0.00050	.000327	.000148
539	-7.69	87.74	10.78	7.3	.00491	0.00060	.000383	.000161
540	-7.66	93.81	11.86	7.3	.00525	0.00066	.000416	.000171
541	-7.70	84.35	10.13	7.2	.00472	0.00057	.000366	.000156
542	-7.77	64.11	7.04	6.8	.00359	0.00039	.000277	.000137

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 35 CONFIGURATION HR BODY PITCH ATTITUDE = -8.0
SHAFT ANGLE = -12 ROTOR-BODY H/R = 100 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
543	58.0	0.9838	519.30	155.81	28.4	0.300
544	58.0	0.9638	519.30	155.81	28.4	0.300
545	58.0	0.9838	519.30	155.81	28.4	0.300
546	58.0	0.9838	519.30	155.81	28.4	0.300

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
543	13.1	-12.0	7.7	-3.1	53.20	1.48	-1.76	5.10
544	14.1	-12.0	8.8	-3.5	64.58	1.17	-1.83	6.10
545	15.1	-12.0	9.9	-4.1	76.85	0.86	-2.04	7.21
546	15.7	-12.0	10.3	-4.4	83.23	0.70	-2.24	7.82

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	X-FORCE (LB)	L/D (-)	CLR (-)	CXR (-)	CPR (-)	CPRO (-)
543	-11.81	52.38	9.44	6.1	.00294	0.00053	.000303	.000130
544	-11.77	63.46	12.02	6.7	.00356	0.00067	.000362	.000139
545	-11.73	75.42	14.78	7.1	.00423	0.00083	.000428	.000150
546	-11.70	81.64	16.20	7.2	.00458	0.00091	.000464	.000157

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 40 CONFIGURATION H BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
549	61.0	0.9835	.	53.12	3.3	.
550	61.0	0.9835	.	53.12	3.3	.
551	61.0	0.9835	.	53.12	3.3	.
552	62.0	0.9816	.	54.76	3.5	.
553	62.0	0.9816	.	54.76	3.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
549	.	-12.0	.	.	2.89	0.03	-1.24	0.01
550	.	-7.9	.	.	3.26	-0.07	-1.24	0.01
551	.	-4.0	.	.	3.55	-0.20	-1.14	0.01
552	.	-0.0	.	.	3.77	-0.20	-1.03	0.01
553	.	4.0	.	.	3.96	-0.10	-0.89	0.01

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 41 CONFIGURATION H BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
554	63.0	0.9797	.	80.24	7.5	.
555	64.0	0.9779	.	80.32	7.5	.
556	64.0	0.9779	.	80.32	7.5	.
557	65.0	0.9760	.	80.39	7.5	.
558	65.0	0.9757	.	80.94	7.6	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
554	.	-12.0	.	.	3.68	0.52	-0.79	0.01
555	.	-7.9	.	.	3.61	0.55	-0.91	0.01
556	.	-4.0	.	.	3.92	0.43	-0.94	0.02
557	.	0.0	.	.	4.06	0.40	-0.81	0.02
558	.	4.0	.	.	4.18	0.42	-0.67	0.02

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 42 CONFIGURATION H BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
559	68.0	0.9705	.	108.56	13.6	.
560	69.0	0.9686	.	109.07	13.7	.
561	69.0	0.9686	.	109.07	13.7	.
562	69.0	0.9686	.	109.07	13.7	.
563	69.0	0.9686	.	109.07	13.7	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
559	.	-12.0	.	.	3.50	1.43	-0.71	0.02
560	.	-8.0	.	.	3.98	1.43	-0.65	0.03
561	.	-4.0	.	.	4.18	1.42	-0.67	0.03
562	.	0.0	.	.	4.45	1.35	-0.48	0.03
563	.	4.0	.	.	4.57	1.30	-0.31	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 45 CONFIGURATION H BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
574	54.0	1.0010	.	154.75	26.5	.
575	56.0	0.9971	.	155.86	28.8	.
576	57.0	0.9951	.	156.28	28.9	.
577	58.0	0.9932	.	156.71	29.0	.
578	58.0	0.9932	.	156.71	29.0	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
574	.	-12.0	.	.	1.85	4.81	-0.82	0.03
575	.	-8.0	.	.	2.59	4.74	-0.50	0.03
576	.	-4.0	.	.	3.08	4.51	-0.46	0.02
577	.	0.0	.	.	3.49	4.31	-0.15	0.03
578	.	4.0	.	.	3.88	3.98	-0.03	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 46 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
582	62.0	0.9810	.	53.19	3.3	.
583	64.0	0.9772	.	53.29	3.3	.
584	64.0	0.9772	.	53.29	3.3	.
585	64.0	0.9772	.	53.29	3.3	.
586	65.0	0.9754	.	54.15	3.4	.
587	65.0	0.9754	.	54.94	3.5	.
588	65.0	0.9754	.	57.24	3.8	.
589	65.0	0.9754	.	58.73	4.0	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
582	.	-16.0	.	.	1.46	0.20	-1.29	0.01
583	.	-12.0	.	.	1.49	0.29	-1.28	0.01
584	.	-8.0	.	.	1.57	0.37	-1.30	0.01
585	.	-4.0	.	.	1.63	0.48	-1.32	0.01
586	.	-0.0	.	.	1.64	0.62	-1.32	0.01
587	.	4.0	.	.	1.62	0.74	-1.34	0.01
588	.	8.0	.	.	1.50	0.77	-1.35	0.01
589	.	-16.0	.	.	1.48	0.59	-1.64	0.01

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 46 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
582	-0.720	0.870	0.080	-0.496	0.013	0.146
583	-0.380	1.010	0.020	0.004	-0.019	0.131
584	0.250	1.000	-0.080	0.291	-0.053	0.194
585	0.840	0.940	-0.200	0.636	-0.098	0.285
586	1.340	0.810	-0.240	0.918	-0.119	0.292
587	1.750	0.740	-0.330	1.351	-0.152	0.336
588	2.210	0.630	-0.300	1.969	-0.151	0.308
589	-0.950	1.100	0.190	-0.492	0.027	0.064

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
582	-12	-0.523	1.001	0.080	-0.496	-0.018	0.145
583	-8.00	-0.236	1.053	0.020	0.004	-0.037	0.128
584	-4.05	0.320	0.980	-0.080	0.291	-0.067	0.190
585	0.02	0.840	0.940	-0.200	0.636	-0.097	0.285
586	3.98	1.281	0.901	-0.240	0.918	-0.098	0.300
587	7.97	1.630	0.975	-0.330	1.351	-0.104	0.354
588	12.00	2.031	1.076	-0.300	1.969	-0.084	0.333
589	-12	-0.701	1.273	0.190	-0.492	0.013	0.068

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
582	-12	-.18521	0.35412	0.02831	-.15775	-.00560	0.04626
583	-8.00	-.08342	0.37265	0.00708	0.00123	-.01138	0.04056
584	-4.05	0.11324	0.34674	-.02831	0.09247	-.02118	0.06040
585	0.02	0.29714	0.33275	-.07078	0.20246	-.03100	0.09075
586	3.98	0.43983	0.30946	-.08243	0.28350	-.03040	0.09258
587	7.97	0.54402	0.32548	-.11011	0.40523	-.03132	0.10604
588	12.00	0.62407	0.33058	-.09219	0.54397	-.02320	0.09188
589	-12	-.20452	0.37179	0.05547	-.12900	0.00348	0.01791

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 47 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
591	66.0	0.9732	.	81.04	7.6	.
592	67.0	0.9713	.	81.12	7.6	.
593	67.0	0.9710	.	81.13	7.6	.
594	67.0	0.9710	.	81.13	7.6	.
595	67.0	0.9710	.	81.13	7.6	.
596	67.0	0.9710	.	81.13	7.6	.
597	67.0	0.9710	.	81.13	7.6	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
591	.	-16.0	.	.	1.35	1.33	-1.70	0.01
592	.	-11.9	.	.	1.34	1.35	-1.65	0.01
593	.	-8.0	.	.	1.42	1.38	-1.59	0.01
594	.	-4.0	.	.	1.43	1.47	-1.54	0.01
595	.	-0.0	.	.	1.39	1.55	-1.50	0.01
596	.	4.0	.	.	1.48	1.59	-1.48	0.01
597	.	8.0	.	.	1.44	1.47	-1.47	0.01

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 47 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
591	-2.020	2.040	0.450	-1.096	0.037	0.013
592	-1.350	2.230	0.310	-0.084	-0.008	0.113
593	-0.300	2.310	0.010	0.731	-0.090	0.331
594	1.530	2.220	-0.180	1.229	-0.137	0.527
595	2.440	2.010	-0.310	2.134	-0.132	0.547
596	3.150	1.790	-0.320	3.165	-0.152	0.476
597	3.770	1.450	-0.340	3.963	-0.163	0.445

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
591	-12	-1.551	2.416	0.450	-1.096	0.033	0.021
592	-7.93	-1.029	2.395	0.310	-0.084	-0.024	0.111
593	-3.99	-0.139	2.325	0.010	0.731	-0.112	0.324
594	0.01	1.530	2.220	-0.180	1.229	-0.137	0.527
595	3.96	2.295	2.174	-0.310	2.134	-0.094	0.555
596	8.00	2.870	2.211	-0.320	3.165	-0.084	0.493
597	11.97	3.387	2.200	-0.340	3.963	-0.067	0.469

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
591	-12	-.23830	0.37123	0.06915	-.15137	0.00462	0.00285
592	-7.93	-.15818	0.36800	0.04763	-.01156	-.00329	0.01528
593	-3.99	-.02129	0.35729	0.00154	0.10093	-.01553	0.04471
594	0.01	0.23503	0.34116	-.02766	0.16976	-.01388	0.07275
595	3.96	0.35270	0.33400	-.04763	0.29476	-.01293	0.07665
596	8.00	0.44103	0.33973	-.04917	0.43711	-.01164	0.06808
597	11.97	0.52048	0.33810	-.05224	0.54741	-.00926	0.06478

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 48 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0456 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
598	66.0	0.9728	.	108.03	13.5	.
599	67.0	0.9710	.	108.54	13.6	.
600	67.0	0.9710	.	108.54	13.6	.
601	67.0	0.9710	.	108.54	13.6	.
602	67.0	0.9710	.	108.54	13.6	.
603	68.0	0.9692	.	108.64	13.6	.
604	68.0	0.9692	.	108.64	13.6	.
605	68.0	0.9692	.	108.64	13.6	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
598	.	-16.0	.	.	0.85	2.19	-1.65	0.02
599	.	-12.0	.	.	0.92	2.24	-1.65	0.02
600	.	-8.0	.	.	1.06	2.22	-1.64	0.02
601	.	-4.0	.	.	1.15	2.28	-1.57	0.02
602	.	0.0	.	.	1.25	2.34	-1.55	0.02
603	.	4.0	.	.	1.29	2.39	-1.51	0.02
604	.	8.0	.	.	1.26	2.34	-1.45	0.02
605	.	-16.0	.	.	0.85	2.24	-1.74	0.02

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 48 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
598	-3.860	3.530	0.840	-2.098	0.072	0.062
599	-2.630	3.900	0.490	-0.451	-0.022	0.336
600	-1.010	3.950	0.160	1.056	-0.084	0.502
601	0.970	3.640	-0.220	2.614	-0.168	0.824
602	3.120	3.490	-0.450	4.008	-0.267	1.077
603	4.850	3.120	-0.420	5.500	-0.206	0.769
604	6.100	2.620	-0.410	6.961	-0.185	0.590
605	-3.860	3.540	0.800	-2.098	0.090	0.069

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
598	-12	-3.042	4.255	0.840	-2.098	0.057	0.076
599	-8.04	-2.059	4.230	0.490	-0.451	-0.068	0.330
600	-4.03	-0.730	4.011	0.160	1.056	-0.119	0.495
601	0.03	0.968	3.641	-0.220	2.614	-0.168	0.324
602	4.04	2.866	3.701	-0.450	4.008	-0.190	1.093
603	8.03	4.367	3.767	-0.420	5.500	-0.096	0.790
604	12.01	5.421	3.832	-0.410	6.961	-0.059	0.615
605	-12	-3.040	4.265	0.800	-2.098	0.074	0.086

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
598	-12	-.26312	0.36810	0.07266	-.16312	0.00445	0.00587
599	-8.04	-.17677	0.36317	0.04207	-.03482	-.00527	0.02546
600	-4.03	-.06267	0.34443	0.01374	0.08154	-.00919	0.03818
601	0.03	0.08313	0.31260	-.01889	0.20177	-.01296	0.06359
602	4.04	0.24613	0.31780	-.03864	0.30939	-.01470	0.08436
603	8.03	0.37495	0.32345	-.03606	0.42451	-.00744	0.06099
604	12.01	0.46551	0.32904	-.03521	0.53728	-.00453	0.04750
605	-12	-.26107	0.36619	0.06869	-.16195	0.00570	0.00666

MAIN ROTOR—FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 49 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
606	68.0	0.9692	.	135.96	21.3	.
607	69.0	0.9673	.	136.40	21.4	.
608	69.0	0.9673	.	136.40	21.4	.
609	69.0	0.9673	.	136.40	21.4	.
610	70.0	0.9655	.	136.85	21.5	.
611	70.0	0.9655	.	136.85	21.5	.
612	70.0	0.9655	.	136.85	21.5	.
613	70.0	0.9655	.	136.85	21.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
606	.	-16.0	.	.	0.46	3.44	-1.80	0.03
607	.	-12.0	.	.	0.71	3.44	-1.76	0.02
608	.	-8.0	.	.	0.87	3.46	-1.72	0.02
609	.	-4.0	.	.	1.04	3.45	-1.72	0.02
610	.	0.0	.	.	1.18	3.44	-1.70	0.03
611	.	4.0	.	.	1.25	3.48	-1.64	0.03
612	.	8.0	.	.	1.26	3.39	-1.60	0.03
613	.	-16.0	.	.	0.54	3.49	-1.90	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 49 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
606	-6.040	5.610	1.170	-3.597	0.144	0.166
607	-3.970	6.120	0.900	-1.084	-0.006	0.346
608	-0.910	6.260	0.390	1.147	-0.155	0.729
609	2.480	5.900	0.230	3.380	-0.141	0.797
610	3.550	5.390	-0.760	6.878	-0.019	1.634
611	6.560	4.970	-0.730	8.866	-0.398	1.486
612	8.960	4.460	-0.500	11.393	-0.249	0.773
613	-6.280	5.660	1.050	-3.397	0.140	0.357

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
606	-12	-4.742	6.743	1.170	-3.597	0.106	0.193
607	-8.03	-3.076	6.615	0.900	-1.084	-0.054	0.342
608	-4.00	-0.471	6.308	0.390	1.147	-0.206	0.716
609	-0.01	2.481	5.900	0.230	3.380	-0.141	0.797
610	4.02	3.163	5.626	-0.760	6.878	0.096	1.631
611	8.00	5.804	5.835	-0.730	8.866	-0.187	1.527
612	12.04	7.833	6.231	-0.500	11.393	-0.082	0.808
613	-12	-4.964	6.844	1.050	-3.397	0.062	0.379

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
606	-12	-.25996	0.36970	0.06415	-.17727	0.00524	0.00949
607	-8.03	-.16786	0.36095	0.04911	-.05316	-.00267	0.01678
608	-4.00	-.02571	0.34424	0.02128	0.05625	-.01009	0.03513
609	-0.01	0.13539	0.32194	0.01255	0.16581	-.00694	0.03909
610	4.02	0.17182	0.30556	-.04128	0.33583	0.00468	0.07964
611	8.00	0.31527	0.31691	-.03965	0.43288	-.00912	0.07455
612	12.04	0.42543	0.33844	-.02716	0.55622	-.00401	0.03945
613	-12	-.26960	0.37172	0.05703	-.16584	0.00303	0.01849

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11266
FORWARD FLIGHT

RUN 50 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
614	71.0	0.9637	.	164.75	31.1	.
615	71.0	0.9637	.	164.75	31.1	.
616	72.0	0.9619	.	165.43	31.3	.
617	72.0	0.9619	.	165.43	31.3	.
618	72.0	0.9619	.	165.43	31.3	.
619	72.0	0.9619	.	165.43	31.3	.
620	72.0	0.9619	.	165.43	31.3	.
621	72.0	0.9619	.	165.43	31.3	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
614	.	-16.0	.	.	0.17	4.98	-1.88	0.04
615	.	-12.0	.	.	0.40	4.98	-1.87	0.03
616	.	-8.0	.	.	0.66	5.05	-1.84	0.03
617	.	-4.0	.	.	0.86	5.05	-1.79	0.03
618	.	0.0	.	.	0.87	5.05	-2.00	0.03
619	.	4.0	.	.	1.04	4.97	-2.00	0.03
620	.	8.0	.	.	1.00	4.92	-2.00	0.03
621	.	-16.0	.	.	0.02	5.11	-2.02	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 50 CONFIGURATION BHF2U BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0458 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
614	-8.770	8.250	1.680	-5.468	0.193	0.334
615	-4.750	8.840	1.260	-2.074	0.068	0.593
616	0.320	9.070	1.240	0.781	-0.103	0.221
617	3.320	8.740	0.760	4.975	-0.171	0.576
618	5.520	8.040	-1.260	9.854	0.002	2.527
619	8.450	7.400	-1.140	13.544	0.057	1.856
620	11.330	6.730	-0.740	17.152	-0.408	1.495
621	-8.750	8.310	1.670	-5.319	0.223	0.403

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
614	-12	-6.865	9.892	1.680	-5.468	0.120	0.367
615	-7.96	-3.480	9.413	1.260	-2.074	-0.015	0.597
616	-3.96	0.946	9.026	1.240	0.781	-0.118	0.214
617	-0.01	3.322	8.739	0.760	4.975	-0.171	0.576
618	4.04	4.940	8.409	-1.260	9.854	0.180	2.521
619	8.02	7.335	8.507	-1.140	13.544	0.315	1.830
620	11.97	9.688	8.933	-0.740	17.152	-0.089	1.548
621	-12	-6.838	9.943	1.670	-5.319	0.135	0.441

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
614	-12	-.25777	0.37144	0.06308	-.18456	0.00404	0.01238
615	-7.96	-.13067	0.35344	0.04731	-.07000	-.00051	0.02014
616	-3.96	0.03528	0.33676	0.04626	0.02621	-.00397	0.00717
617	-0.01	0.12392	0.32606	0.02836	0.16685	-.00575	0.01932
618	4.04	0.18430	0.31373	-.04701	0.33046	0.00605	0.08453
619	8.02	0.27366	0.31738	-.04253	0.45422	0.01058	0.06137
620	11.97	0.36145	0.33330	-.02761	0.57521	-.00298	0.05190
621	-12	-.25512	0.37096	0.06231	-.17837	0.00451	0.01478

MAIN ROTOR–FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 51 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
625	57.0	0.9884	.	52.18	3.2	.
626	58.0	0.9865	.	52.23	3.2	.
627	58.0	0.9865	.	52.23	3.2	.
628	58.0	0.9865	.	52.23	3.2	.
629	58.0	0.9865	.	52.23	3.2	.
630	58.0	0.9865	.	52.23	3.2	.
631	58.0	0.9865	.	54.62	3.5	.
632	58.0	0.9865	.	56.92	3.8	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
625	.	-16.0	.	.	1.09	0.46	-0.46	0.01
626	.	-12.0	.	.	1.28	0.36	-0.45	0.01
627	.	-8.0	.	.	1.41	0.39	-0.47	0.02
628	.	-4.0	.	.	1.53	0.29	-0.41	0.02
629	.	-0.1	.	.	1.62	0.32	-0.39	0.01
630	.	4.0	.	.	1.60	0.11	0.25	0.02
631	.	8.0	.	.	1.59	0.13	0.24	0.02
632	.	-15.9	.	.	1.49	0.37	0.13	0.02

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 51 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
625	-1.180	1.070	0.130	-0.557	0.015	0.070
626	-0.720	1.110	0.090	-0.165	-0.017	0.057
627	-0.150	1.140	0.050	0.006	-0.048	0.114
628	0.410	1.000	0.030	0.223	-0.039	0.092
629	0.860	1.010	-0.060	0.815	-0.032	0.136
630	1.090	1.090	-0.440	1.109	-0.117	0.188
631	1.640	1.050	-0.440	1.571	-0.137	0.178
632	-1.220	1.280	-0.170	-0.928	-0.106	0.127

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
625	-12	-0.931	1.292	0.130	-0.557	0.000	0.071
626	-7.99	-0.559	1.199	0.090	-0.165	-0.024	0.054
627	-3.99	-0.070	1.148	0.050	0.006	-0.056	0.110
628	0.04	0.409	1.000	0.030	0.223	-0.039	0.092
629	3.94	0.789	1.067	-0.060	0.815	-0.023	0.137
630	8.05	0.927	1.232	-0.440	1.109	-0.089	0.202
631	12.00	1.386	1.368	-0.440	1.571	-0.097	0.202
632	-11.9	-0.929	1.505	-0.170	-0.928	-0.130	0.103

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
625	-12	-.33986	0.47160	0.04744	-.18284	0.00003	0.02334
626	-7.99	-.20390	0.43767	0.03284	-.05412	-.00798	0.01764
627	-3.99	-.02566	0.41883	0.01825	0.00195	-.01834	0.03610
628	0.04	0.14937	0.36504	0.01095	0.07299	-.01273	0.03026
629	3.94	0.28778	0.38928	-.02190	0.26745	-.00750	0.04509
630	8.05	0.33815	0.44956	-.16057	0.36387	-.02926	0.06627
631	12.00	0.46240	0.45645	-.14681	0.47127	-.02900	0.06060
632	-11.9	-.28543	0.46242	-.05224	-.25642	-.03604	0.02837

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 52 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
633	58.0	0.9865	.	78.89	7.3	.
634	58.0	0.9865	.	78.89	7.3	.
635	58.0	0.9865	.	78.89	7.3	.
636	58.0	0.9865	.	78.89	7.3	.
637	58.0	0.9865	.	78.89	7.3	.
638	58.0	0.9865	.	78.89	7.3	.
639	58.0	0.9865	.	78.89	7.3	.
640	58.0	0.9865	.	78.89	7.3	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
633	.	-15.9	.	.	1.48	1.08	0.06	0.02
634	.	-12.0	.	.	1.56	1.01	0.02	0.03
635	.	-7.9	.	.	1.56	0.89	0.02	0.02
636	.	-4.0	.	.	1.52	0.85	0.08	0.02
637	.	-0.0	.	.	1.72	0.88	0.15	0.02
638	.	4.0	.	.	1.83	0.86	0.22	0.02
639	.	8.0	.	.	1.86	0.85	0.20	0.02
640	.	-16.0	.	.	1.57	1.03	0.07	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 52 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
633	-2.250	2.290	0.090	-1.822	-0.107	0.167
634	-1.690	2.460	-0.010	-0.837	-0.100	0.189
635	-0.470	2.600	-0.200	-0.343	-0.158	0.265
636	0.980	2.540	-0.270	0.336	-0.210	0.250
637	2.180	2.420	-0.400	1.199	-0.175	0.320
638	2.750	2.240	-0.480	2.318	-0.178	0.395
639	3.440	1.950	-0.390	3.160	-0.175	0.211
640	-2.090	2.290	0.060	-1.981	-0.128	0.154

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
633	-11.9	-1.727	2.706	0.090	-1.822	-0.139	0.141
634	-7.96	-1.333	2.670	-0.010	-0.837	-0.126	0.174
635	-3.94	-0.290	2.626	-0.200	-0.343	-0.175	0.254
636	-0.02	0.981	2.540	-0.270	0.336	-0.210	0.250
637	3.96	2.008	2.565	-0.400	1.199	-0.153	0.332
638	7.98	2.412	2.600	-0.480	2.318	-0.122	0.416
639	11.98	2.960	2.622	-0.390	3.160	-0.127	0.243
640	-12	-1.566	2.676	0.060	-1.981	-0.157	0.124

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
633	-11.9	-.27628	0.43292	0.01440	-.26204	-.01996	0.02027
634	-7.96	-.21325	0.42718	-.00160	-.12042	-.01806	0.02495
635	-3.94	-.04643	0.42011	-.03199	-.04929	-.02522	0.03649
636	-0.02	0.15691	0.40627	-.04319	0.04838	-.03024	0.03595
637	3.96	0.32117	0.41029	-.06399	0.17248	-.02193	0.04771
638	7.98	0.38591	0.41594	-.07679	0.33336	-.01749	0.05975
639	11.98	0.47356	0.41938	-.06239	0.45441	-.01827	0.03493
640	-12	-.25057	0.42802	0.00960	-.28479	-.02260	0.01789

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 53 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
641	58.0	0.9869	.	105.26	13.0	.
642	58.0	0.9869	.	105.26	13.0	.
643	58.0	0.9869	.	105.26	13.0	.
644	57.0	0.9888	.	105.16	13.0	.
645	57.0	0.9888	.	105.16	13.0	.
646	57.0	0.9888	.	105.16	13.0	.
647	57.0	0.9888	.	105.16	13.0	.
648	57.0	0.9888	.	105.16	13.0	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
641	.	-16.0	.	.	1.13	2.19	0.12	0.03
642	.	-11.9	.	.	1.29	2.12	0.11	0.03
643	.	-8.0	.	.	1.48	2.02	0.14	0.03
644	.	-4.0	.	.	1.64	2.00	0.17	0.03
645	.	0.0	.	.	1.74	2.01	0.18	0.03
646	.	4.0	.	.	1.90	2.01	0.16	0.03
647	.	8.0	.	.	1.99	1.92	0.20	0.03
648	.	-16.0	.	.	1.46	2.09	-0.01	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 53 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
641	-3.790	3.900	0.300	-3.437	-0.139	0.212
642	-2.720	4.160	0.090	-1.898	-0.147	0.417
643	-1.320	4.170	-0.090	-0.305	-0.173	0.453
644	1.110	3.980	-0.380	0.842	-0.214	0.522
645	2.570	3.780	-0.490	2.457	-0.308	0.604
646	4.050	3.550	-0.590	4.235	-0.292	0.606
647	5.400	3.160	-0.580	5.919	-0.242	0.357
648	-3.870	3.840	0.200	-3.290	-0.142	0.375

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
641	-12	-2.899	4.601	0.300	-3.437	-0.180	0.179
642	-7.93	-2.120	4.495	0.090	-1.898	-0.203	0.392
643	-3.98	-1.027	4.252	-0.090	-0.305	-0.204	0.440
644	0.04	1.107	3.981	-0.380	0.842	-0.214	0.522
645	4.04	2.297	3.952	-0.490	2.457	-0.265	0.624
646	8.01	3.516	4.080	-0.590	4.235	-0.205	0.641
647	12.00	4.625	4.214	-0.580	5.919	-0.162	0.400
648	-12	-2.985	4.562	0.200	-3.290	-0.217	0.337

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
641	-12	-.26039	0.41333	0.02695	-.27749	-.01451	0.01443
642	-7.93	-.19044	0.40383	0.00808	-.15322	-.01637	0.03169
643	-3.98	-.09229	0.38192	-.00808	-.02460	-.01651	0.03555
644	0.04	0.09946	0.35759	-.03414	0.06797	-.01728	0.04216
645	4.04	0.20637	0.35498	-.04402	0.19839	-.02141	0.05039
646	8.01	0.31582	0.36648	-.05300	0.34194	-.01654	0.05178
647	12.00	0.41546	0.37851	-.05210	0.47794	-.01311	0.03227
648	-12	-.26818	0.40978	0.01797	-.26568	-.01755	0.02720

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 54 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
649	58.0	0.9865	.	131.55	20.3	.
650	58.0	0.9865	.	131.55	20.3	.
652	58.0	0.9865	.	131.55	20.3	.
653	58.0	0.9865	.	131.55	20.3	.
654	58.0	0.9865	.	131.55	20.3	.
655	58.0	0.9865	.	131.55	20.3	.
656	59.0	0.9846	.	131.68	20.3	.
657	59.0	0.9846	.	131.68	20.3	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
649	.	-16.0	.	.	1.22	3.49	-0.22	0.04
650	.	-12.0	.	.	1.38	3.44	-0.29	0.04
652	.	-8.0	.	.	1.59	3.47	-0.32	0.04
653	.	-3.9	.	.	1.78	3.47	-0.23	0.04
654	.	0.0	.	.	1.95	3.41	-0.21	0.04
655	.	4.0	.	.	2.08	3.38	-0.17	0.04
656	.	8.0	.	.	2.20	3.29	-0.05	0.03
657	.	-16.0	.	.	1.37	3.63	-0.34	0.04

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 54 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
649	-5.890	5.950	0.490	-5.169	-0.242	0.426
650	-4.110	6.170	0.270	-3.006	-0.170	0.640
652	-1.570	6.380	-0.090	-0.906	-0.273	0.803
653	2.190	6.220	0.190	1.067	-0.393	0.284
654	3.440	5.740	-0.700	4.207	-0.126	1.078
655	4.650	5.260	-0.760	7.195	-0.389	1.144
656	7.020	4.860	-0.940	9.894	-0.495	1.071
657	-5.930	5.870	0.550	-5.249	-0.159	0.451

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
649	-12	-4.522	7.046	0.490	-5.169	-0.325	0.366
650	-7.97	-3.215	6.680	0.270	-3.006	-0.257	0.610
652	-4.04	-1.117	6.475	-0.090	-0.906	-0.329	0.782
653	0.07	2.182	6.223	0.190	1.067	-0.392	0.284
654	4.01	3.030	5.967	-0.700	4.207	-0.051	1.085
655	7.97	3.876	5.854	-0.760	7.195	-0.226	1.187
656	12.00	5.856	6.213	-0.940	9.894	-0.262	1.150
657	-12	-4.578	6.976	0.550	-5.249	-0.250	0.408

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
649	-12	-.26012	0.40534	0.02819	-.26728	-.01680	0.01895
650	-7.97	-.18494	0.38429	0.01553	-.15543	-.01328	0.03155
652	-4.04	-.06423	0.37247	-.00518	-.04687	-.01703	0.04044
653	0.07	0.12555	0.35797	0.01093	0.05517	-.02030	0.01471
654	4.01	0.17432	0.34323	-.04027	0.21755	-.00262	0.05608
655	7.97	0.22296	0.33676	-.04372	0.37202	-.01170	0.06137
656	12.00	0.33688	0.35743	-.05407	0.51163	-.01355	0.05948
657	-12	-.26333	0.40132	0.03164	-.27141	-.01291	0.02107

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 55 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
658	59.0	0.9846	.	158.47	29.4	.
659	60.0	0.9827	.	158.62	29.4	.
660	60.0	0.9827	.	158.62	29.4	.
661	60.0	0.9827	.	158.62	29.4	.
662	60.0	0.9827	.	158.62	29.4	.
663	60.0	0.9827	.	158.62	29.4	.
664	60.0	0.9827	.	158.62	29.4	.
665	60.0	0.9827	.	158.62	29.4	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
658	.	-16.0	.	.	1.02	5.35	-0.55	0.04
659	.	-12.0	.	.	1.19	5.41	-0.52	0.04
660	.	-8.0	.	.	1.41	5.29	-0.45	0.04
661	.	-4.0	.	.	1.69	5.31	-0.39	0.04
662	.	0.0	.	.	1.75	5.19	-0.29	0.04
663	.	4.0	.	.	2.04	5.11	-0.16	0.04
664	.	8.0	.	.	2.16	4.94	-0.05	0.04
665	.	-16.0	.	.	0.95	5.43	-0.44	0.04

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 55 CONFIGURATION BHF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
658	-8.540	8.430	0.760	-7.478	-0.221	0.826
659	-5.660	8.950	0.570	-4.535	-0.198	0.852
660	-0.670	9.050	0.320	-2.091	-0.388	0.824
661	2.820	9.070	0.460	1.896	-0.513	0.304
662	4.680	8.240	-0.900	6.624	-0.194	1.604
663	6.480	7.440	-0.780	10.767	-0.359	1.442
664	9.350	6.920	-1.120	14.499	-0.682	1.657
665	-8.470	8.550	0.800	-7.437	-0.220	0.819

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
658	-12	-6.601	10.021	0.760	-7.478	-0.388	0.762
659	-8.02	-4.356	9.652	0.570	-4.535	-0.315	0.816
660	-3.97	-0.042	9.075	0.320	-2.091	-0.444	0.795
661	-0.01	2.822	9.070	0.460	1.896	-0.513	0.304
662	4.05	4.086	8.550	-0.900	6.624	-0.080	1.613
663	8.04	5.376	8.273	-0.780	10.767	-0.154	1.479
664	12.03	7.702	8.717	-1.120	14.499	-0.322	1.763
665	-12	-6.513	10.121	0.800	-7.437	-0.385	0.756

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
658	-12	-.26218	0.39805	0.03019	-.26699	-.01386	0.02721
659	-8.02	-.17302	0.38339	0.02264	-.16192	-.01126	0.02913
660	-3.97	-.00166	0.36045	0.01271	-.07465	-.01585	0.02838
661	-0.01	0.11208	0.36025	0.01827	0.06769	-.01831	0.01085
662	4.05	0.16231	0.33961	-.03575	0.23651	-.00286	0.05760
663	8.04	0.21353	0.32862	-.03098	0.38443	-.00550	0.05279
664	12.03	0.30594	0.34624	-.04449	0.51765	-.01149	0.06295
665	-12	-.25868	0.40200	0.03178	-.26554	-.01374	0.02698

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 56 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
671	50.0	1.0020	.	51.01	3.1	.
672	50.0	1.0020	.	51.01	3.1	.
673	50.0	1.0020	.	51.01	3.1	.
674	50.0	1.0020	.	51.01	3.1	.
675	50.0	1.0020	.	51.01	3.1	.
676	50.0	1.0020	.	51.01	3.1	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
671	.	-12.0	.	.	1.48	0.40	-0.48	0.02
672	.	-8.0	.	.	1.74	0.40	-0.45	0.02
673	.	-4.0	.	.	1.93	0.33	-0.41	0.02
674	.	0.0	.	.	2.15	0.38	-0.39	0.02
675	.	4.0	.	.	2.17	0.35	-0.40	0.01
676	.	-12.0	.	.	2.26	0.37	-0.39	0.02

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 56 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
671	-0.070	0.810	0.130	-0.516	-0.015	0.060
672	-0.210	0.820	0.090	0.074	-0.027	0.077
673	0.010	0.800	0.020	0.481	-0.039	0.101
674	0.070	0.860	-0.010	1.083	-0.070	0.099
675	0.120	0.900	-0.020	1.605	-0.061	0.059
676	-0.070	0.030	0.190	-0.556	-0.033	0.004

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
671	-7.98	0.043	0.812	0.130	-0.516	-0.023	0.057
672	-3.97	-0.153	0.633	0.090	0.074	-0.032	0.075
673	0.04	0.009	0.800	0.020	0.481	-0.039	0.102
674	4.05	0.009	0.863	-0.010	1.083	-0.063	0.104
675	8.01	-0.007	0.908	-0.020	1.605	-0.052	0.066
676	-8.05	-0.065	0.040	0.190	-0.556	-0.033	-0.001

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
671	-7.98	0.01625	0.30584	0.04897	-.17463	-.00786	0.01927
672	-3.97	-.05753	0.31363	0.03390	0.02491	-.01078	0.02526
673	0.04	0.00356	0.30137	0.00753	0.16272	-.01327	0.03437
674	4.05	0.00342	0.32502	-.00377	0.36662	-.02140	0.03521
675	8.01	-.00248	0.34203	-.00753	0.54344	-.01761	0.02249
676	-8.05	-.02453	0.01488	0.07157	-.18837	-.01120	-.00021

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 57 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
677	50.0	1.0020	.	102.43	12.5	.
678	50.0	1.0020	.	102.43	12.5	.
679	50.0	1.0020	.	102.43	12.5	.
680	50.0	1.0020	.	102.43	12.5	.
681	50.0	1.0020	.	102.43	12.5	.
682	51.0	1.0000	.	102.53	12.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
677	.	-12.0	.	.	1.97	2.27	-0.30	0.03
678	.	-8.0	.	.	2.20	2.31	-0.27	0.03
679	.	-4.0	.	.	2.32	2.07	-0.25	0.03
680	.	0.0	.	.	2.49	2.02	-0.27	0.02
681	.	4.0	.	.	2.59	2.07	-0.32	0.03
682	.	-12.0	.	.	2.19	2.14	-0.33	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 57 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
677	-0.500	3.210	0.610	-2.478	-0.047	0.225
678	-0.020	3.380	0.410	-0.809	-0.055	0.350
679	0.190	3.150	0.040	1.425	-0.098	0.513
680	0.490	3.100	-0.120	3.529	-0.115	0.611
681	0.940	3.060	-0.180	5.494	-0.127	0.567
682	-0.360	3.180	0.770	-2.557	-0.061	0.017

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
677	-8.02	-0.047	3.248	0.610	-2.478	-0.076	0.216
678	-4.03	0.218	3.373	0.410	-0.809	-0.079	0.346
679	0.03	0.188	3.150	0.040	1.425	-0.098	0.513
680	4.05	0.270	3.127	-0.120	3.529	-0.071	0.618
681	8.02	0.504	3.161	-0.180	5.494	-0.046	0.579
682	-7.96	0.084	3.199	0.770	-2.557	-0.063	0.008

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
677	-8.02	-.00441	0.30347	0.05699	-.20809	-.00654	0.01816
678	-4.03	0.02033	0.31512	0.03830	-.06794	-.00664	0.02902
679	0.03	0.01760	0.29429	0.00374	0.11968	-.00825	0.04308
680	4.05	0.02521	0.29212	-.01121	0.29637	-.00597	0.05187
681	8.02	0.04707	0.29533	-.01682	0.46135	-.00390	0.04861
682	-7.96	0.00783	0.29888	0.07194	-.21469	-.00526	0.00069

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 58 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
683	52.0	0.9981	.	154.70	28.4	.
684	52.0	0.9981	.	154.70	28.4	.
685	53.0	0.9961	.	155.12	28.5	.
686	53.0	0.9961	.	155.12	28.5	.
687	53.0	0.9961	.	155.12	28.5	.
688	53.0	0.9961	.	155.12	28.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
683	.	-12.1	.	.	1.93	5.27	-0.44	0.05
684	.	-8.0	.	.	1.99	5.19	-0.45	0.05
685	.	-4.0	.	.	2.29	5.14	-0.57	0.04
686	.	-0.0	.	.	2.44	5.15	-0.65	0.04
687	.	4.0	.	.	2.59	5.04	-0.73	0.04
688	.	-12.0	.	.	1.83	5.27	-0.74	0.04

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 58 CONFIGURATION BHFWO BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
683	-0.420	7.090	1.280	-6.308	-0.082	0.484
684	0.060	7.210	0.820	-1.788	-0.139	0.710
685	0.460	7.130	0.320	3.125	-0.188	1.114
686	1.410	7.030	-0.100	7.589	-0.214	1.423
687	2.470	6.790	-0.310	12.036	-0.202	1.407
688	-0.490	7.030	1.140	-5.961	-0.137	0.604

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
683	-8.06	0.578	7.079	1.280	-6.308	-0.149	0.468
684	-4.01	0.564	7.188	0.820	-1.788	-0.188	0.699
685	0.04	0.455	7.130	0.320	3.125	-0.187	1.114
686	3.97	0.920	7.111	-0.100	7.589	-0.115	1.434
687	8.02	1.499	7.068	-0.310	12.036	-0.003	1.422
688	-8.00	0.493	7.030	1.140	-5.961	-0.220	0.579

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
683	-8.06	0.02378	0.29106	0.05263	-.23317	-.00550	0.01730
684	-4.01	0.02319	0.29557	0.03372	-.06607	-.00696	0.02584
685	0.04	0.01864	0.29216	0.01311	0.11510	-.00689	0.04102
686	3.97	0.03769	0.29136	-.00410	0.27951	-.00423	0.05282
687	8.02	0.06140	0.28962	-.01270	0.44330	-.00013	0.05236
688	-8.00	0.02021	0.28805	0.04671	-.21957	-.00809	0.02133

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 59 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	FP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
693	50.0	1.0040	.	50.96	3.1	.
694	50.0	1.0040	.	50.96	3.1	.
695	50.0	1.0040	.	50.96	3.1	.
696	50.0	1.0040	.	50.96	3.1	.
697	50.0	1.0040	.	50.96	3.1	.
698	50.0	1.0040	.	50.96	3.1	.
699	50.0	1.0040	.	50.96	3.1	.
700	50.0	1.0040	.	50.96	3.1	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
693	.	-16.0	.	.	1.57	0.58	-0.21	0.02
694	.	-12.0	.	.	2.04	0.54	-0.11	0.02
695	.	-7.9	.	.	2.06	0.55	0.04	0.02
696	.	-4.0	.	.	2.18	0.54	0.20	0.02
697	.	0.0	.	.	2.13	0.58	0.23	0.02
698	.	3.9	.	.	2.28	0.54	0.24	0.02
699	.	8.0	.	.	2.31	0.48	0.19	0.02
700	.	-16.0	.	.	2.21	0.57	0.06	0.02

MAIN ROTOR–FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 59 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
693	-1.400	0.990	0.050	0.519	-0.028	0.084
694	-1.330	1.020	0.160	0.733	-0.044	-0.048
695	-0.690	1.050	0.120	0.610	-0.095	-0.031
696	0.070	0.960	0.040	0.438	-0.078	0.093
697	0.380	0.920	-0.020	0.563	-0.071	0.139
698	0.750	0.740	0.060	0.527	-0.068	0.014
699	0.850	0.540	0.030	0.642	-0.059	0.012
700	-1.180	0.980	0.070	0.346	-0.057	0.055

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
693	-12	-1.163	1.260	0.050	0.519	-0.045	0.076
694	-8.00	-1.175	1.195	0.160	0.733	-0.037	-0.054
695	-3.95	-0.616	1.095	0.120	0.610	-0.093	-0.038
696	0.03	0.069	0.980	0.040	0.438	-0.078	0.093
697	4.00	0.315	0.944	-0.020	0.563	-0.061	0.143
698	7.92	0.641	0.836	0.060	0.527	-0.065	0.024
699	12.04	0.719	0.705	0.030	0.642	-0.055	0.024
700	-12	-0.950	1.204	0.070	0.346	-0.068	0.042

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
693	-12	-.47753	0.51760	0.02054	0.21333	-.01846	0.03121
694	-8.00	-.48263	0.49087	0.06571	0.30123	-.01513	-.02212
695	-3.95	-.25301	0.44975	0.04929	0.25033	-.03824	-.01546
696	0.03	0.02854	0.40251	0.01643	0.17997	-.03222	0.03819
697	4.00	0.12933	0.38782	-.00821	0.23136	-.02502	0.05878
698	7.92	0.26322	0.34347	0.02464	0.21661	-.02674	0.00970
699	12.04	0.29516	0.28973	0.01232	0.26381	-.02260	0.00995
700	-12	-.39028	0.49453	0.02875	0.14211	-.02776	0.01726

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 60 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
701	49.0	1.0064	.	76.49	7.0	.
702	50.0	1.0044	.	76.56	7.0	.
703	50.0	1.0044	.	76.56	7.0	.
704	50.0	1.0044	.	76.56	7.0	.
705	50.0	1.0044	.	76.56	7.0	.
706	50.0	1.0044	.	76.56	7.0	.
707	50.0	1.0044	.	76.56	7.0	.
708	50.0	1.0044	.	76.56	7.0	.

MAIN ROTOR DATA - HUB REFERENCE CENTER.

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
701	.	-16.0	.	.	2.39	1.36	-0.16	0.03
702	.	-12.0	.	.	2.54	1.31	-0.09	0.03
703	.	-7.9	.	.	2.48	1.22	0.03	0.03
704	.	-4.0	.	.	2.62	1.28	0.25	0.03
705	.	-0.0	.	.	2.58	1.29	0.40	0.03
706	.	4.0	.	.	2.59	1.34	0.43	0.03
707	.	8.0	.	.	2.65	1.34	0.41	0.03
708	.	-15.9	.	.	2.39	1.43	0.06	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 60 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
701	-2.490	1.990	0.080	0.831	-0.047	0.216
702	-2.240	2.010	0.190	1.079	-0.083	0.064
703	-1.620	1.870	0.180	1.290	-0.123	0.013
704	0.420	1.770	0.030	0.564	-0.139	0.222
705	0.760	1.610	0.100	0.925	-0.126	0.107
706	1.380	1.370	0.090	0.900	-0.117	0.047
707	2.140	1.060	0.120	0.738	-0.115	-0.041
708	-2.490	1.910	0.120	0.754	-0.085	0.209

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
701	-12	-2.024	2.463	0.080	0.831	-0.091	0.201
702	-7.96	-1.940	2.301	0.190	1.079	-0.091	0.052
703	-3.95	-1.487	1.977	0.180	1.290	-0.124	0.005
704	0.00	0.420	1.770	0.030	0.564	-0.139	0.222
705	3.97	0.647	1.659	0.100	0.925	-0.118	0.116
706	8.03	1.175	1.549	0.090	0.900	-0.109	0.062
707	11.97	1.874	1.481	0.120	0.738	-0.121	-0.016
708	-11.9	-2.041	2.384	0.120	0.754	-0.127	0.187

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
701	-12	-.36806	0.44795	0.01455	0.15120	-.01650	0.03665
702	-7.96	-.35287	0.41849	0.03456	0.19625	-.01653	0.00944
703	-3.95	-.27053	0.35962	0.03274	0.23463	-.02252	0.00087
704	0.00	0.07639	0.32194	0.00546	0.10262	-.02526	0.04042
705	3.97	0.11763	0.30171	0.01819	0.16830	-.02155	0.02107
706	8.03	0.21373	0.28181	0.01637	0.16372	-.01982	0.01136
707	11.97	0.34079	0.26934	0.02183	0.13420	-.02210	-.00297
708	-11.9	-.37115	0.43365	0.02183	0.13720	-.02306	0.03394

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 61 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
709	50.0	1.0047	.	102.29	12.5	.
710	50.0	1.0047	.	102.29	12.5	.
711	49.0	1.0067	.	102.19	12.5	.
712	49.0	1.0067	.	102.19	12.5	.
713	49.0	1.0067	.	102.19	12.5	.
714	49.0	1.0067	.	102.19	12.5	.
715	49.0	1.0067	.	102.19	12.5	.
716	49.0	1.0067	.	102.19	12.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
709	.	-16.0	.	.	2.24	2.55	-0.34	0.03
710	.	-12.0	.	.	2.72	2.53	-0.25	0.03
711	.	-7.9	.	.	2.79	2.56	-0.07	0.04
712	.	-4.0	.	.	2.83	2.59	0.15	0.03
713	.	0.0	.	.	2.86	2.61	0.36	0.03
714	.	4.0	.	.	2.99	2.55	0.46	0.03
715	.	8.0	.	.	3.02	2.38	0.49	0.04
716	.	-16.0	.	.	2.54	2.54	-0.08	0.03

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 61 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
709	-3.680	3.340	0.070	1.108	-0.087	0.405
710	-3.480	3.410	0.320	1.585	-0.138	0.074
711	-2.410	3.300	0.250	1.858	-0.251	0.108
712	0.650	3.040	0.310	0.873	-0.248	0.013
713	1.470	2.700	-0.120	1.187	-0.175	0.451
714	2.240	2.360	-0.090	1.536	-0.223	0.363
715	3.200	1.820	0.020	1.587	-0.169	0.111
716	-4.100	3.300	0.110	1.293	-0.106	0.398

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
709	-12	-3.100	4.074	0.070	1.108	-0.170	0.378
710	-7.99	-2.972	3.861	0.320	1.585	-0.147	0.054
711	-3.94	-2.178	3.458	0.250	1.858	-0.257	0.091
712	-0.04	0.652	3.040	0.310	0.873	-0.248	0.013
713	4.02	1.277	2.796	-0.120	1.187	-0.142	0.462
714	7.97	1.891	2.648	-0.090	1.536	-0.171	0.391
715	11.98	2.753	2.445	0.020	1.587	-0.162	0.148
716	-12	-3.324	4.081	0.110	1.293	-0.186	0.367

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
709	-12	-.31576	0.41499	0.00713	0.11284	-.01729	0.03851
710	-7.99	-.30274	0.39323	0.03259	0.16141	-.01495	0.00547
711	-3.94	-.22180	0.35220	0.02546	0.18923	-.02622	0.00927
712	-0.04	0.06642	0.30960	0.03158	0.08895	-.02529	0.00129
713	4.02	0.13008	0.28483	-.01222	0.12086	-.01451	0.04709
714	7.97	0.19263	0.26970	-.00917	0.15647	-.01740	0.03961
715	11.98	0.28036	0.24900	0.00204	0.16168	-.01650	0.01511
716	-12	-.33853	0.41567	0.01120	0.13171	-.01898	0.03742

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 62 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
717	50.0	1.0047	.	127.76	19.5	.
718	50.0	1.0047	.	127.76	19.5	.
719	50.0	1.0047	.	127.76	19.5	.
720	50.0	1.0047	.	127.76	19.5	.
721	50.0	1.0047	.	127.76	19.5	.
722	50.0	1.0047	.	127.76	19.5	.
723	50.0	1.0047	.	127.76	19.5	.
724	50.0	1.0047	.	127.76	19.5	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
717	.	-16.0	.	.	2.56	3.95	-0.58	0.04
718	.	-12.0	.	.	2.78	4.01	-0.42	0.04
719	.	-8.0	.	.	2.89	4.01	-0.17	0.04
720	.	-4.0	.	.	3.00	4.02	-0.01	0.04
721	.	0.0	.	.	3.06	3.94	0.26	0.04
722	.	4.0	.	.	3.18	3.93	0.42	0.04
723	.	8.0	.	.	3.27	3.76	0.45	0.04
724	.	-16.0	.	.	2.21	4.05	-0.33	0.04

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 62 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
717	-5.980	5.130	0.280	1.755	-0.119	0.401
718	-4.960	5.120	0.440	2.280	-0.173	0.132
719	-2.490	4.840	0.530	2.034	-0.430	-0.071
720	1.300	4.650	0.540	1.170	-0.290	-0.150
721	2.430	4.150	-0.370	1.643	-0.164	0.733
722	3.170	3.610	-0.170	2.638	-0.146	0.367
723	4.320	2.880	-0.020	2.650	-0.221	0.209
724	-5.990	5.140	0.160	1.754	-0.133	0.513

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
717	-12	-4.778	6.265	0.280	1.755	-0.200	0.367
718	-8.02	-4.217	5.765	0.440	2.280	-0.190	0.107
719	-4.02	-2.145	5.003	0.530	2.034	-0.424	-0.101
720	0.00	1.300	4.650	0.540	1.170	-0.290	-0.150
721	4.01	2.134	4.310	-0.370	1.643	-0.112	0.742
722	8.04	2.634	4.018	-0.170	2.638	-0.094	0.384
723	12.03	3.625	3.717	-0.020	2.650	-0.172	0.250
724	-12	-4.786	6.276	0.180	1.754	-0.237	0.474

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
717	-12	-.31199	0.40903	0.01828	0.11462	-.01308	0.02396
718	-8.02	-.27534	0.37640	0.02873	0.14884	-.01242	0.00698
719	-4.02	-.14002	0.32664	0.03461	0.13279	-.02766	-.00659
720	0.00	0.08488	0.30361	0.03526	0.07642	-.01891	-.00981
721	4.01	0.13932	0.28140	-.02416	0.10725	-.00733	0.04847
722	8.04	0.17198	0.26234	-.01110	0.17222	-.00611	0.02509
723	12.03	0.23668	0.24270	-.00131	0.17302	-.01126	0.01632
724	-12	-.31250	0.40980	0.01175	0.11455	-.01550	0.03096

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 63 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
725	51.0	1.0028	.	153.79	28.2	.
726	52.0	1.0008	.	153.94	28.2	.
727	52.0	1.0008	.	153.94	28.2	.
728	52.0	1.0008	.	153.94	28.2	.
729	52.0	1.0008	.	153.94	28.2	.
730	52.0	1.0008	.	153.94	28.2	.
731	52.0	1.0008	.	153.94	28.2	.
732	52.0	1.0008	.	153.94	28.2	.

MAIN ROTOR DATA - HUB REFERENCE CENTER

(SHAFT AXIS)

RECORD	THETA (DEG)	ALPHS (DEG)	B1 (DEG)	A1 (DEG)	THRUST (LB)	H-FORCE (LB)	Y-FORCE (LB)	MRHP (HP)
725	.	-16.0	.	.	2.27	5.78	-0.99	0.04
726	.	-12.0	.	.	2.48	5.90	-0.77	0.05
727	.	-8.0	.	.	2.73	5.96	-0.42	0.05
728	.	-4.0	.	.	2.88	5.88	-0.29	0.05
729	.	-0.0	.	.	2.97	5.79	-0.15	0.05
730	.	4.0	.	.	3.28	5.56	0.04	0.05
731	.	8.0	.	.	3.37	5.33	0.19	0.05
732	.	-16.0	.	.	1.96	5.74	-0.48	0.05

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 63 CONFIGURATION BH BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = .0833 ROTOR-GROUND Z/R = 1.4063

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
725	-8.220	7.370	-0.040	2.436	-0.182	1.007
726	-6.470	7.350	0.610	2.726	-0.277	0.245
727	-1.170	7.300	1.700	1.678	-0.626	-1.185
728	1.870	6.730	0.870	1.644	-0.407	-0.376
729	3.910	6.000	-0.220	1.922	-0.228	0.514
730	4.800	5.170	-0.490	3.289	-0.168	0.804
731	6.420	4.260	-0.120	3.373	-0.135	0.311
732	-8.480	7.420	-0.420	2.605	-0.226	1.439

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
725	-12	-6.508	8.918	-0.040	2.436	-0.387	0.947
726	-7.98	-5.387	8.177	0.610	2.726	-0.308	0.204
727	-4.04	-0.653	7.364	1.700	1.678	-0.541	-1.226
728	-0.02	1.872	6.729	0.870	1.644	-0.407	-0.376
729	3.97	3.485	6.256	-0.220	1.922	-0.192	0.528
730	8.03	4.031	5.790	-0.490	3.289	-0.055	0.820
731	12.02	5.392	5.504	-0.120	3.373	-0.067	0.332
732	-12	-6.754	9.020	-0.420	2.605	-0.520	1.361

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
725	-12	-.29383	0.40264	-.00181	0.10997	-.01747	0.04277
726	-7.98	-.24322	0.36919	0.02754	0.12306	-.01392	0.00922
727	-4.04	-.02947	0.33249	0.07675	0.07577	-.02442	-.05534
728	-0.02	0.08454	0.30383	0.03928	0.07423	-.01838	-.01698
729	3.97	0.15735	0.28247	-.00993	0.08678	-.00868	0.02385
730	8.03	0.18198	0.26141	-.02212	0.14849	-.00246	0.03700
731	12.02	0.24345	0.24848	-.00542	0.15228	-.00302	0.01501
732	-12	-.30492	0.40724	-.01896	0.11760	-.02347	0.06144

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 64 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
736	49.0	1.0070	.	50.66	3.1	.
737	49.0	1.0070	.	50.88	3.1	.
738	49.0	1.0070	.	50.88	3.1	.
739	49.0	1.0070	.	50.88	3.1	.
740	49.0	1.0070	.	50.88	3.1	.
741	49.0	1.0070	.	50.88	3.1	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 64 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
736	-0.840	0.790	0.150	0.468	0.006	-0.009
737	-0.600	0.780	0.090	0.606	0.013	0.037
738	0.580	0.640	0.160	0.129	0.006	-0.058
739	0.730	0.510	0.100	0.465	0.014	0.007
740	-0.930	0.760	0.160	0.563	0.006	0.002
741	1.310	0.470	0.060	0.559	0.012	0.064

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
736	-7.97	-0.722	0.899	0.150	0.468	0.007	-0.008
737	-4.04	-0.544	0.820	0.090	0.606	0.011	0.037
738	0.03	0.580	0.640	0.160	0.129	0.006	-0.058
739	4.05	0.692	0.560	0.100	0.465	0.014	0.006
740	-7.95	-0.816	0.881	0.160	0.563	0.006	0.003
741	8.07	1.231	0.649	0.060	0.559	0.021	0.062

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
736	-7.97	-.29668	0.36916	0.06161	0.19232	0.00281	-.00331
737	-4.04	-.22325	0.33692	0.03696	0.24903	0.00443	0.01540
738	0.03	0.23808	0.26298	0.06571	0.05283	0.00247	-.02390
739	4.05	0.28428	0.23012	0.04107	0.19082	0.00586	0.00262
740	-7.95	-.33512	0.36197	0.06571	0.23113	0.00235	0.00108
741	8.07	0.50561	0.26665	0.02464	0.22954	0.00870	0.02549

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 65 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
742	49.0	1.0074	.	101.75	12.4	.
743	49.0	1.0074	.	101.75	12.4	.
744	49.0	1.0074	.	101.75	12.4	.
745	49.0	1.0074	.	101.75	12.4	.
747	49.0	1.0074	.	101.75	12.4	.
748	49.0	1.0074	.	101.75	12.4	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 65 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
742	-3.950	2.860	0.430	2.261	0.076	0.112
743	-2.940	2.640	0.370	2.704	0.054	0.097
744	0.000	2.170	0.350	2.028	0.003	0.036
745	1.670	1.820	0.140	2.115	-0.025	0.320
747	2.540	1.270	-0.030	2.359	-0.041	0.448
748	-3.730	2.850	0.410	2.197	0.075	0.070

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
742	-8.01	-3.513	3.363	0.430	2.261	0.060	0.121
743	-4.00	-2.749	2.839	0.370	2.704	0.047	0.101
744	-0.03	0.001	2.170	0.350	2.028	0.003	0.036
745	4.07	1.537	1.934	0.140	2.115	-0.002	0.321
747	8.03	2.338	1.612	-0.030	2.359	0.022	0.449
748	-7.94	-3.301	3.338	0.410	2.197	0.065	0.080

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
742	-8.01	-.36070	0.34731	0.04415	0.23213	0.00615	0.01245
743	-4.00	-.28223	0.29147	0.03799	0.27760	0.00483	0.01035
744	-0.03	0.00012	0.22281	0.03594	0.20825	0.00033	0.00368
745	4.07	0.15778	0.19857	0.01437	0.21711	-.00020	0.03299
747	8.03	0.24003	0.16555	-.00308	0.24226	0.00224	0.04612
748	-7.94	-.33889	0.34273	0.04210	0.22562	0.00668	0.00821

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 66 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
749	50.0	1.0054	.	153.04	28.0	.
750	51.0	1.0034	.	153.19	28.0	.
751	51.0	1.0034	.	153.19	28.0	.
752	51.0	1.0034	.	153.19	28.0	.
753	51.0	1.0034	.	153.19	28.0	.
754	51.0	1.0034	.	153.19	28.0	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 66 CONFIGURATION B BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
749	-8.500	6.300	0.940	5.025	0.195	0.139
750	-3.000	5.690	0.800	3.754	0.000	0.209
751	-0.050	5.060	0.580	4.835	-0.018	0.223
752	3.430	4.100	-0.020	4.518	0.079	0.589
753	4.560	2.630	-0.220	5.097	-0.098	0.974
754	-8.430	6.320	0.770	5.160	0.229	0.297

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
749	-7.97	-7.544	7.418	0.940	5.025	0.174	0.165
750	-3.96	-2.600	5.884	0.800	3.754	-0.014	0.209
751	-0.05	-0.046	5.060	0.580	4.835	-0.018	0.223
752	4.04	3.133	4.331	-0.020	4.518	0.121	0.581
753	8.05	4.147	3.243	-0.220	5.097	0.039	0.978
754	-7.98	-7.471	7.429	0.770	5.160	0.186	0.326

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
749	-7.97	-.34306	0.33730	0.04274	0.22852	0.00792	0.00751
750	-3.96	-.11822	0.26754	0.03638	0.17071	-.00065	0.00948
751	-0.05	-.00207	0.23009	0.02637	0.21988	-.00083	0.01013
752	4.04	0.14245	0.19696	-.00091	0.20545	0.00548	0.02644
753	8.05	0.18856	0.14745	-.01000	0.23177	0.00177	0.04447
754	-7.98	-.33972	0.33781	0.03501	0.23463	0.00844	0.01481

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 67 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
760	49.0	1.0084	.	50.85	3.1	.
761	49.0	1.0084	.	50.85	3.1	.
762	49.0	1.0084	.	50.85	3.1	.
763	49.0	1.0084	.	50.85	3.1	.
764	49.0	1.0084	.	50.85	3.1	.
765	49.0	1.0084	.	50.85	3.1	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 67 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
760	-0.920	0.900	0.140	0.038	0.045	0.110
761	-0.110	0.960	0.130	0.125	0.015	0.120
762	0.390	0.960	0.080	0.633	0.033	0.106
763	0.970	0.960	0.020	1.065	0.021	0.161
764	1.360	0.910	-0.010	1.566	0.010	0.219
765	-0.970	1.060	0.130	0.108	0.075	0.140

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
760	-7.94	-0.787	1.018	0.140	0.038	0.030	0.116
761	-3.96	-0.042	0.985	0.130	0.125	0.007	0.120
762	-0.05	0.391	0.960	0.080	0.633	0.033	0.106
763	4.06	0.900	1.026	0.020	1.065	0.032	0.160
764	7.97	1.221	1.090	-0.010	1.566	0.040	0.216
765	-7.94	-0.814	1.184	0.130	0.108	0.055	0.149

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
760	-7.94	-.29641	0.38366	0.05274	0.01293	0.01003	0.03912
761	-3.96	-.01584	0.37115	0.04897	0.04230	0.00224	0.04075
762	-0.05	0.14723	0.36151	0.03014	0.21419	0.01115	0.03587
763	4.06	0.33888	0.38660	0.00753	0.36073	0.01088	0.05404
764	7.97	0.45984	0.41053	-.00377	0.53026	0.01352	0.07308
765	-7.94	-.30674	0.44596	0.04897	0.03673	0.01859	0.05032

MAIN ROTOR—FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 68 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
768	49.0	1.0084	.	101.70	12.4	.
770	49.0	1.0084	.	101.70	12.4	.
771	49.0	1.0084	.	101.70	12.4	.
772	49.0	1.0084	.	101.70	12.4	.
773	49.0	1.0084	.	101.70	12.4	.
774	49.0	1.0084	.	101.70	12.4	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 68 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
768	-3.670	3.380	0.590	-0.528	0.012	0.514
770	-1.920	3.330	0.610	0.743	-0.087	0.385
771	-0.100	3.040	0.310	2.178	-0.068	0.563
772	1.380	2.780	0.350	3.807	-0.087	0.566
773	2.940	2.600	0.060	5.569	-0.046	0.784
774	-3.870	3.230	0.740	-0.357	-0.022	0.345

(WIND AXIS)

RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
768	-8.06	-3.160	3.861	0.590	-0.528	-0.060	0.510
770	-3.98	-1.684	3.455	0.610	0.743	-0.113	0.378
771	0.05	-0.103	3.040	0.310	2.178	-0.068	0.563
772	4.06	1.180	2.871	0.350	3.807	-0.047	0.571
773	8.05	2.547	2.986	0.060	5.569	0.063	0.783
774	-7.95	-3.386	3.734	0.740	-0.357	-0.070	0.338

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
768	-8.06	-.29758	0.36363	0.05556	-.04471	-.00507	0.04319
770	-3.98	-.15862	0.32540	0.05745	0.06288	-.00961	0.03200
771	0.05	-.00967	0.28629	0.02919	0.18437	-.00574	0.04765
772	4.06	0.11110	0.27036	0.03296	0.32227	-.00394	0.04830
773	8.05	0.23986	0.28122	0.00565	0.47141	0.00530	0.06632
774	-7.95	-.31889	0.35167	0.06969	-.03024	-.00589	0.02863

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 69 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

(TEST CONDITIONS)

RECORD	TEMP (DEG F)	SIGPRM	TP (FPS)	VEL (FPS)	Q (LB/FT2)	MU
775	50.0	1.0068	.	152.94	28.0	.
776	51.0	1.0048	.	153.09	28.0	.
777	51.0	1.0048	.	153.09	28.0	.
778	51.0	1.0048	.	153.09	28.0	.
779	51.0	1.0048	.	153.09	28.0	.
780	52.0	1.0028	.	153.24	28.0	.

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 69 CONFIGURATION BF2L BODY PITCH ATTITUDE = ---
SHAFT ANGLE = --- ROTOR-BODY H/R = --- ROTOR-GROUND Z/R = ---

FUSELAGE DATA - AERODYNAMIC REFERENCE CENTER

(BODY AXIS)

RECORD	NF (LBS)	AF (LBS)	SF (LBS)	PM (FT-LB)	RM (FT-LB)	YM (FT-LB)
775	-6.890	7.460	1.780	-2.420	-0.033	0.551
776	-1.840	7.450	1.560	-0.507	-0.311	0.535
777	0.200	6.830	0.710	4.207	-0.243	1.122
778	2.170	6.370	0.210	9.280	-0.082	1.705
779	3.430	5.590	0.220	13.652	-0.232	1.856
780	-6.670	7.460	1.940	-2.483	-0.147	0.513

(WIND AXIS)

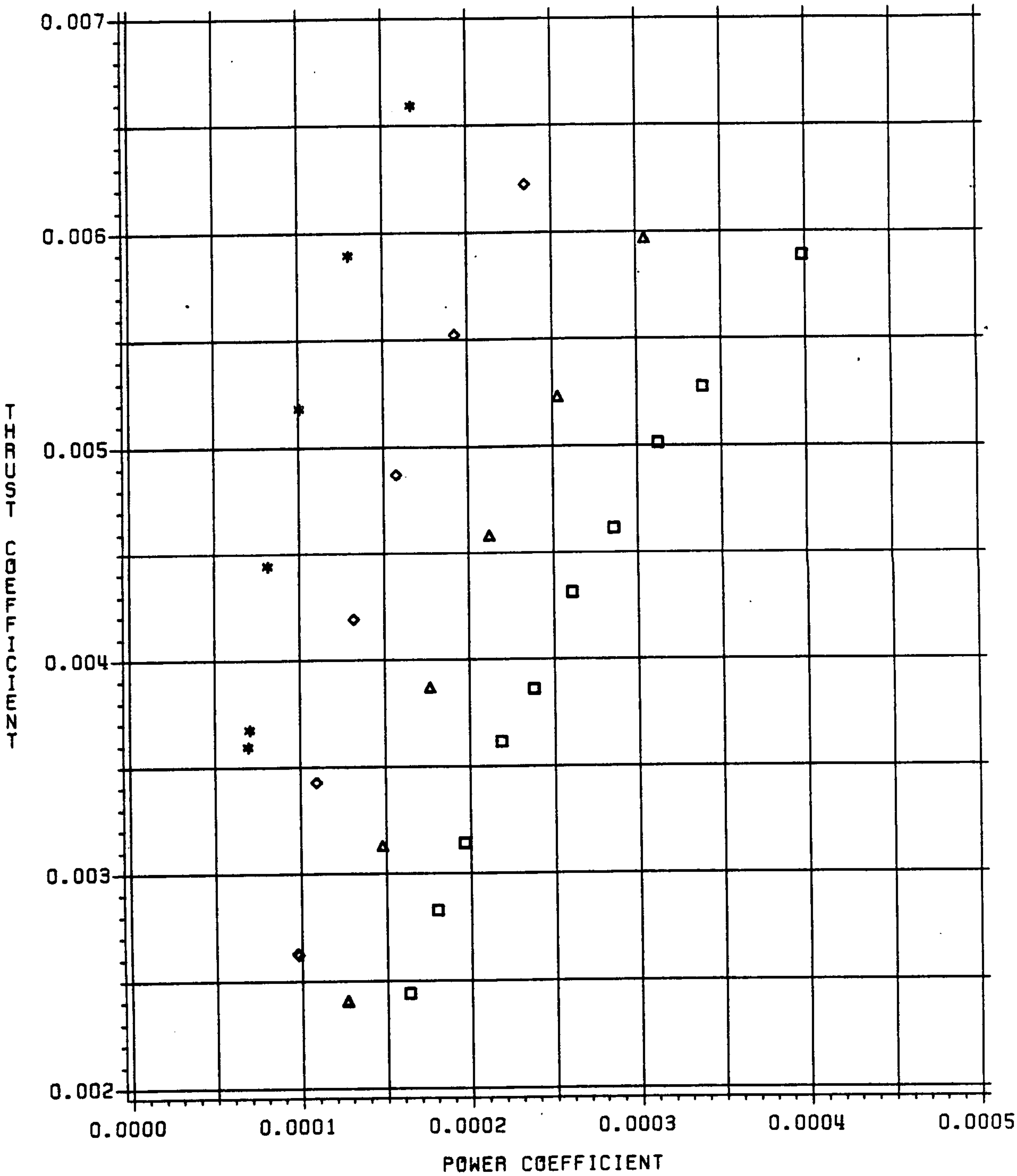
RECORD	ALPHW (DEG)	LIFT (LB)	DRAG (LB)	SFB (LB)	PMB (FT-LB)	RMB (FT-LB)	YMB (FT-LB)
775	-7.94	-5.793	8.340	1.780	-2.420	-0.109	0.541
776	-3.97	-1.320	7.560	1.560	-0.507	-0.347	0.512
777	-0.01	0.201	6.830	0.710	4.207	-0.243	1.122
778	4.00	1.720	6.506	0.210	9.280	0.037	1.707
779	8.06	2.612	6.016	0.220	13.652	0.031	1.870
780	-7.98	-5.570	8.314	1.940	-2.483	-0.217	0.468

(WIND AXIS)

RECORD	ALPHW (DEG)	CLB (-)	CDB (-)	CYB (-)	CMYB (-)	CMXB (-)	CMZB (-)
775	-7.94	-.24163	0.34784	0.07424	-.09071	-.00407	0.02030
776	-3.97	-.05504	0.31528	0.06506	-.01900	-.01303	0.01920
777	-0.01	0.00839	0.28486	0.02961	0.15772	-.00913	0.04207
778	4.00	0.07175	0.27134	0.00876	0.34789	0.00139	0.06400
779	8.06	0.10895	0.25090	0.00918	0.51181	0.00116	0.07012
780	-7.98	-.23230	0.34674	0.08091	-.09310	-.00812	0.01828

MAIN ROTOR CT VS CP

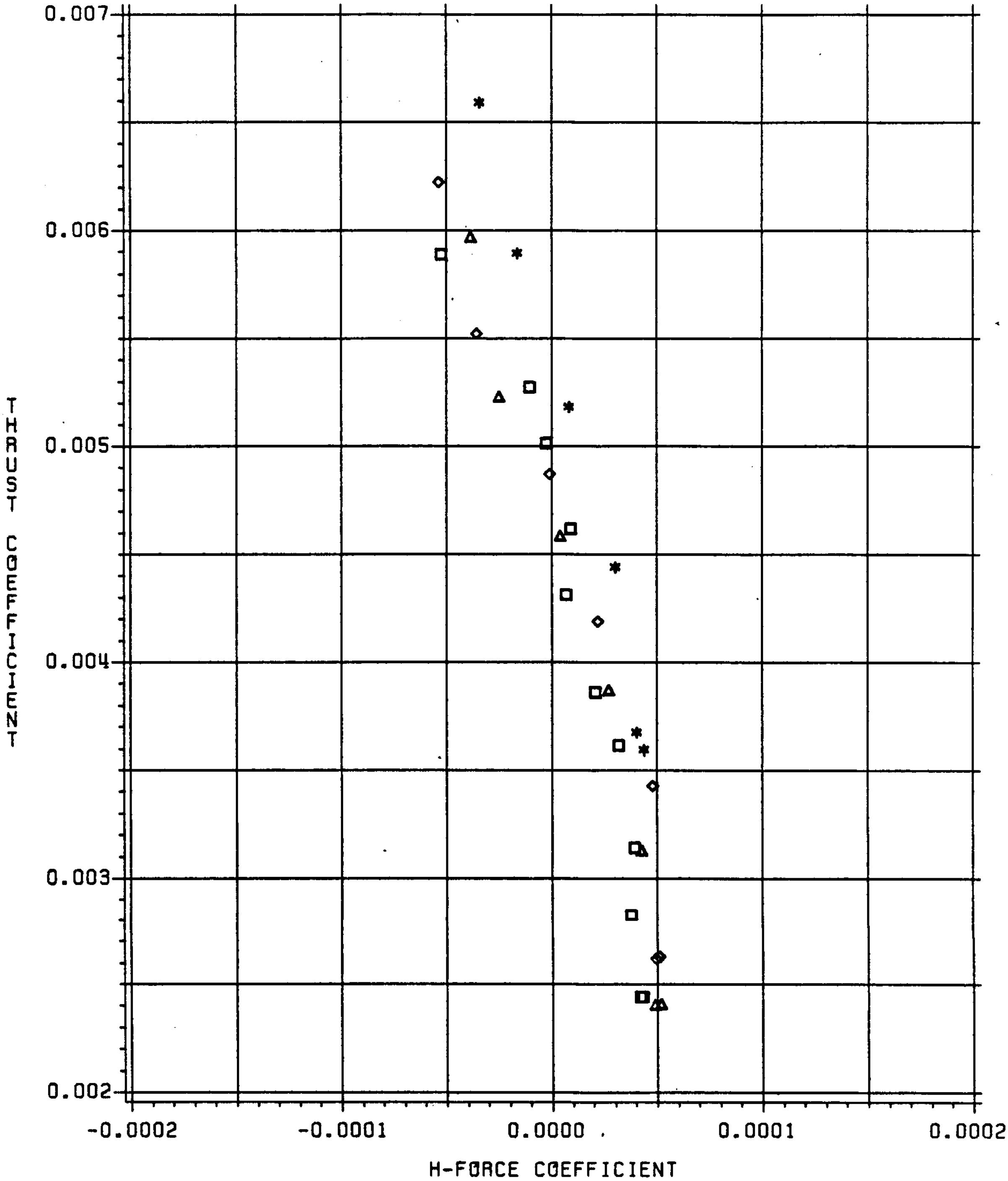
CONFIGURATION - BHR (RUN 15) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CH

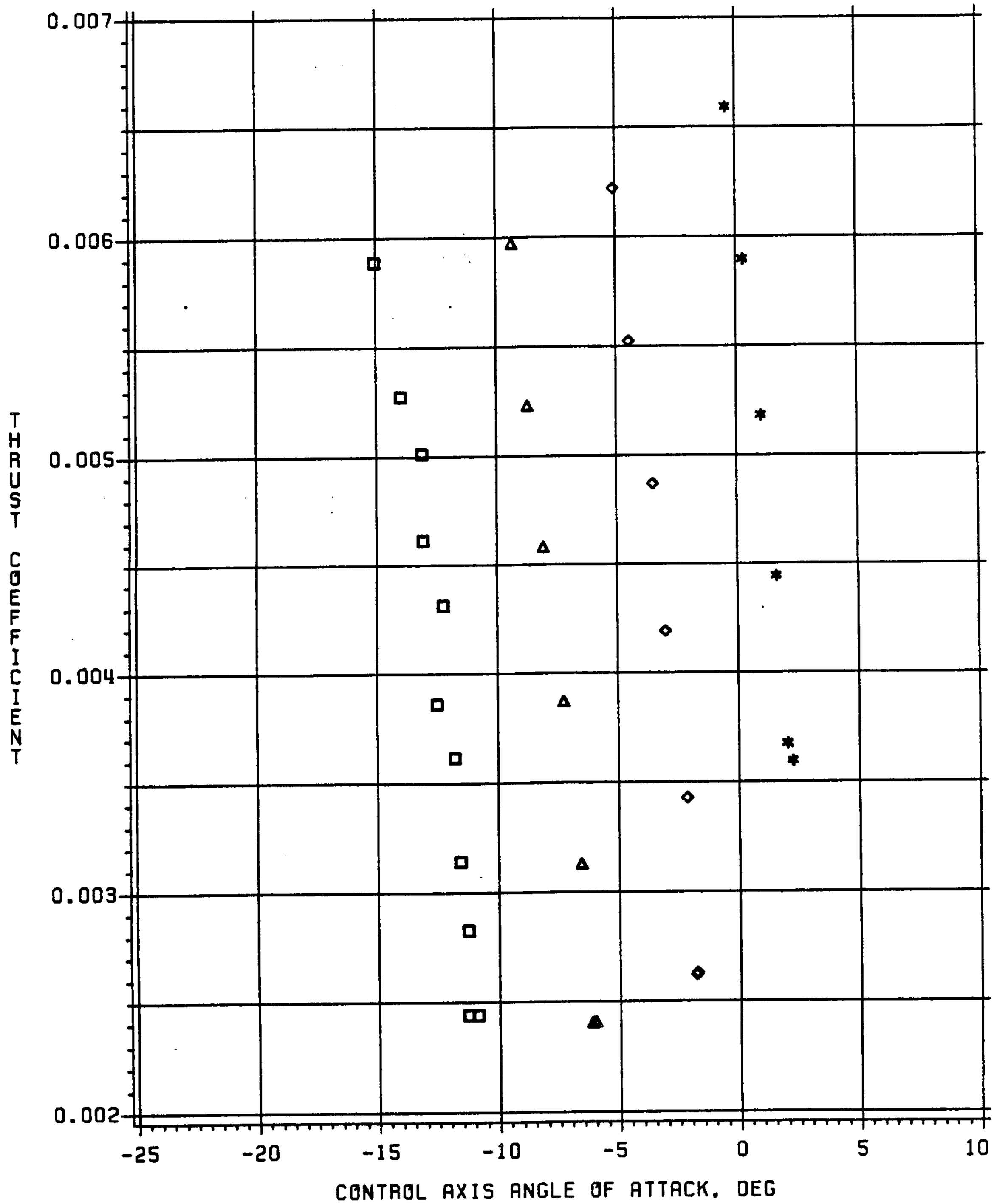
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS ALPHAC

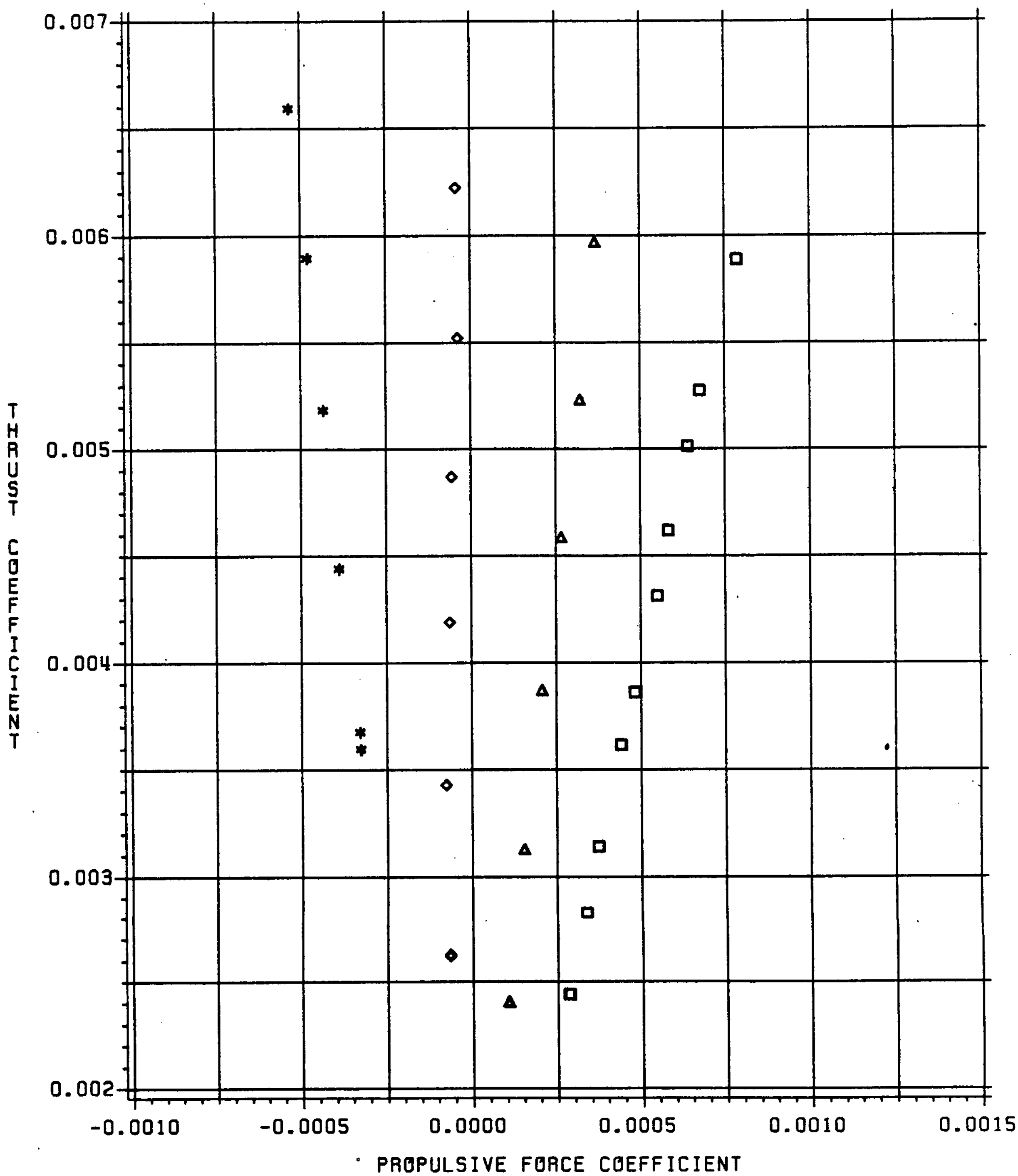
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

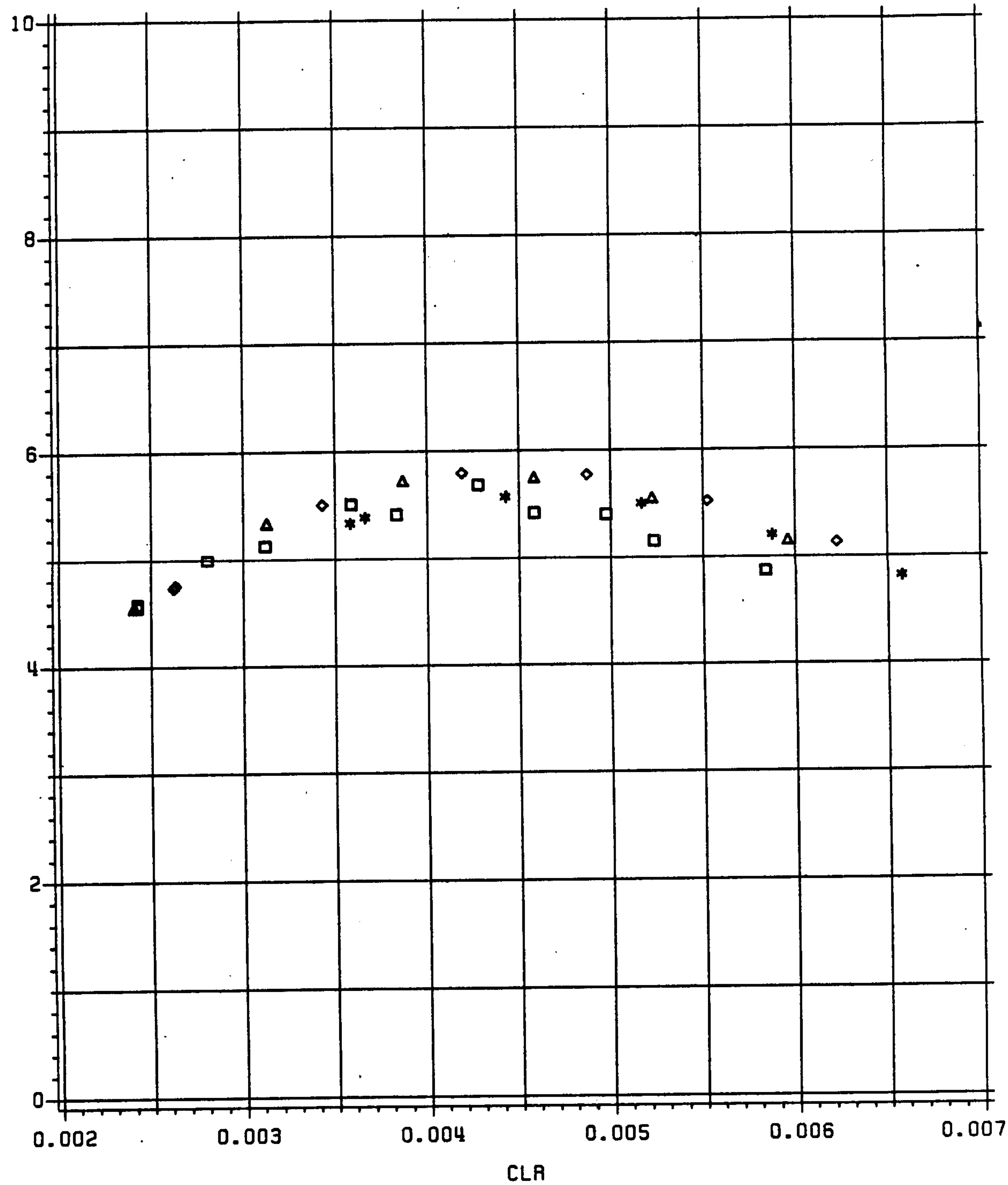
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

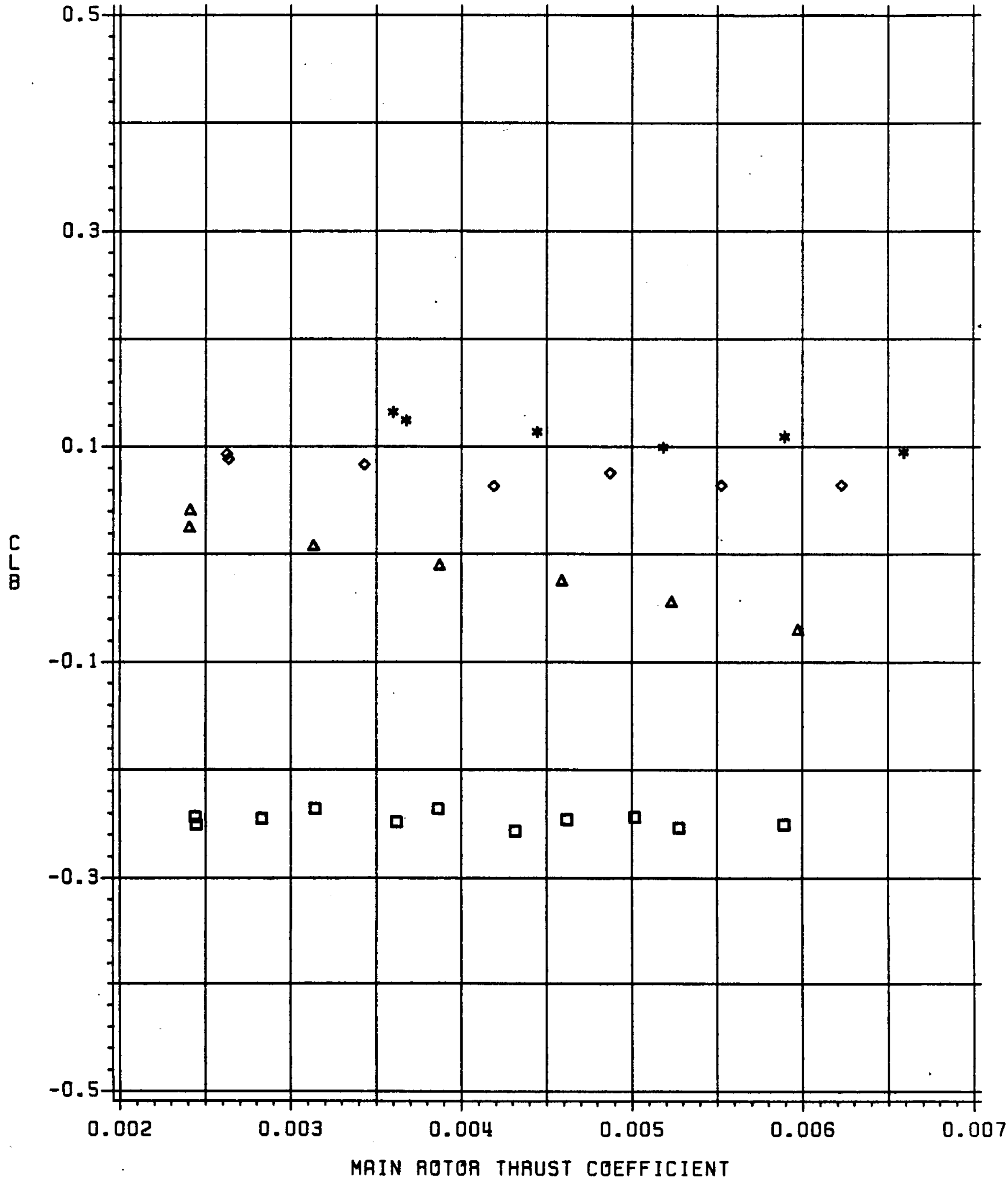
CONFIGURATION - BHR (RUN 15) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS CT

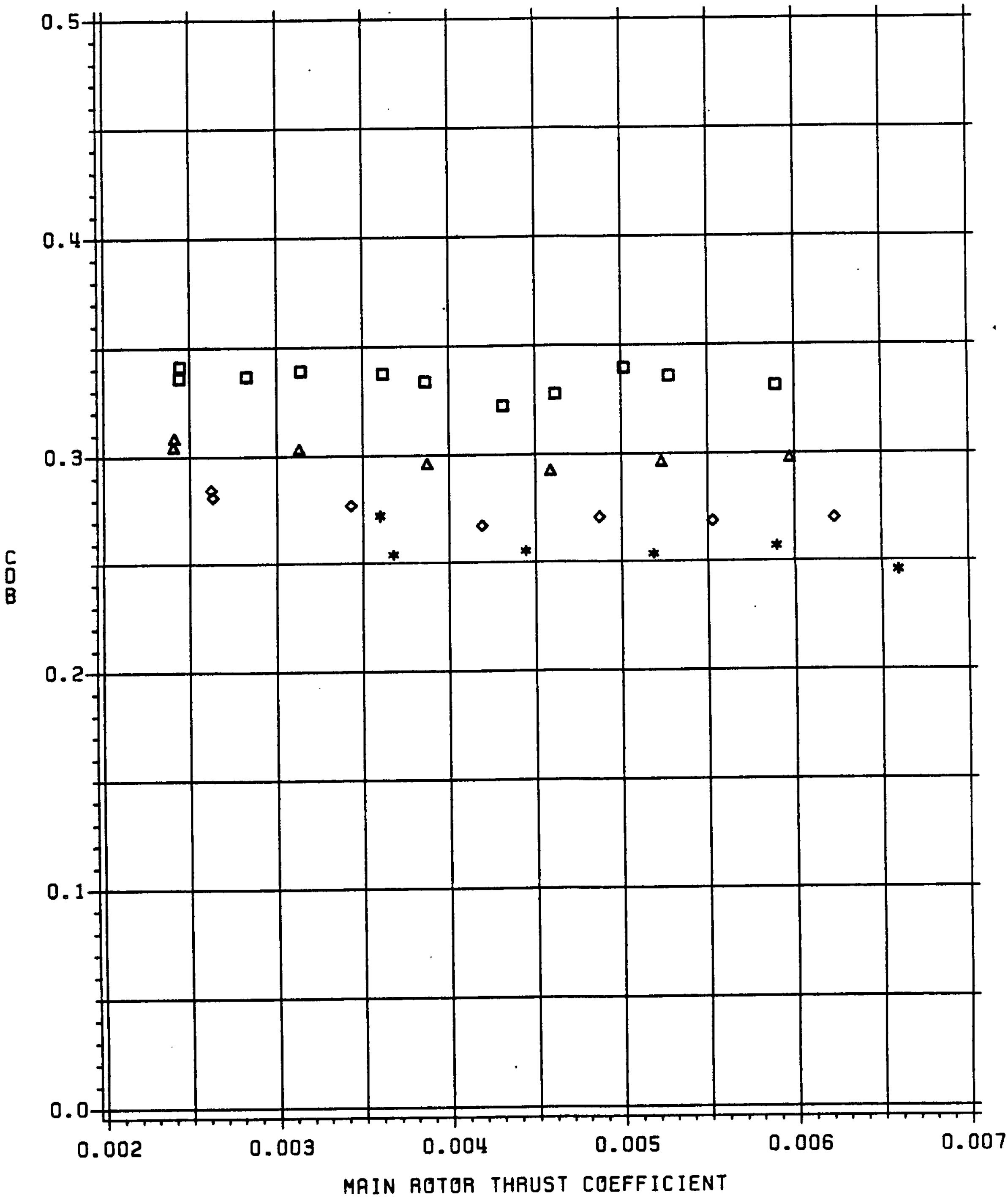
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

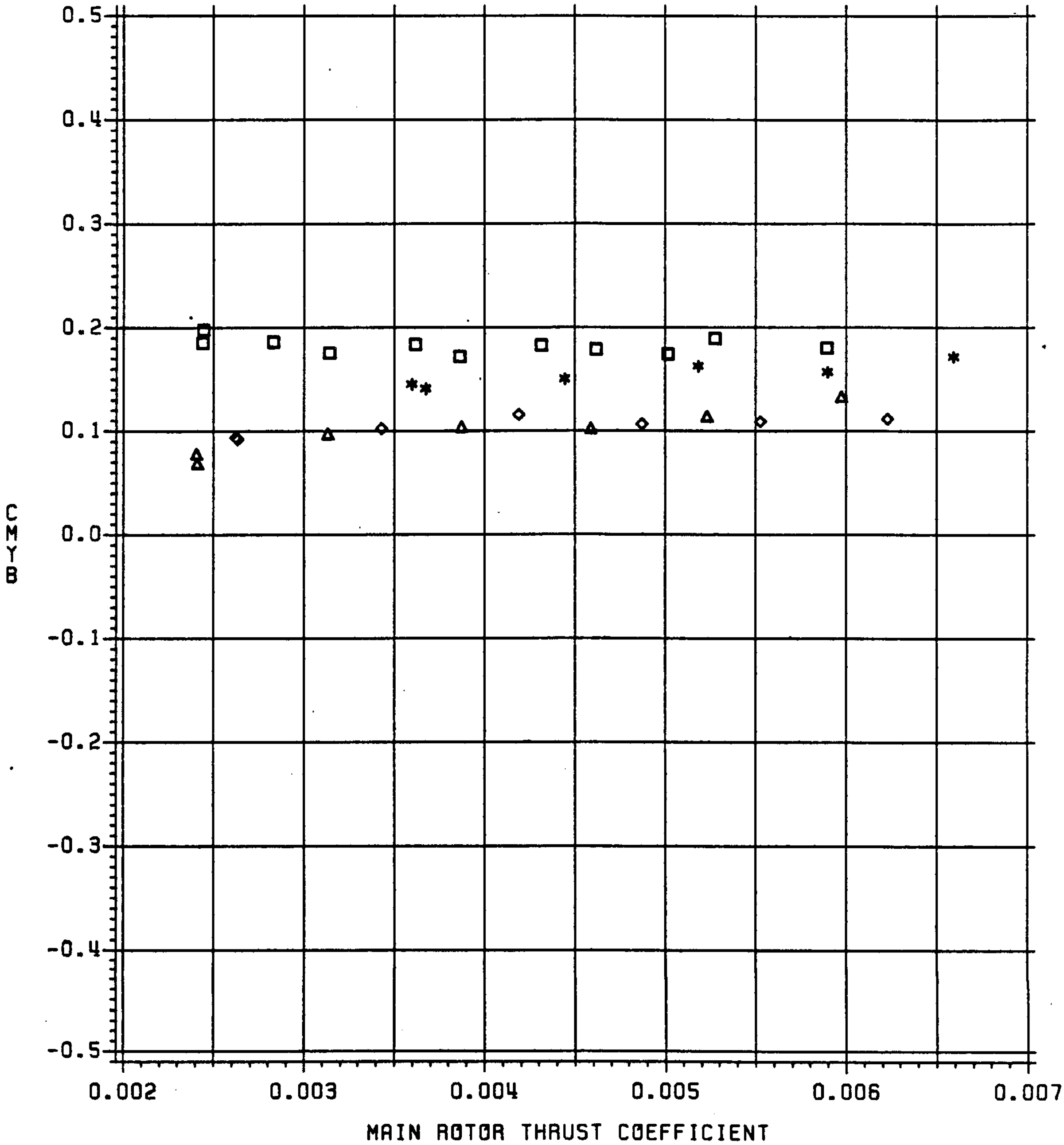
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

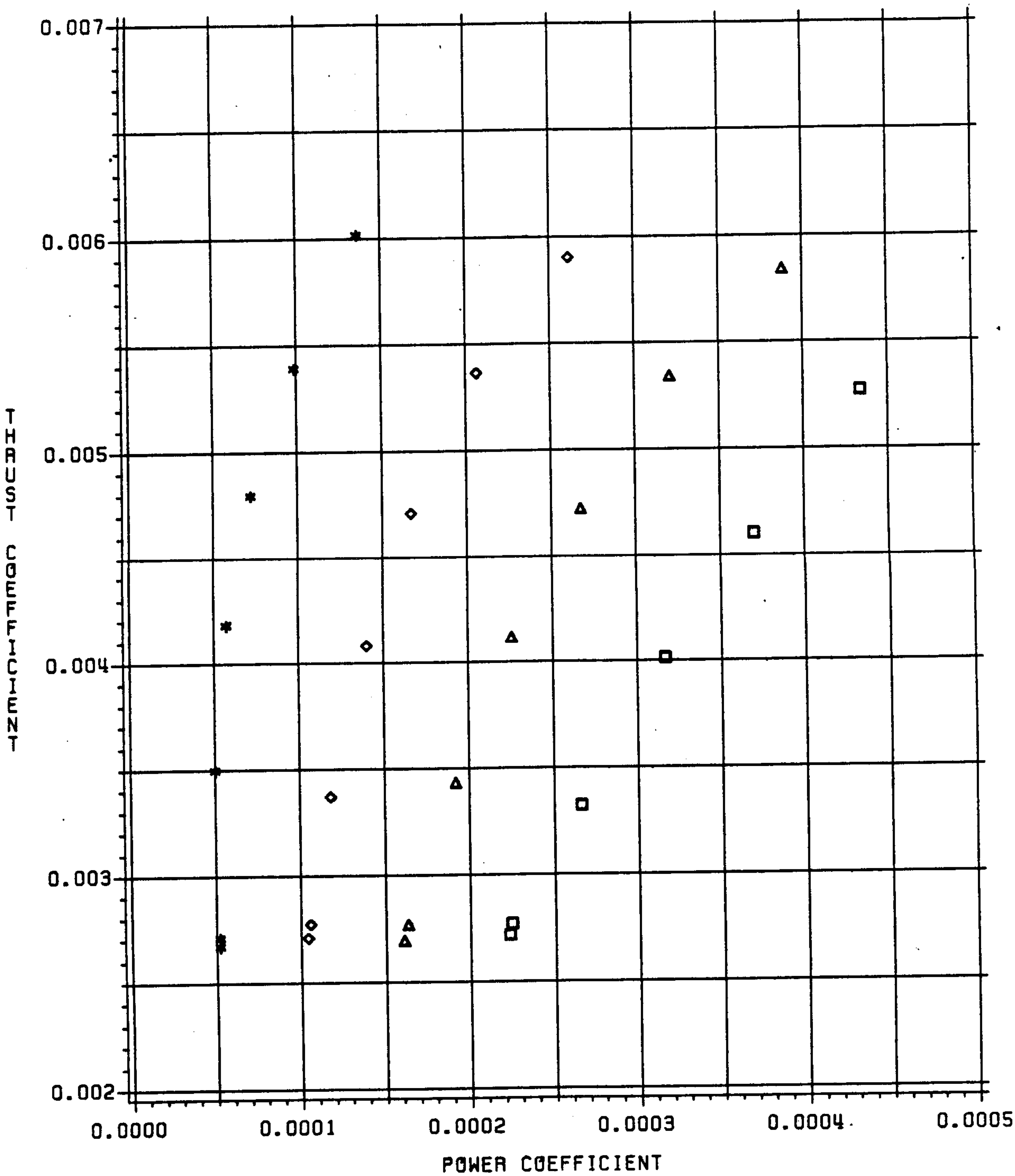
CONFIGURATION - BHR (RUN 15)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

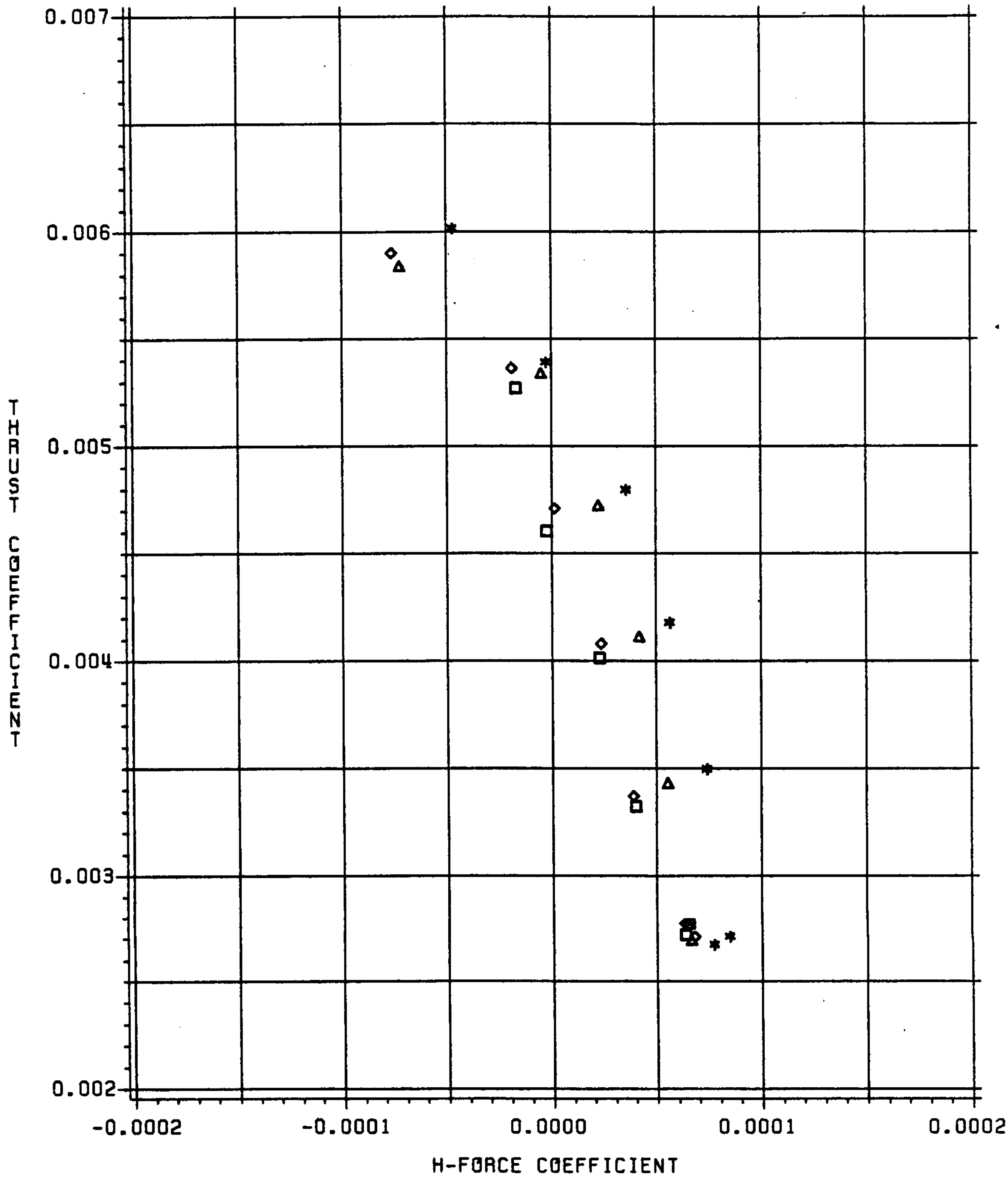
CONFIGURATION - BHA (RUN 16)   MU = 0.30



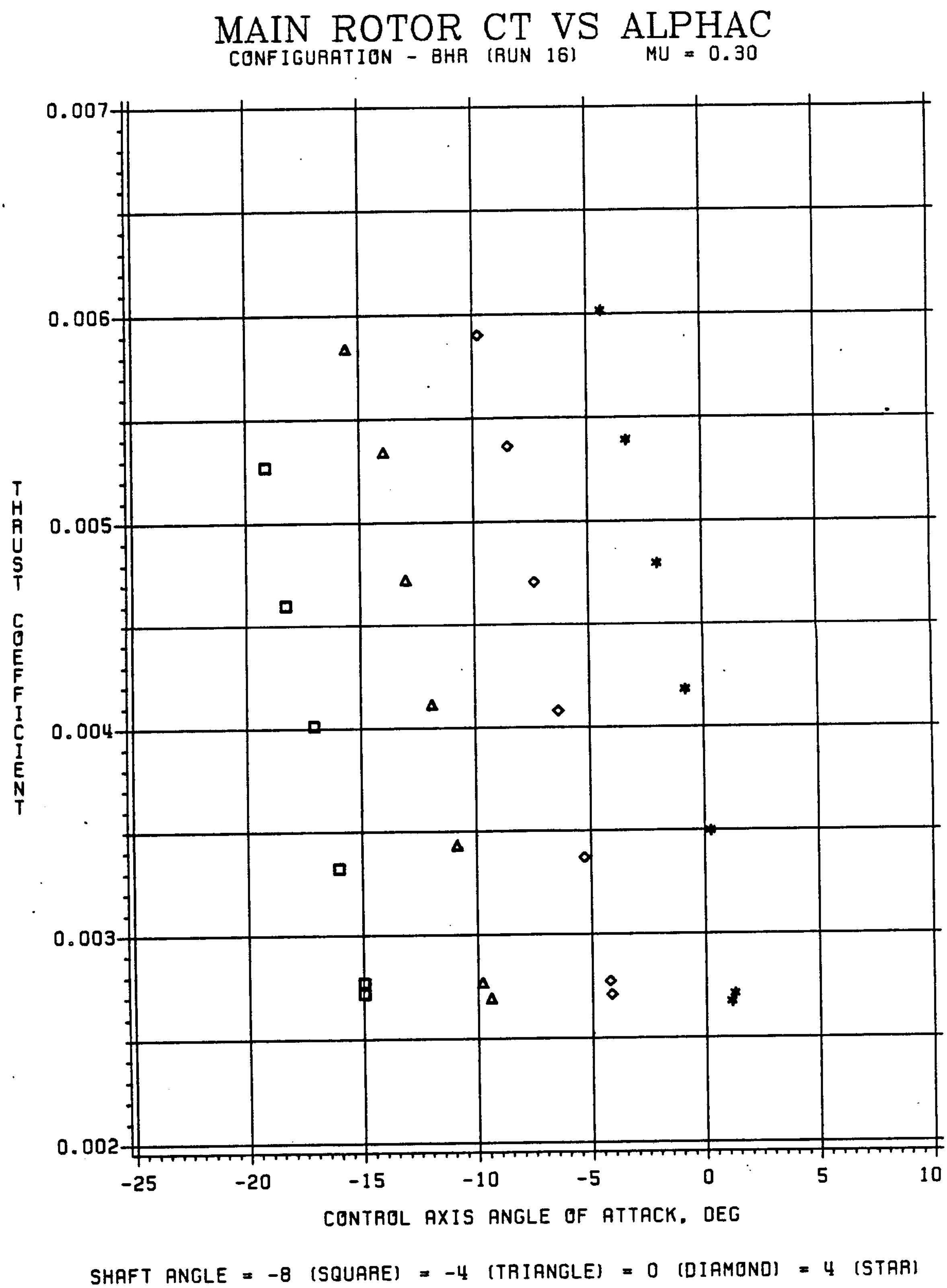
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

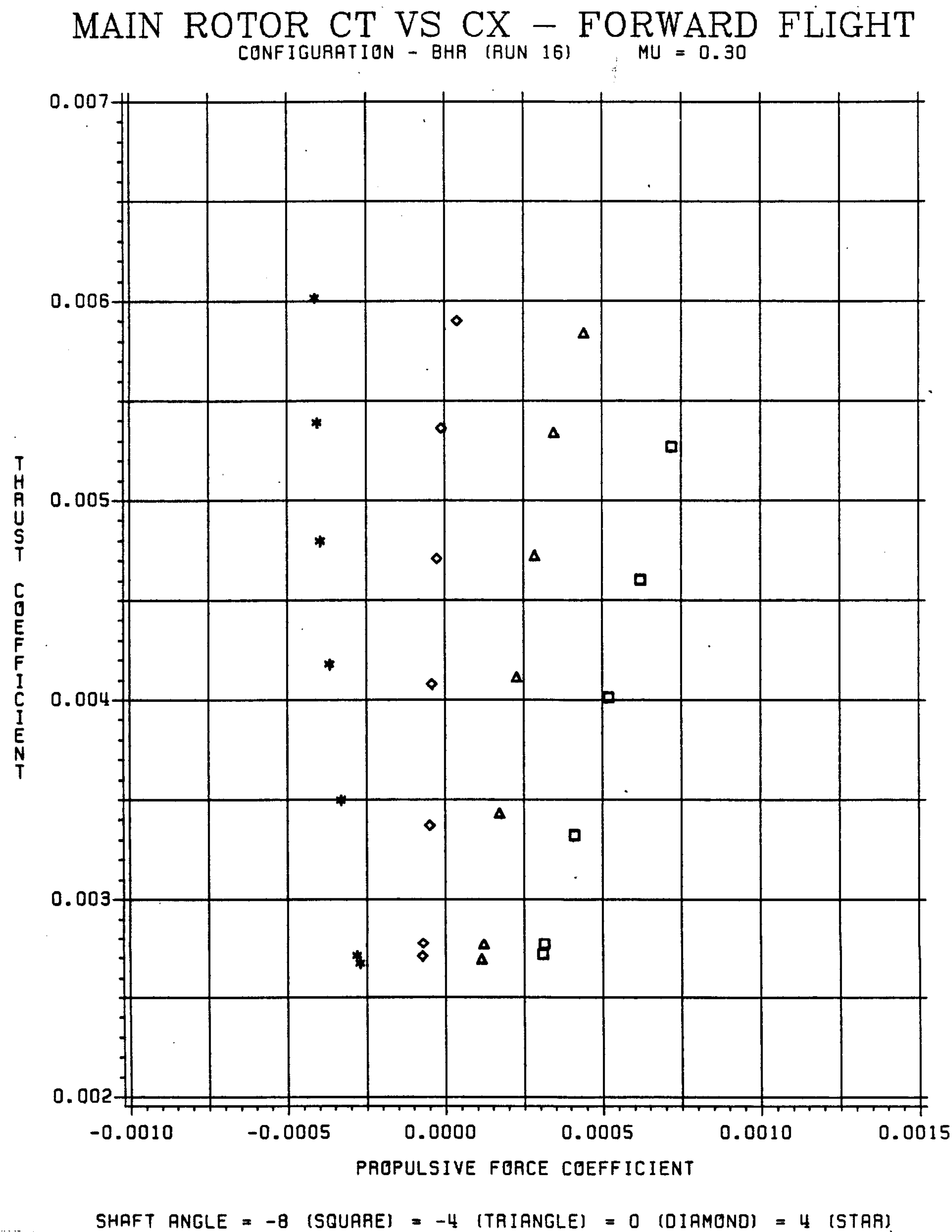
MAIN ROTOR CT VS CH

CONFIGURATION - BHR (RUN 16)   MU = 0.30



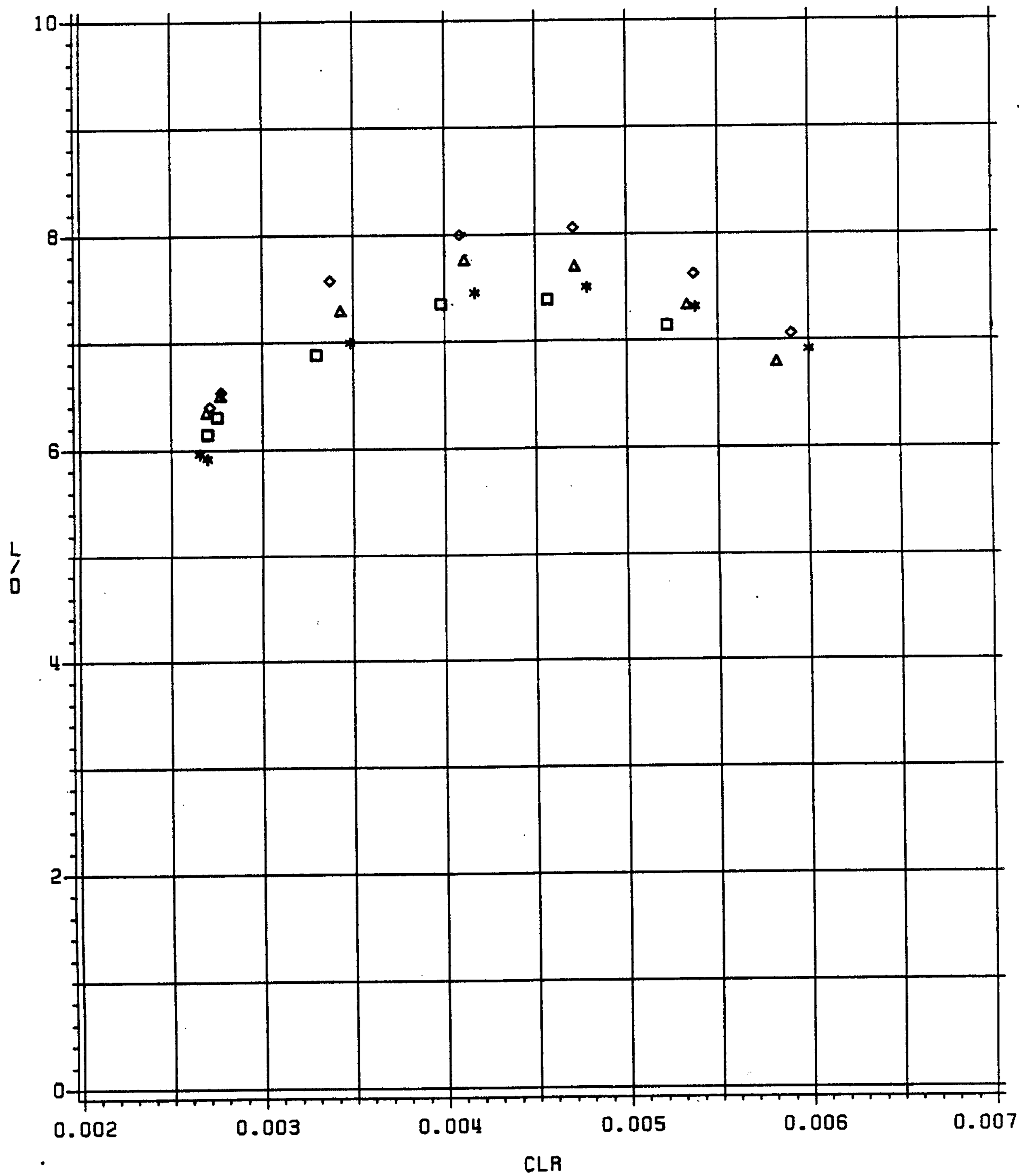
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)


MAIN ROTOR CT VS ALPHAC
CONFIGURATION - BHR (RUN 16)   MU = 0.30
THRUST COEFFICIENT
0.007
0.006
0.005
0.004
0.003
0.002
-25
-20
-15
-10
-5
0
5
10
CONTROL AXIS ANGLE OF ATTACK, DEG
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)


MAIN ROTOR CT VS CX – FORWARD FLIGHT
CONFIGURATION - BHR (RUN 16) MU = 0.30
THRUST COEFFICIENT
0.007
0.006
0.005
0.004
0.003
0.002
-0.0010
-0.0005
0.0000
0.0005
0.0010
0.0015
PROPULSIVE FORCE COEFFICIENT
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

CONFIGURATION - BHA (RUN 16) MU = 0.30

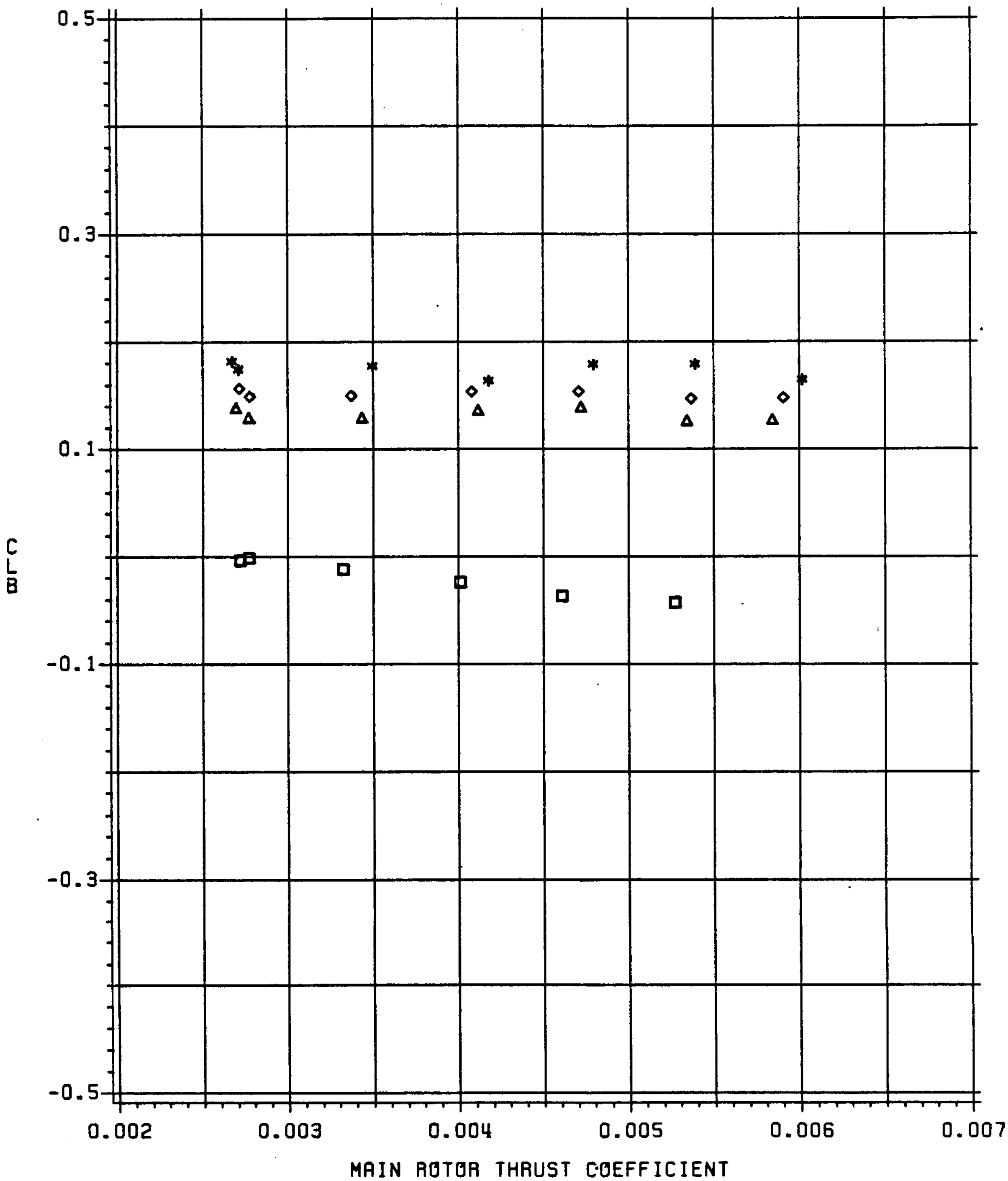


SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

C-6

BODY LIFT COEFFICIENT VS CT

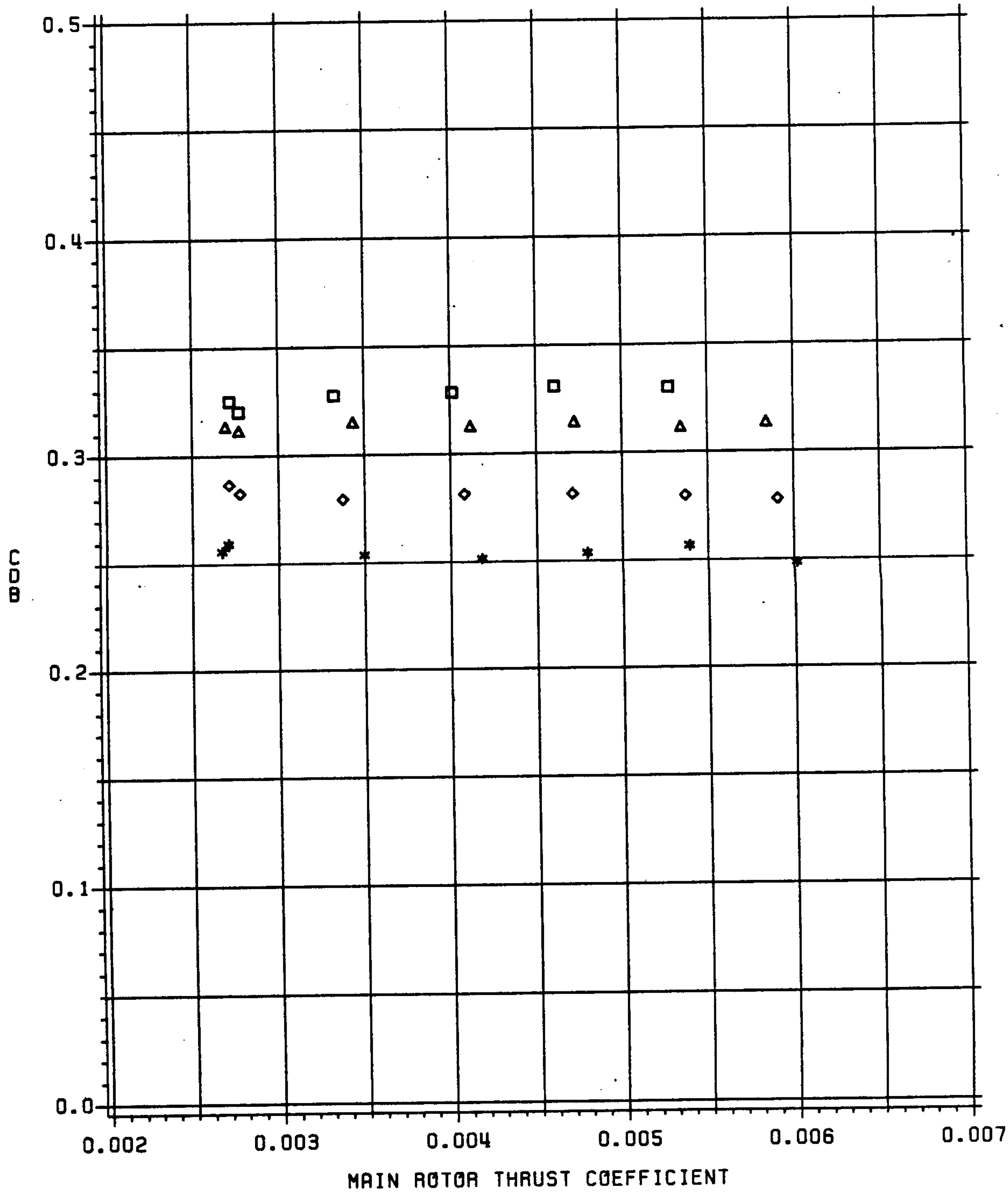
CONFIGURATION - BHR (RUN 16)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

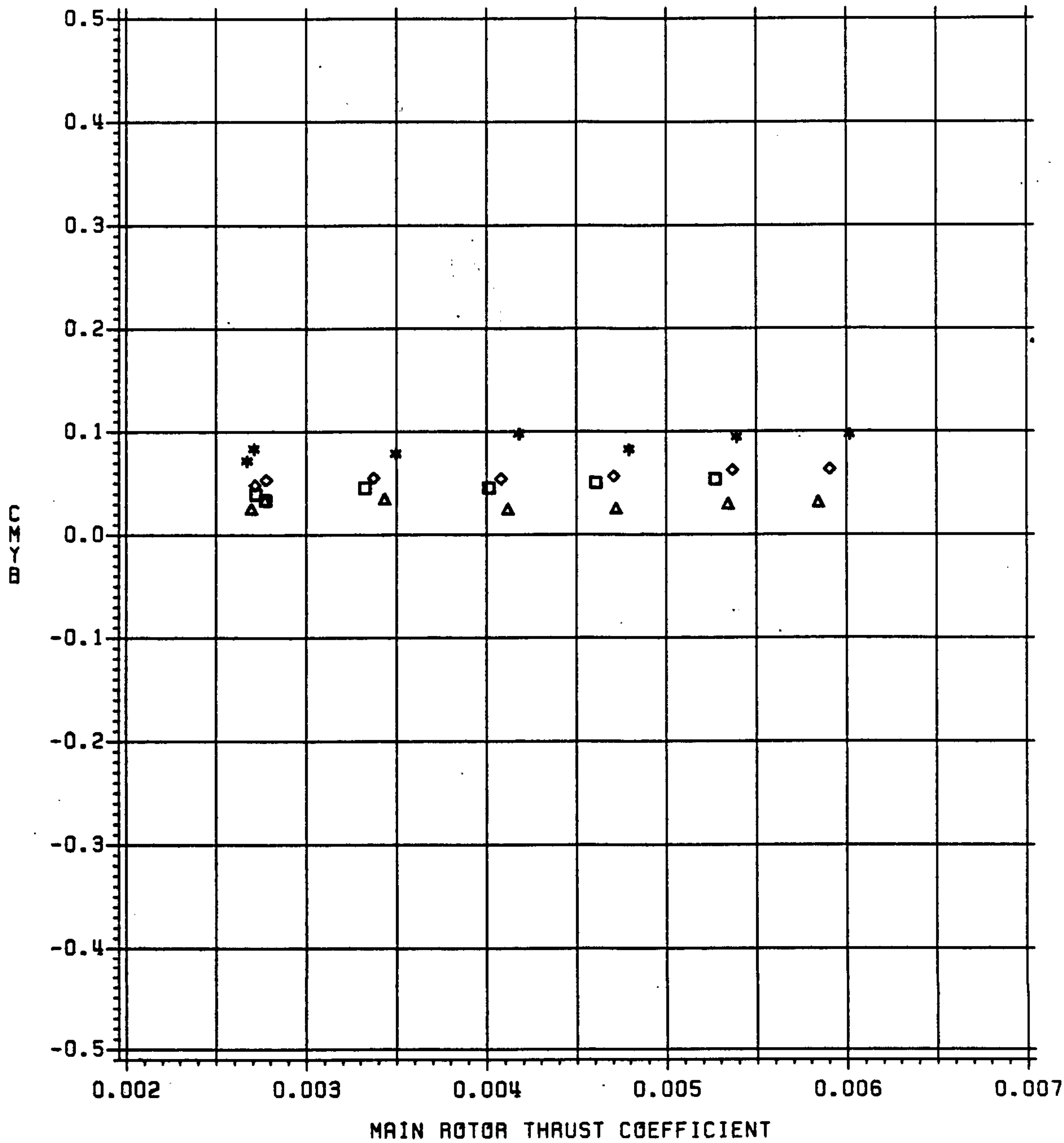
CONFIGURATION - BHR (RUN 16)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

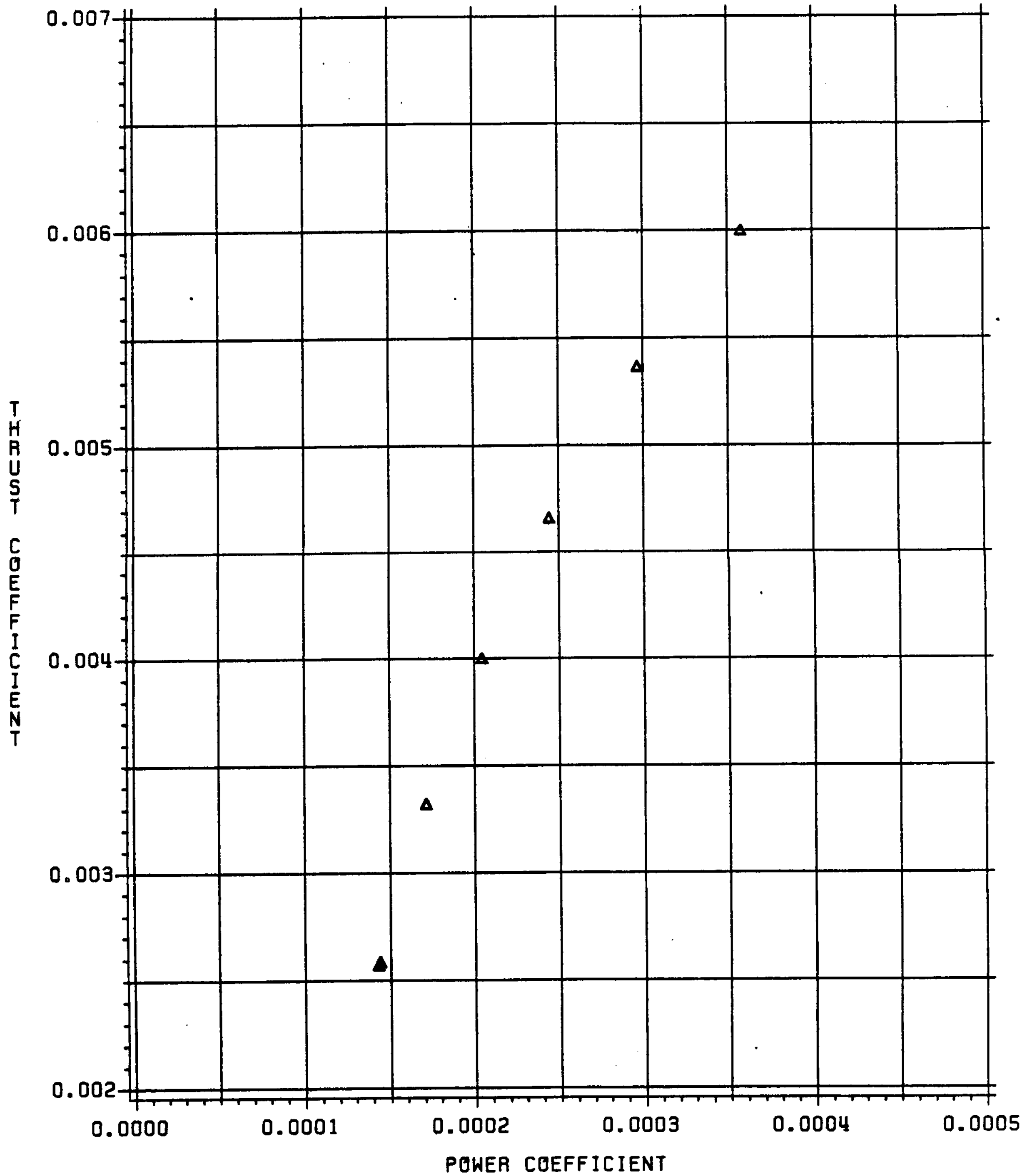
CONFIGURATION - BHR (RUN 16) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

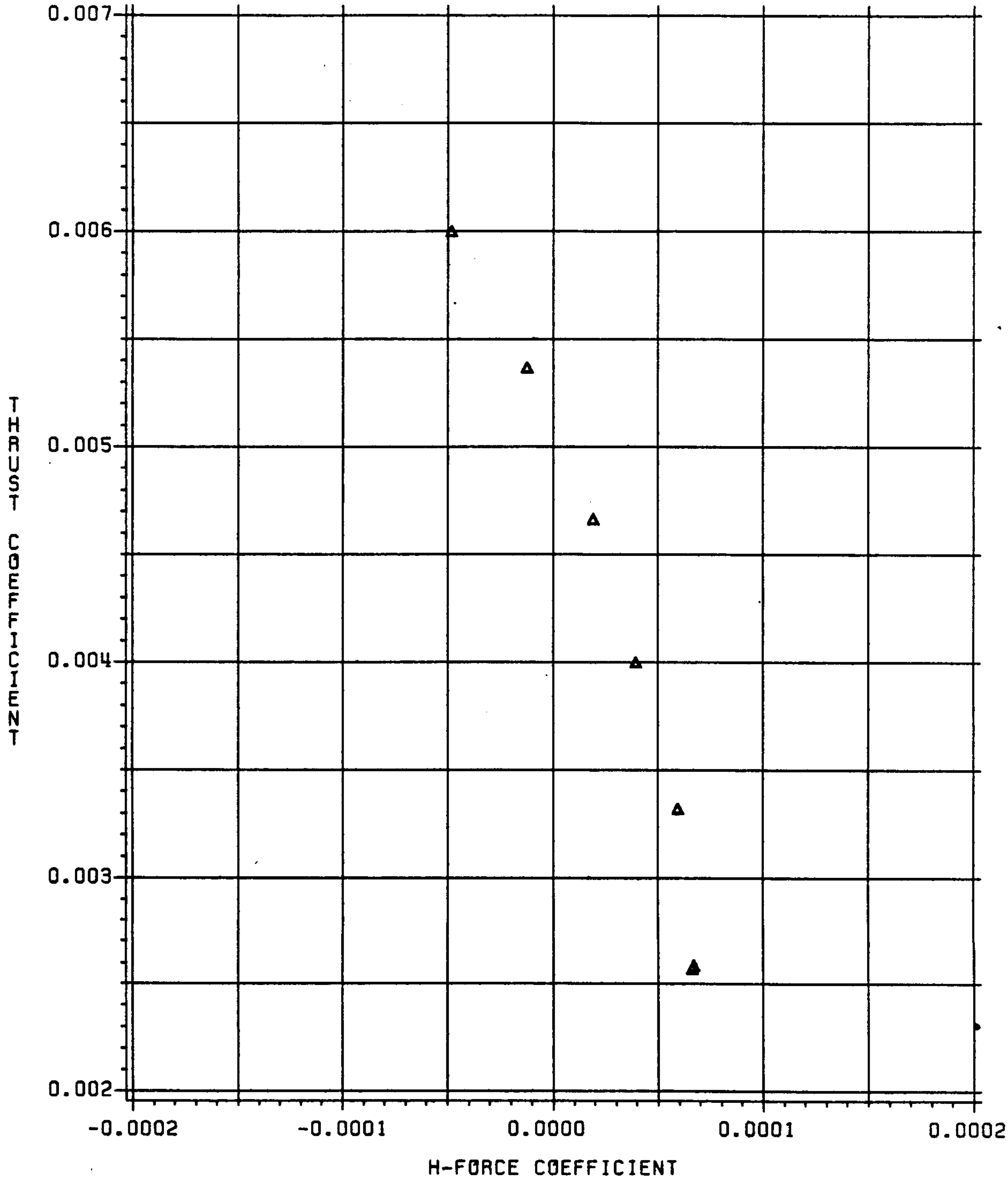
CONFIGURATION - BHR (RUN 17)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

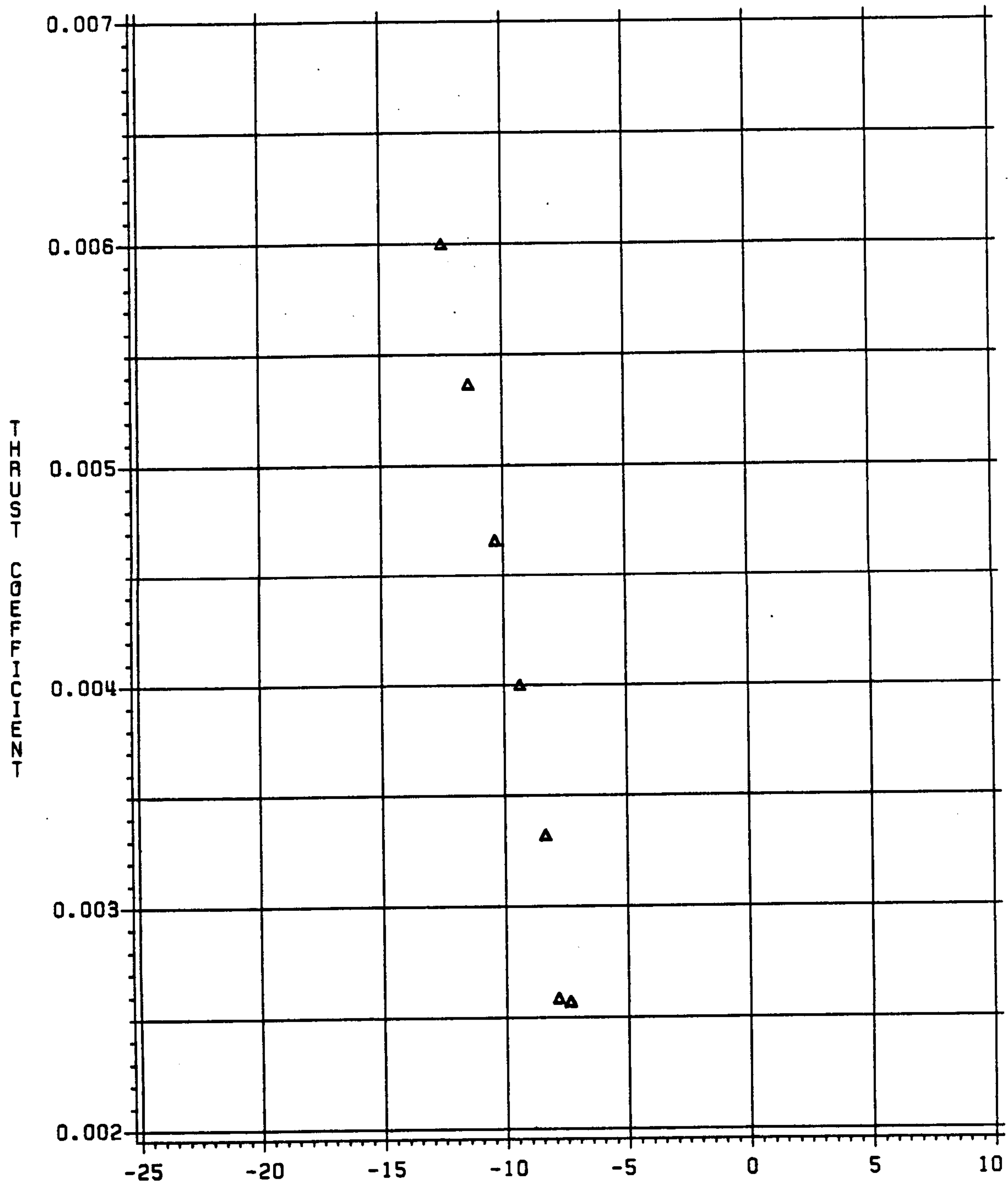
CONFIGURATION - BHR (RUN 17)   MU = 0.25



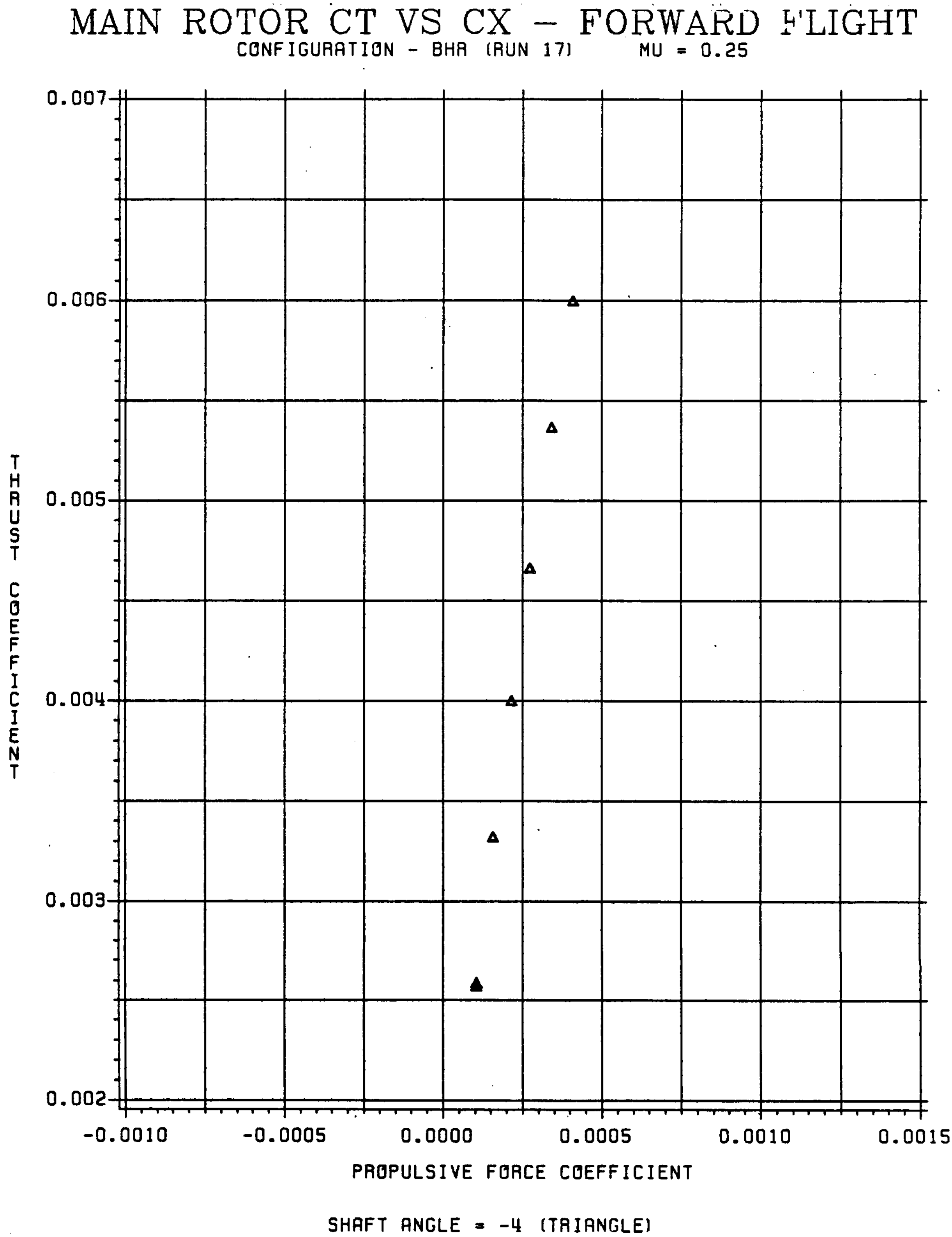
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

CONFIGURATION - BHR (RUN 17) MU = 0.25

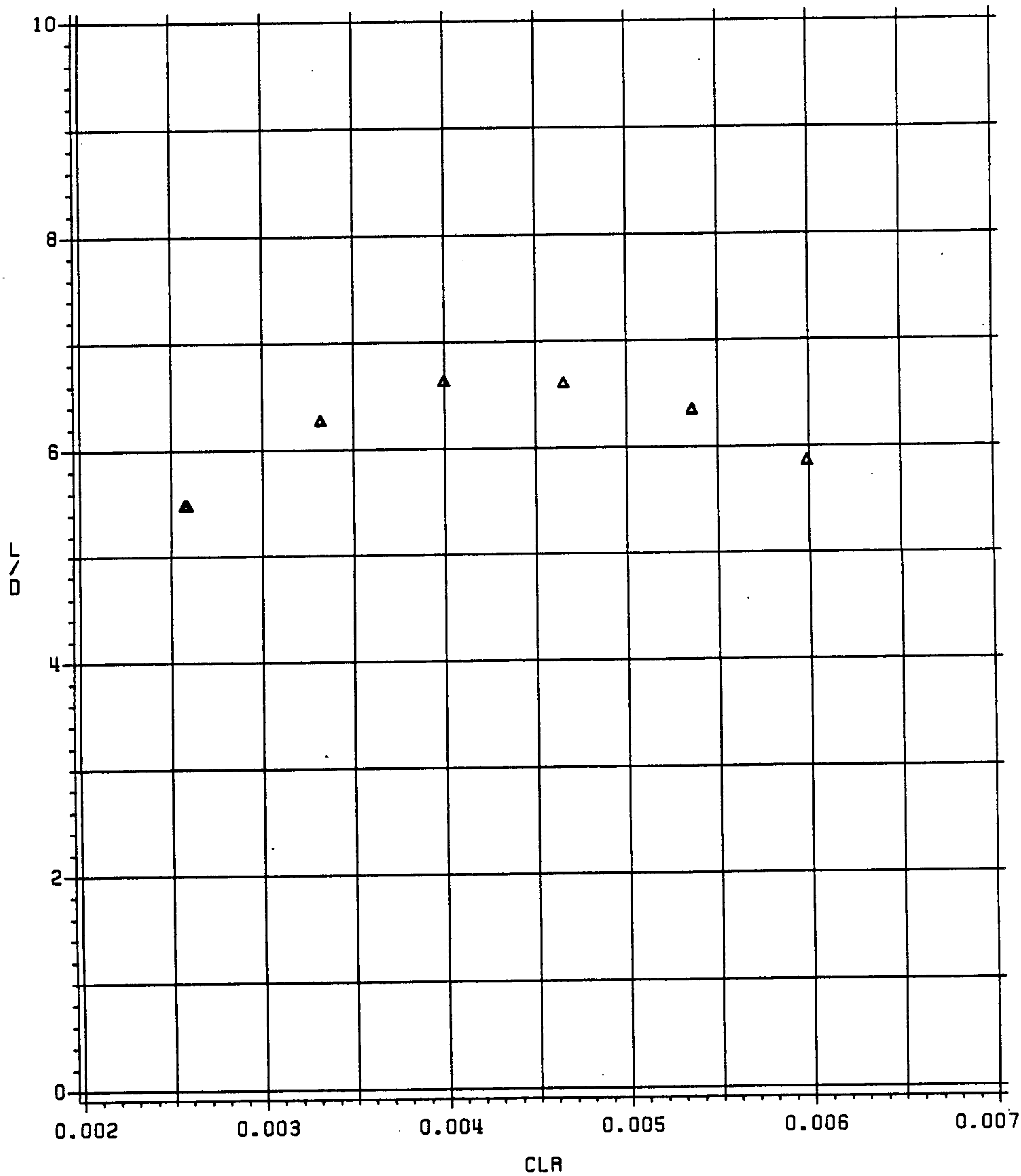


SHAFT ANGLE = -4 (TRIANGLE)


MAIN ROTOR CT VS CX – FORWARD FLIGHT
CONFIGURATION - BHR (RUN 17)   MU = 0.25
THRUST COEFFICIENT
0.007
0.006
0.005
0.004
0.003
0.002
-0.0010
-0.0005
0.0000
0.0005
0.0010
0.0015
PROPULSIVE FORCE COEFFICIENT
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

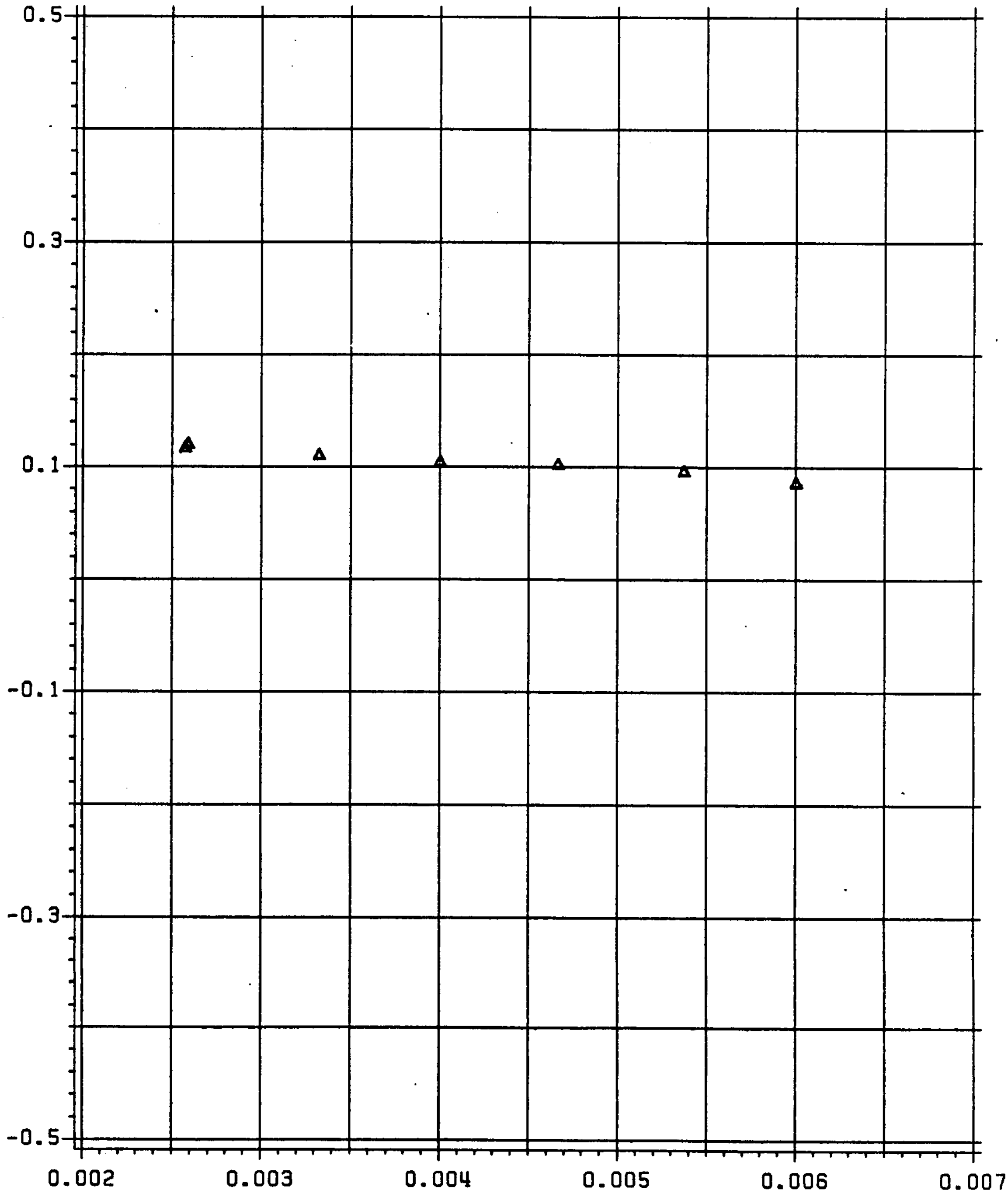
CONFIGURATION - BHR (RUN 17) MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

BODY LIFT COEFFICIENT VS CT

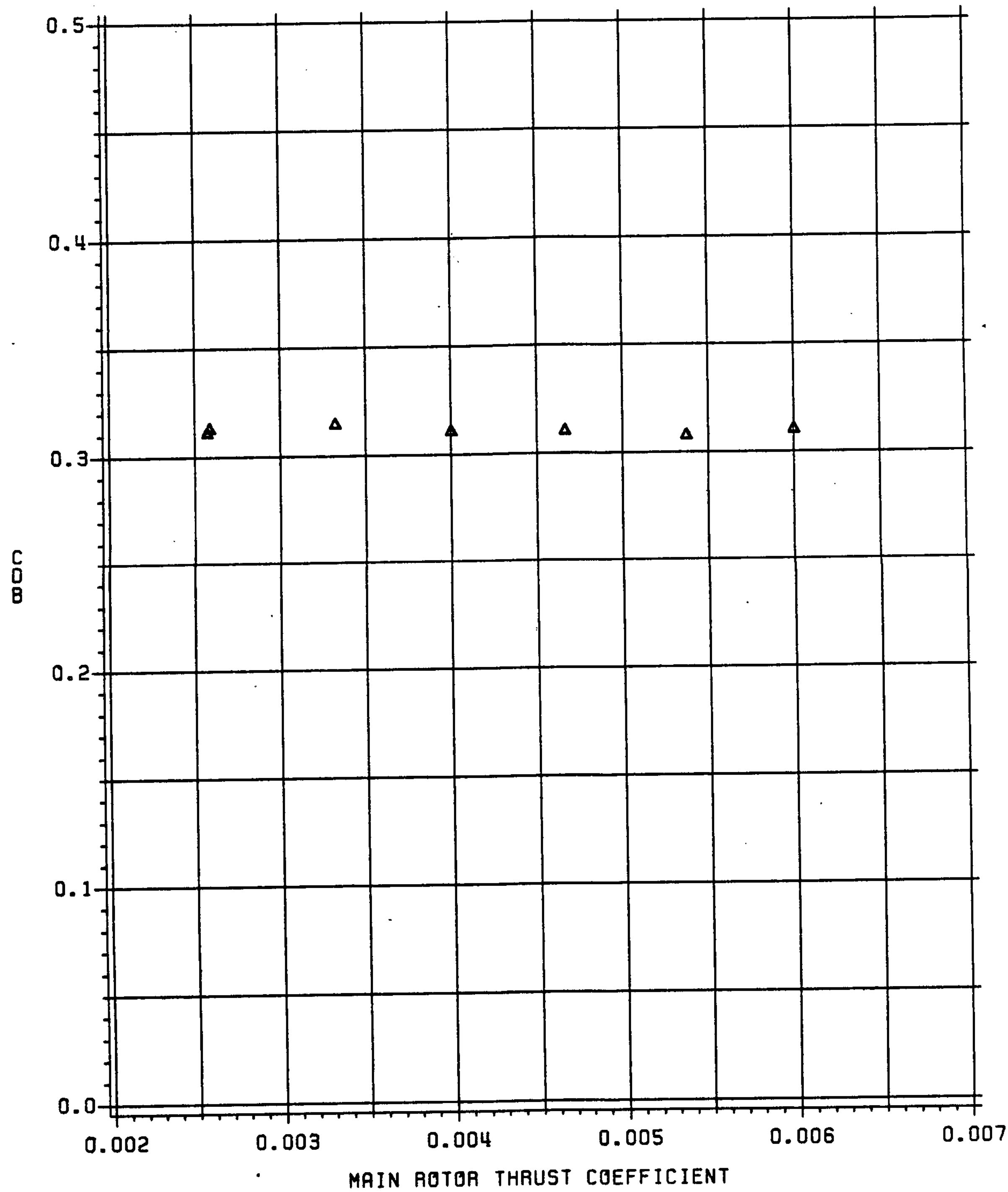
CONFIGURATION - 8HR (RUN 17)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

BODY DRAG COEFFICIENT VS CT

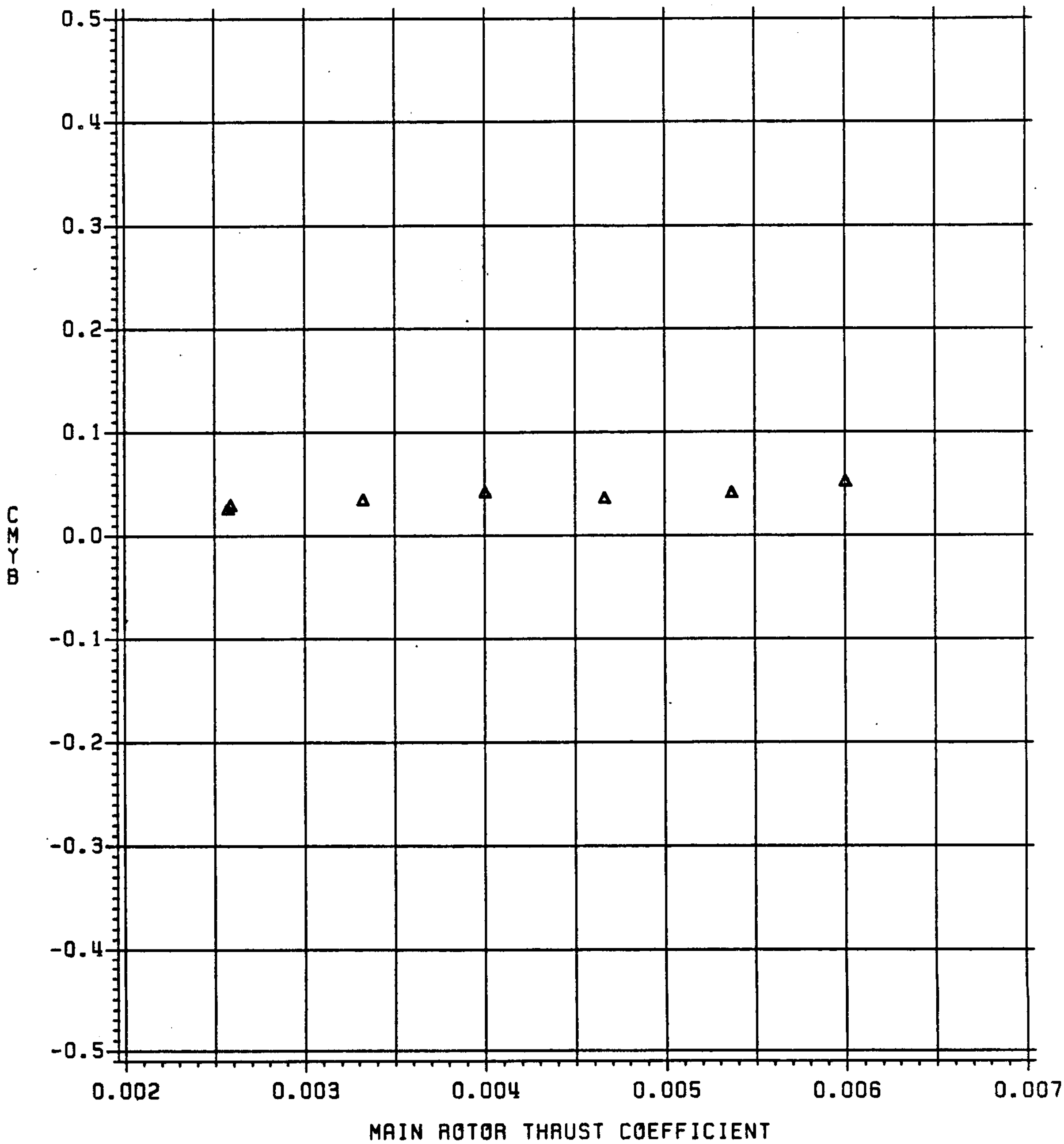
CONFIGURATION - BHR (RUN 17) MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

BODY PITCHING MOMENT COEFFICIENT VS CT

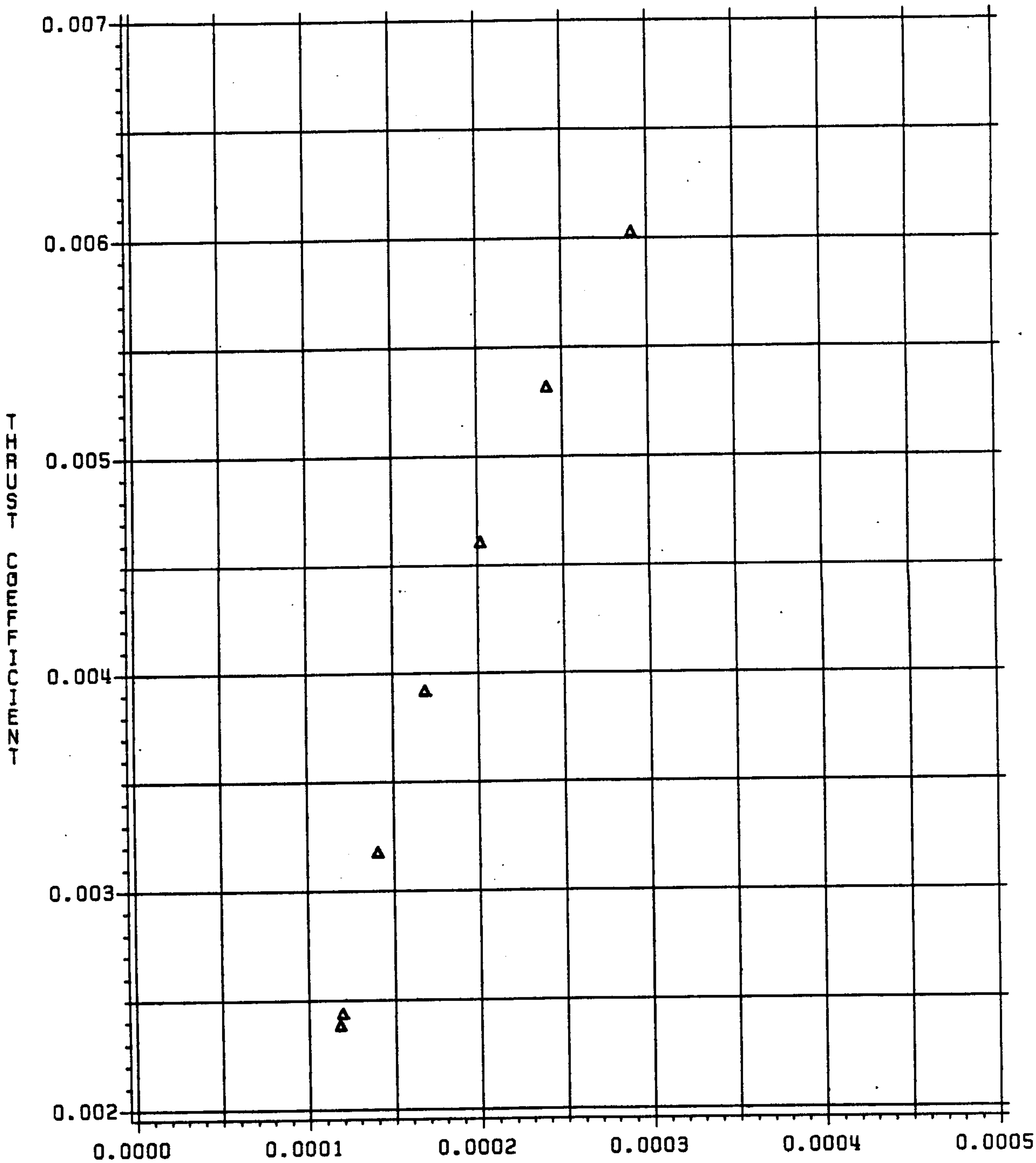
CONFIGURATION - BHR (RUN 17)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CP

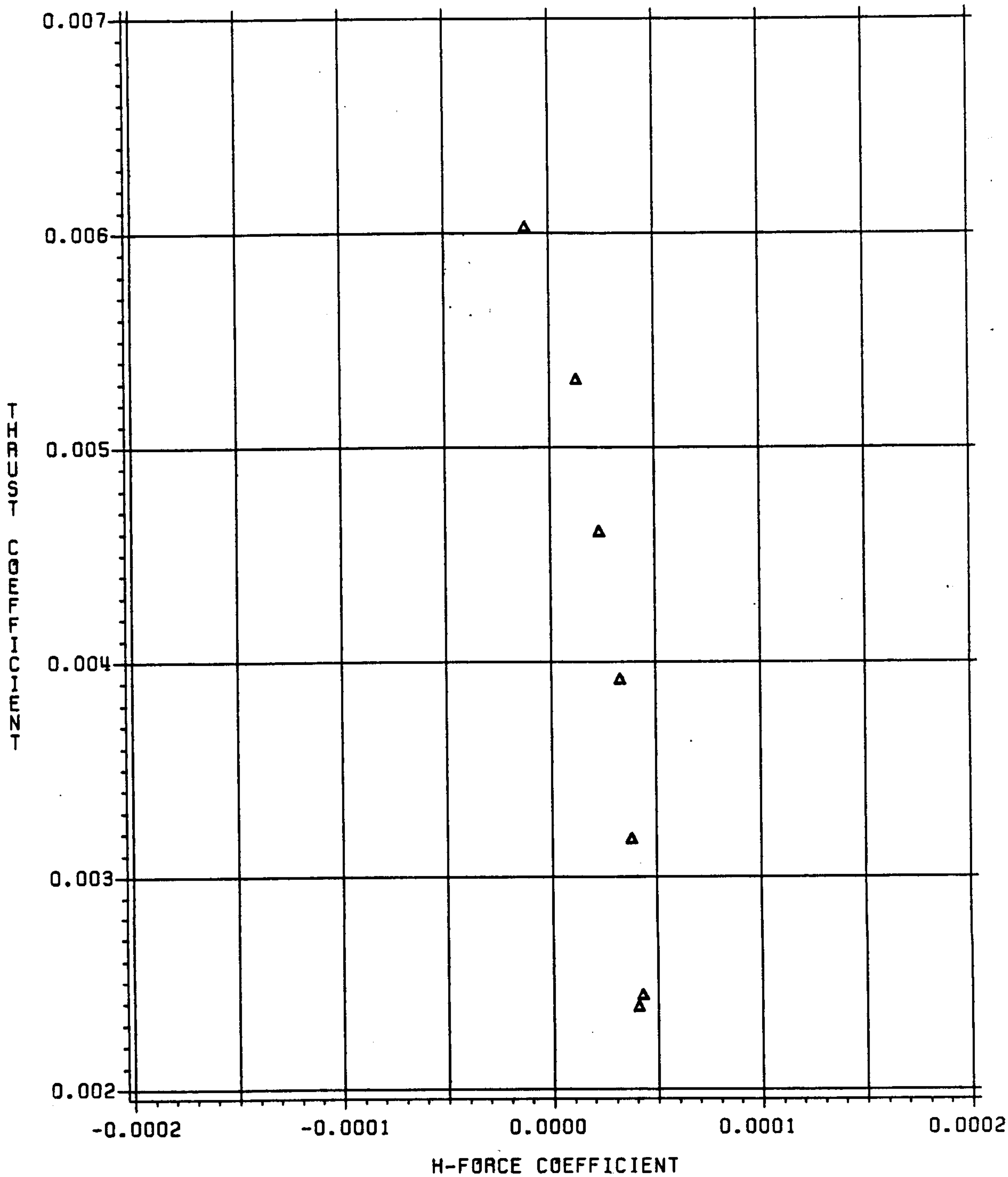
CONFIGURATION - BHR (RUN 18)   MU = 0.15



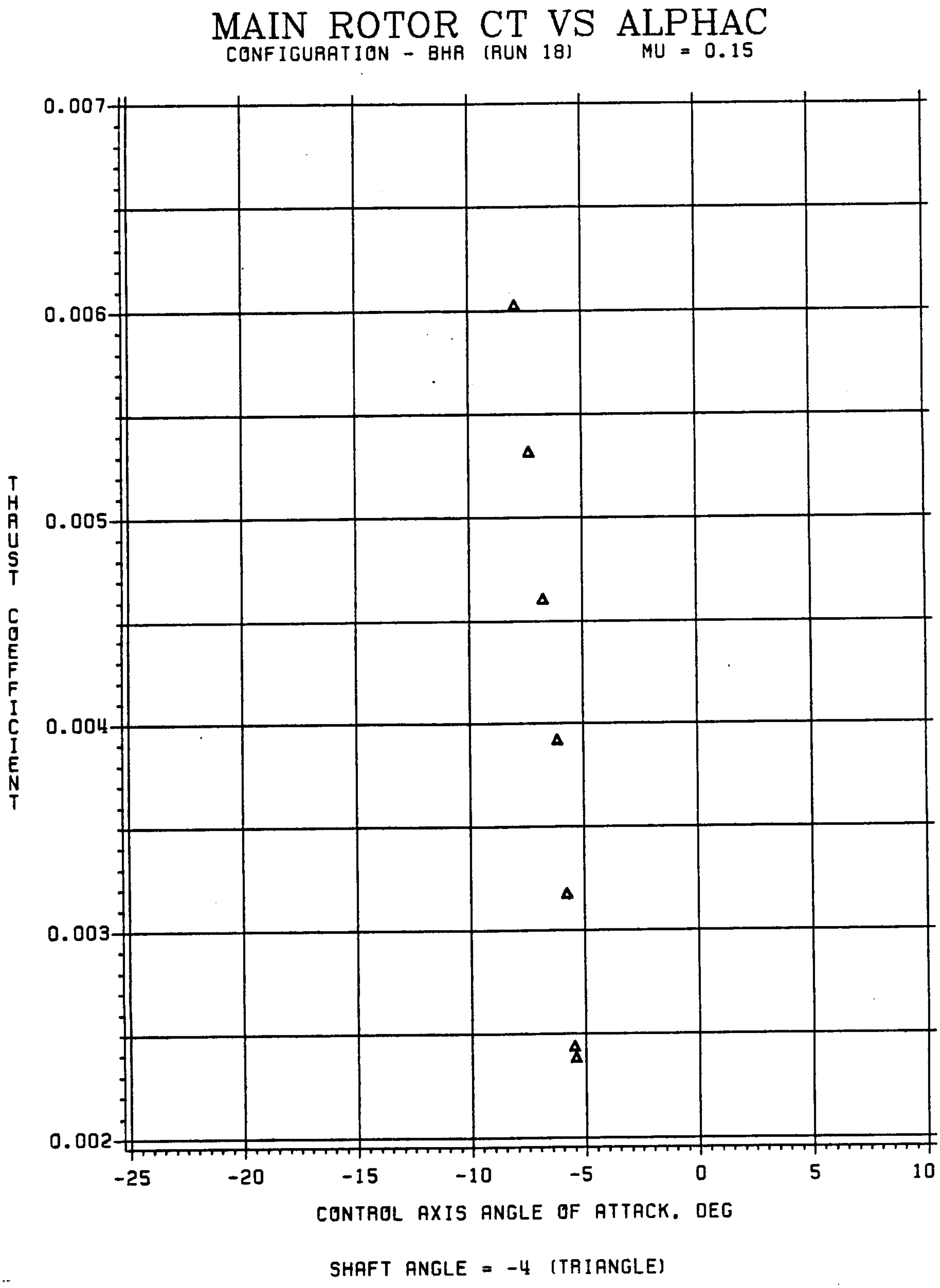
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

CONFIGURATION - BHA (RUN 18)   MU = 0.15

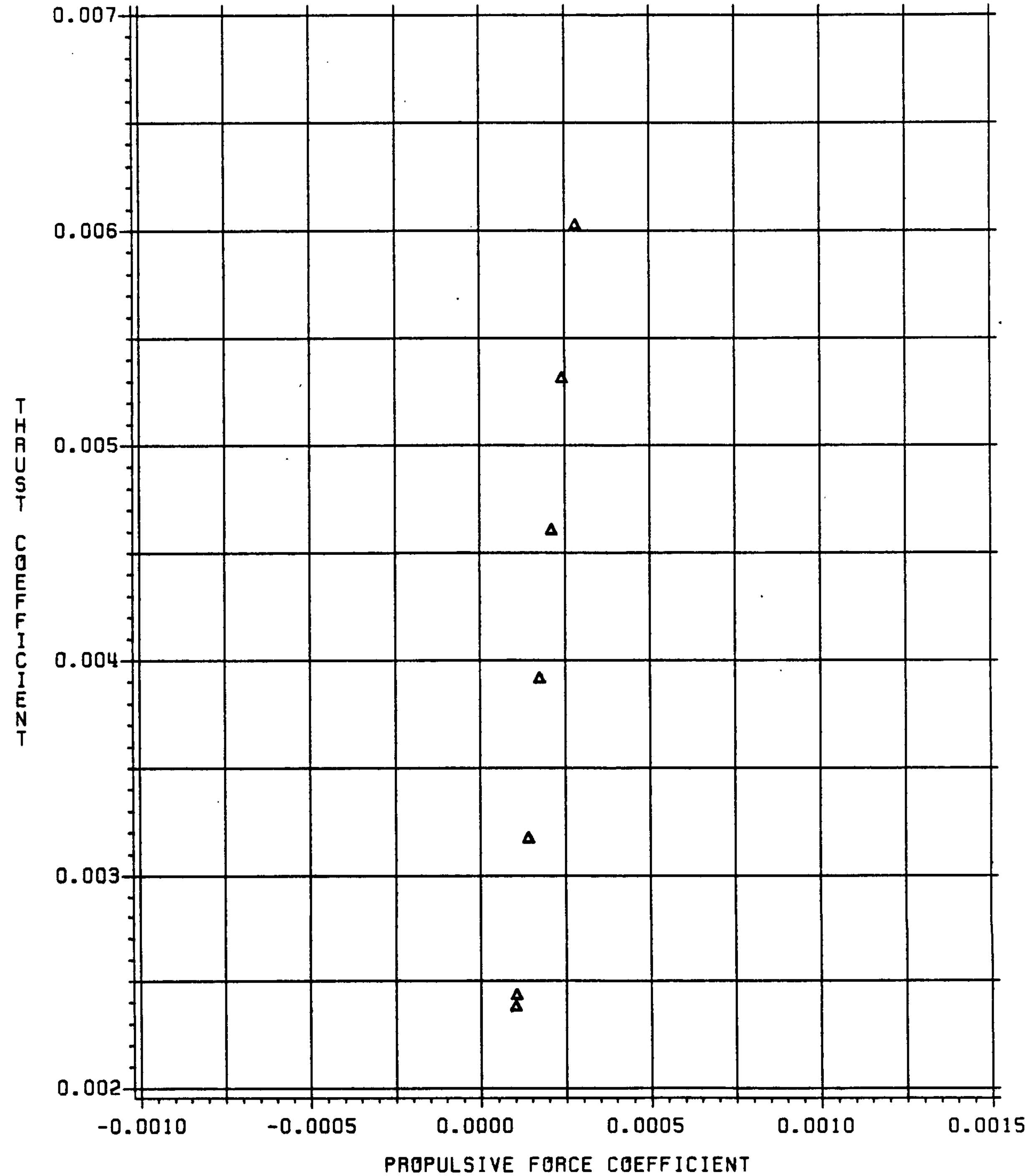


SHAFT ANGLE = -4 (TRIANGLE)


MAIN ROTOR CT VS ALPHAC
CONFIGURATION - BHA (RUN 18)   MU = 0.15
THRUST COEFFICIENT
0.007
0.006
0.005
0.004
0.003
0.002
-25
-20
-15
-10
-5
0
5
10
CONTROL AXIS ANGLE OF ATTACK, DEG
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX - FORWARD FLIGHT

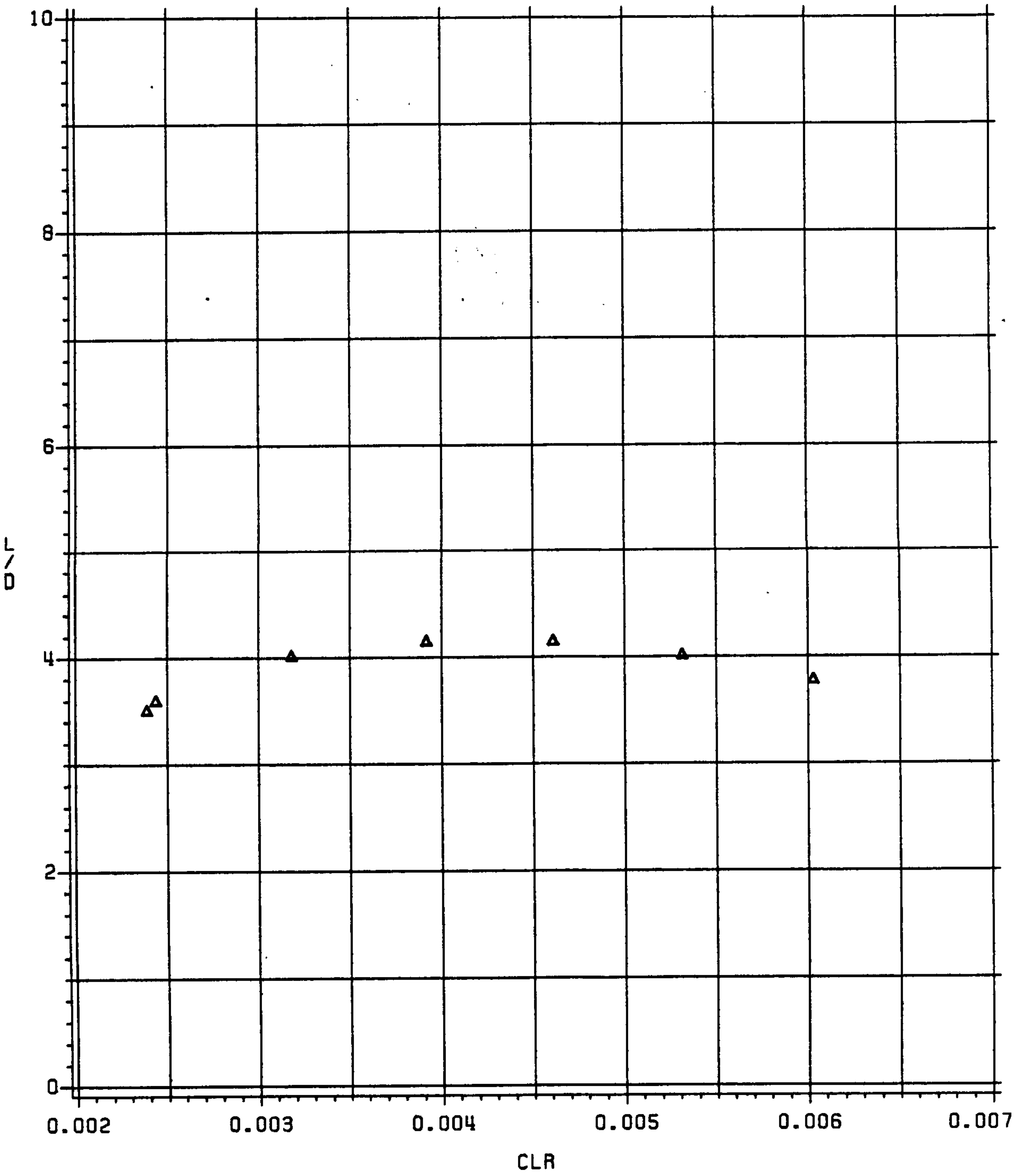
CONFIGURATION - BHA (RUN 18)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

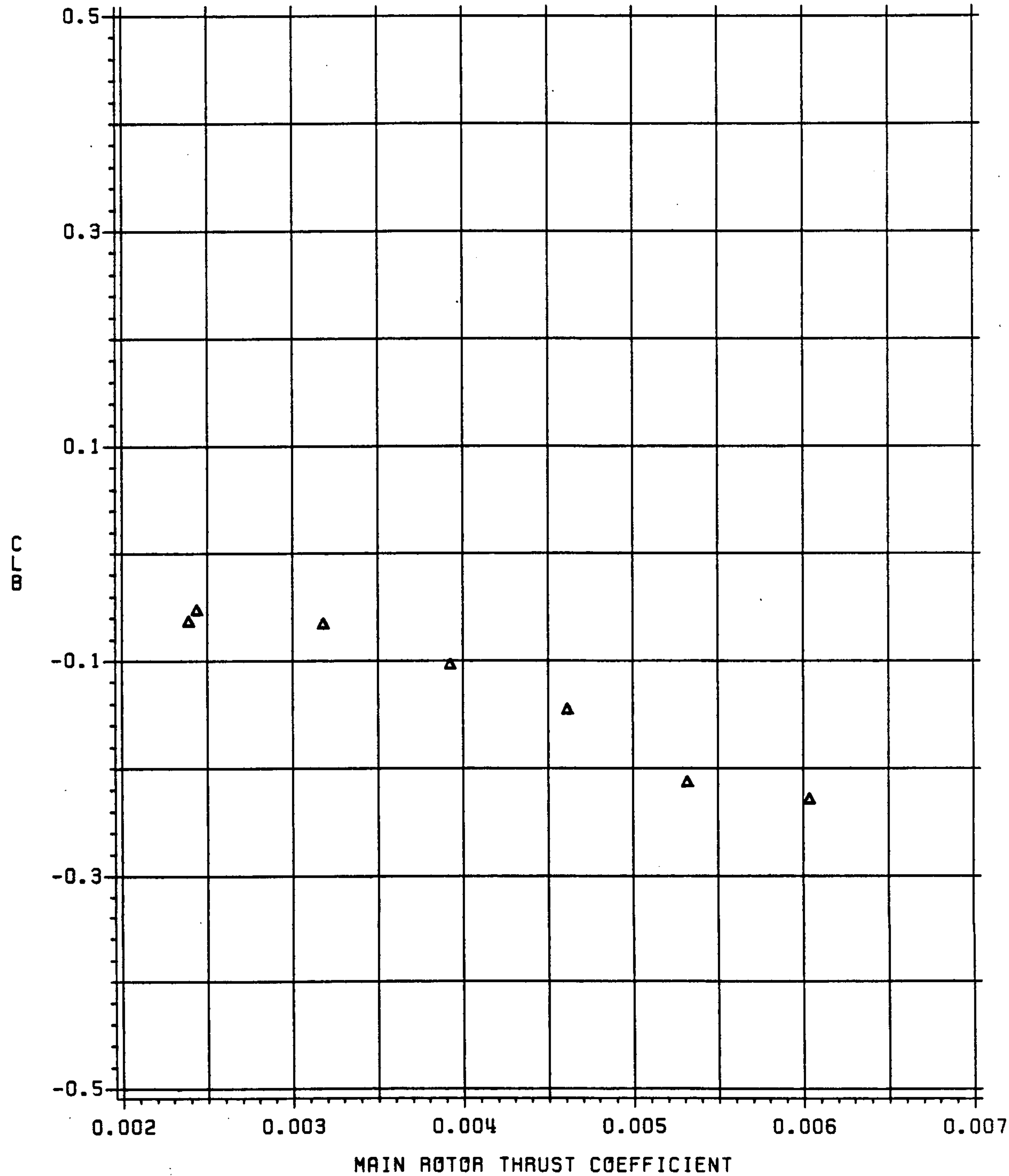
CONFIGURATION - BHR (RUN 18)   MU = 0.15



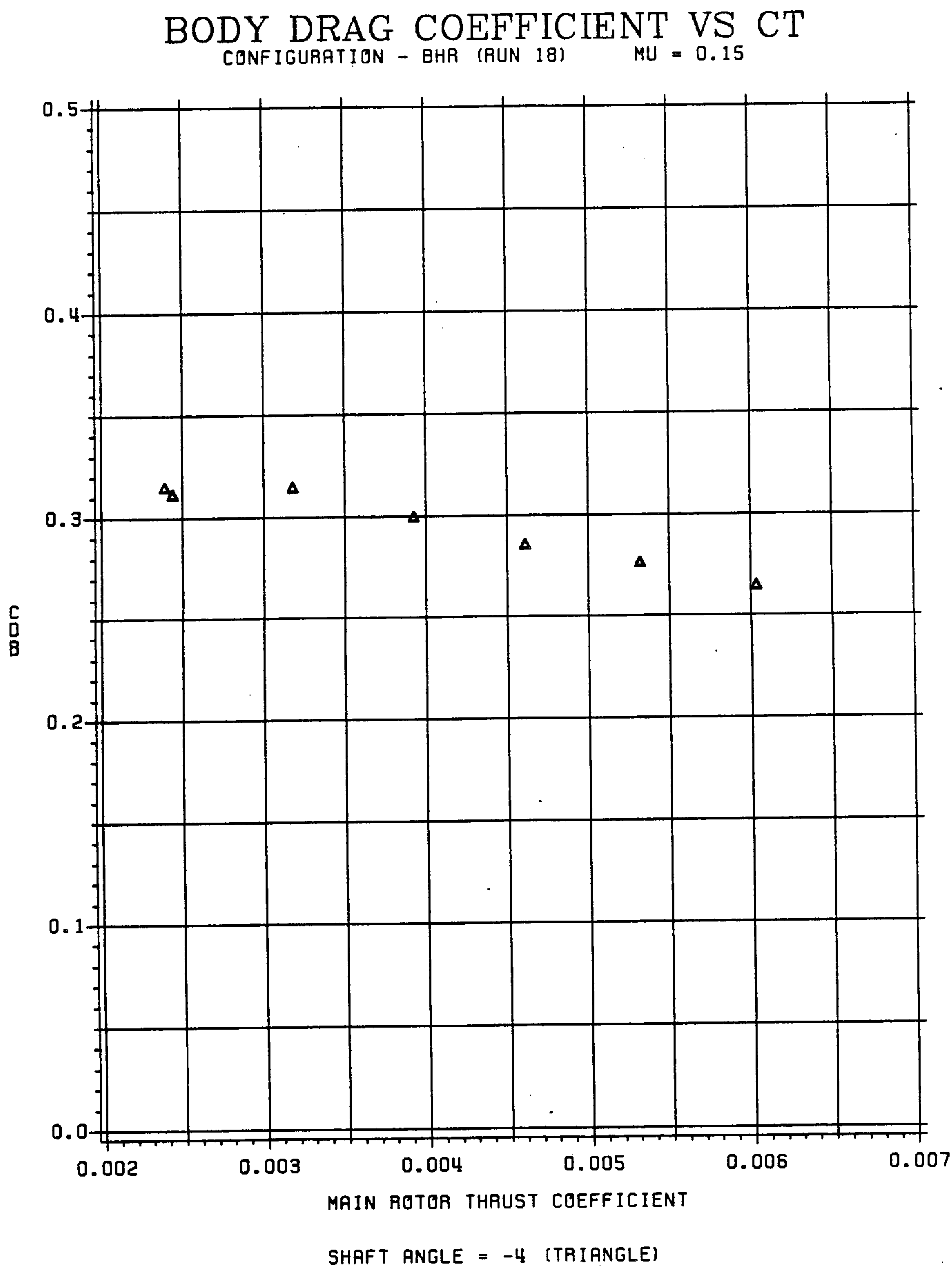
SHAFT ANGLE = -4 (TRIANGLE)

BODY LIFT COEFFICIENT VS CT

CONFIGURATION - BHR (RUN 18)   MU = 0.15



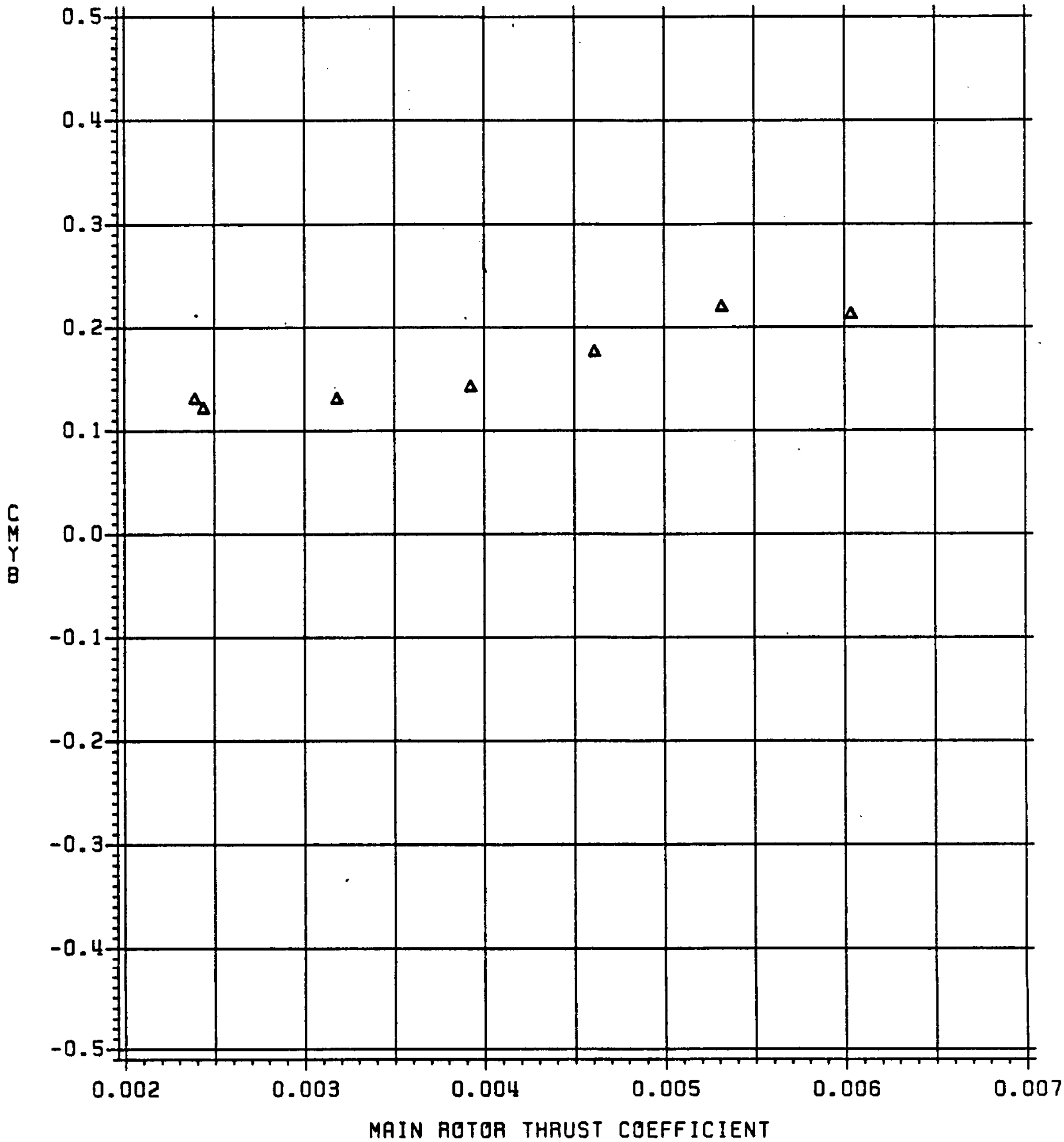
SHAFT ANGLE = -4 (TRIANGLE)



BODY DRAG COEFFICIENT VS CT
CONFIGURATION - BHR (RUN 18) MU = 0.15
0.5
0.4
0.3
0.2
0.1
0.0
CDB
0.002
0.003
0.004
0.005
0.006
0.007
MAIN ROTOR THRUST COEFFICIENT
SHAFT ANGLE = -4 (TRIANGLE)

BODY PITCHING MOMENT COEFFICIENT VS CT

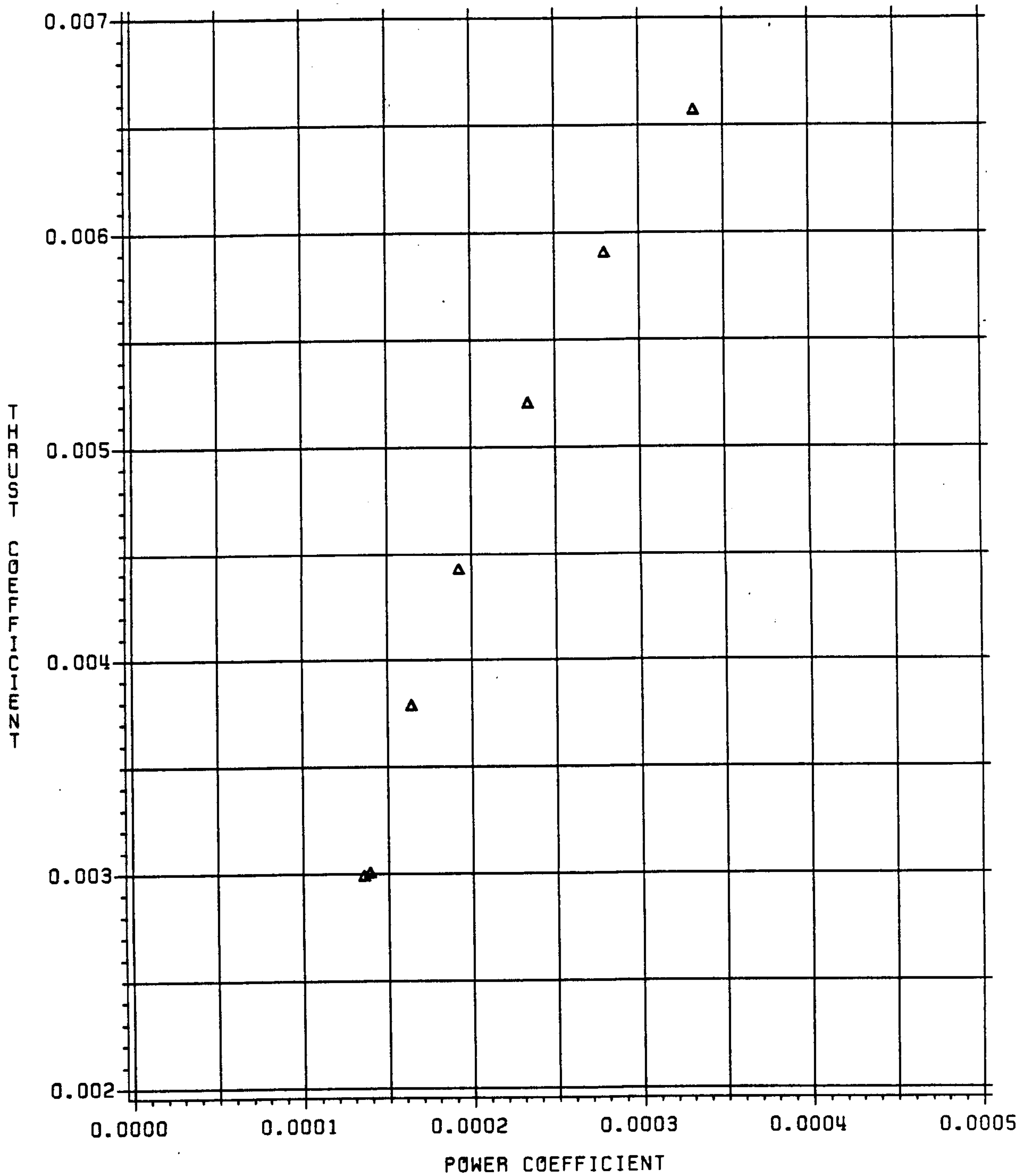
CONFIGURATION - BHR (RUN 18)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CP

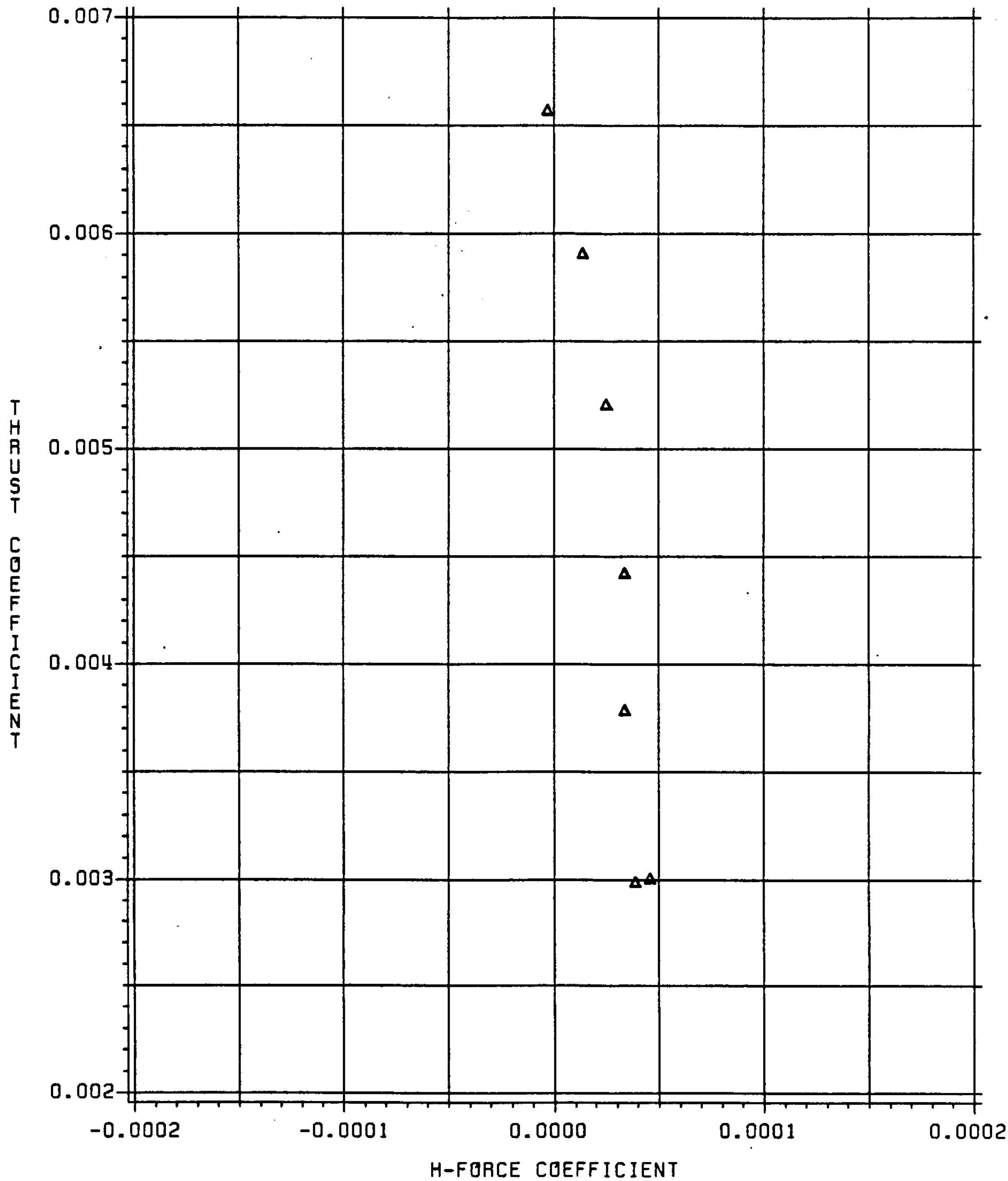
CONFIGURATION - BHAF2L (RUN 18) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

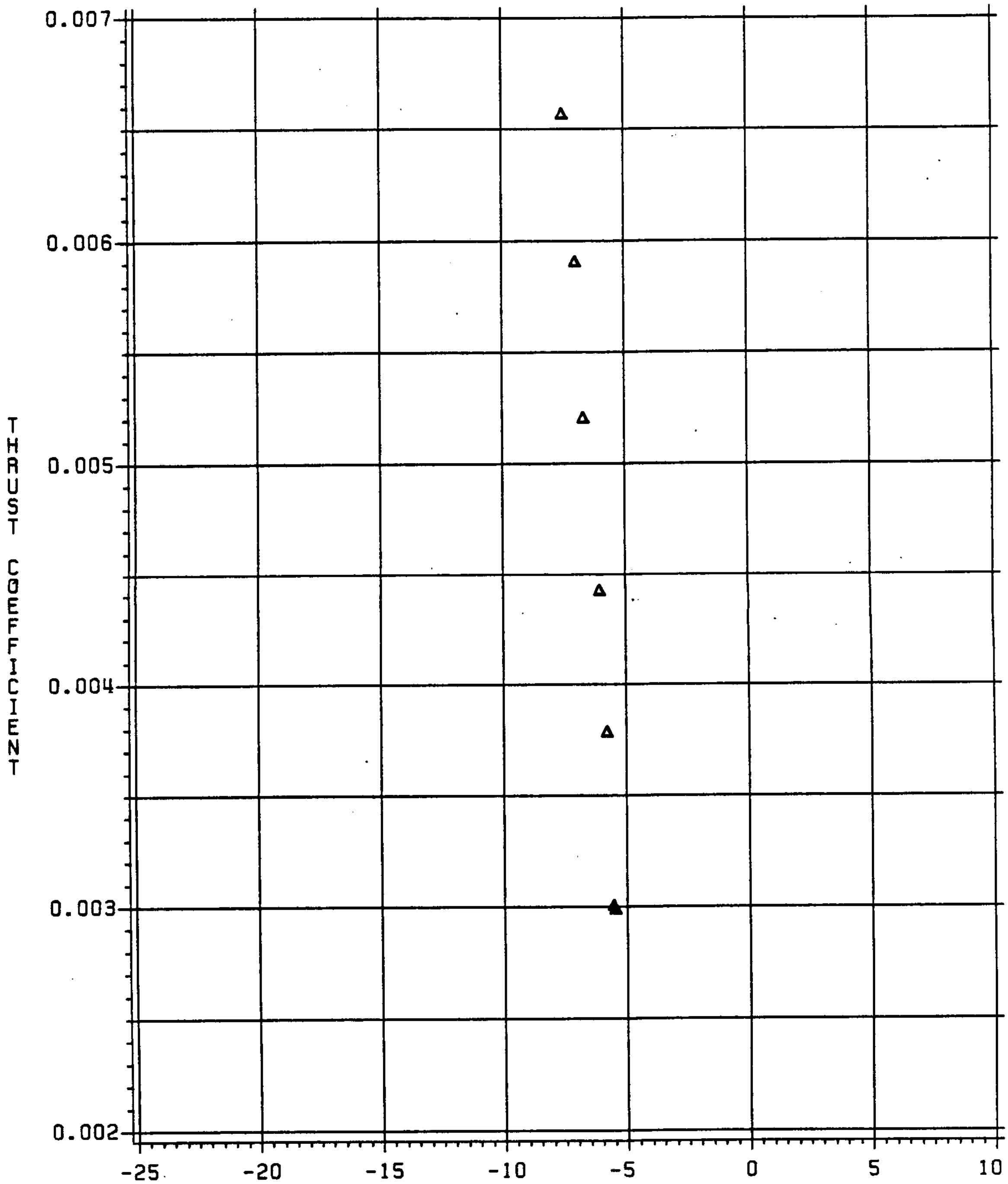
CONFIGURATION - BHAF2L (RUN 20)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

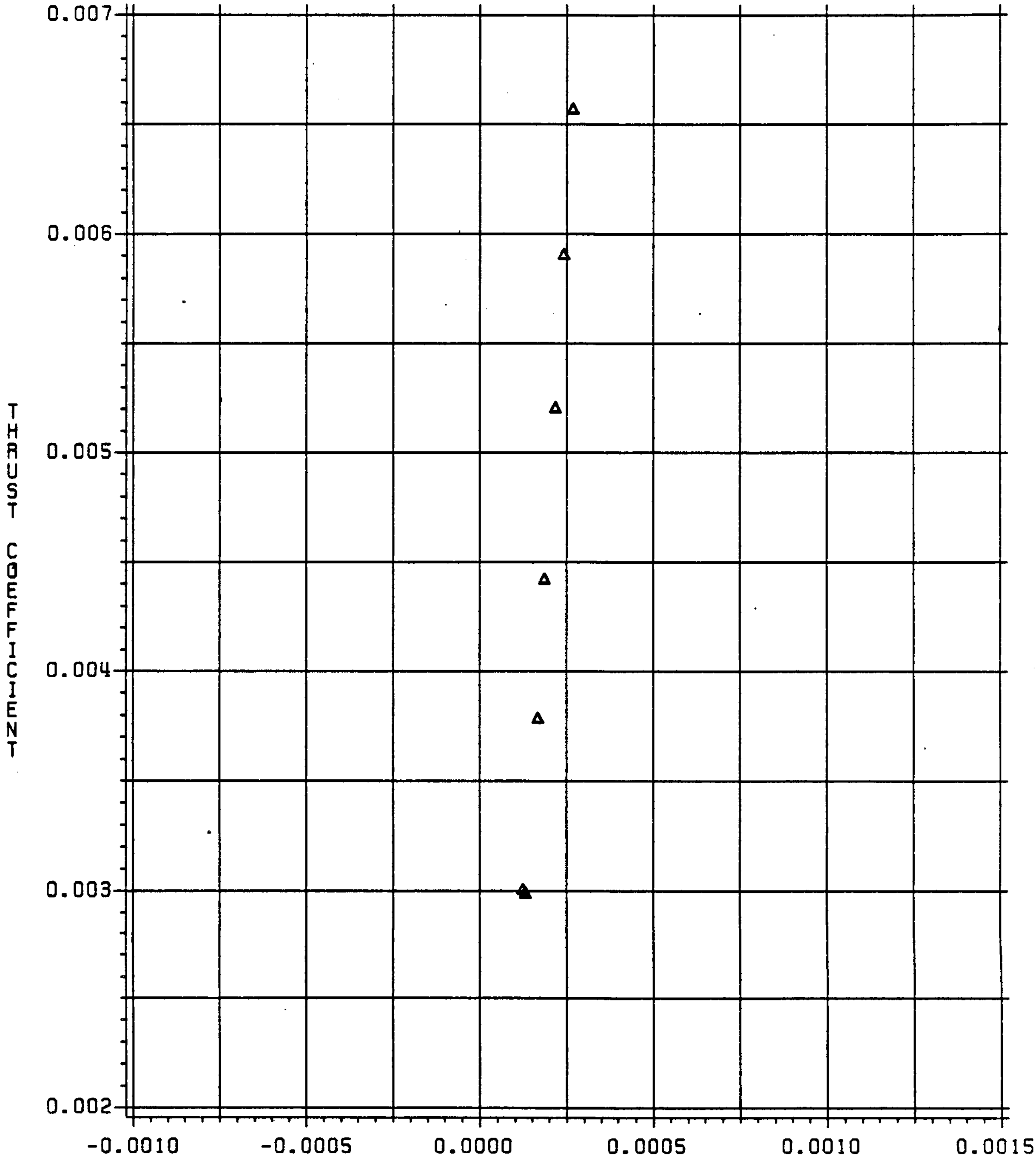
CONFIGURATION - BHAF2L (RUN 20)   MU = 0.15



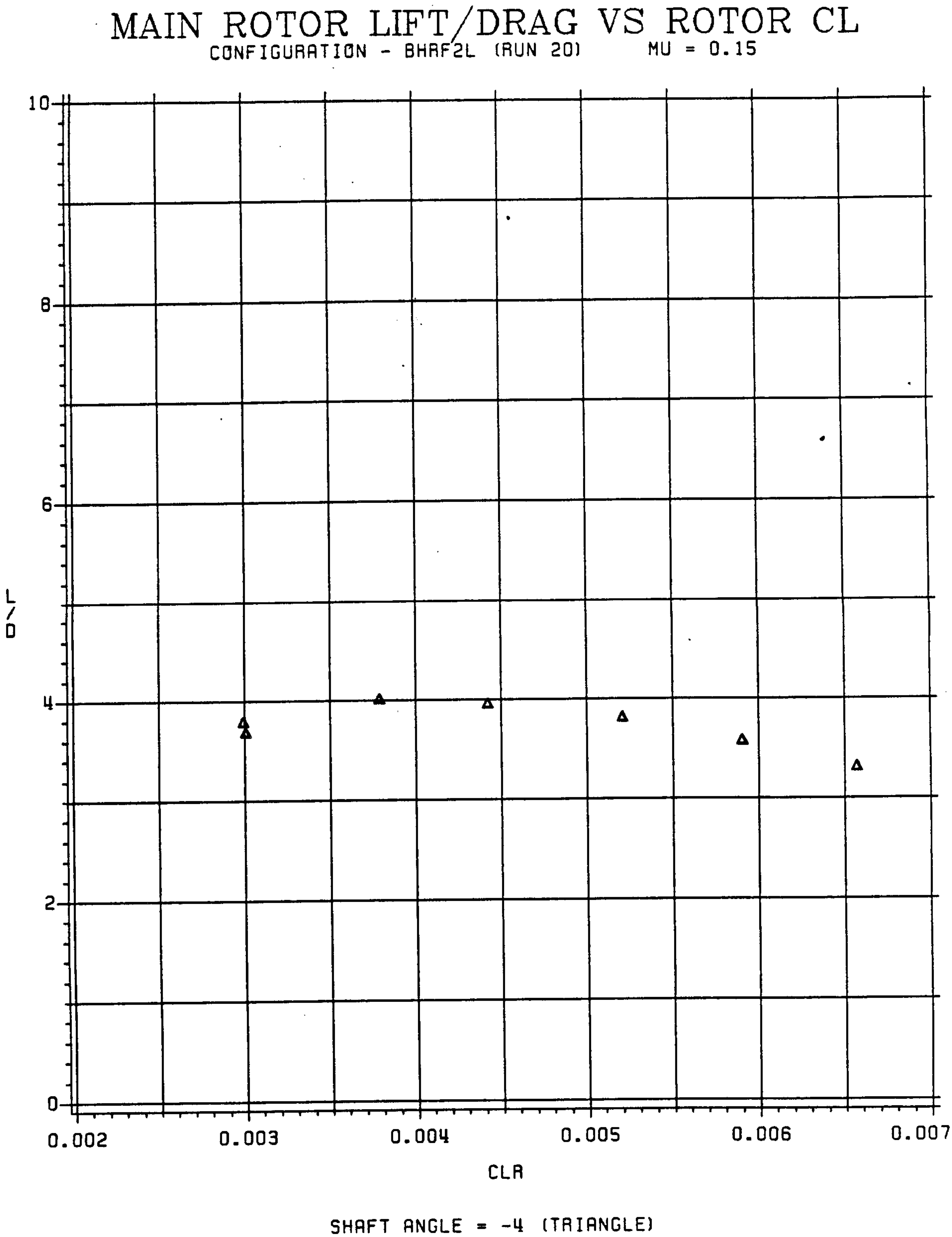
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX - FORWARD FLIGHT

CONFIGURATION - BHAF2L (RUN 20)   MU = 0.15

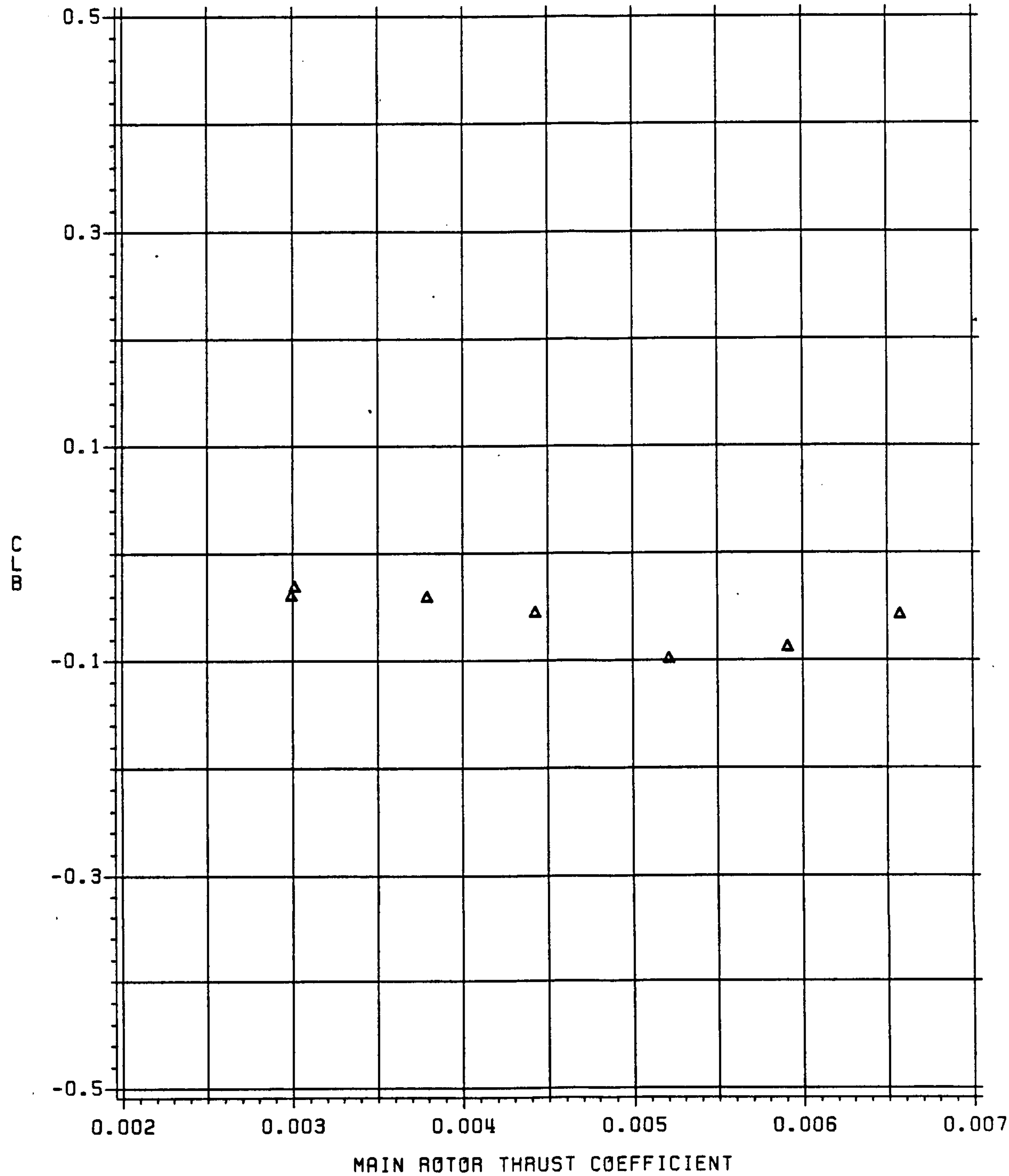


SHAFT ANGLE = -4 (TRIANGLE)


MAIN ROTOR LIFT/DRAG VS ROTOR CL
CONFIGURATION - BHAF2L (RUN 20) MU = 0.15
L/D
10
8
6
4
2
0
0.002
0.003
0.004
0.005
0.006
0.007
CLR
SHAFT ANGLE = -4 (TRIANGLE)

BODY LIFT COEFFICIENT VS CT

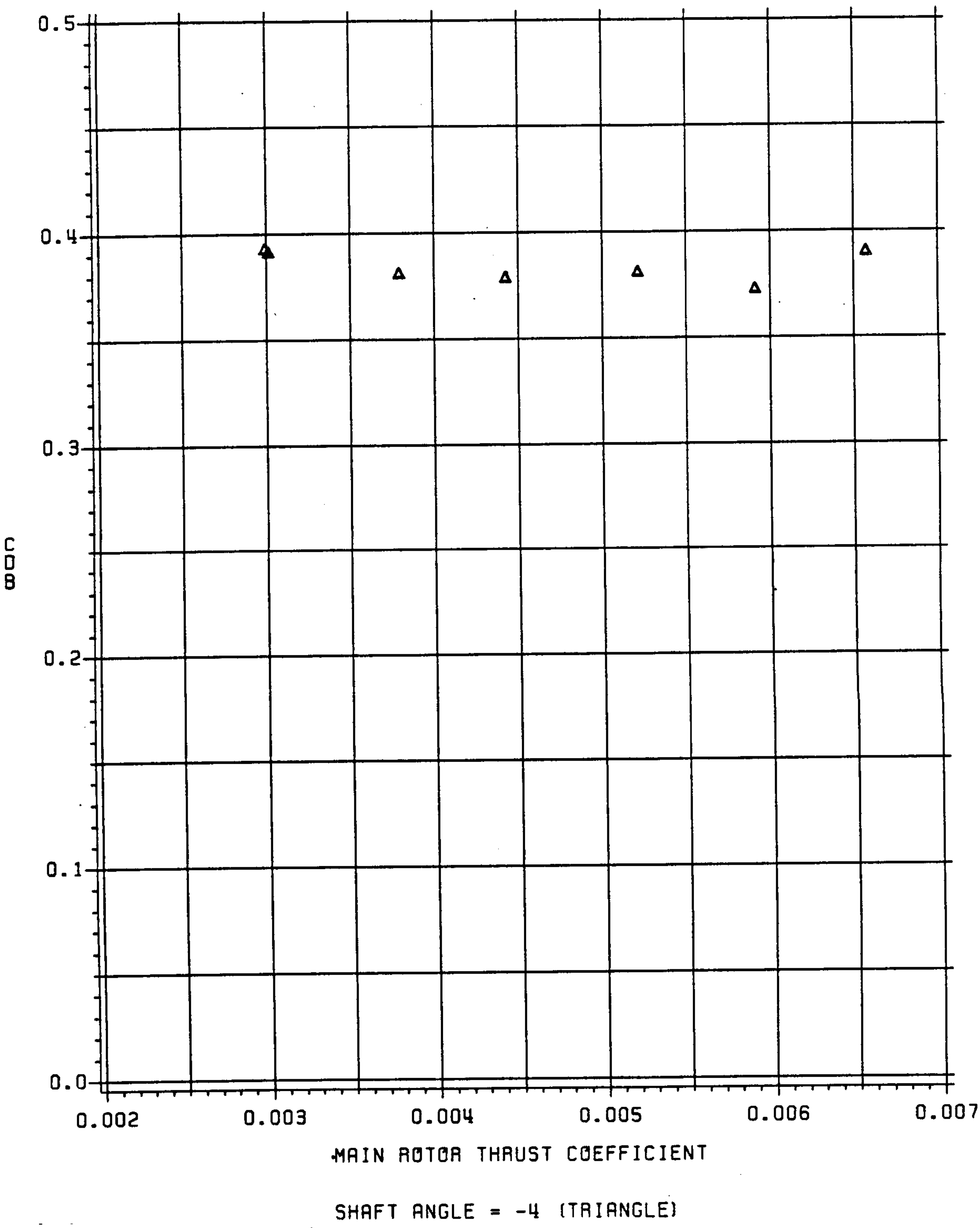
CONFIGURATION - BHAF2L (RUN 20) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

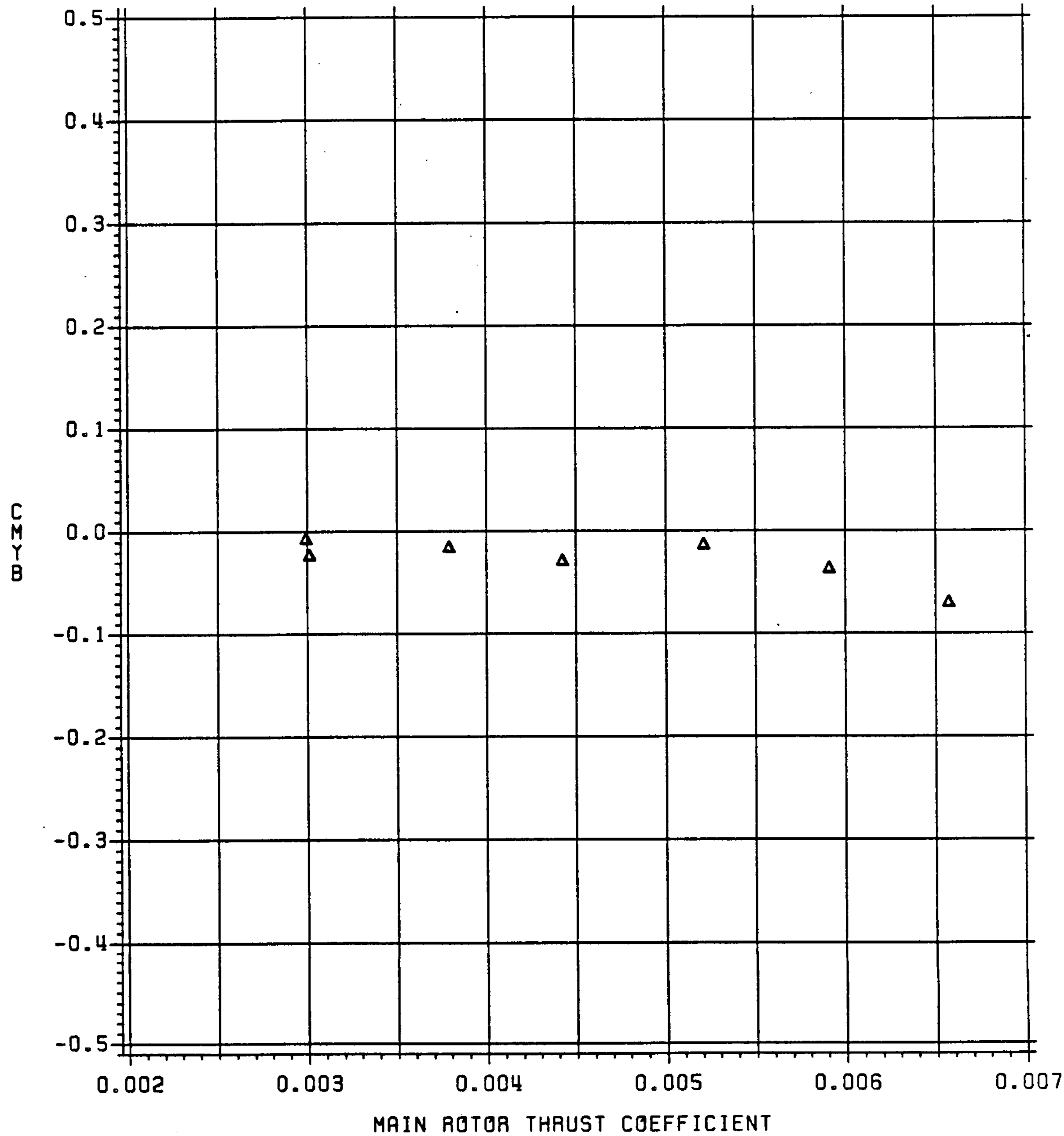
BODY DRAG COEFFICIENT VS CT

CONFIGURATION - BHAF2L (RUN 20) MU = 0.15



BODY PITCHING MOMENT COEFFICIENT VS CT

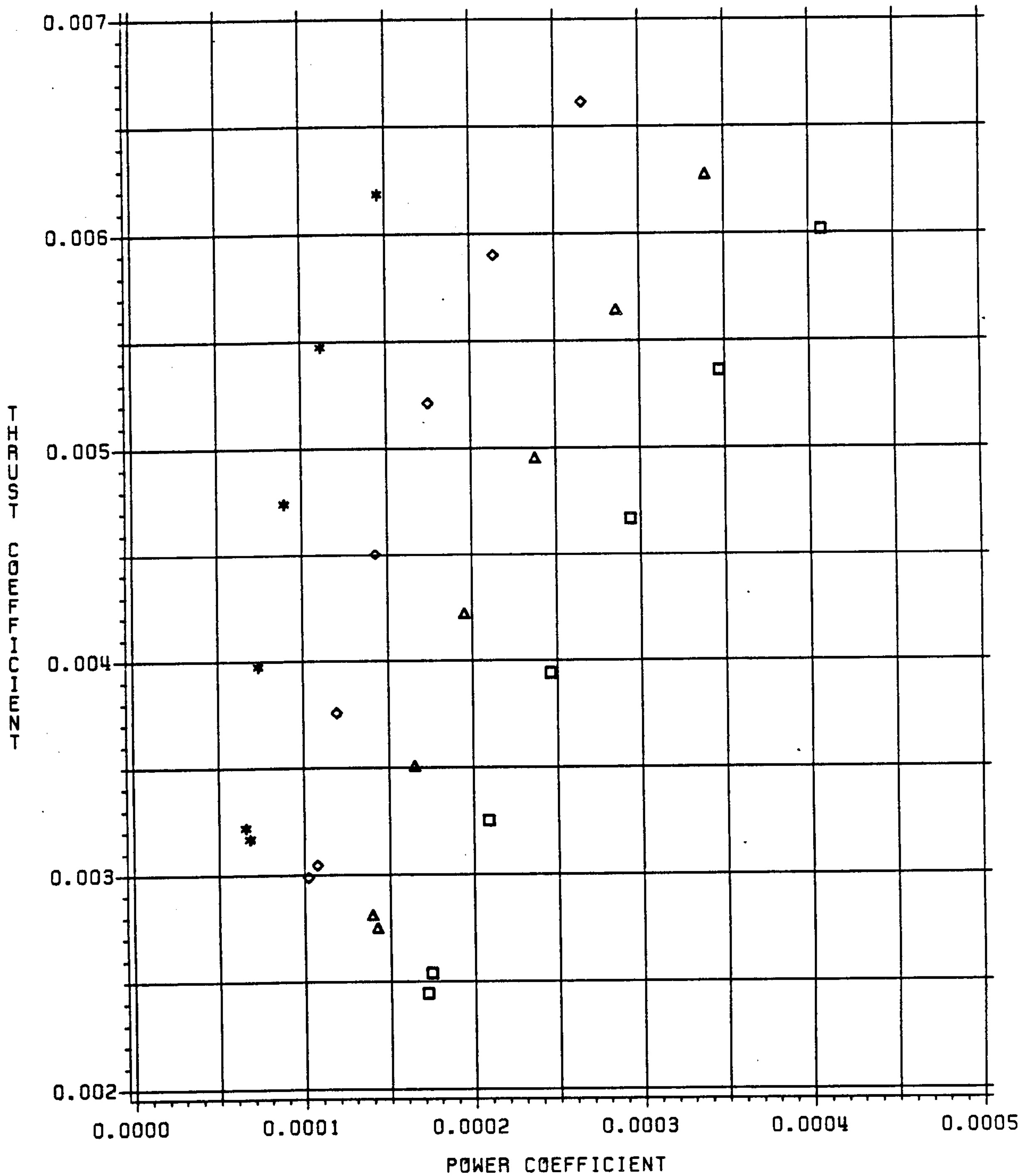
CONFIGURATION - BHAF2L (RUN 20)   MU = 0.15



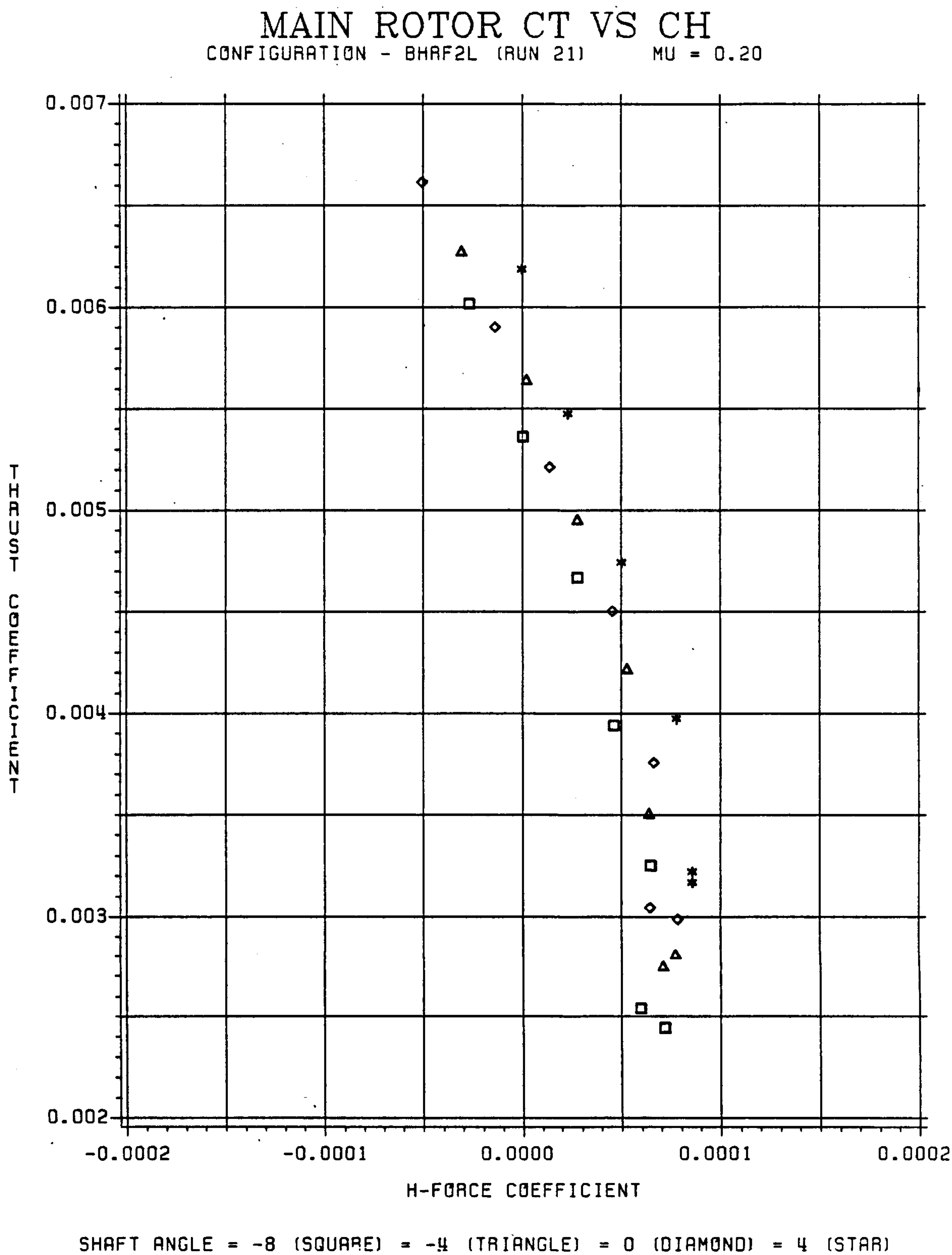
SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CP

CONFIGURATION - BHAF2L (RUN 21)   MU = 0.20

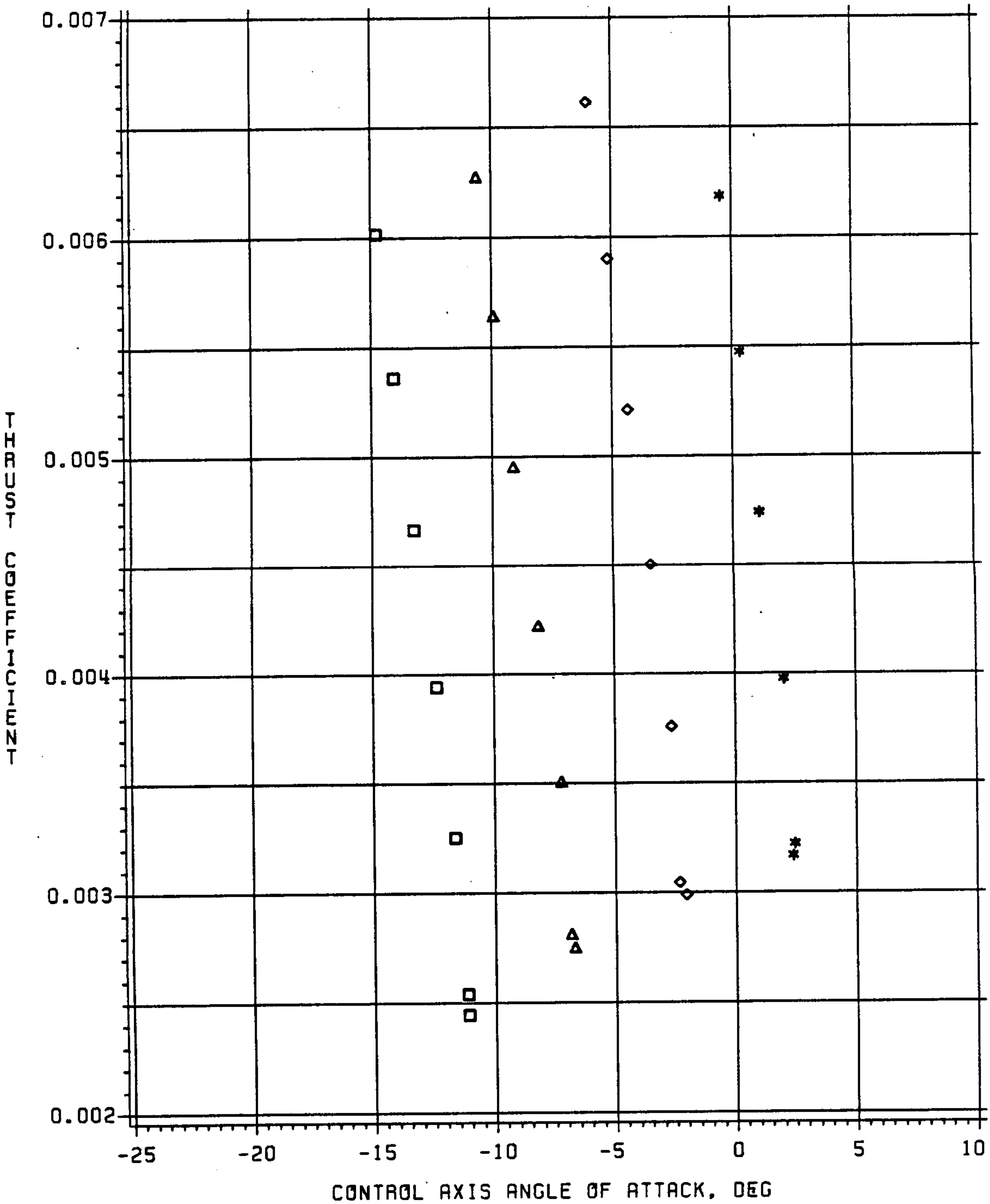


SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)


MAIN ROTOR CT VS CH
CONFIGURATION - BHAF2L (RUN 21) MU = 0.20
0.007
0.006
0.005
0.004
0.003
0.002
THRUST COEFFICIENT
-0.0002
-0.0001
0.0000
0.0001
0.0002
H-FORCE COEFFICIENT
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS ALPHAC

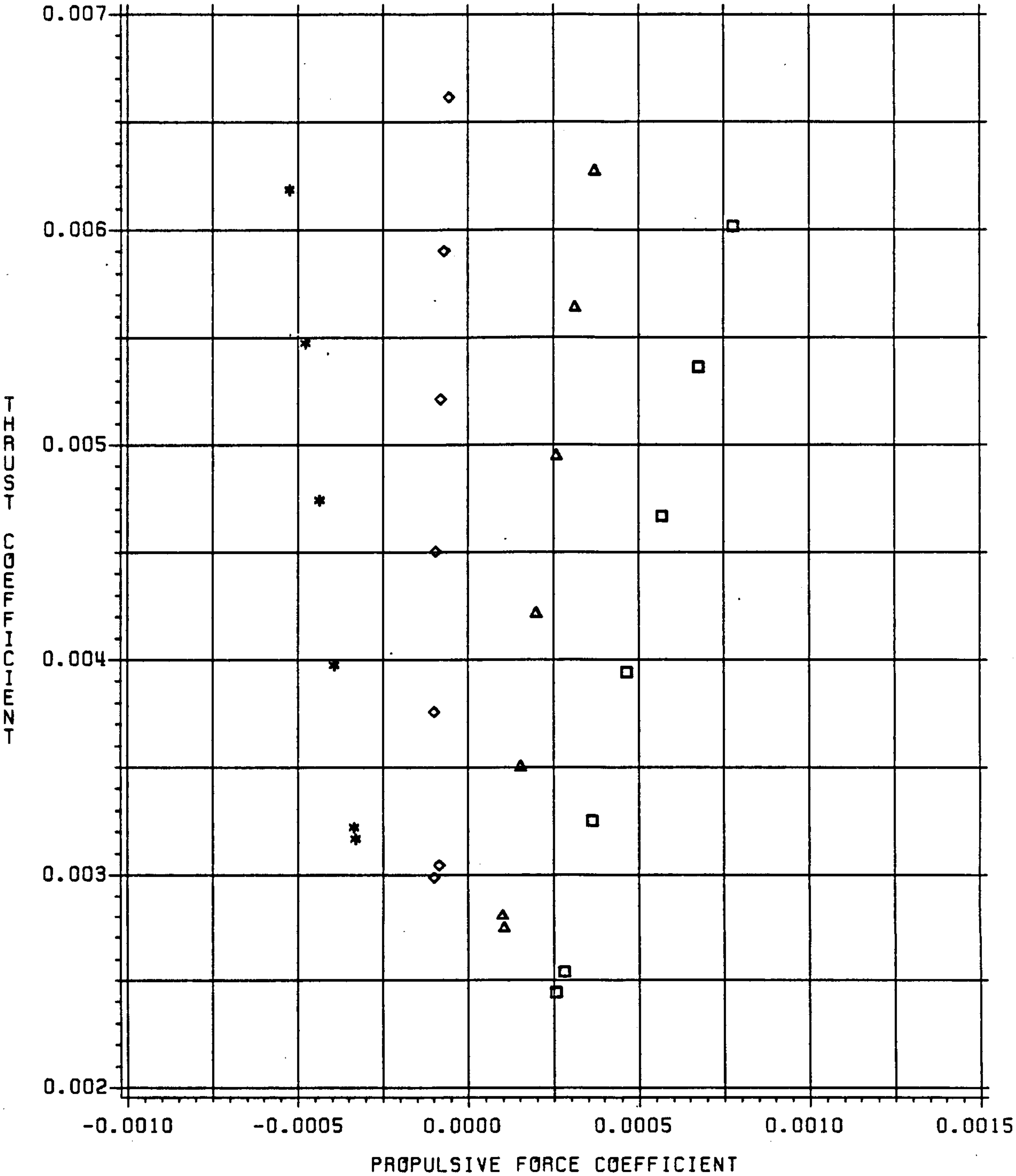
CONFIGURATION - BHAF2L (RUN 21)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

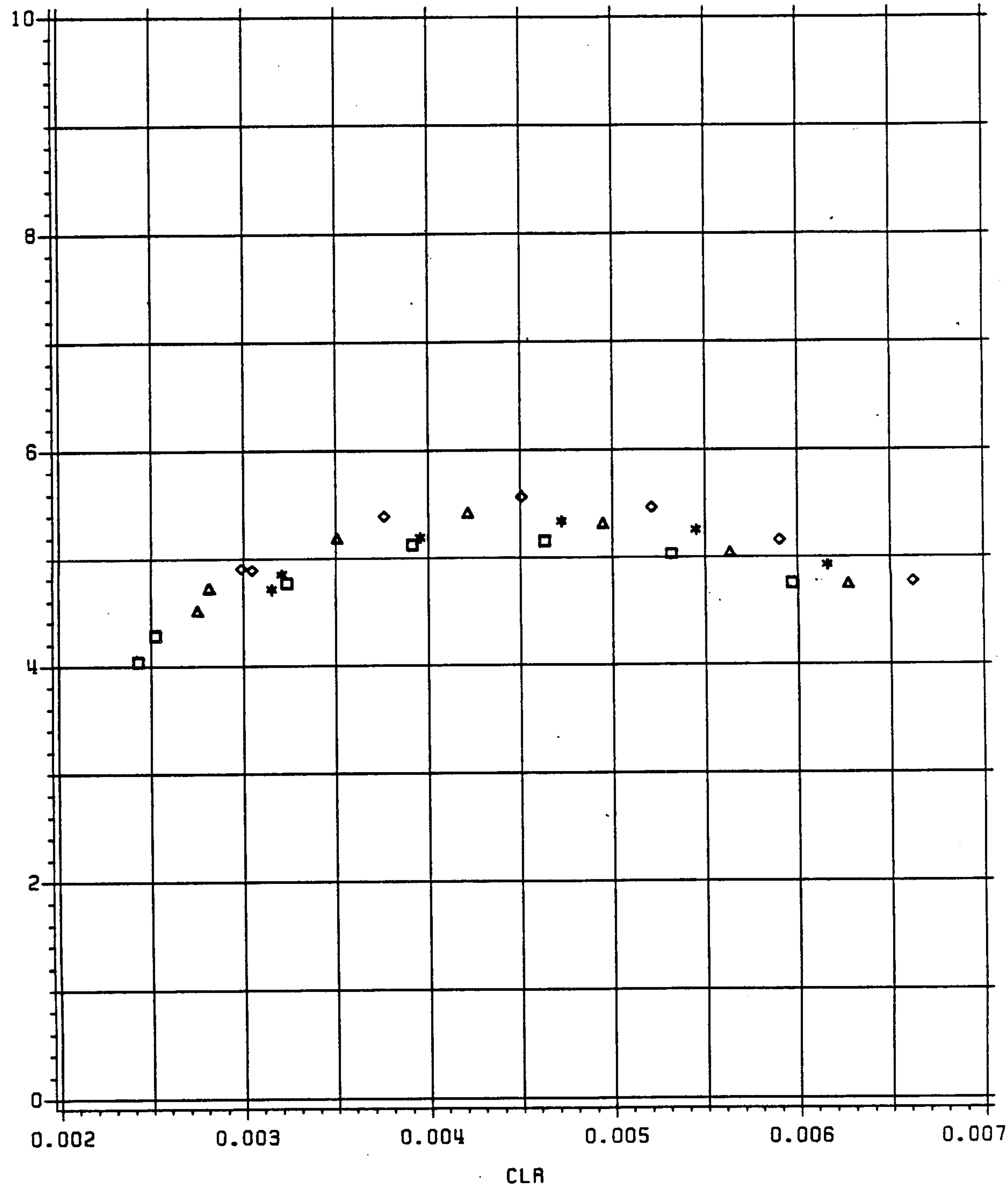
CONFIGURATION - BHAF2L (RUN 21)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

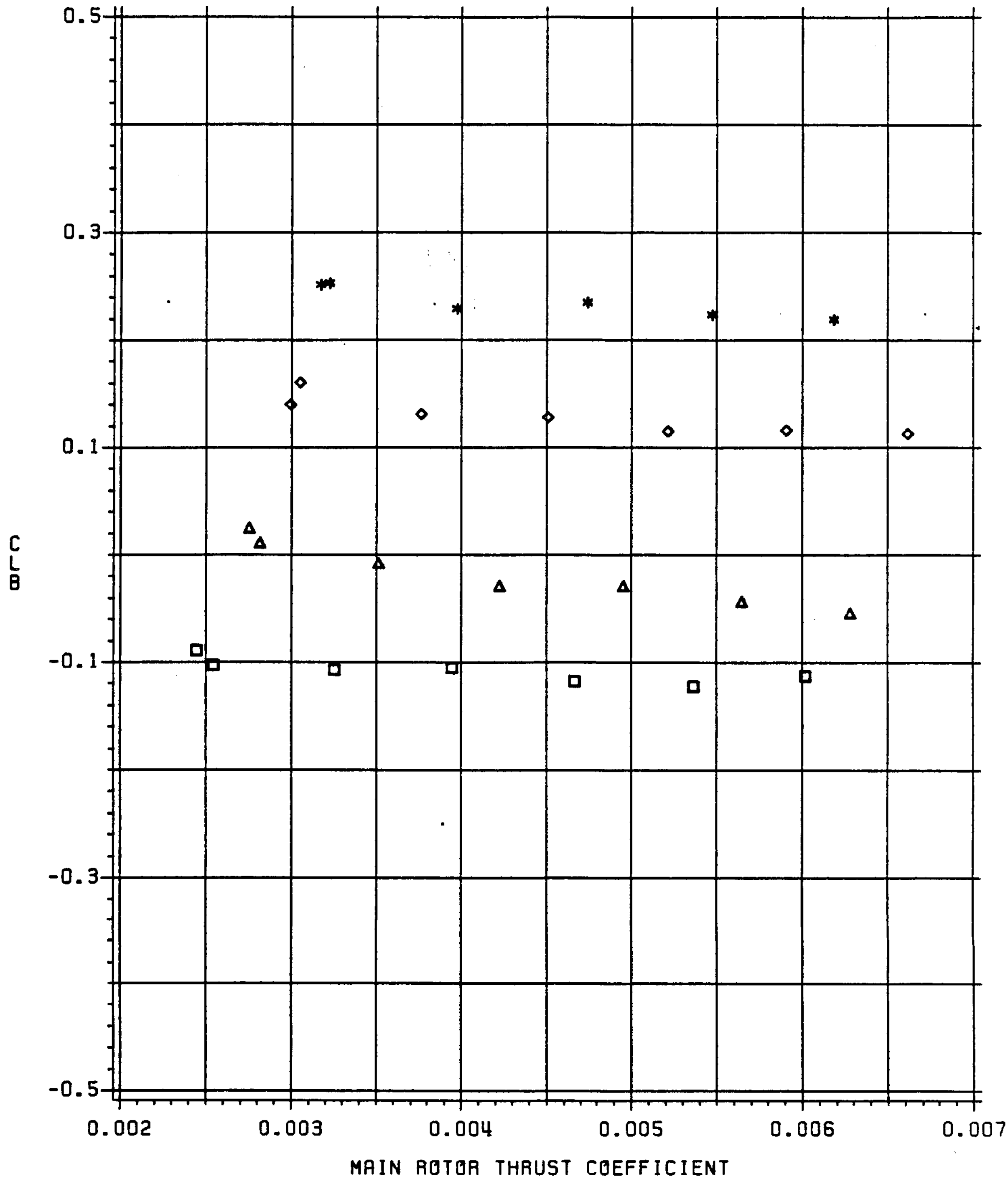
CONFIGURATION - BHRF2L (RUN 21) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS CT

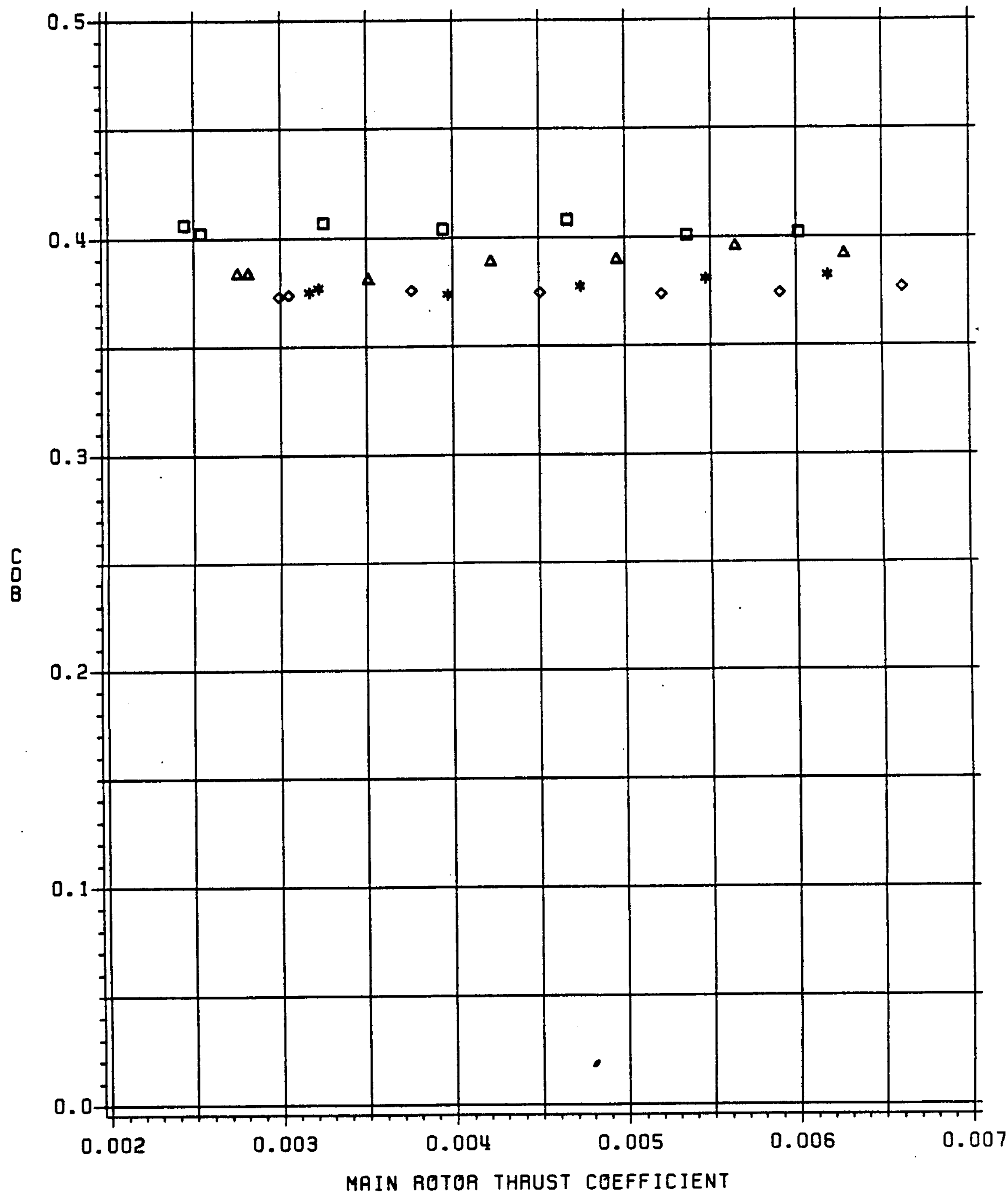
CONFIGURATION - BHAF2L (RUN 21) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

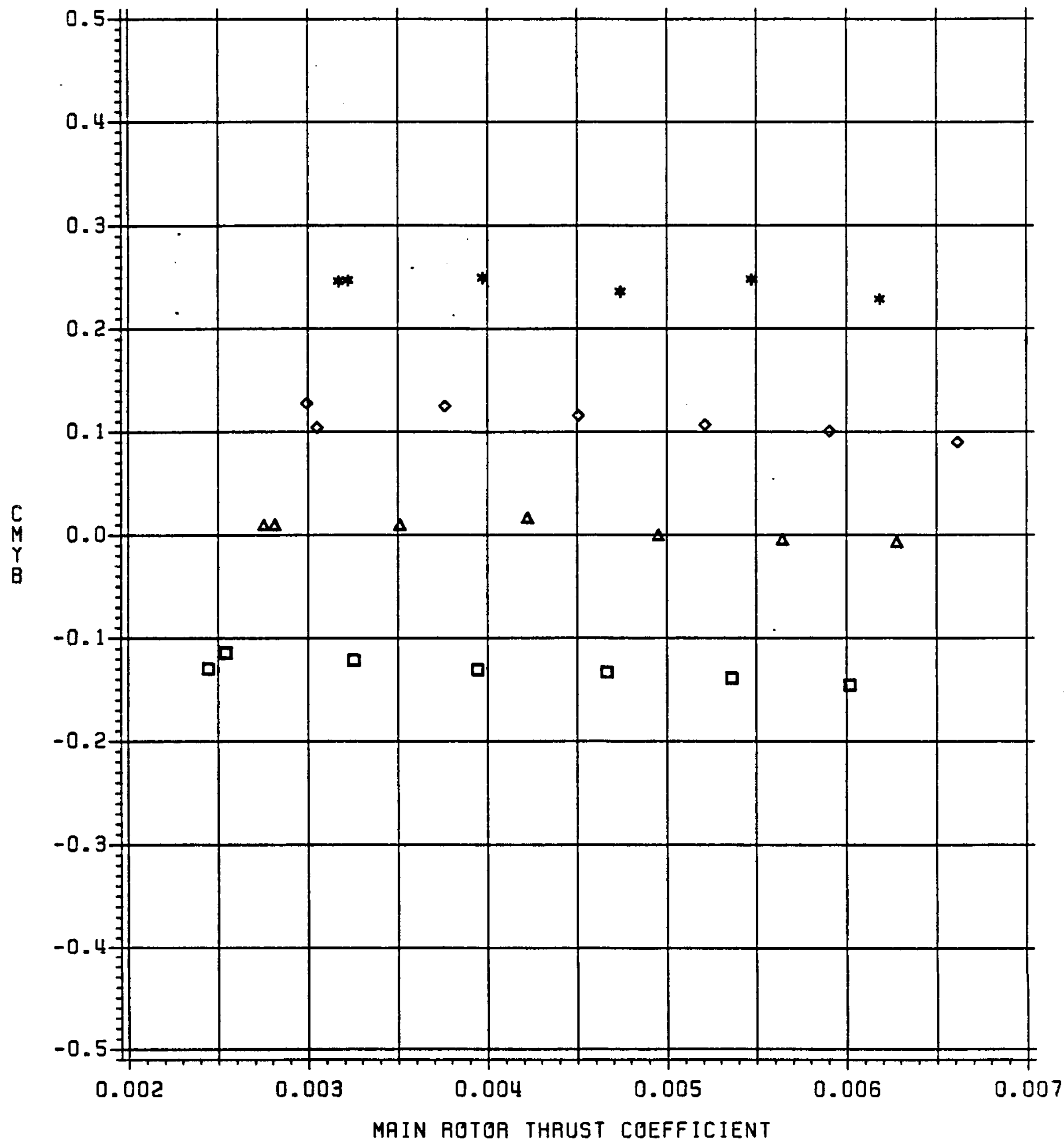
CONFIGURATION - BHRF2L (RUN 21) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

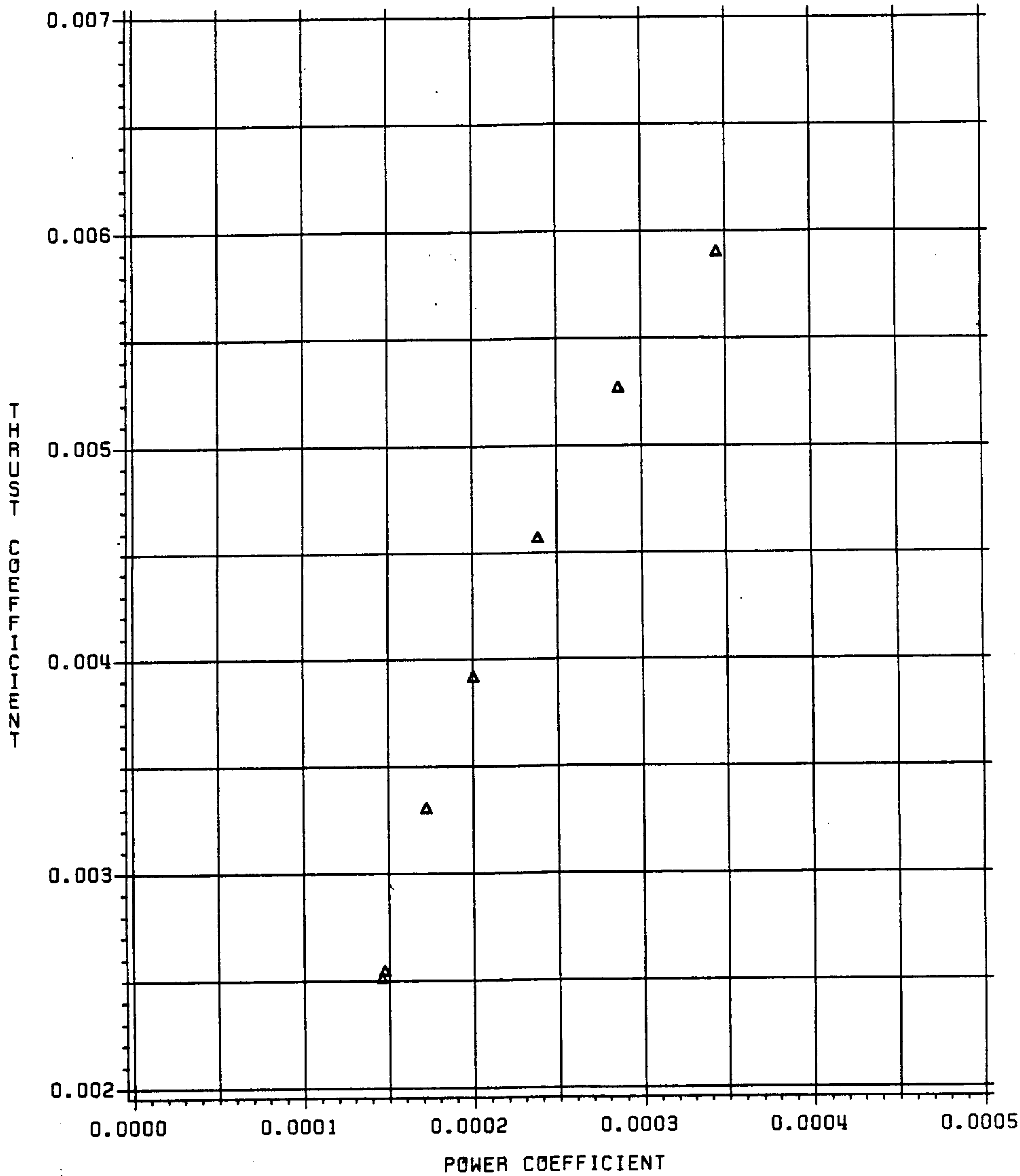
CONFIGURATION - BHAF2L (RUN 21)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

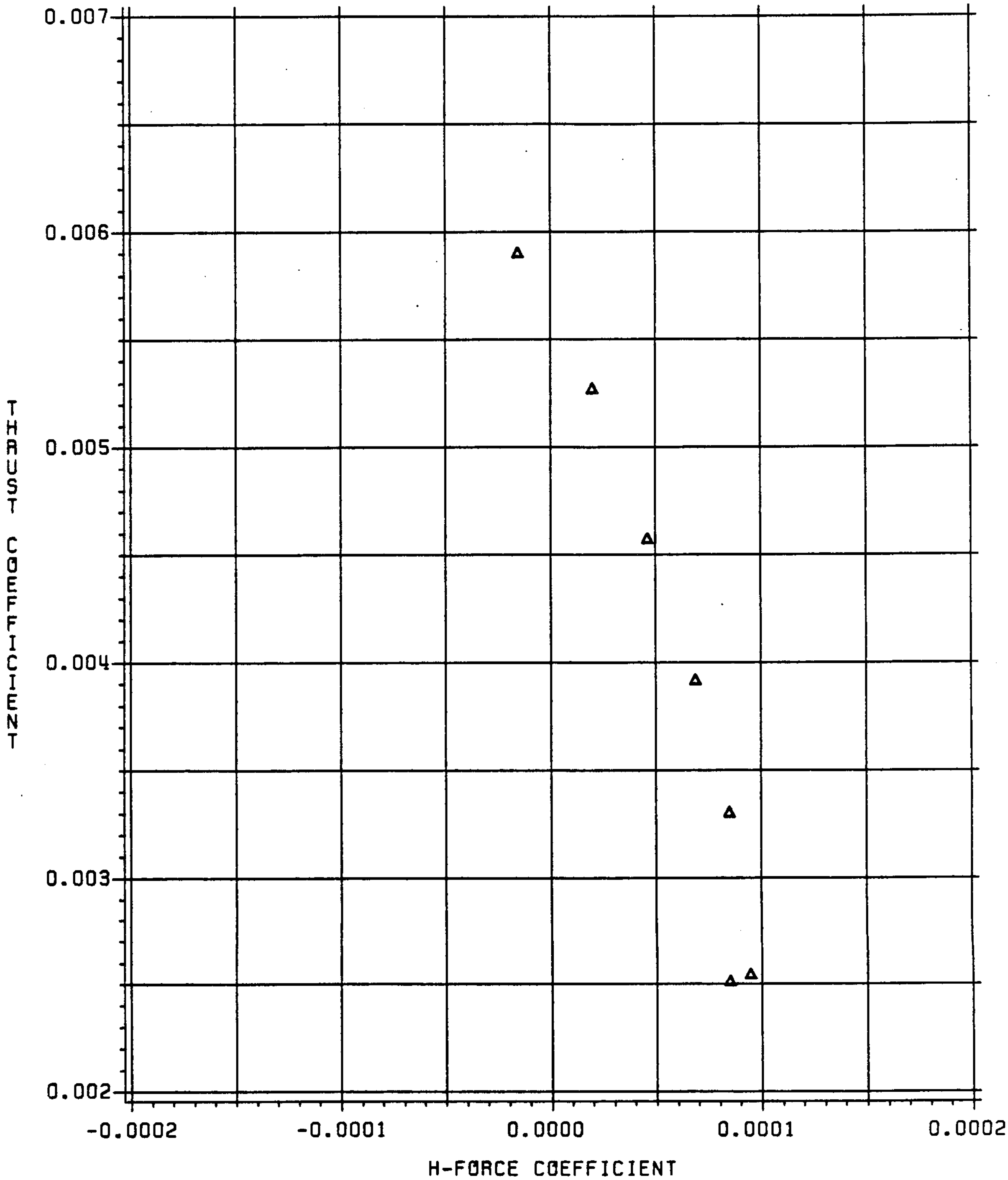
CONFIGURATION - BHRF2L (RUN 18)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

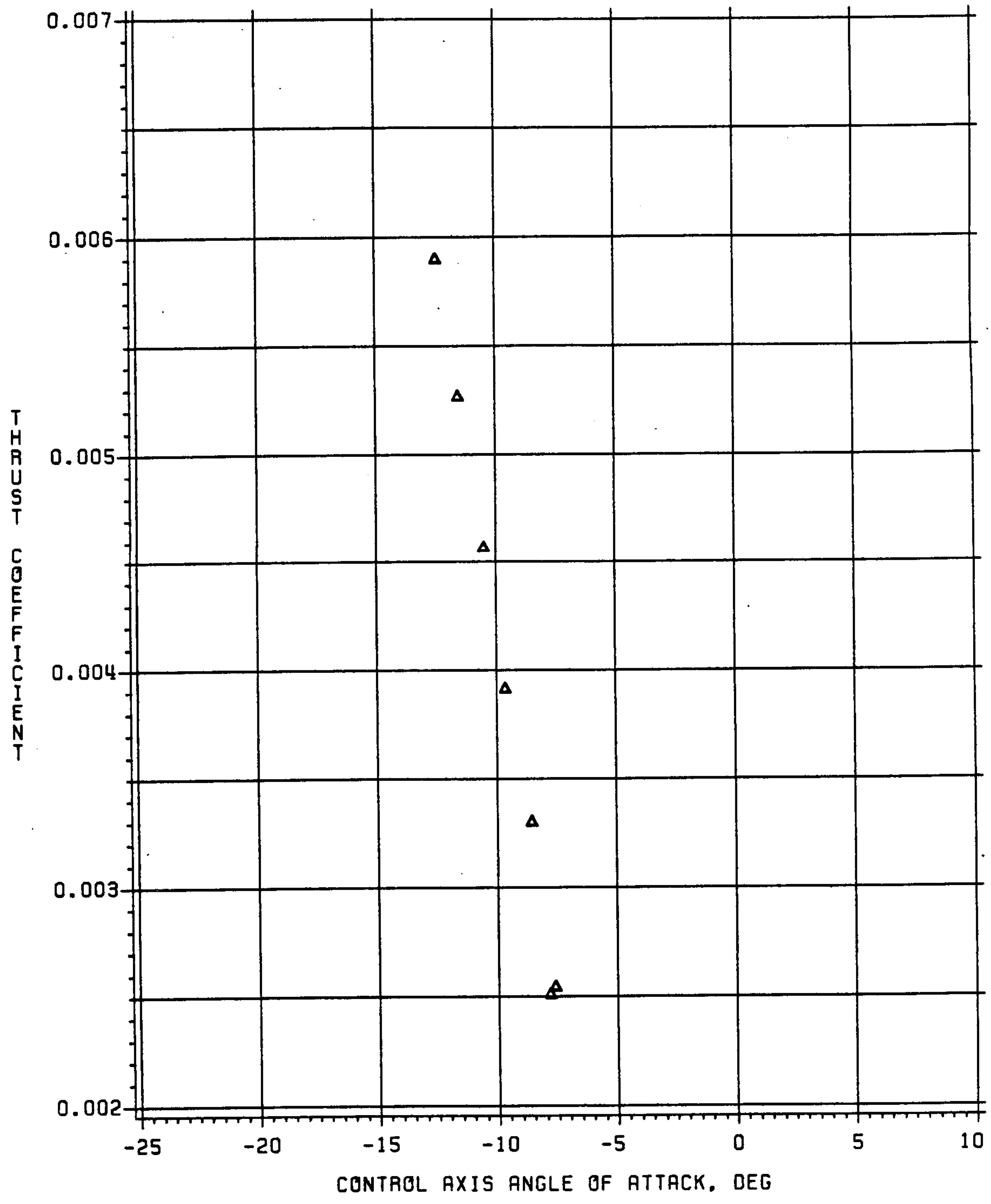
CONFIGURATION - BHAF2L (RUN 22) MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

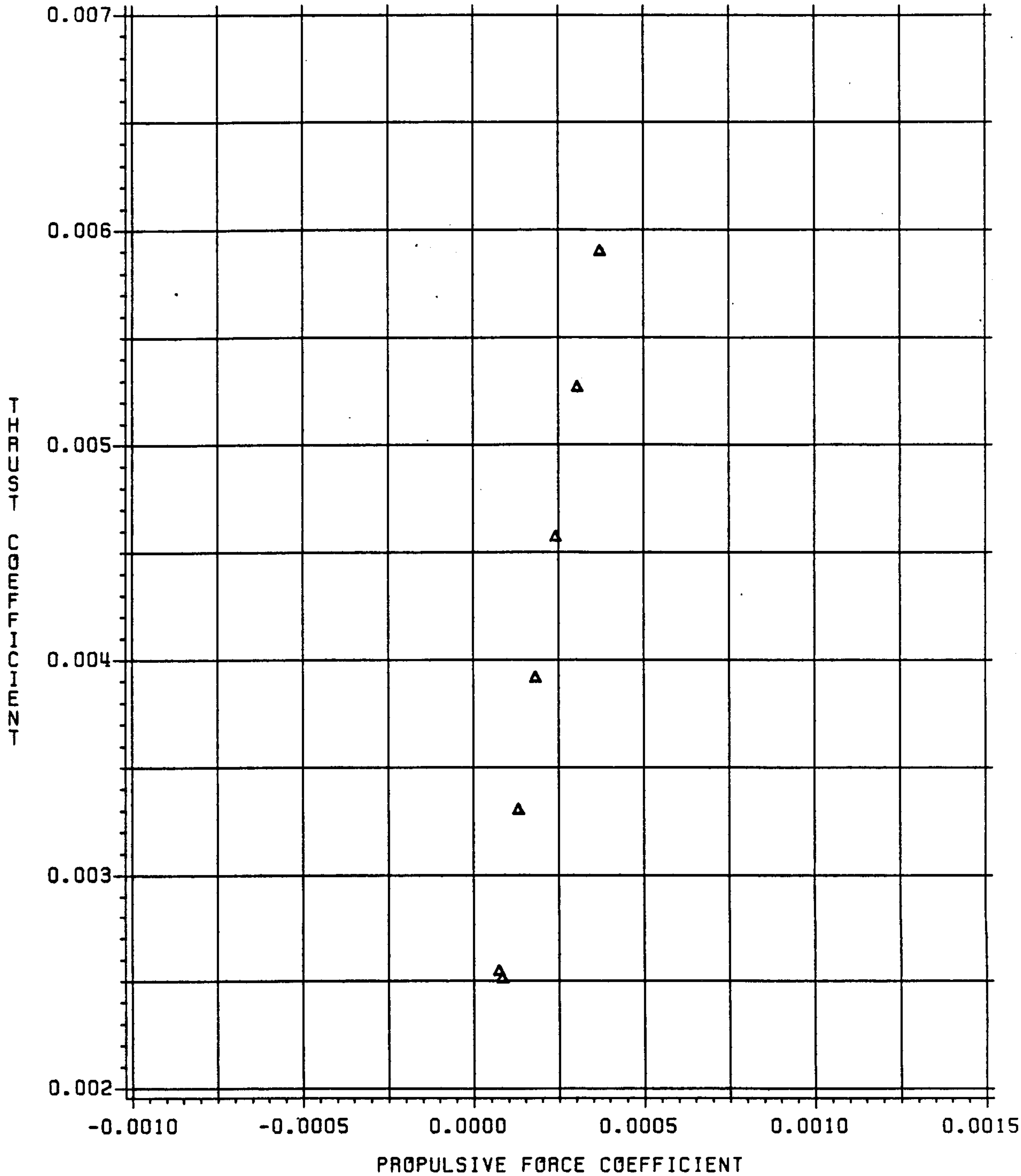
CONFIGURATION - BHAF2L (RUN 22)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX - FORWARD FLIGHT

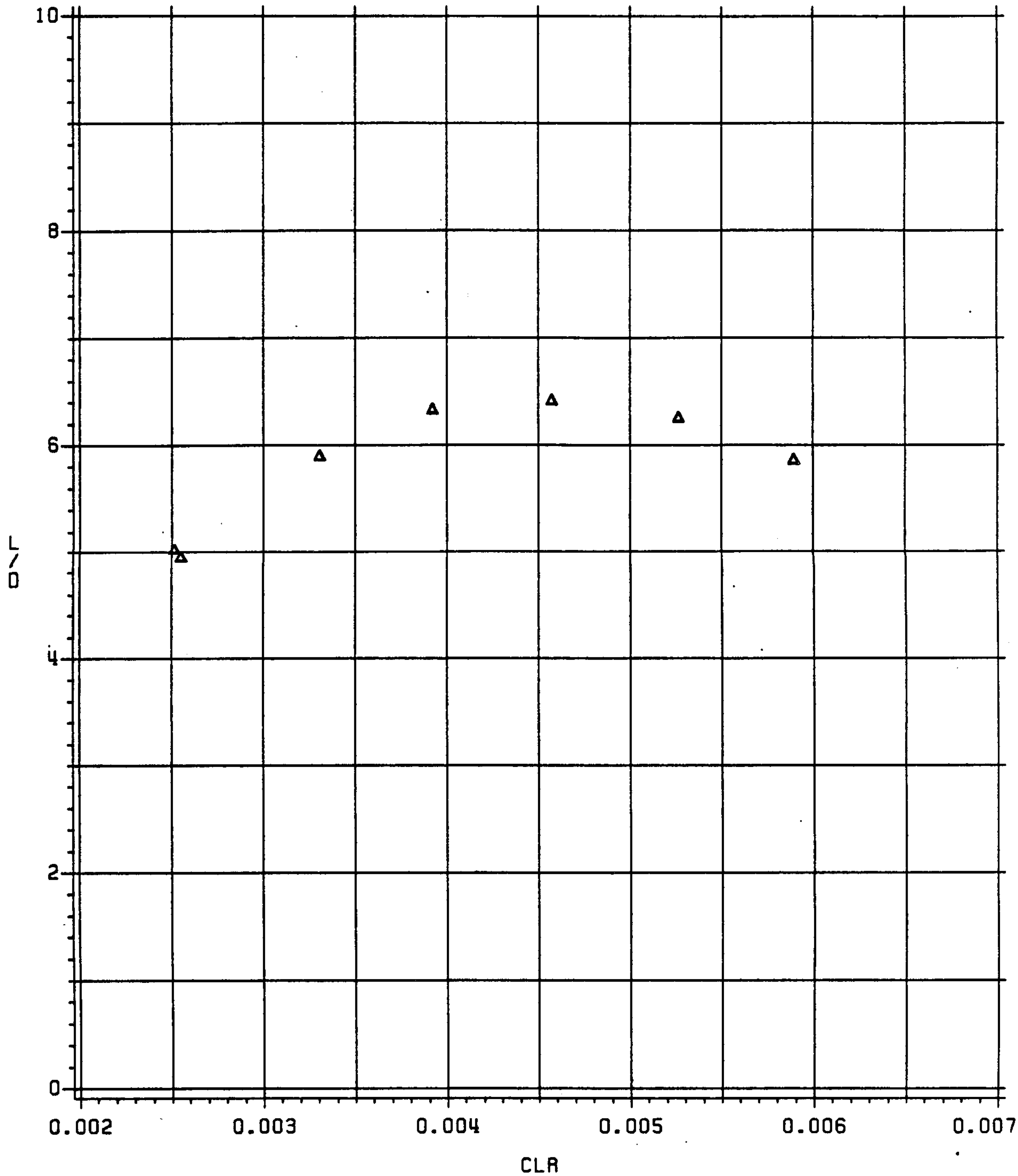
CONFIGURATION - BHRF2L (RUN 22)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

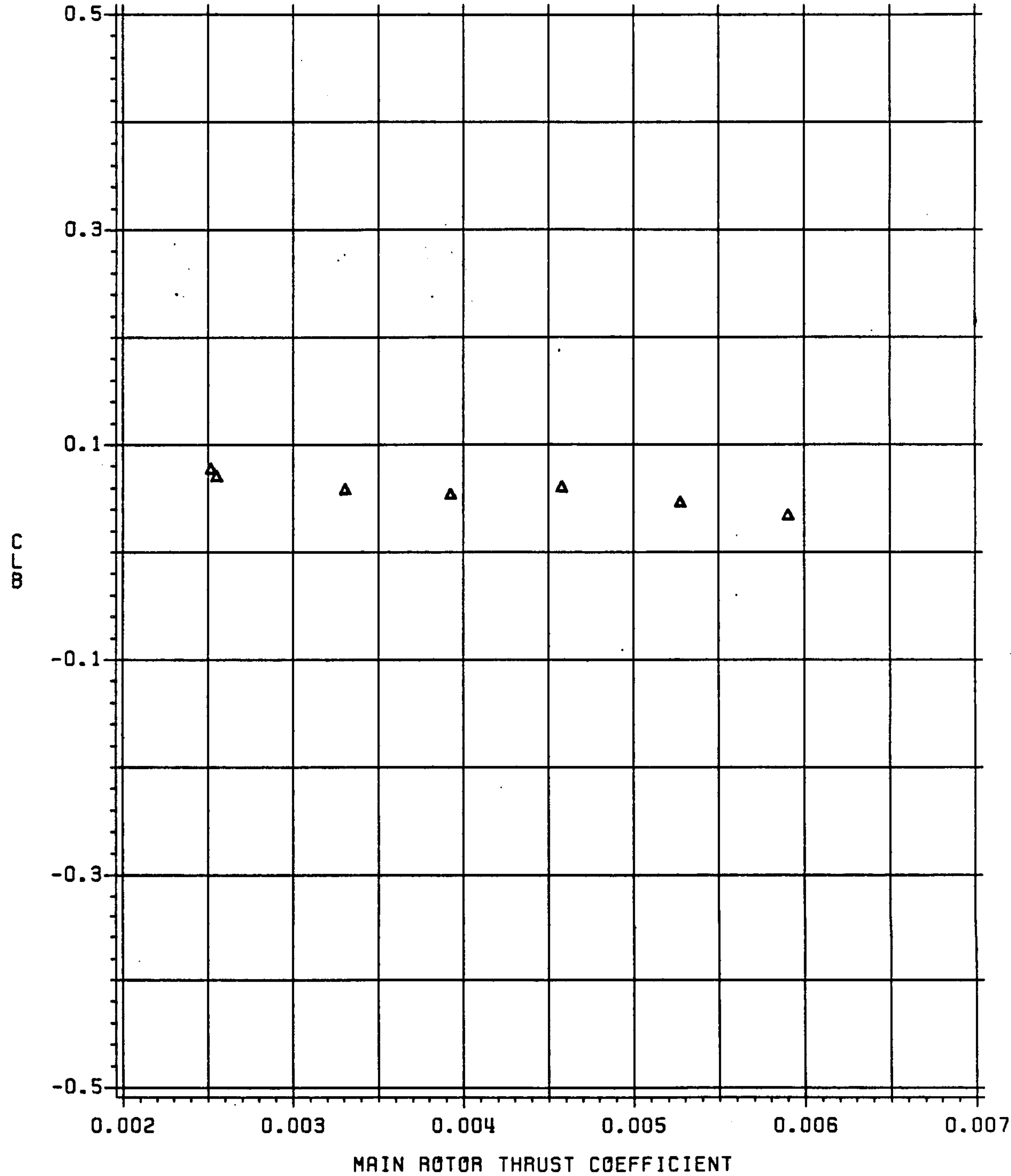
CONFIGURATION - BHAF2L (RUN 22)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

BODY LIFT COEFFICIENT VS CT

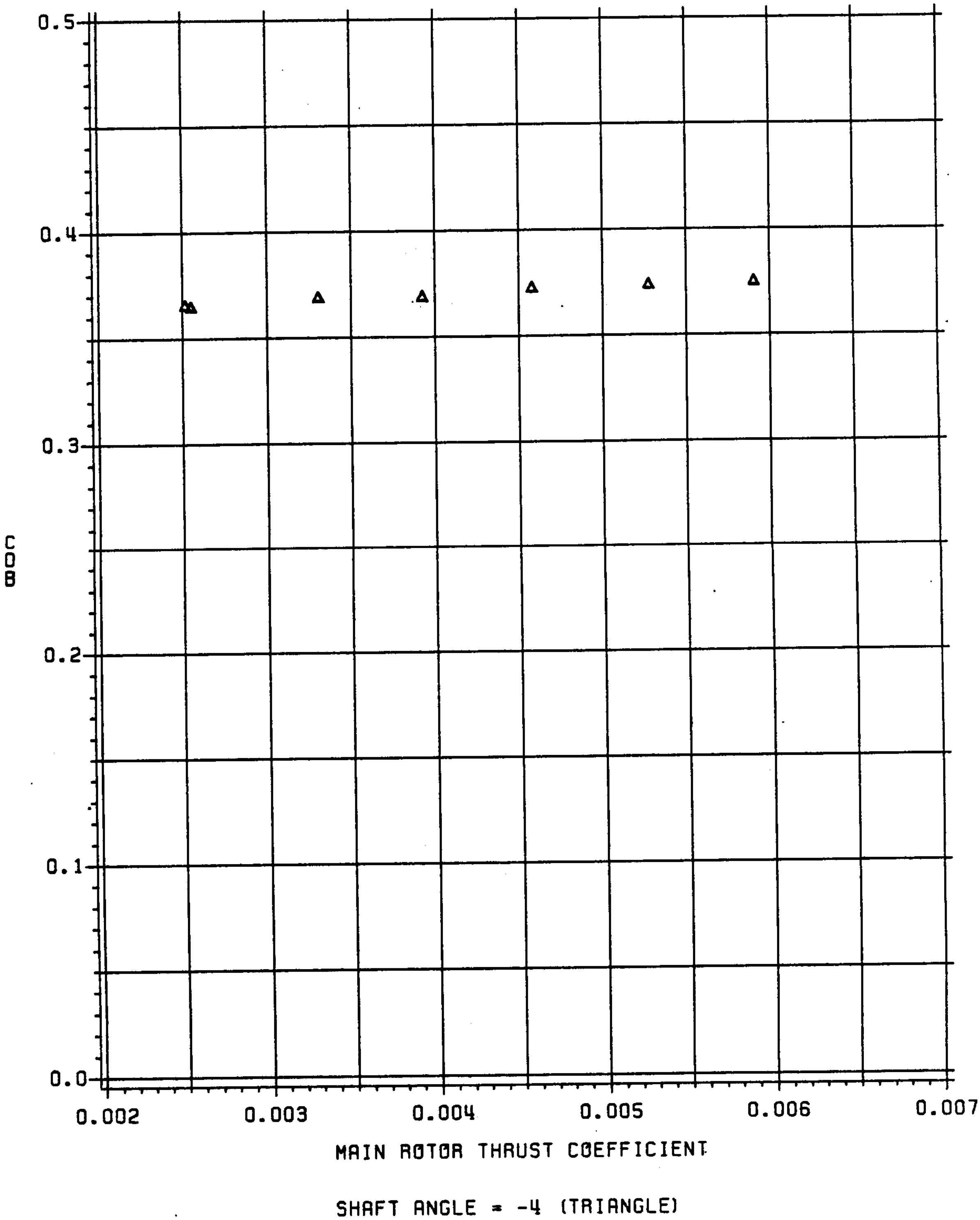
CONFIGURATION - BHRF2L (RUN 22)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

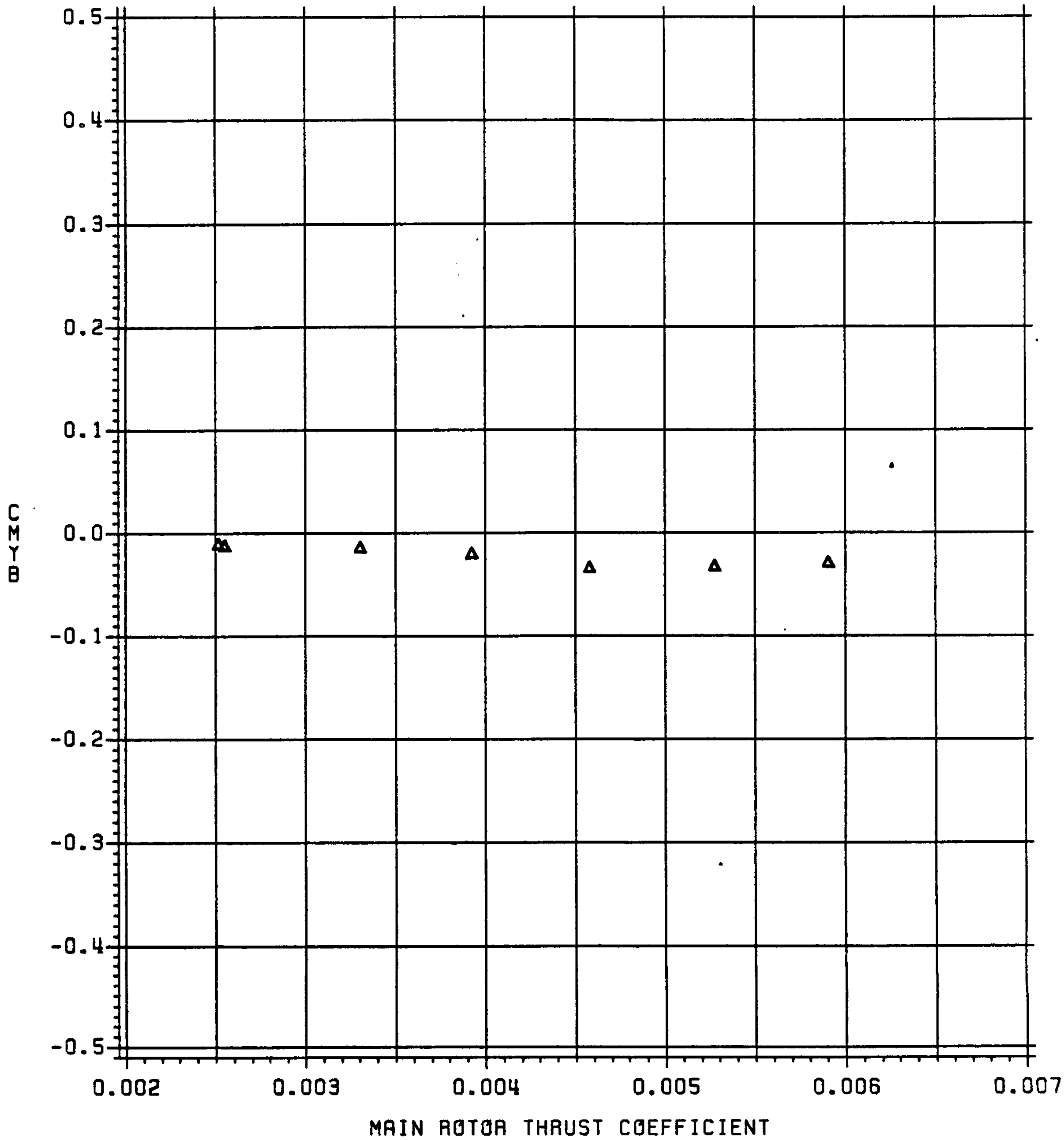
BODY DRAG COEFFICIENT VS CT

CONFIGURATION - BHRF2L (RUN 22) MU = 0.25

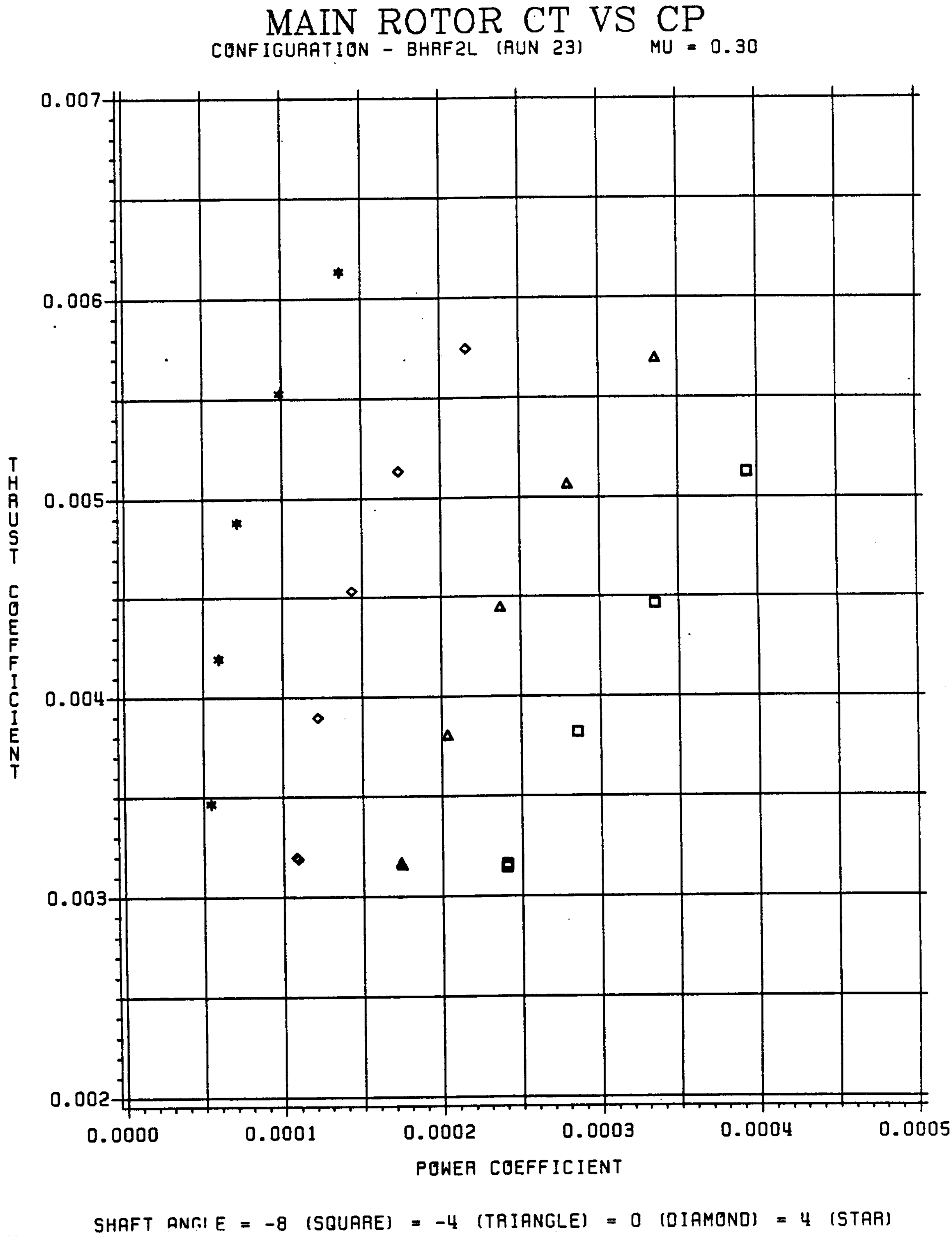


BODY PITCHING MOMENT COEFFICIENT VS CT

CONFIGURATION - BHAF2L (RUN 22) MU = 0.25

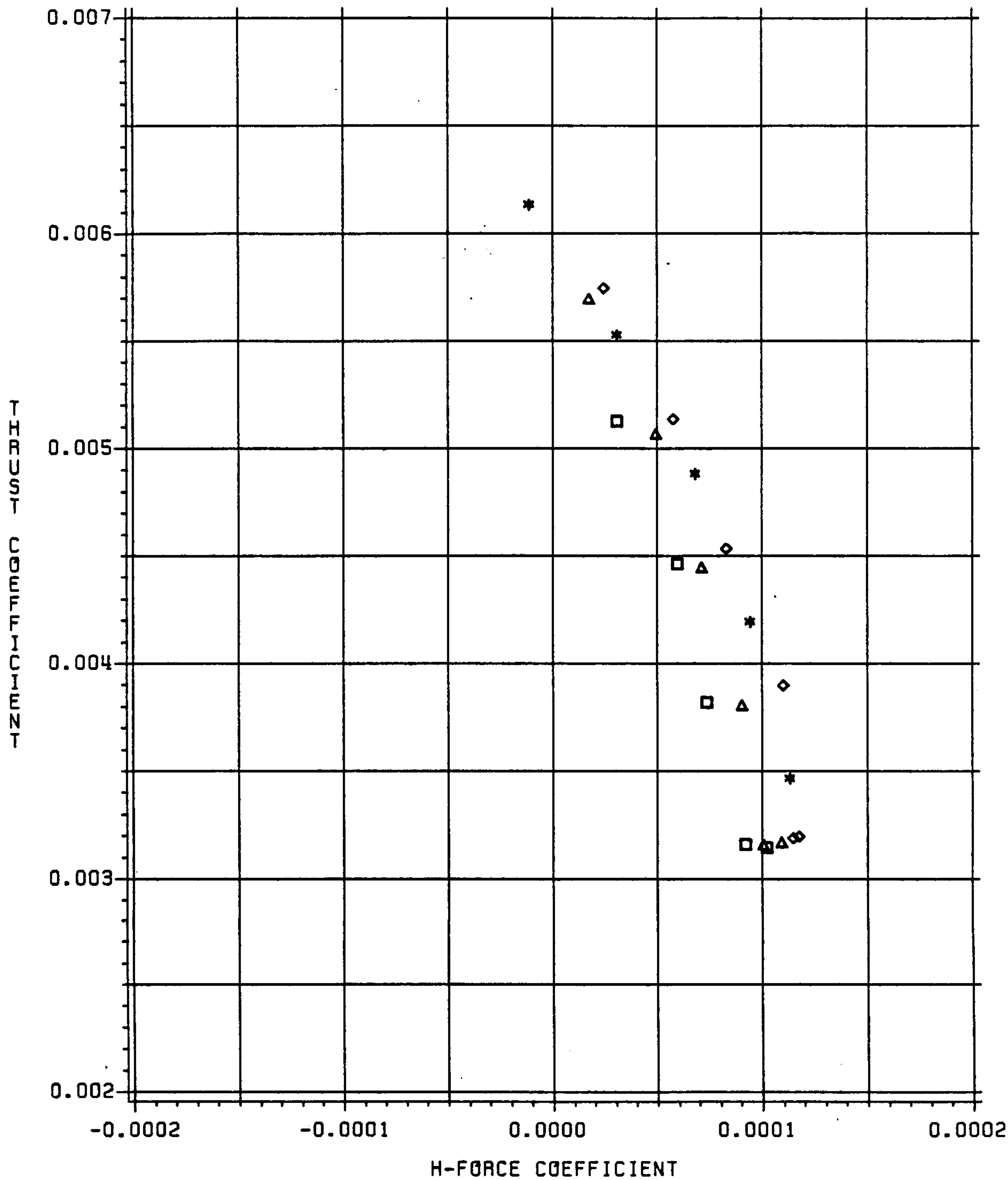


SHAFT ANGLE = -4 (TRIANGLE)


MAIN ROTOR CT VS CP
CONFIGURATION - BHAF2L (RUN 23) MU = 0.30
0.007
0.006
0.005
0.004
0.003
0.002
THRUST COEFFICIENT
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
POWER COEFFICIENT
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CH

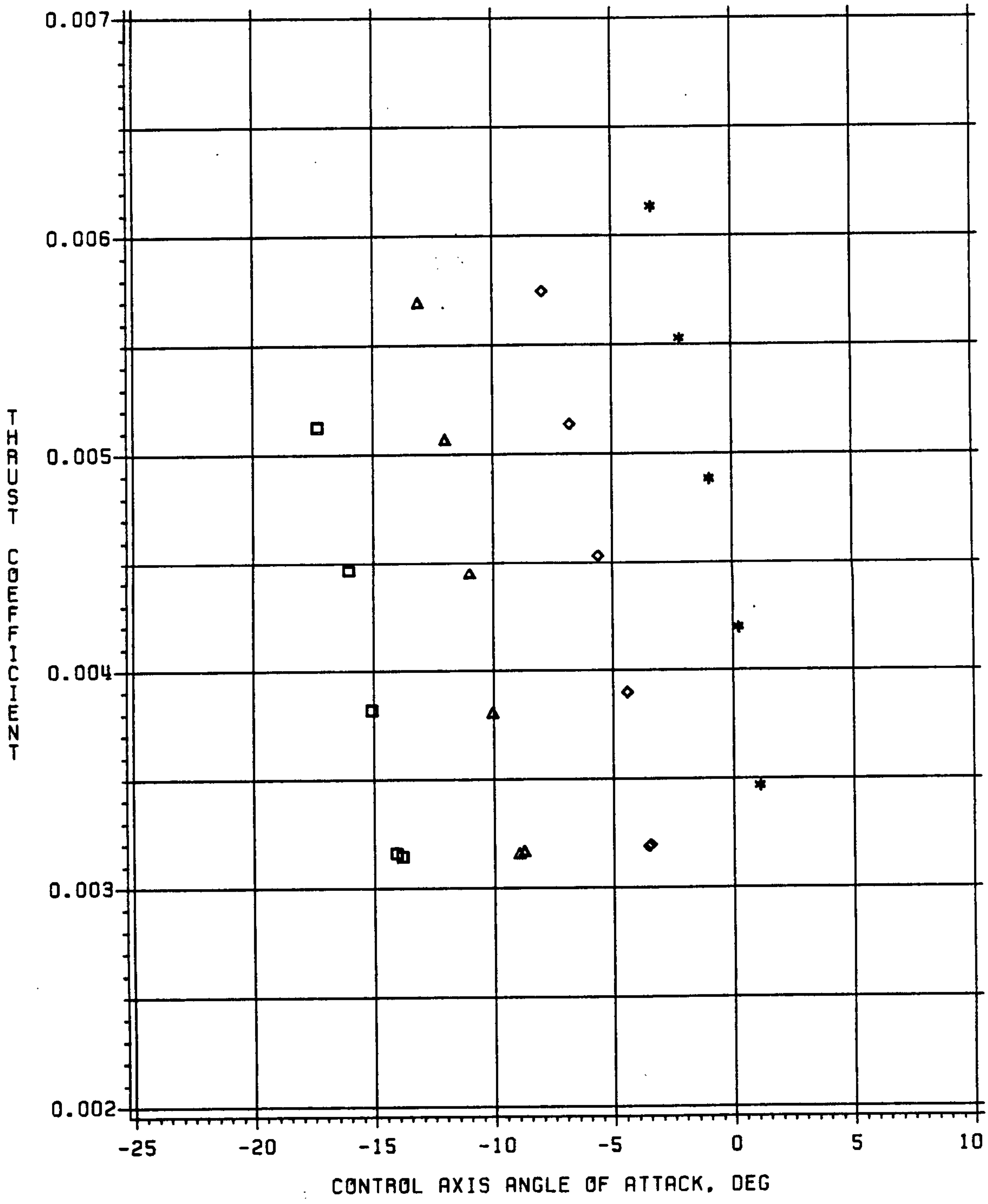
CONFIGURATION - BHAF2L (RUN 23) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

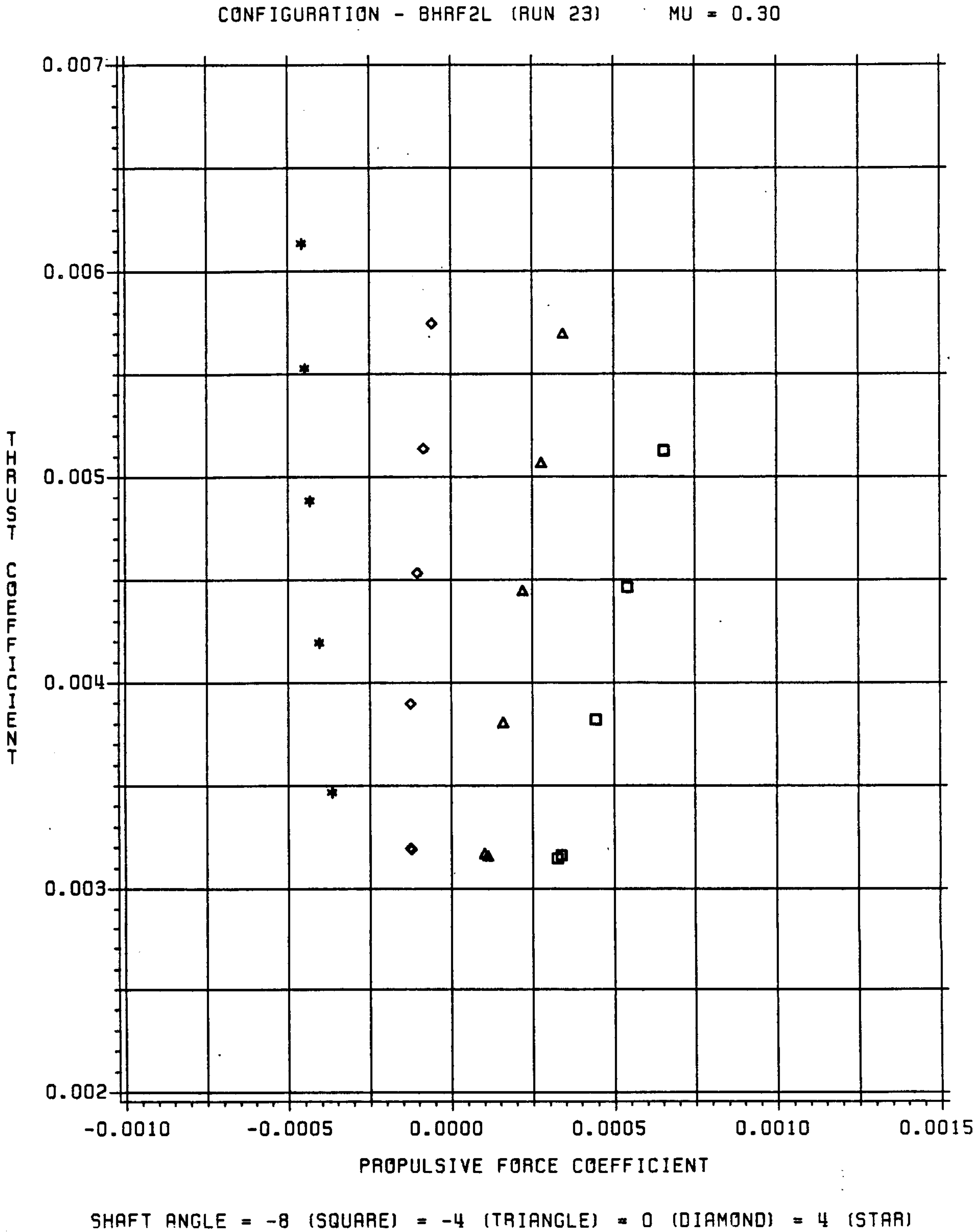
MAIN ROTOR CT VS ALPHAC

CONFIGURATION - BHAF2L (RUN 23) MU = 0.30



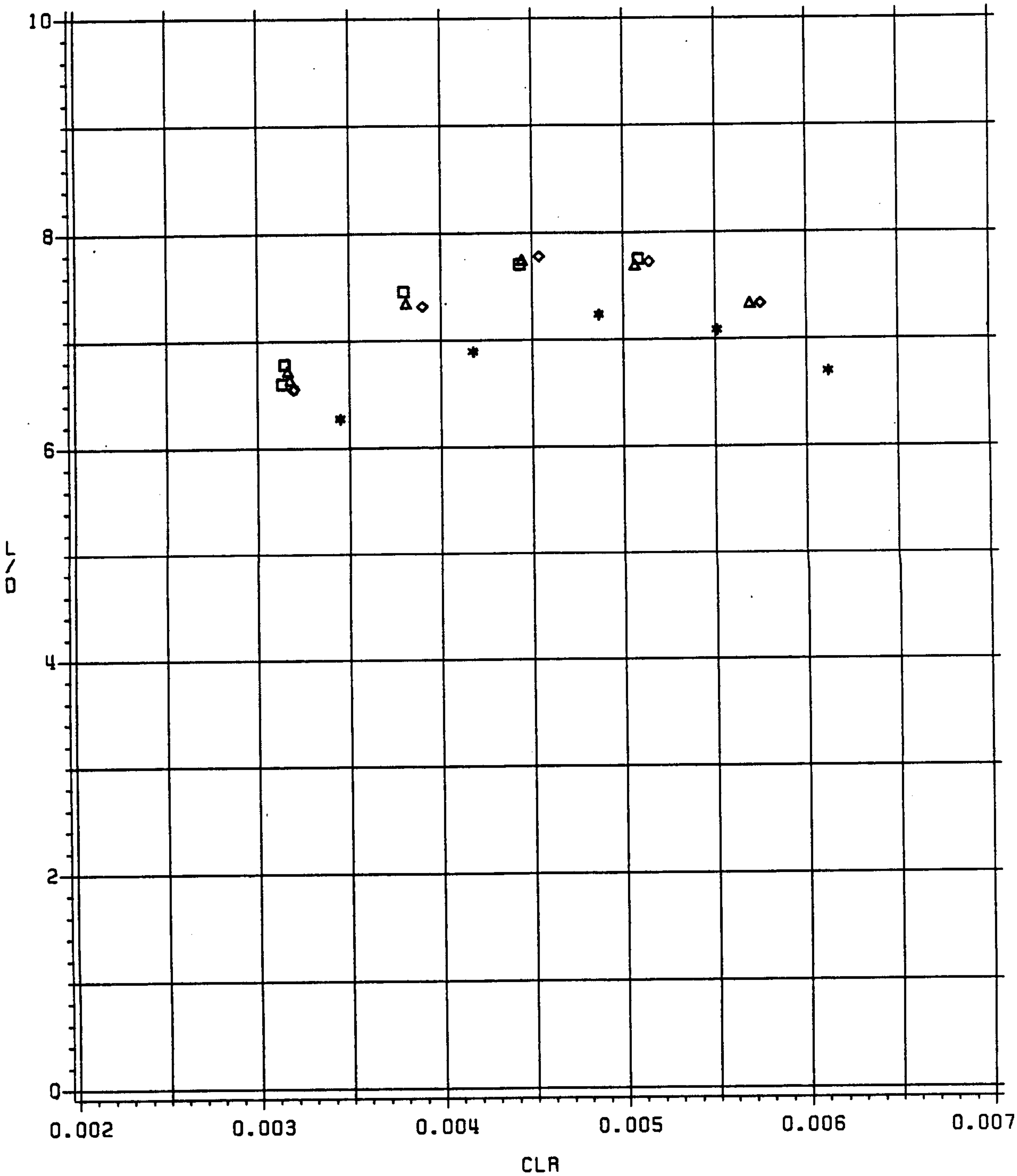
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT



MAIN ROTOR LIFT/DRAG VS ROTOR CL

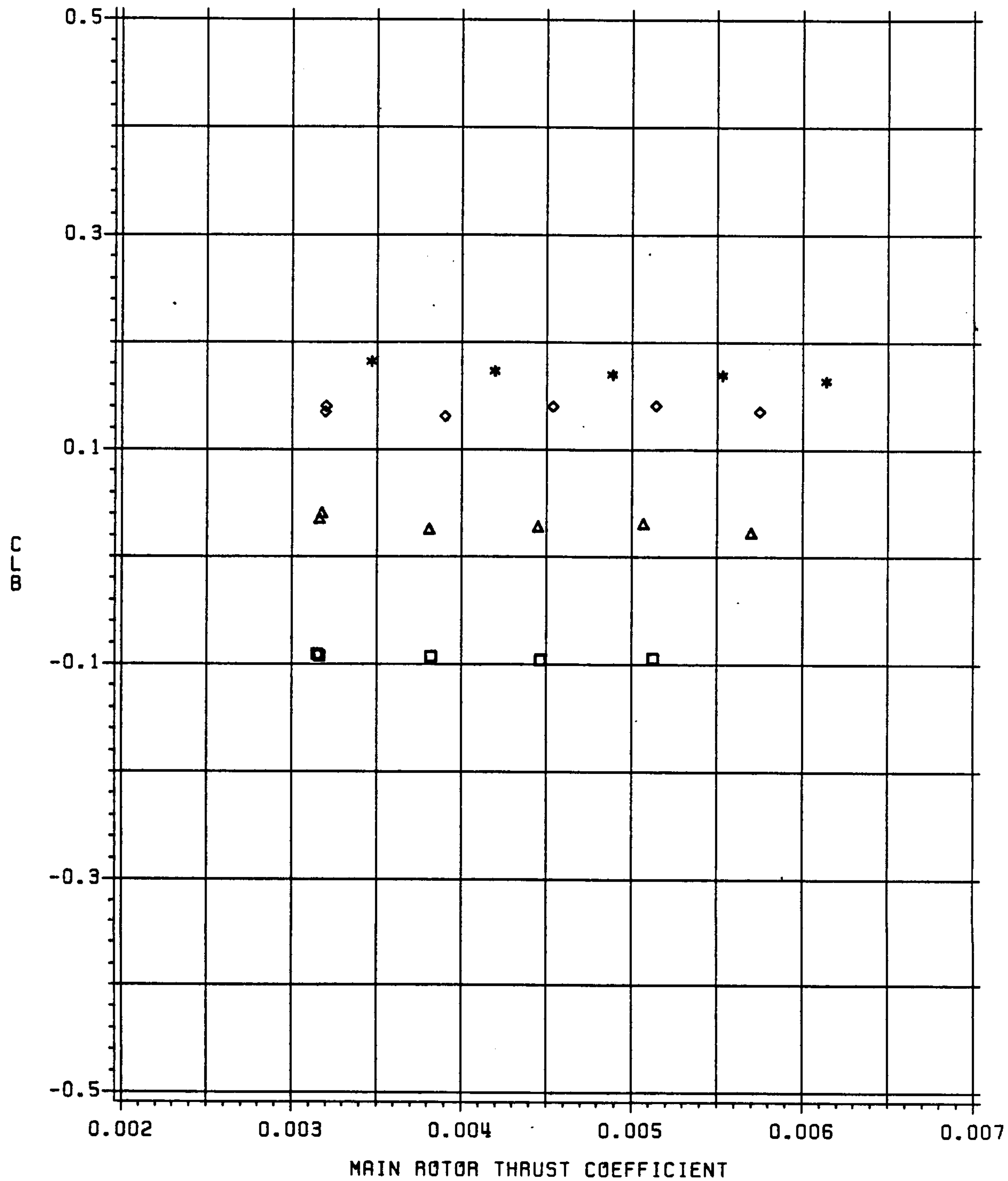
CONFIGURATION - BHAF2L (RUN 23)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS CT

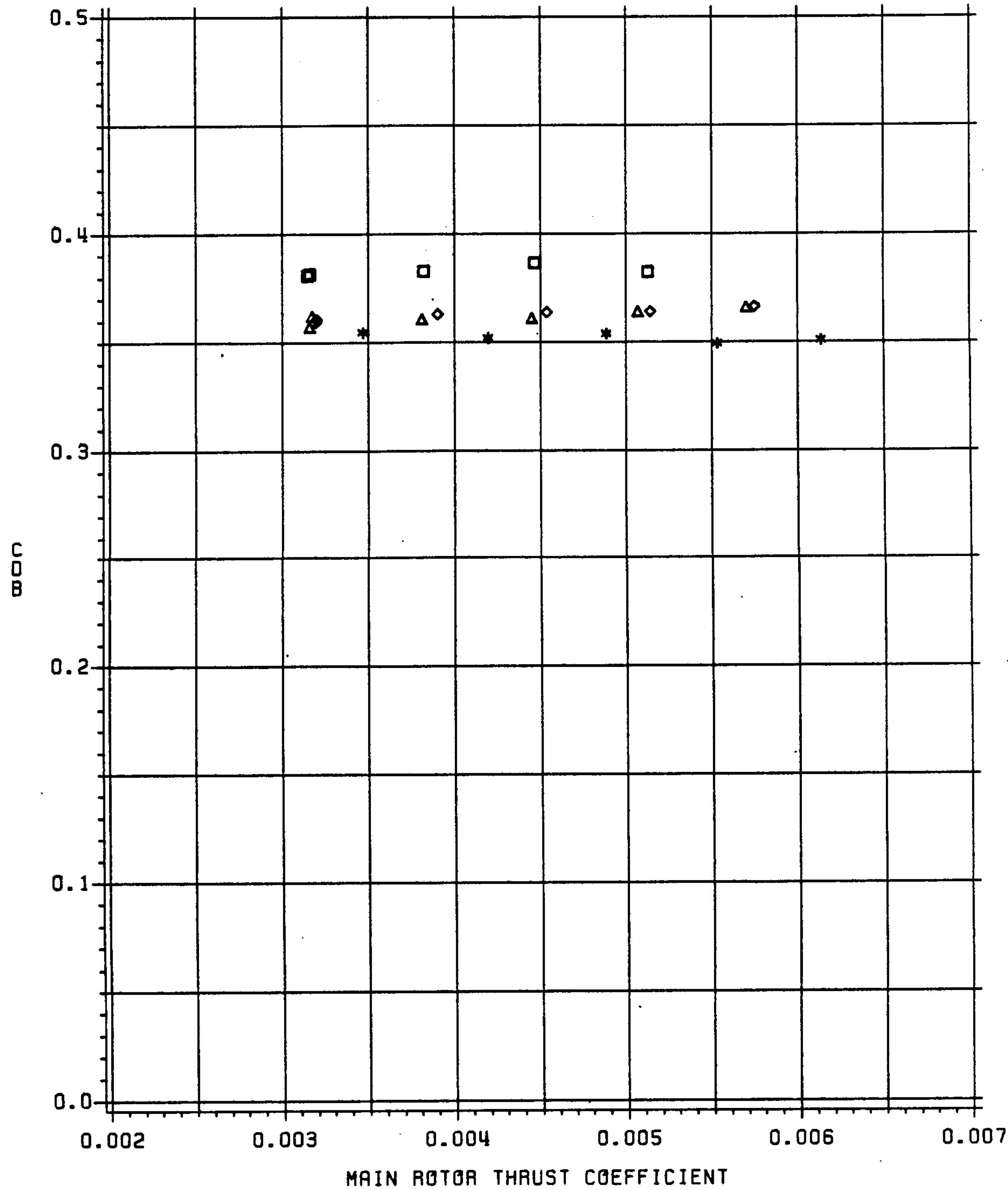
CONFIGURATION - BHAF2L (RUN 23)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

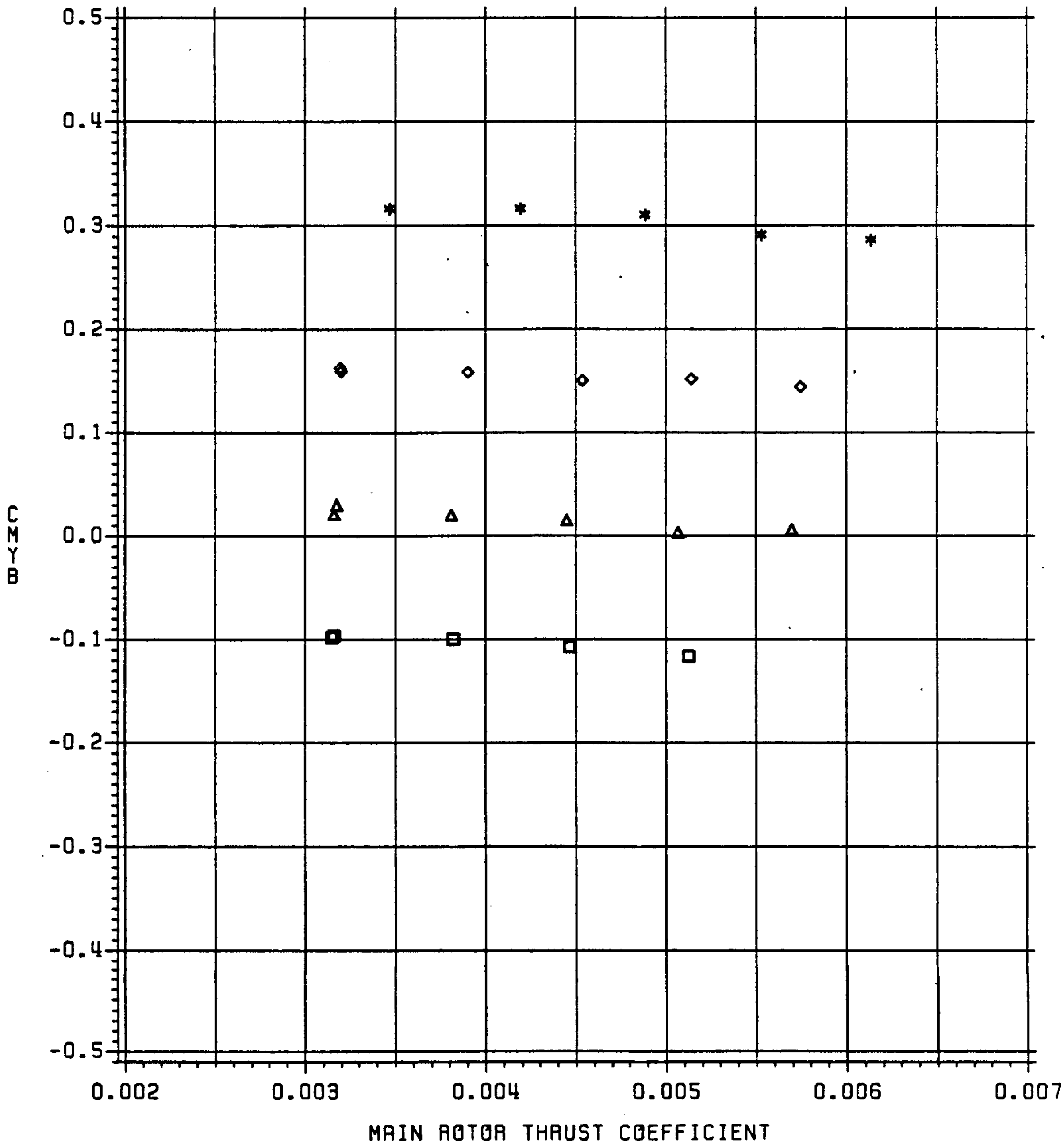
CONFIGURATION - BHAF2L (RUN 23) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

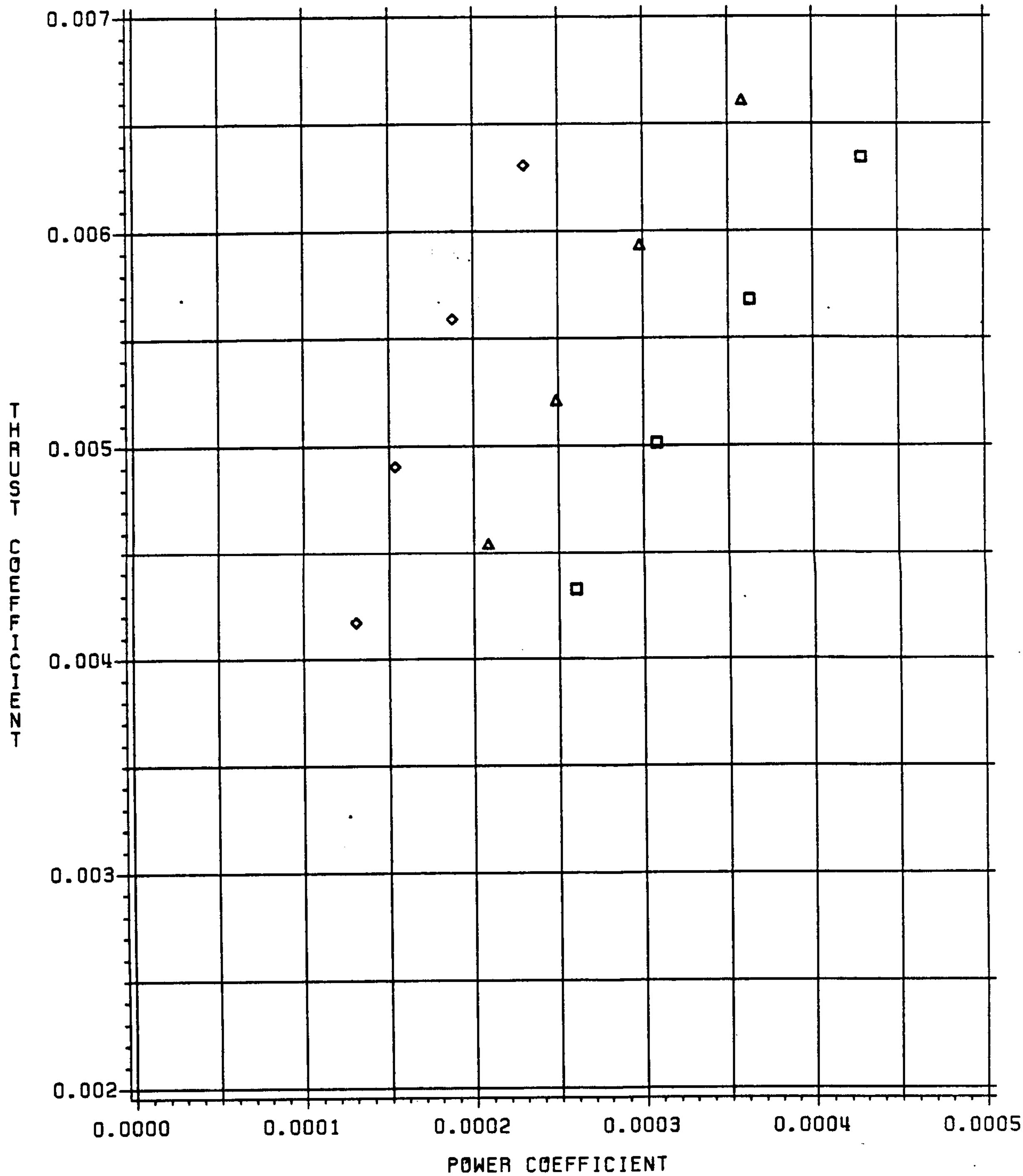
CONFIGURATION - BHAF2L (RUN 23) MU = 0.30



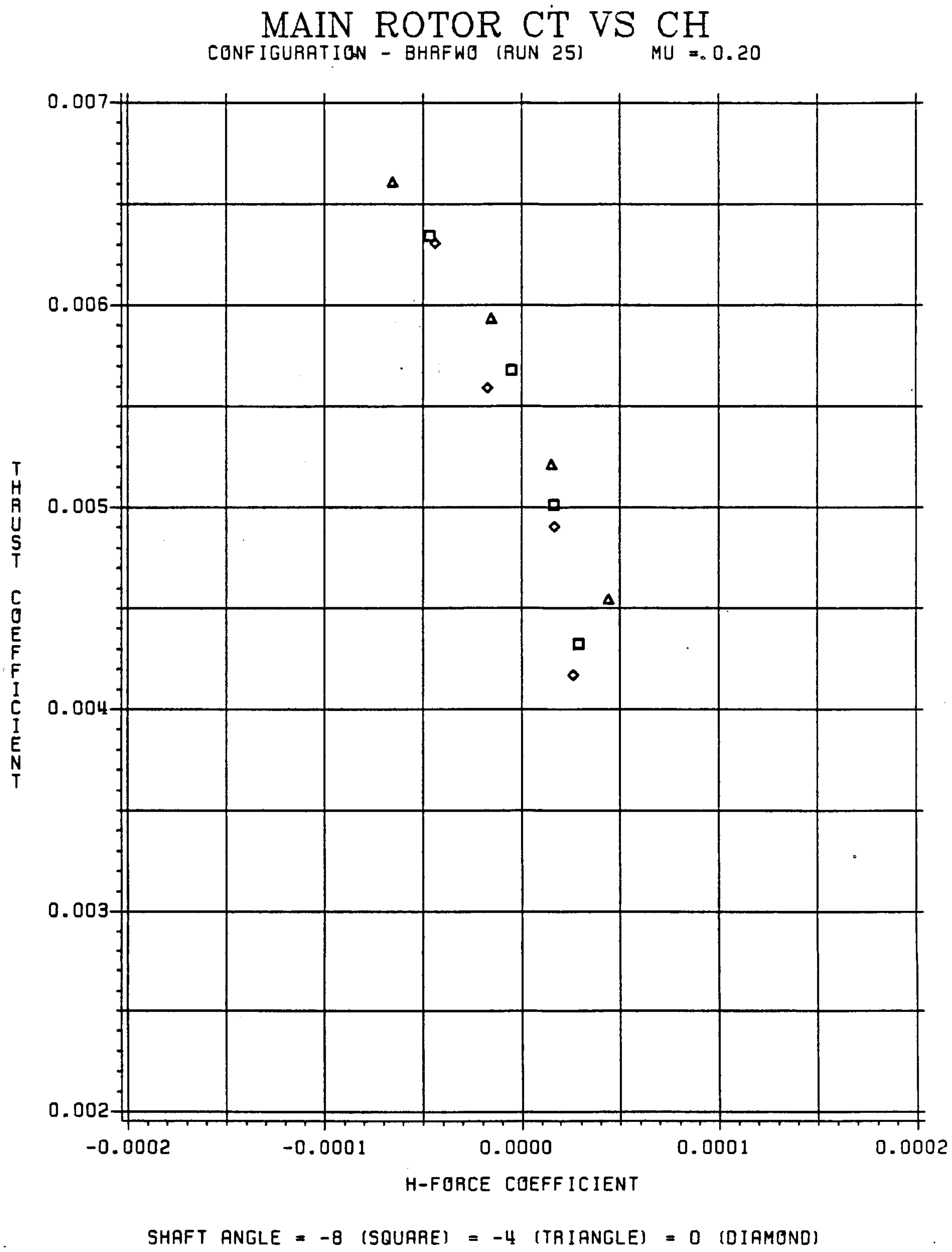
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

CONFIGURATION - BHAFWO (RUN 25)   MU = 0.20

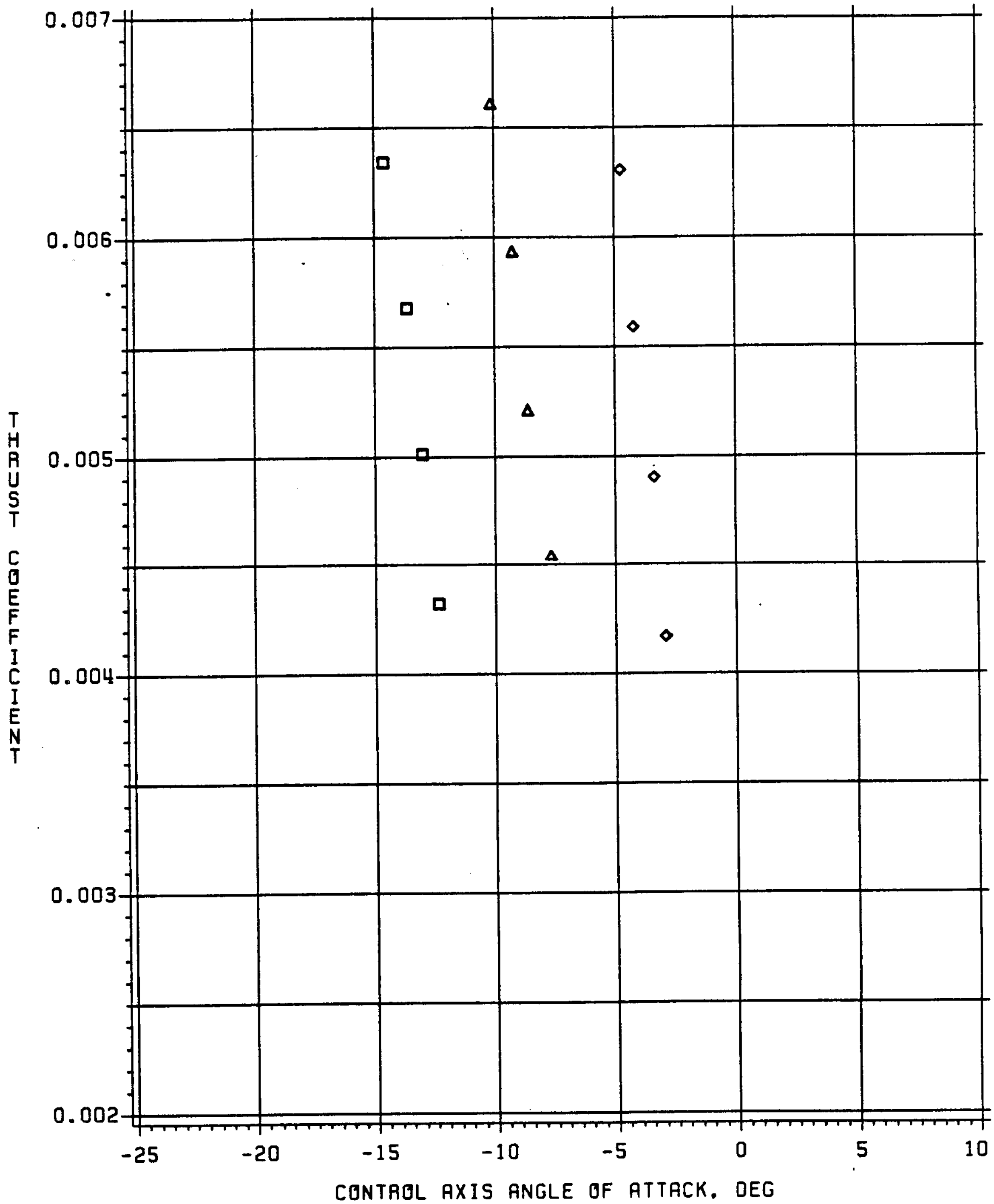


SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)


MAIN ROTOR CT VS CH
CONFIGURATION - BHAFWO (RUN 25) MU = 0.20
THRUST COEFFICIENT
0.007
0.006
0.005
0.004
0.003
0.002
-0.0002
-0.0001
0.0000
0.0001
0.0002
H-FORCE COEFFICIENT
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

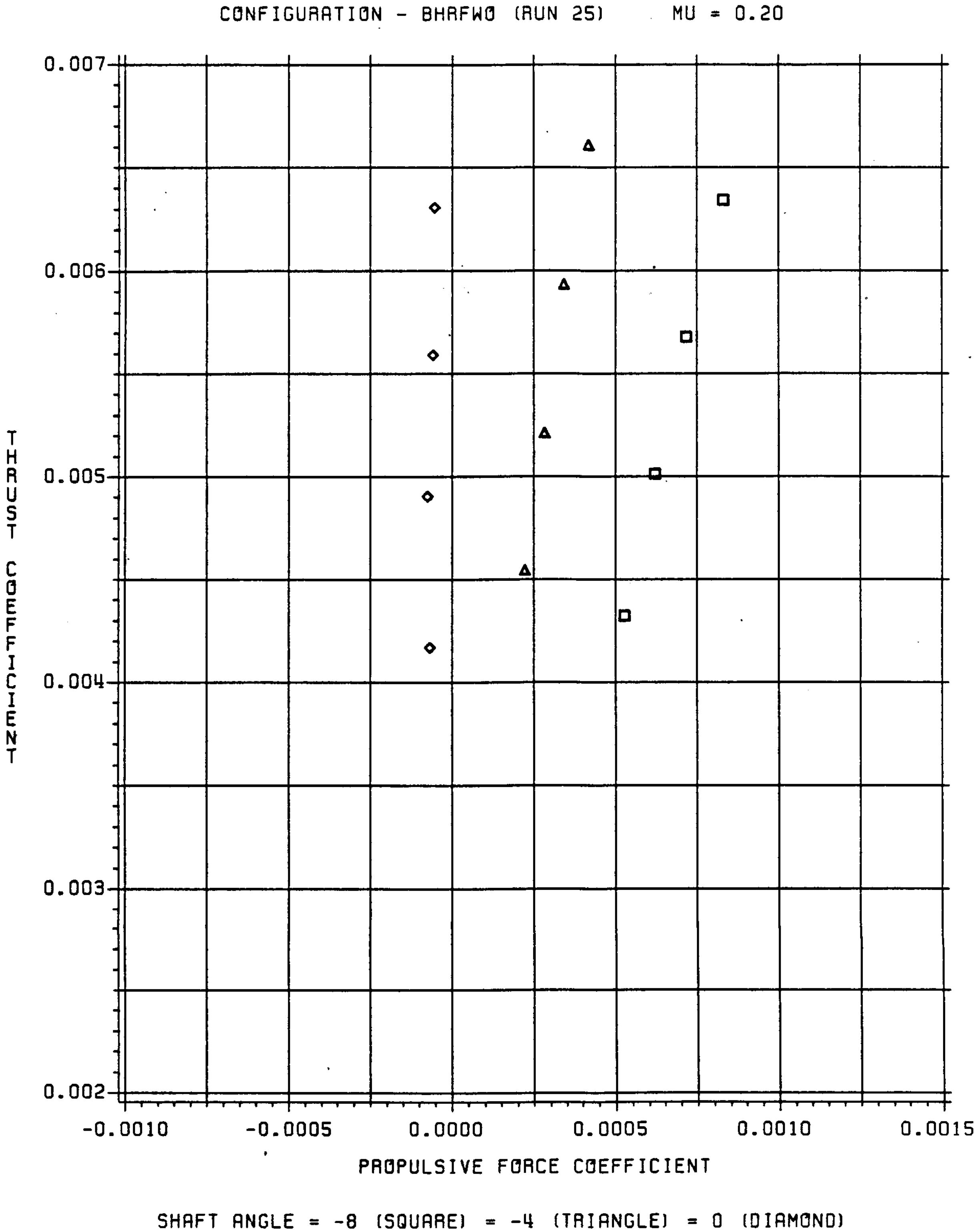
MAIN ROTOR CT VS ALPHAC

CONFIGURATION - BHAFWO (RUN 25)   MU = 0.20



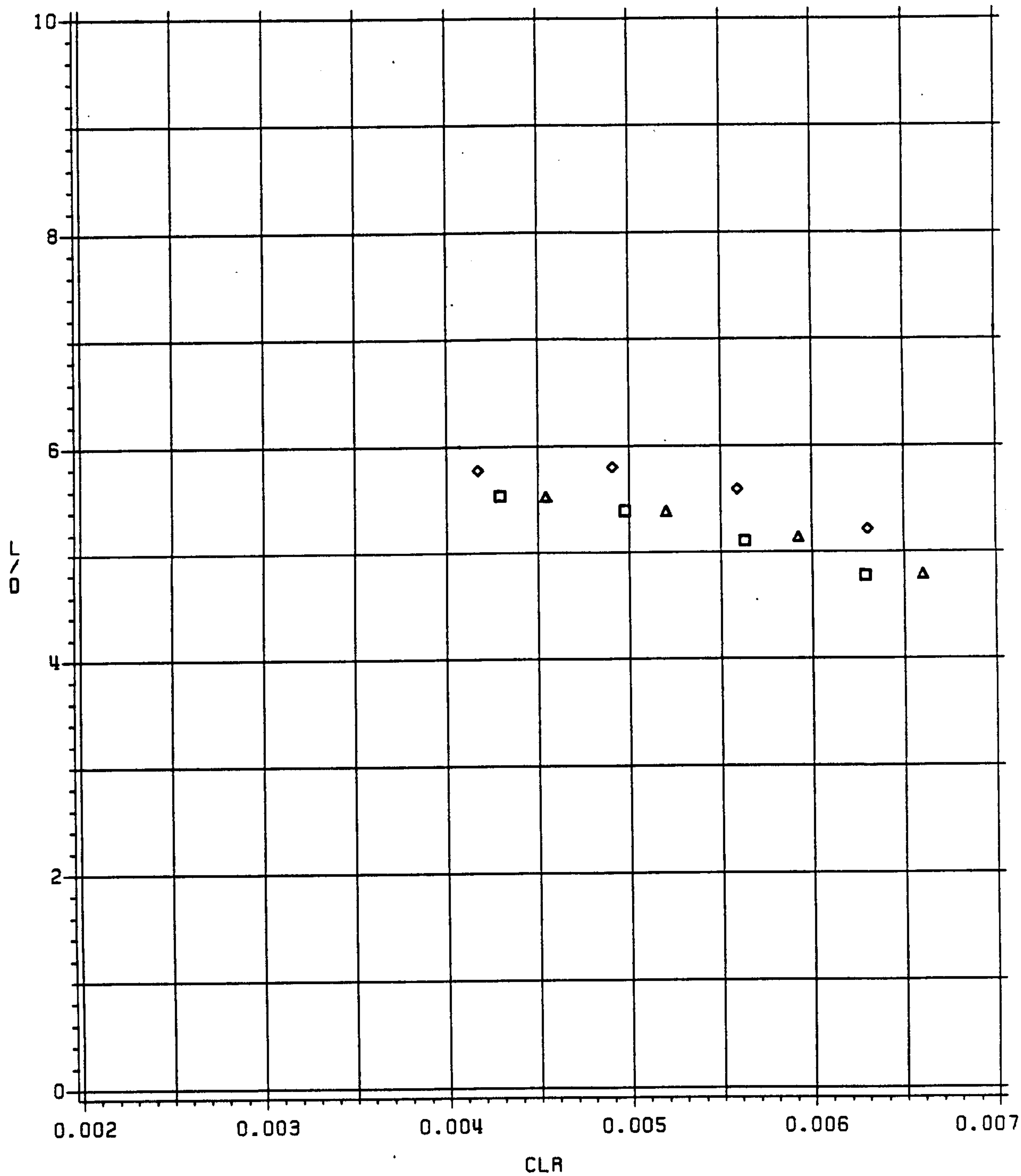
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

MAIN ROTOR CT VS CX – FORWARD FLIGHT



MAIN ROTOR LIFT/DRAG VS ROTOR CL

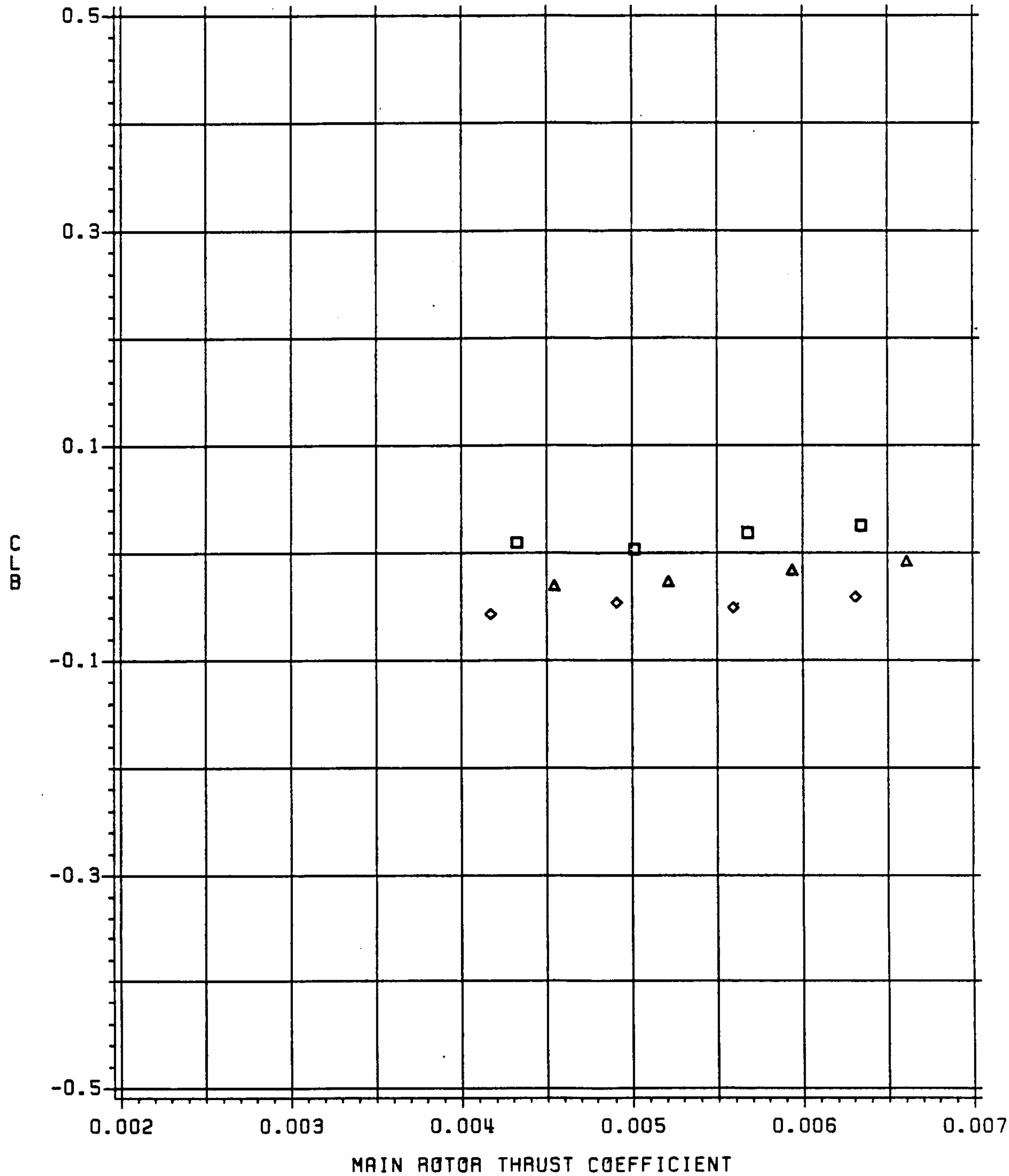
CONFIGURATION - BHAFWO (RUN 25) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

BODY LIFT COEFFICIENT VS CT

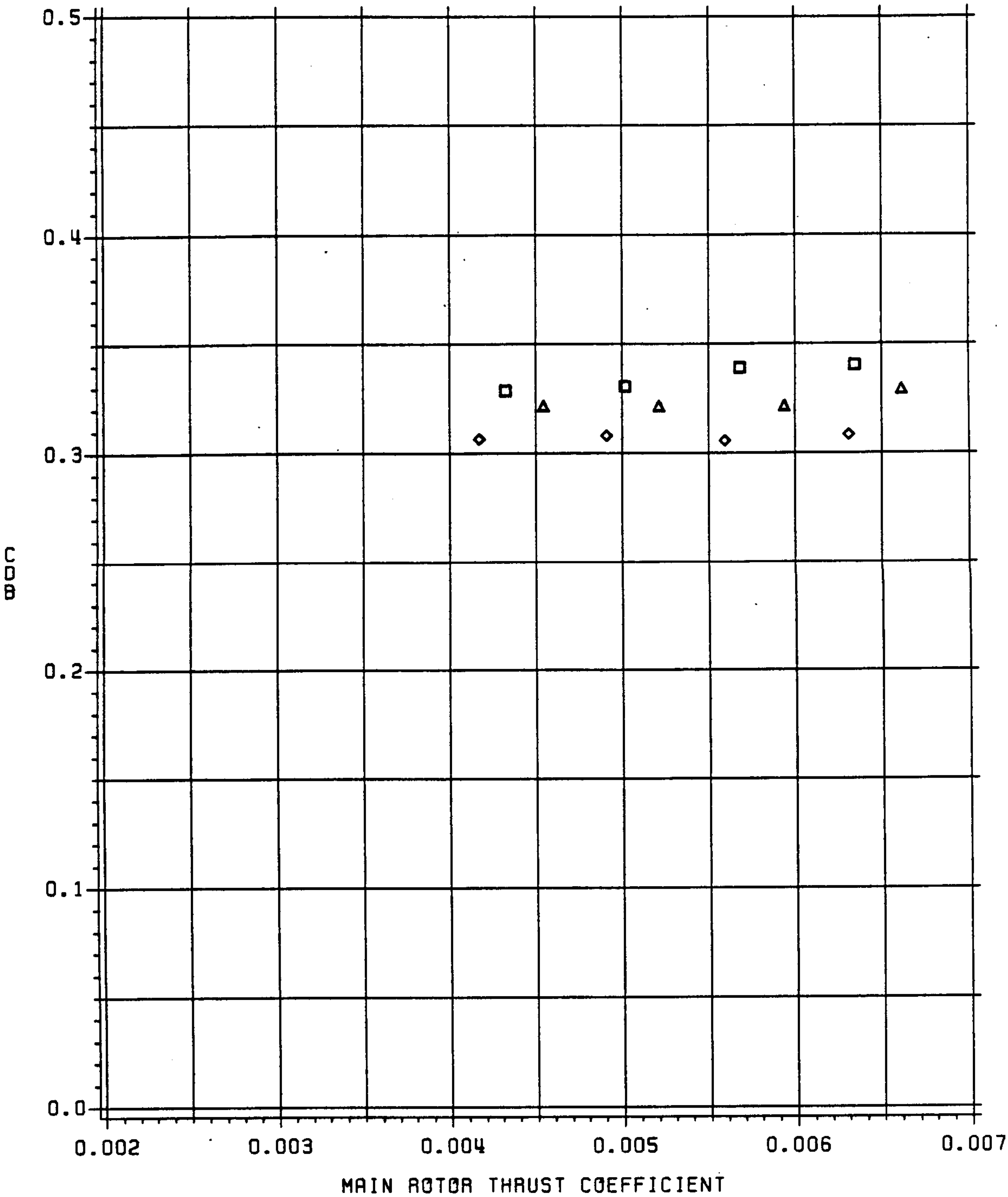
CONFIGURATION - BHRFWO (RUN 25)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

BODY DRAG COEFFICIENT VS CT

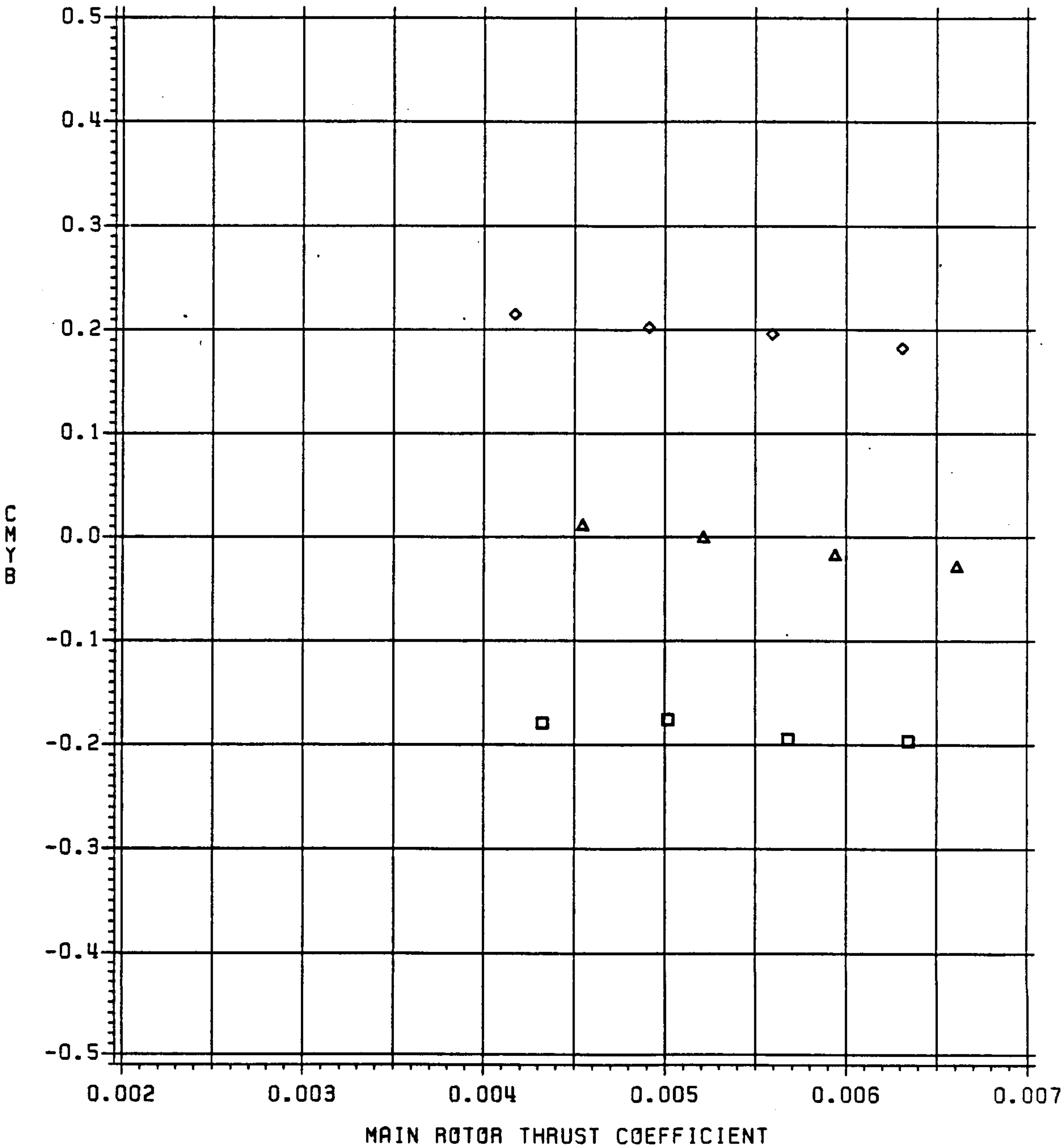
CONFIGURATION - BHAFWO (RUN 25)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

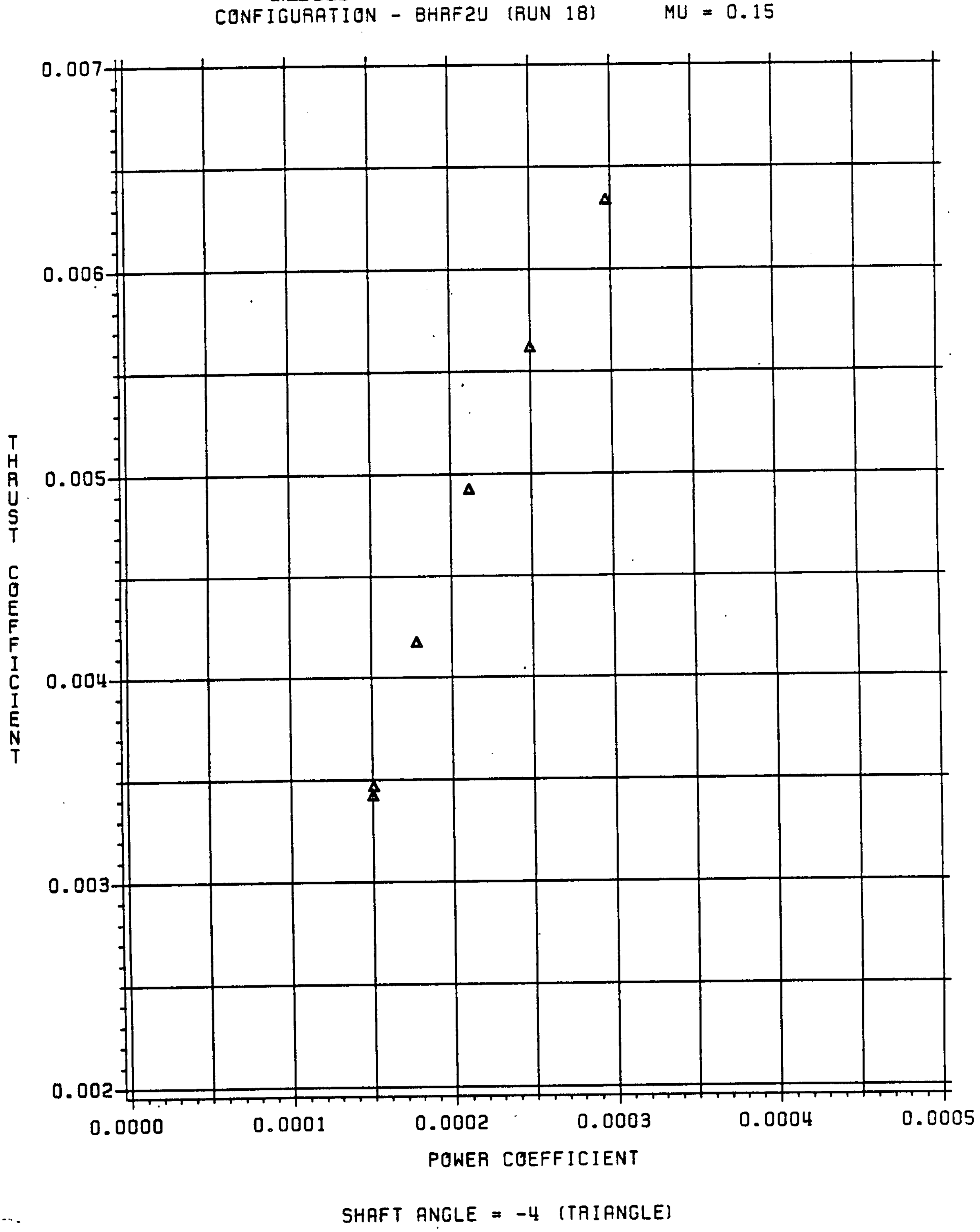
BODY PITCHING MOMENT COEFFICIENT VS CT

CONFIGURATION - BHAFWO (RUN 25)   MU = 0.20



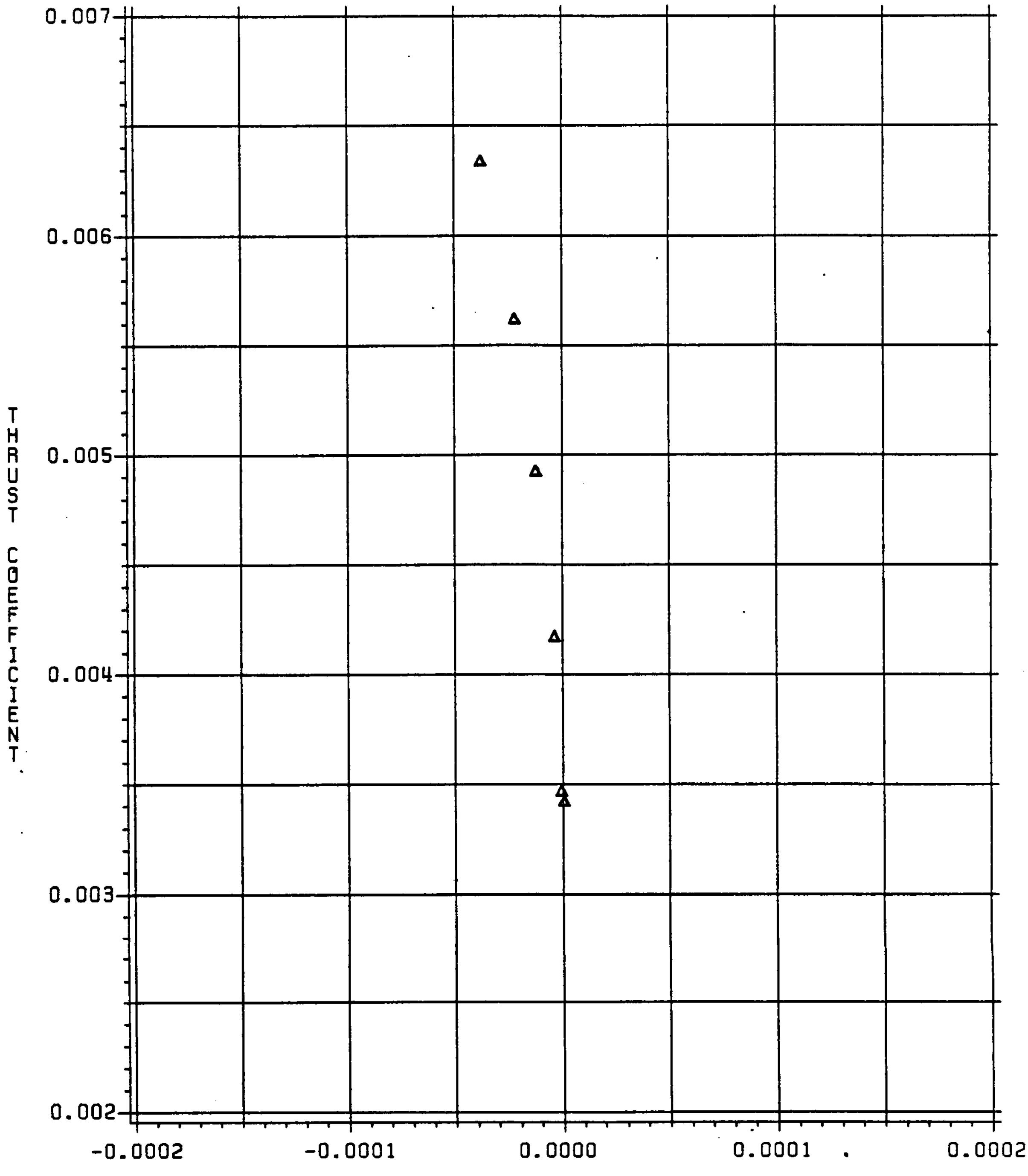
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND)

MAIN ROTOR CT VS CP



MAIN ROTOR CT VS CH

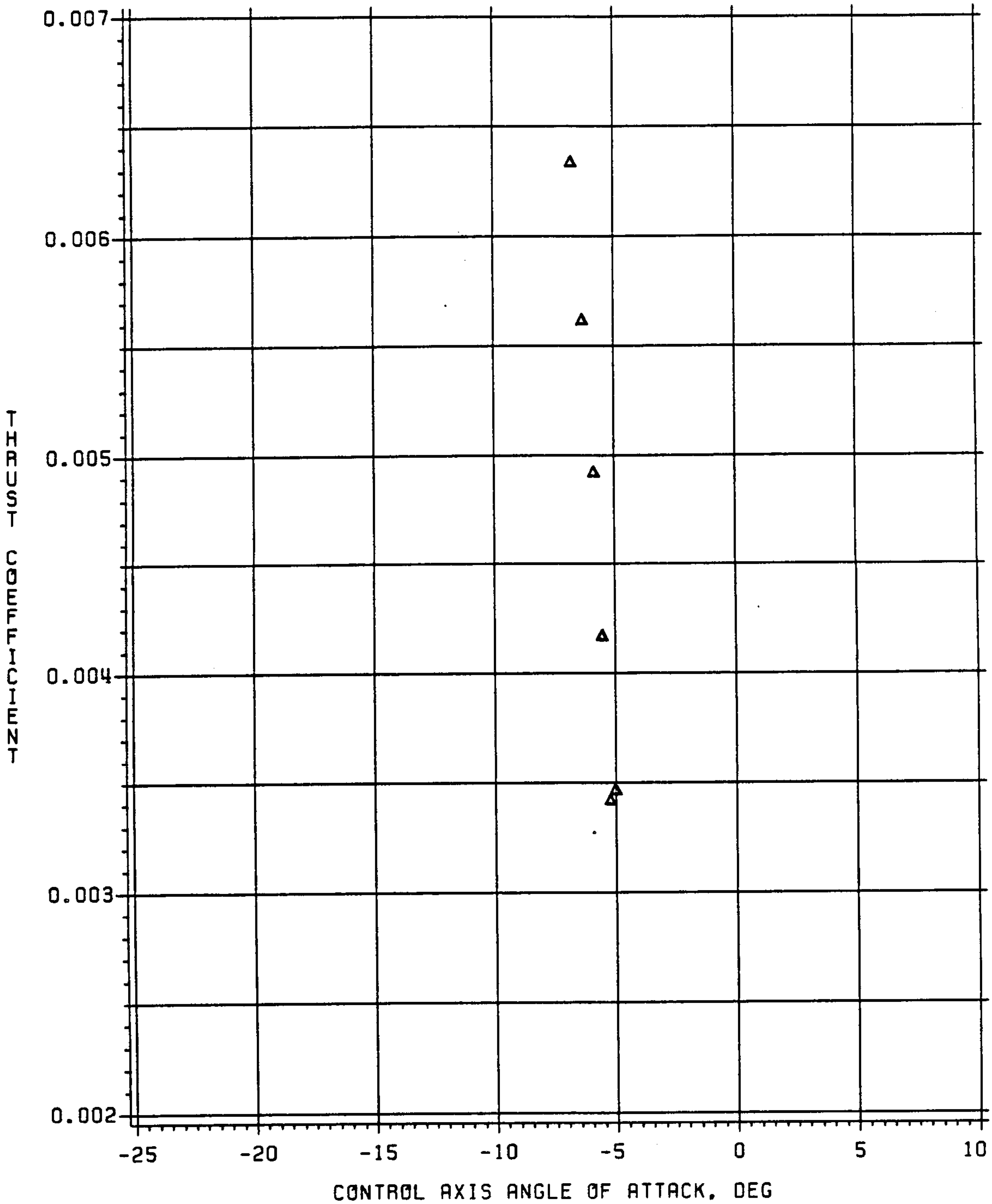
CONFIGURATION - BHAF2U (RUN 28)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

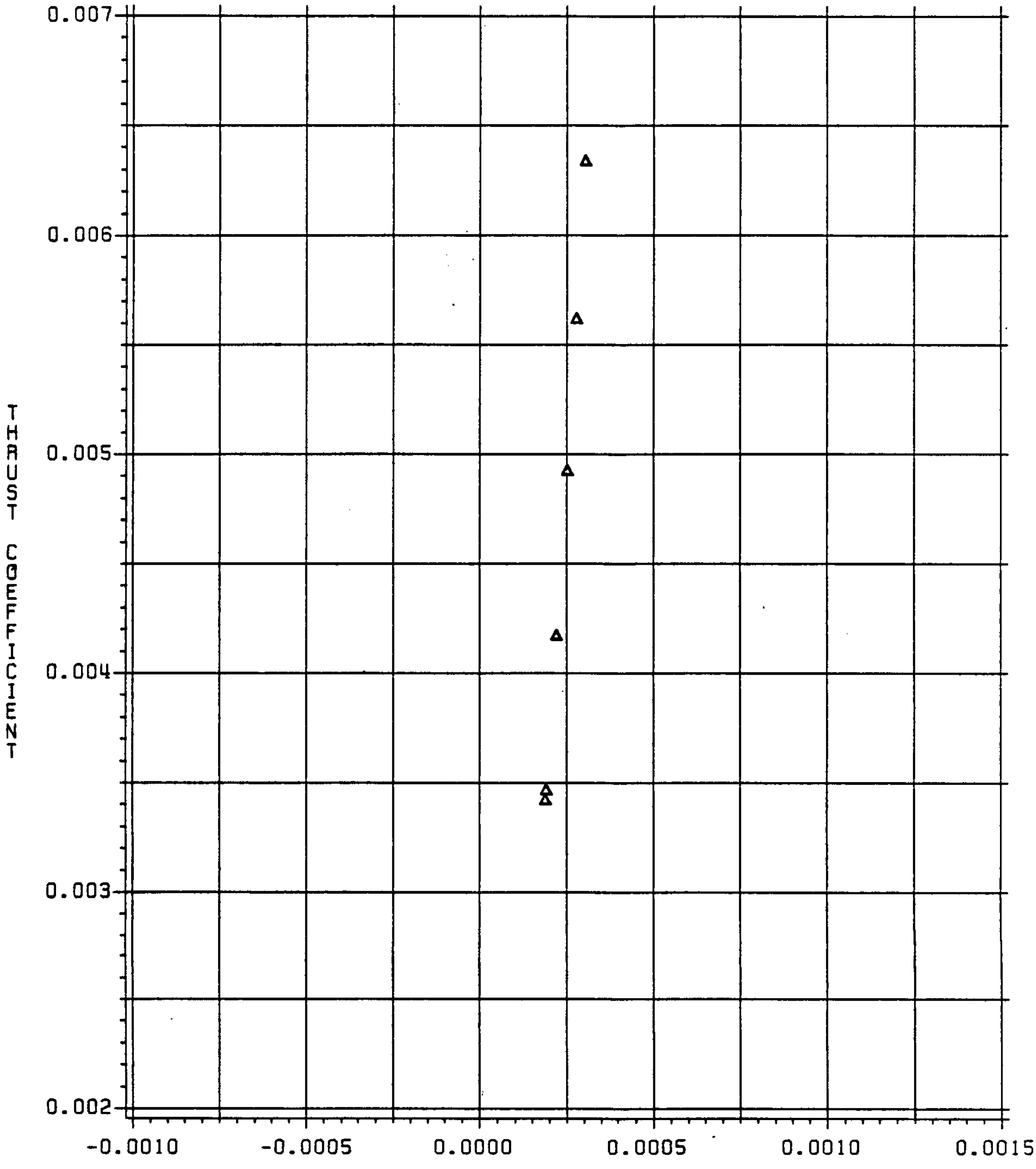
CONFIGURATION - BHAF2U (RUN 28) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX - FORWARD FLIGHT

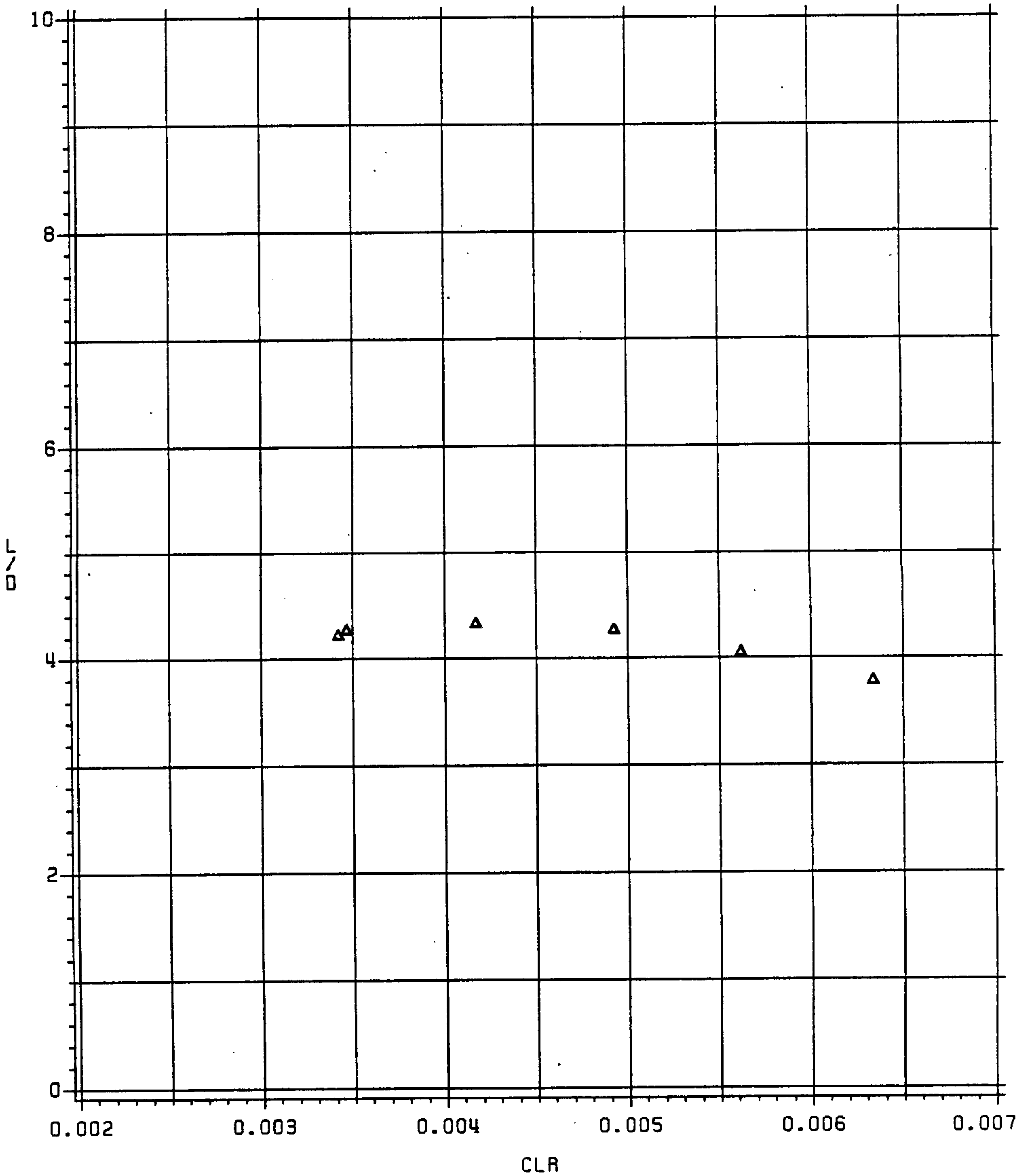
CONFIGURATION - BHAF2U (RUN 28) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

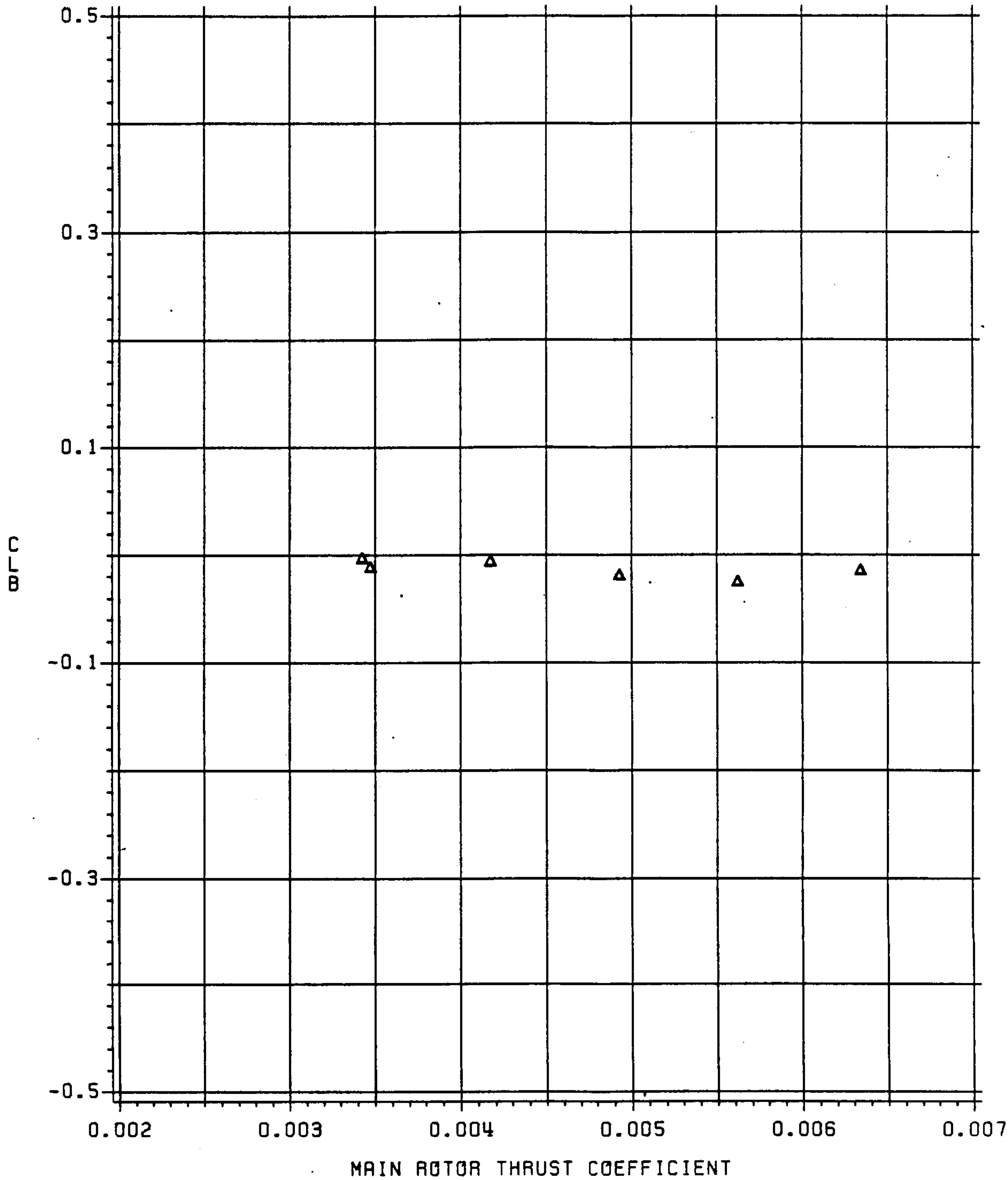
CONFIGURATION - BHAF2U (RUN 28)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

BODY LIFT COEFFICIENT VS CT

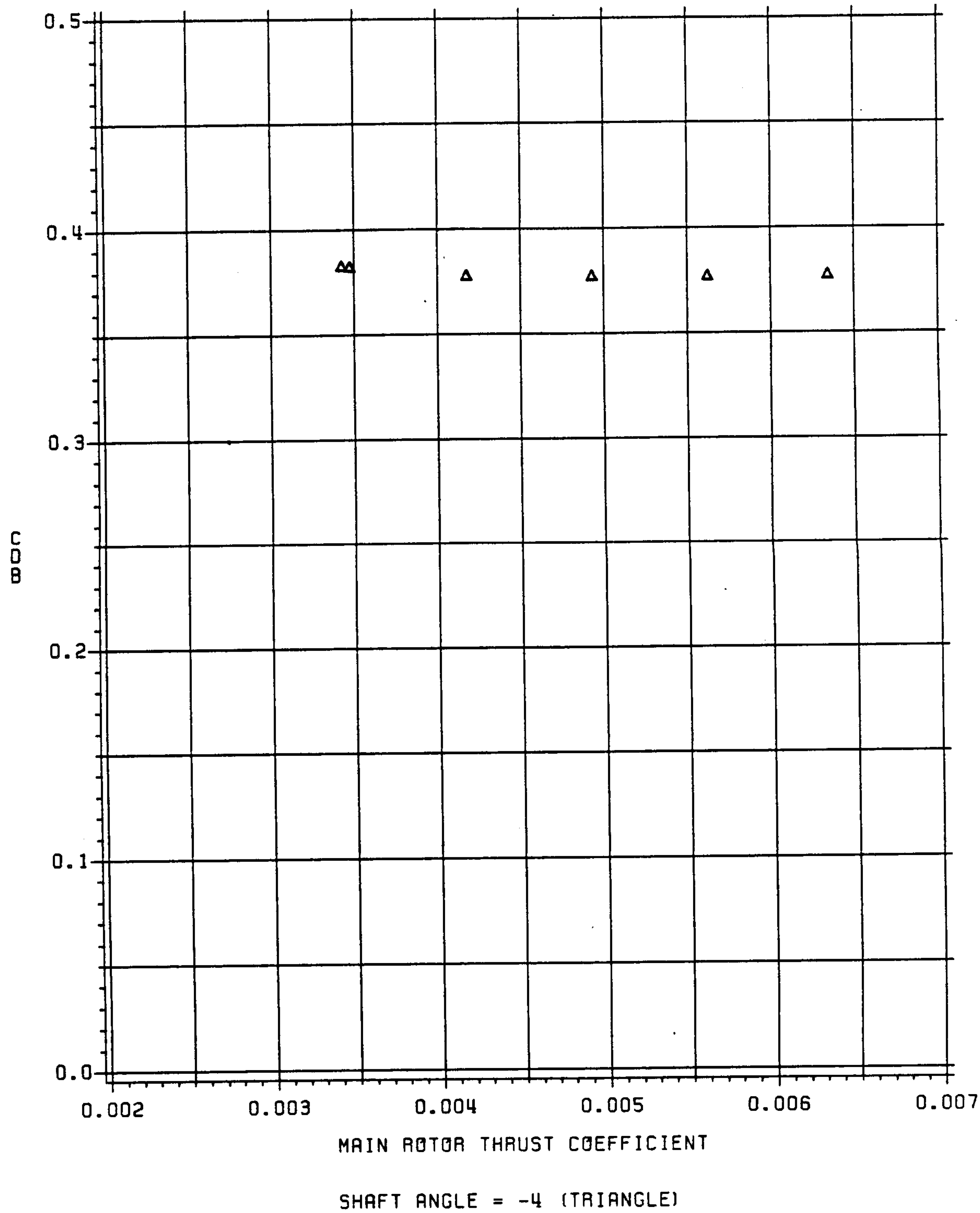
CONFIGURATION - BHAF2U (RUN 28)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

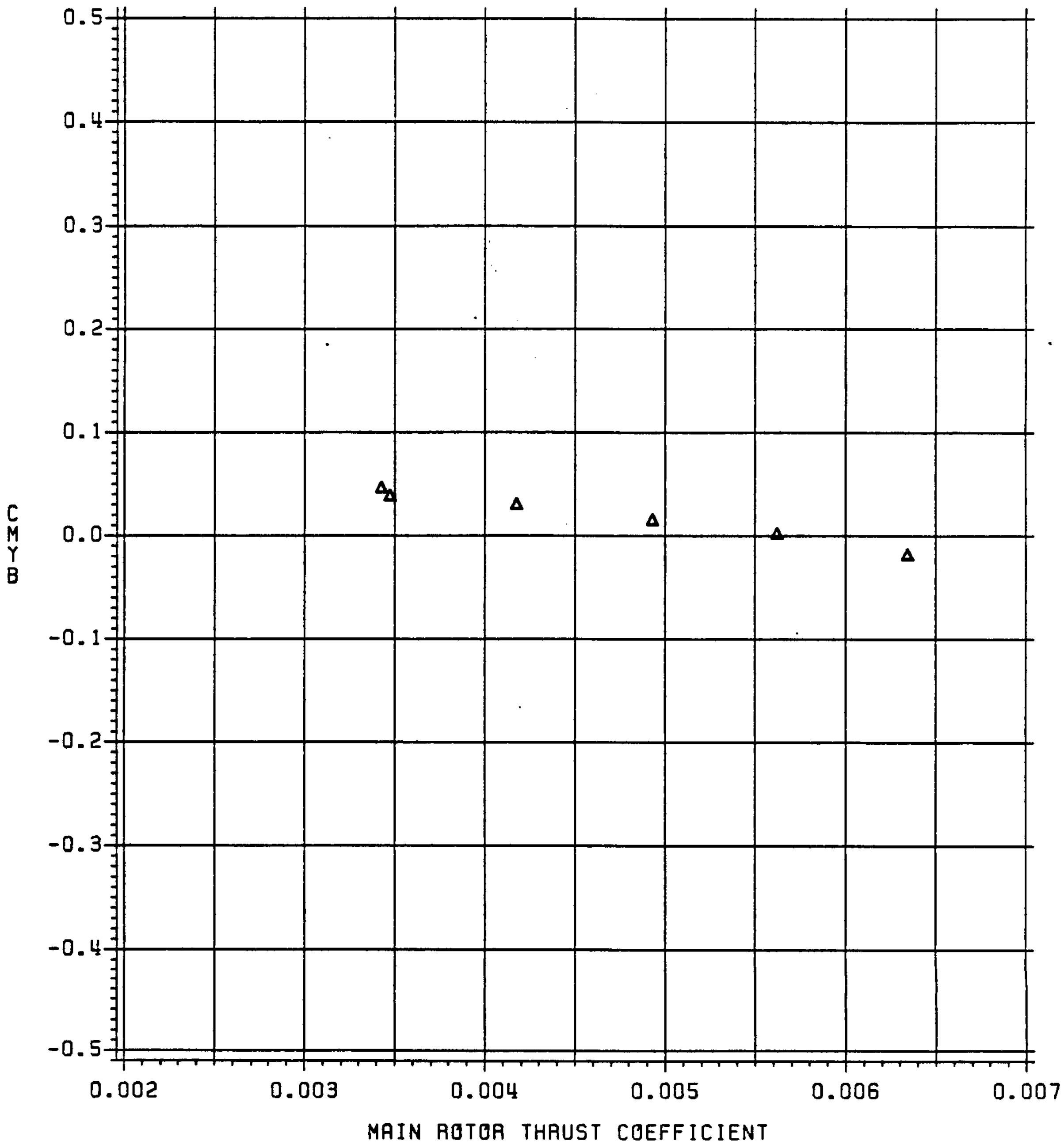
BODY DRAG COEFFICIENT VS CT

CONFIGURATION - BHAF2U (RUN 28)   MU = 0.15



BODY PITCHING MOMENT COEFFICIENT VS CT

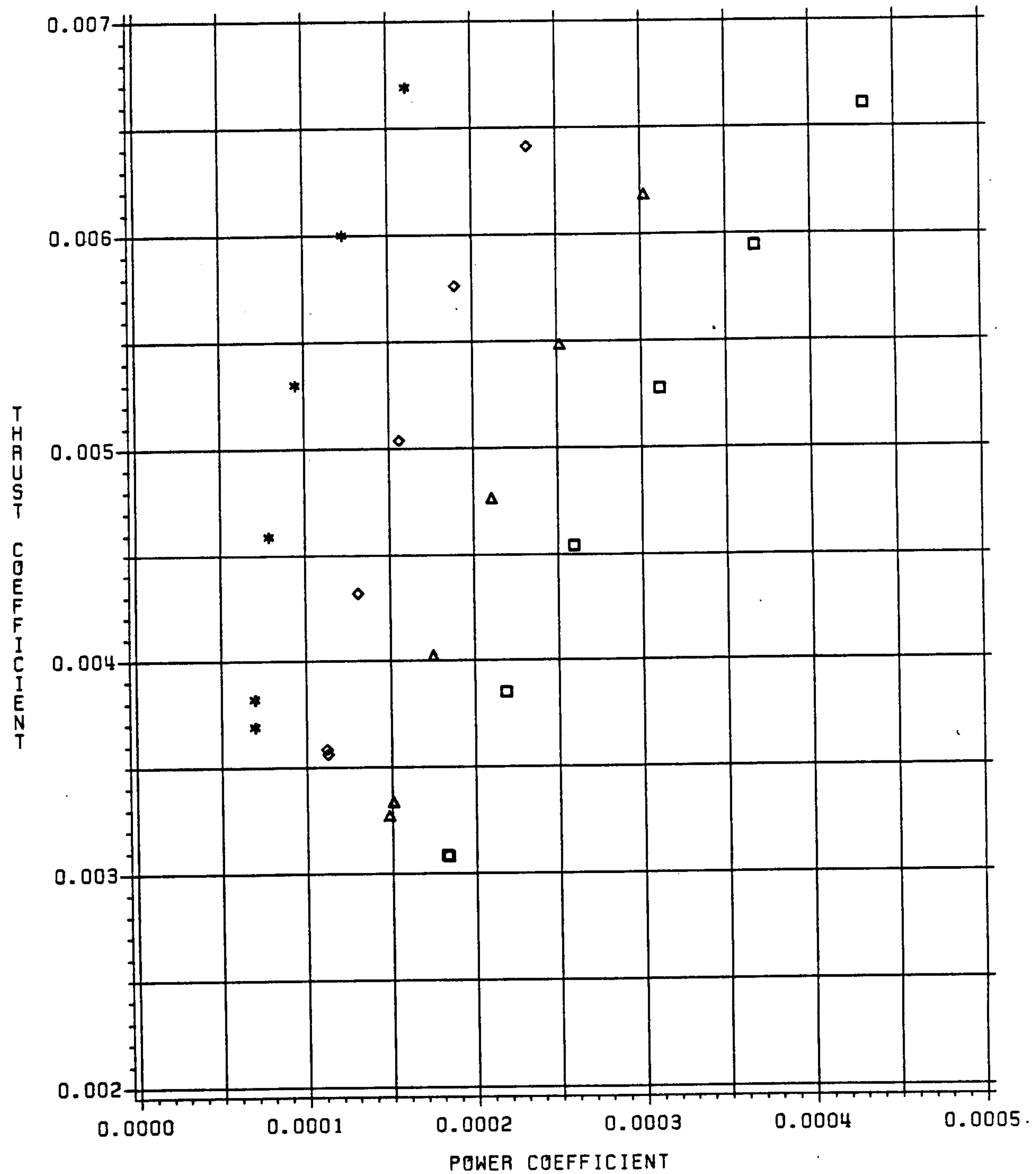
CONFIGURATION - BHAF2U (RUN 28) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CP

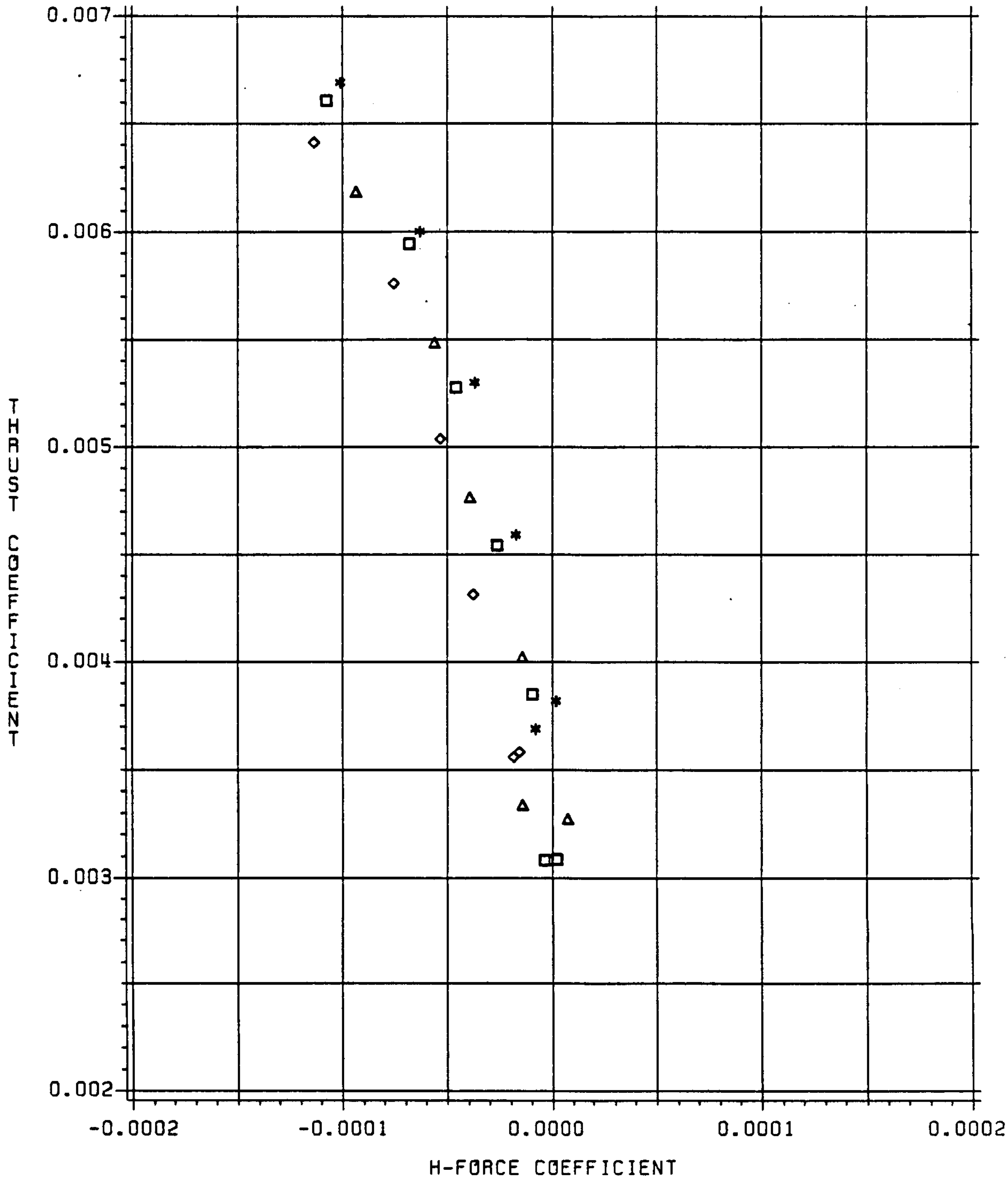
CONFIGURATION - BHAF2U (RUN 29) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CH

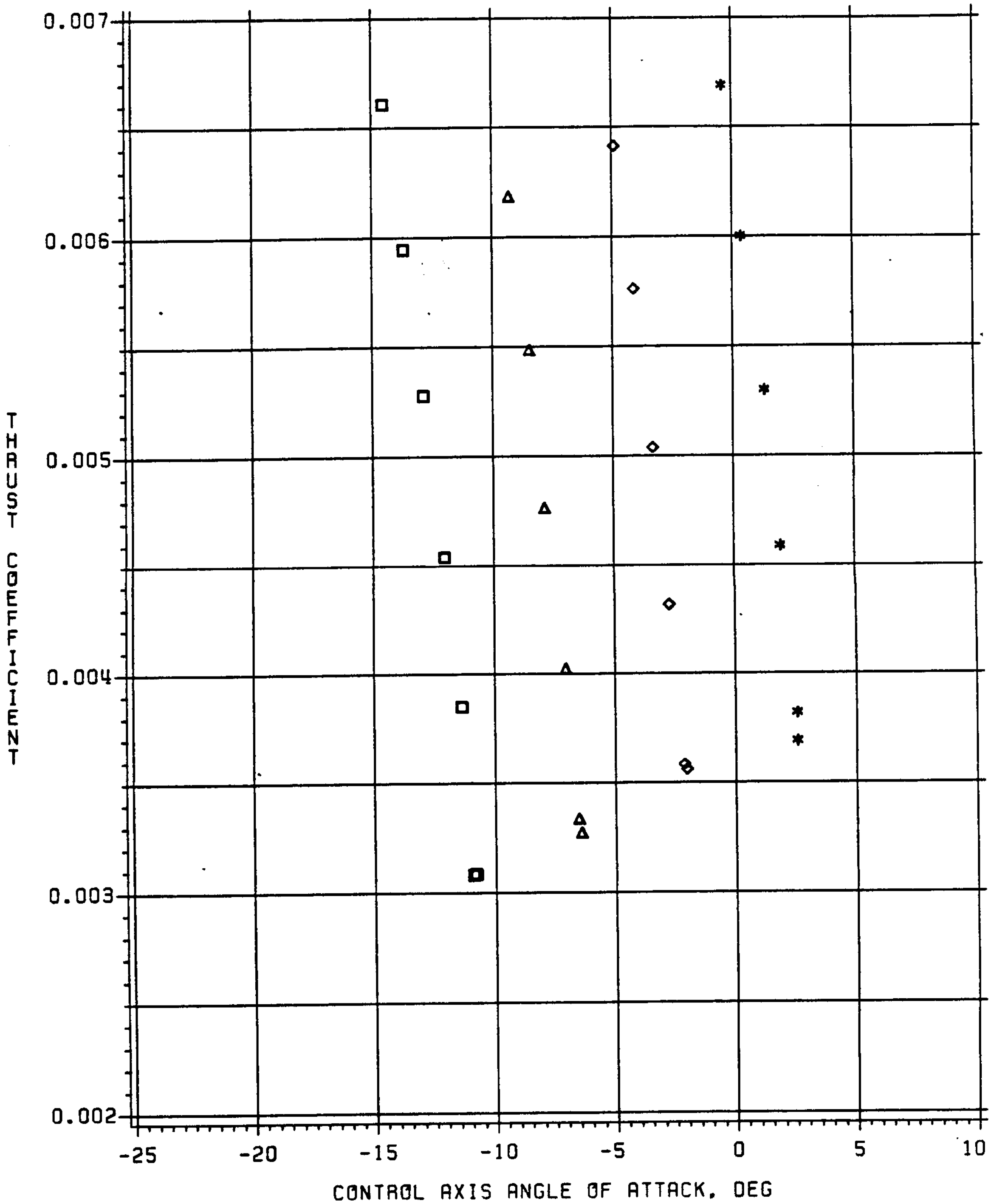
CONFIGURATION - 6HAF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS ALPHAC

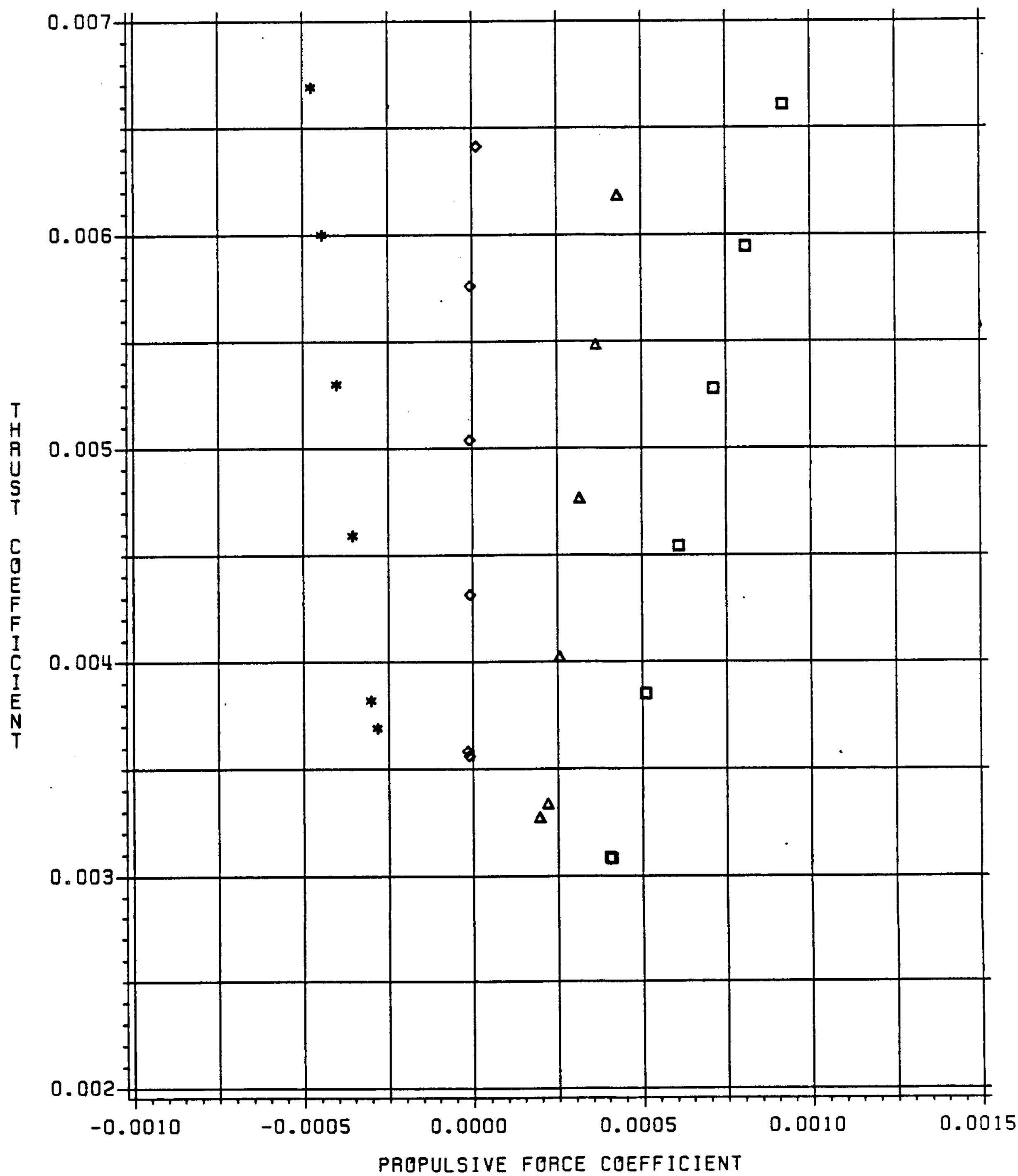
CONFIGURATION - BHRF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

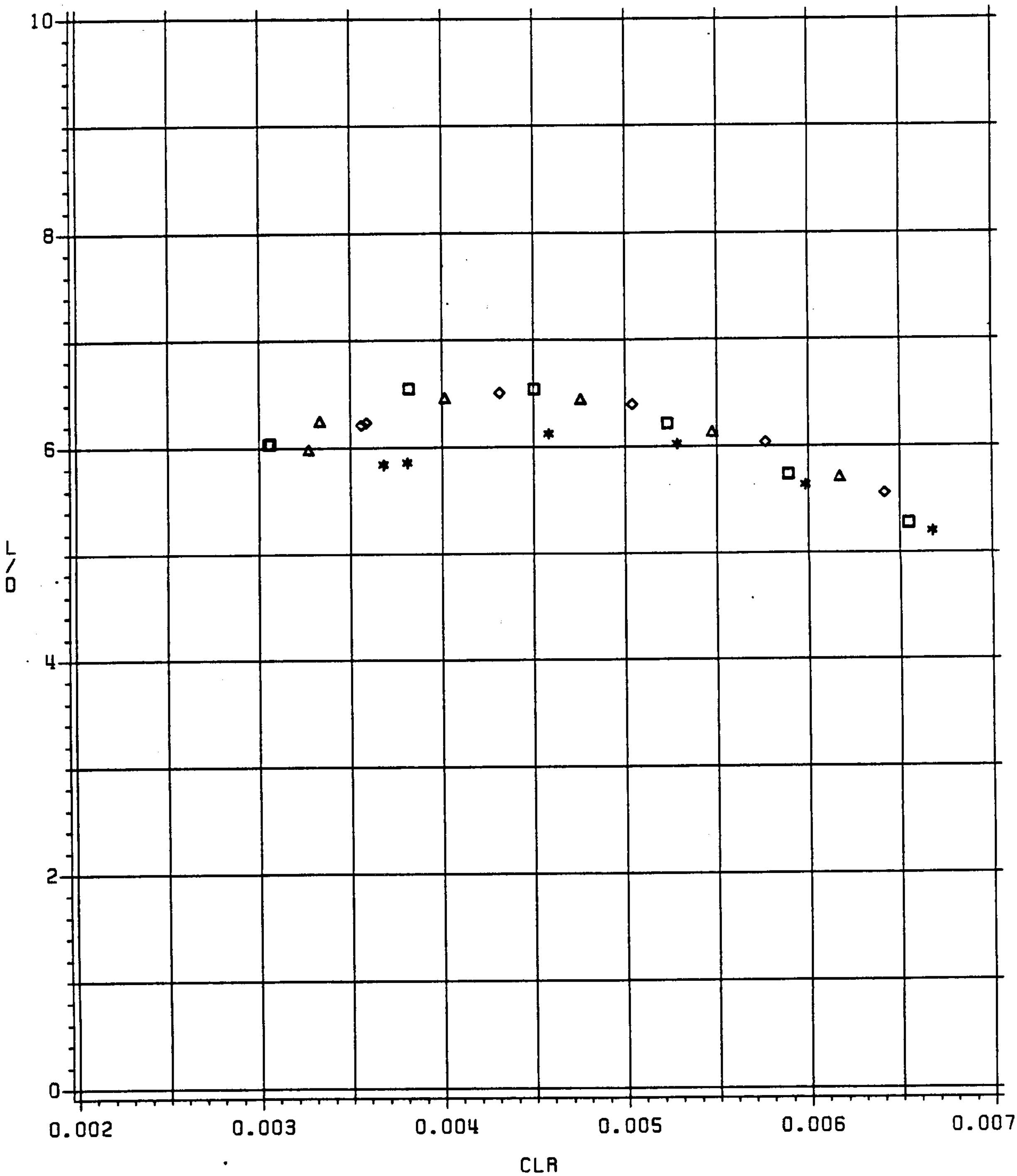
CONFIGURATION - BHRF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

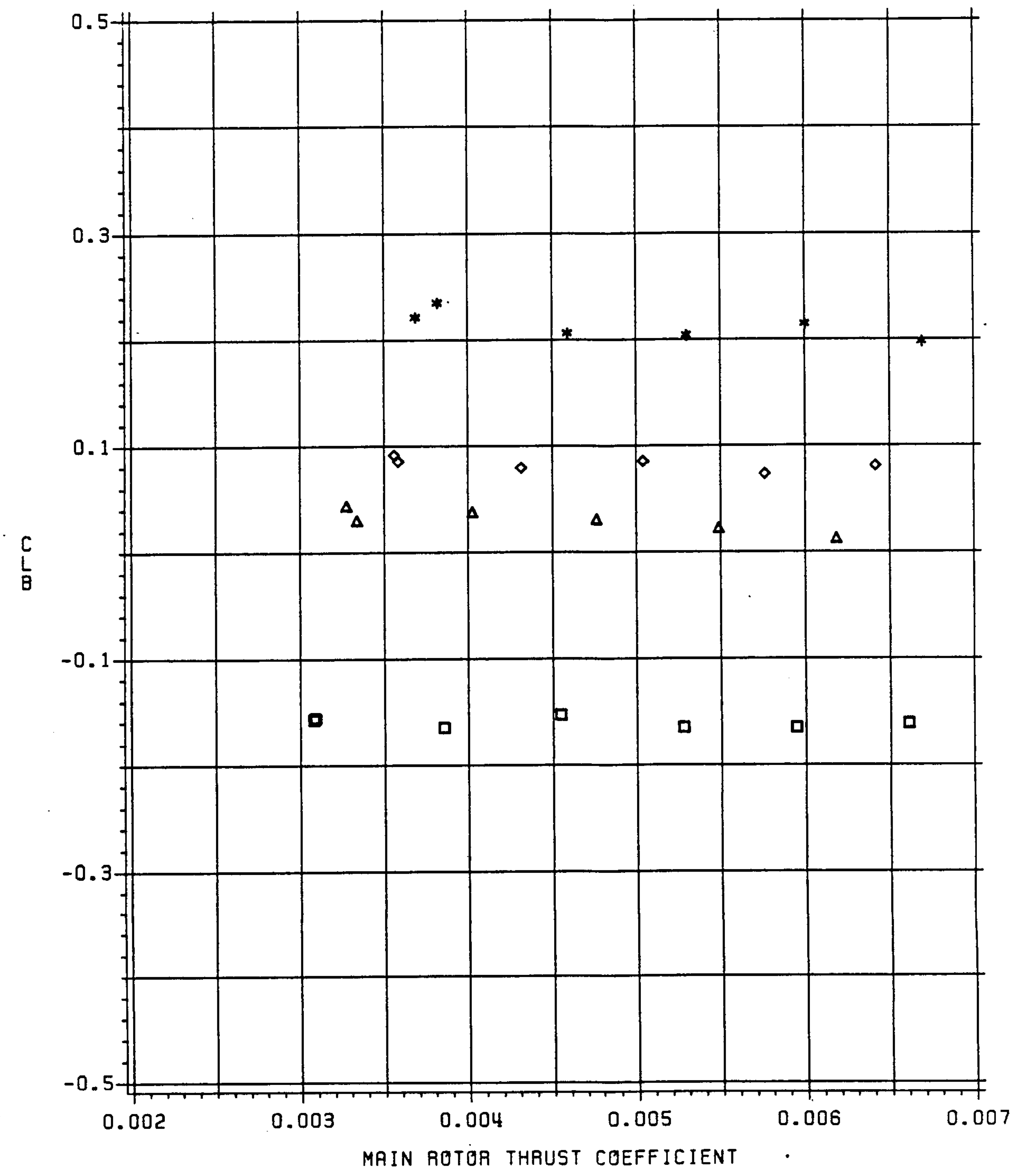
CONFIGURATION - BHRF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS CT

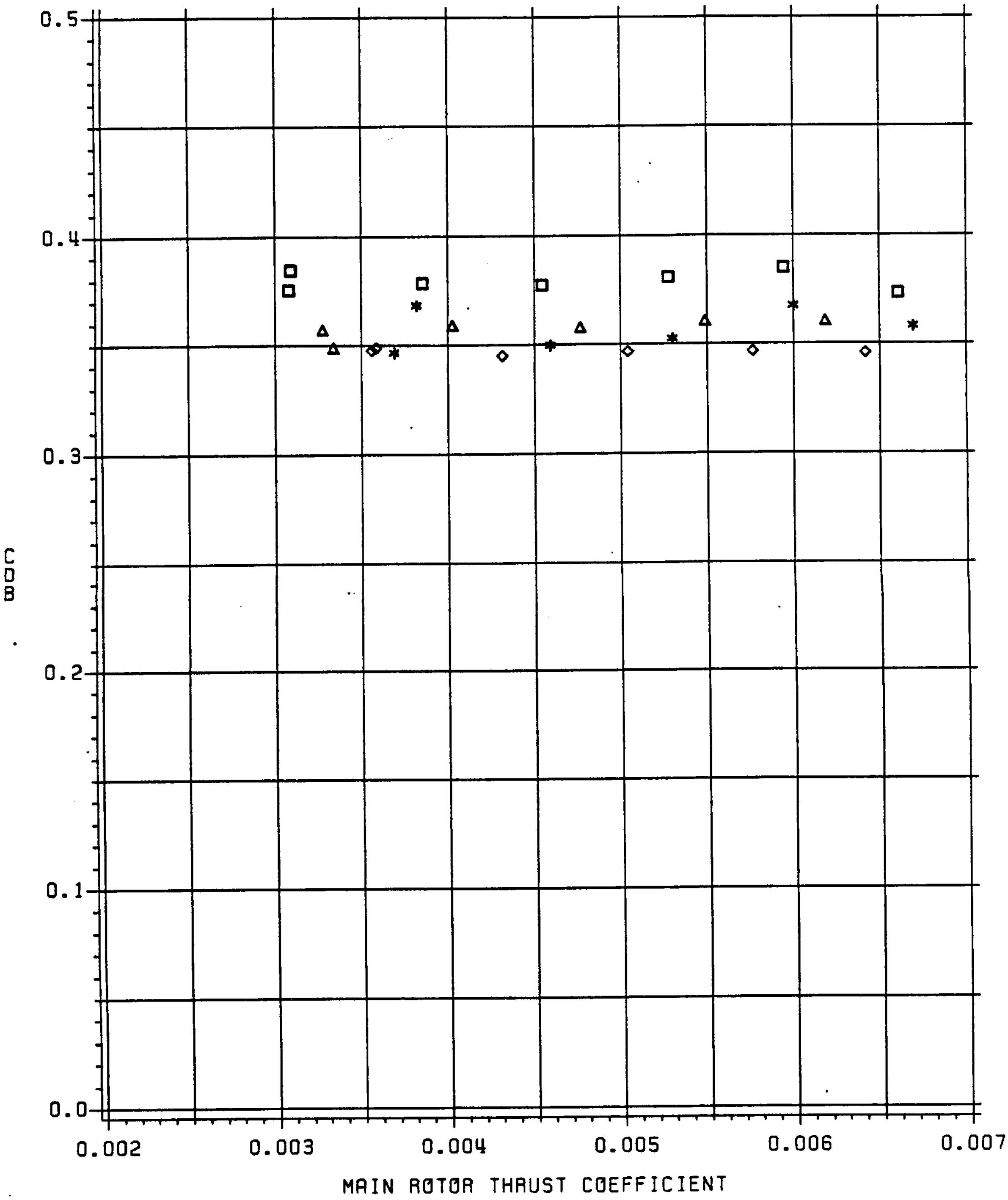
CONFIGURATION - BHAF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

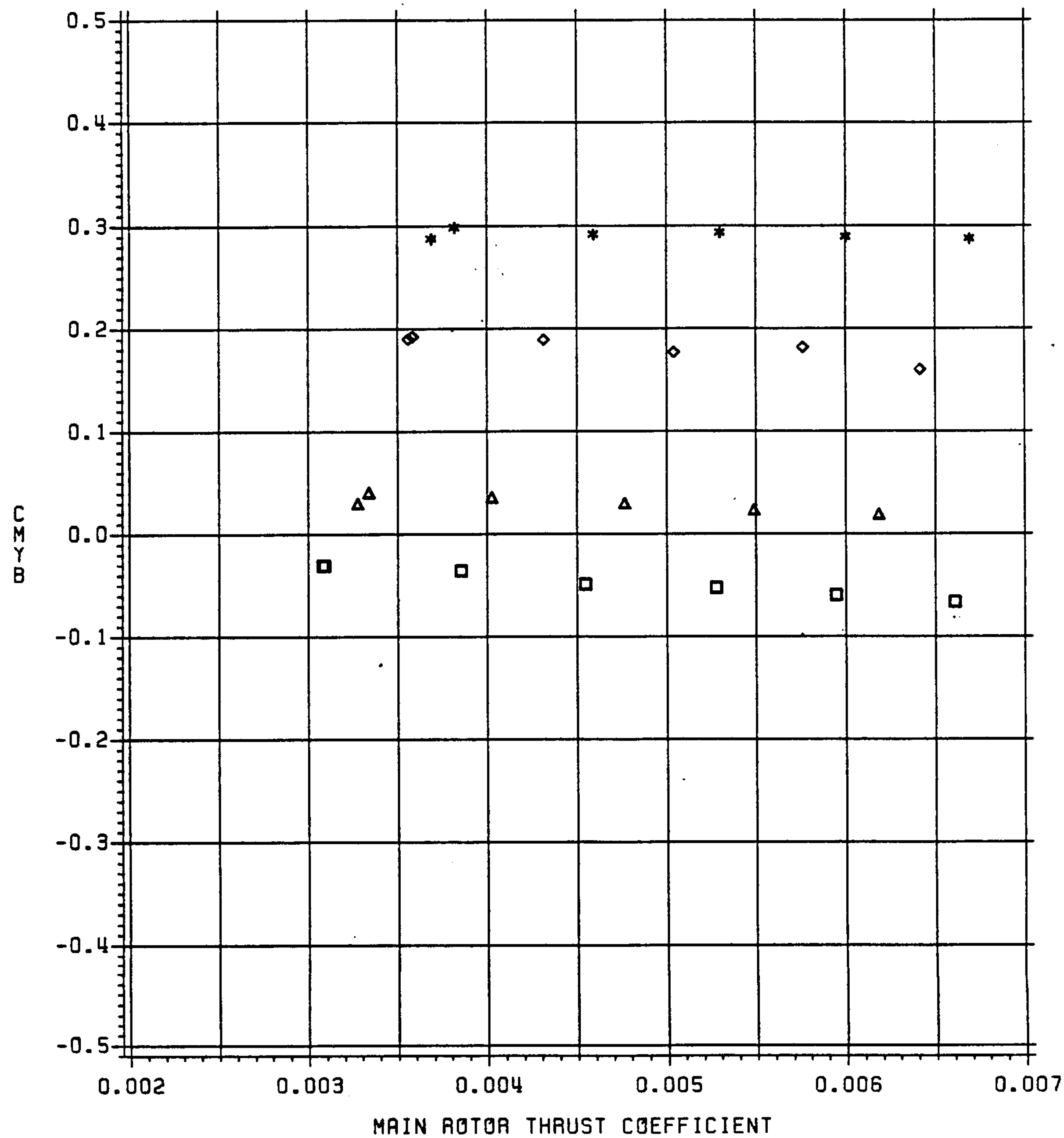
CONFIGURATION - BHRF2U (RUN 29)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

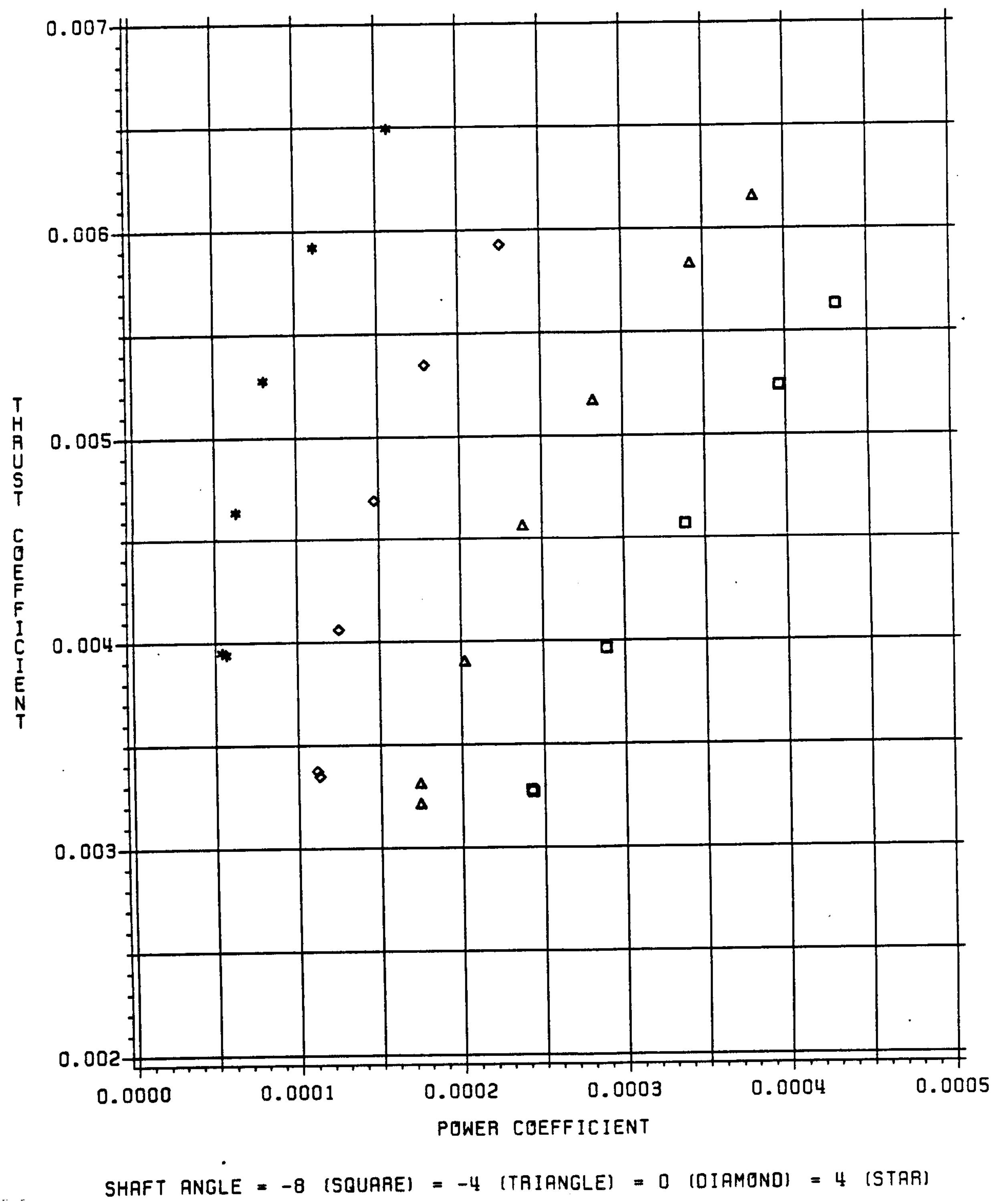
CONFIGURATION - BHAF2U (RUN 29) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

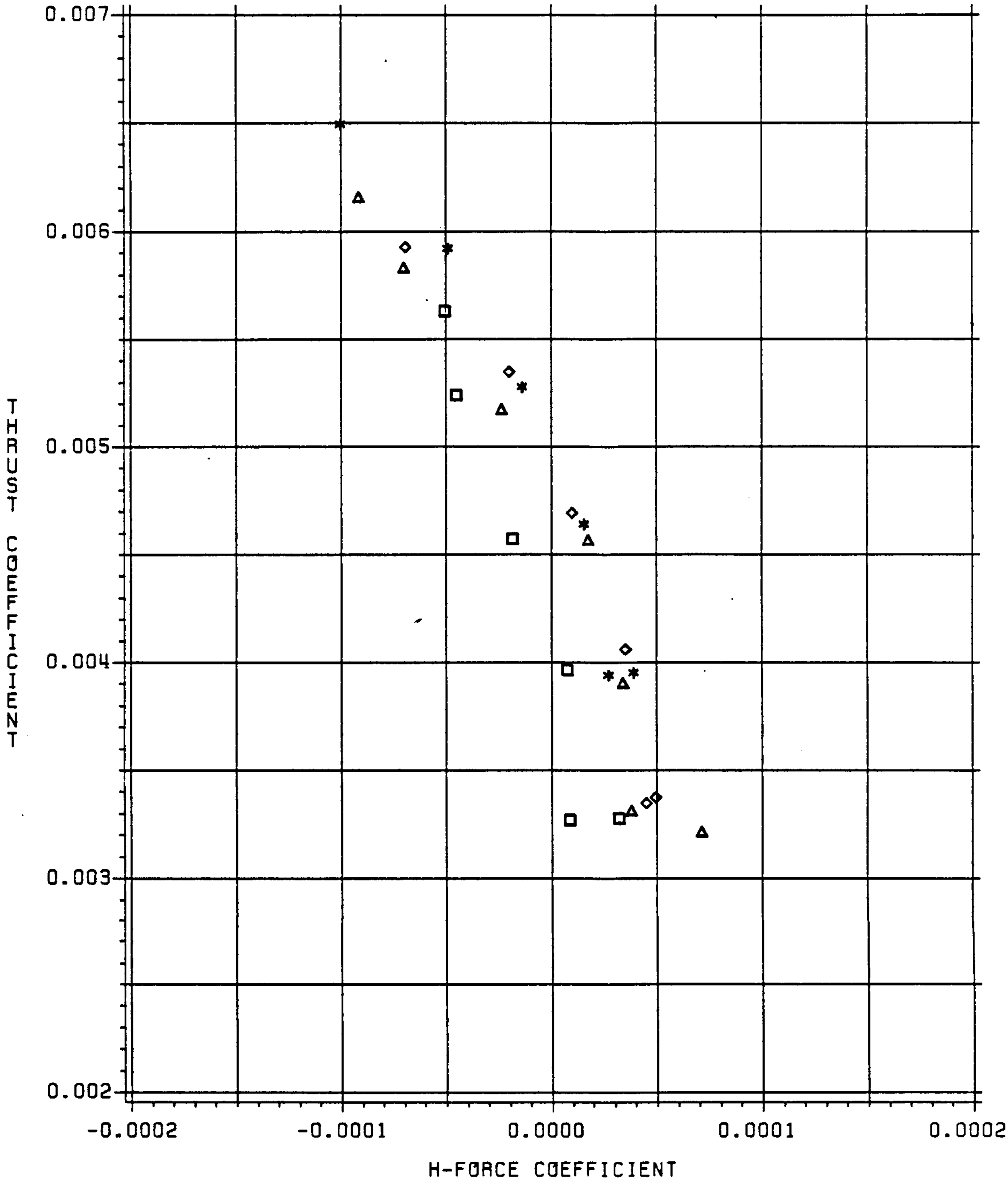
MAIN ROTOR CT VS CP

CONFIGURATION - BHRF2U (RUN 30) MU = 0.30

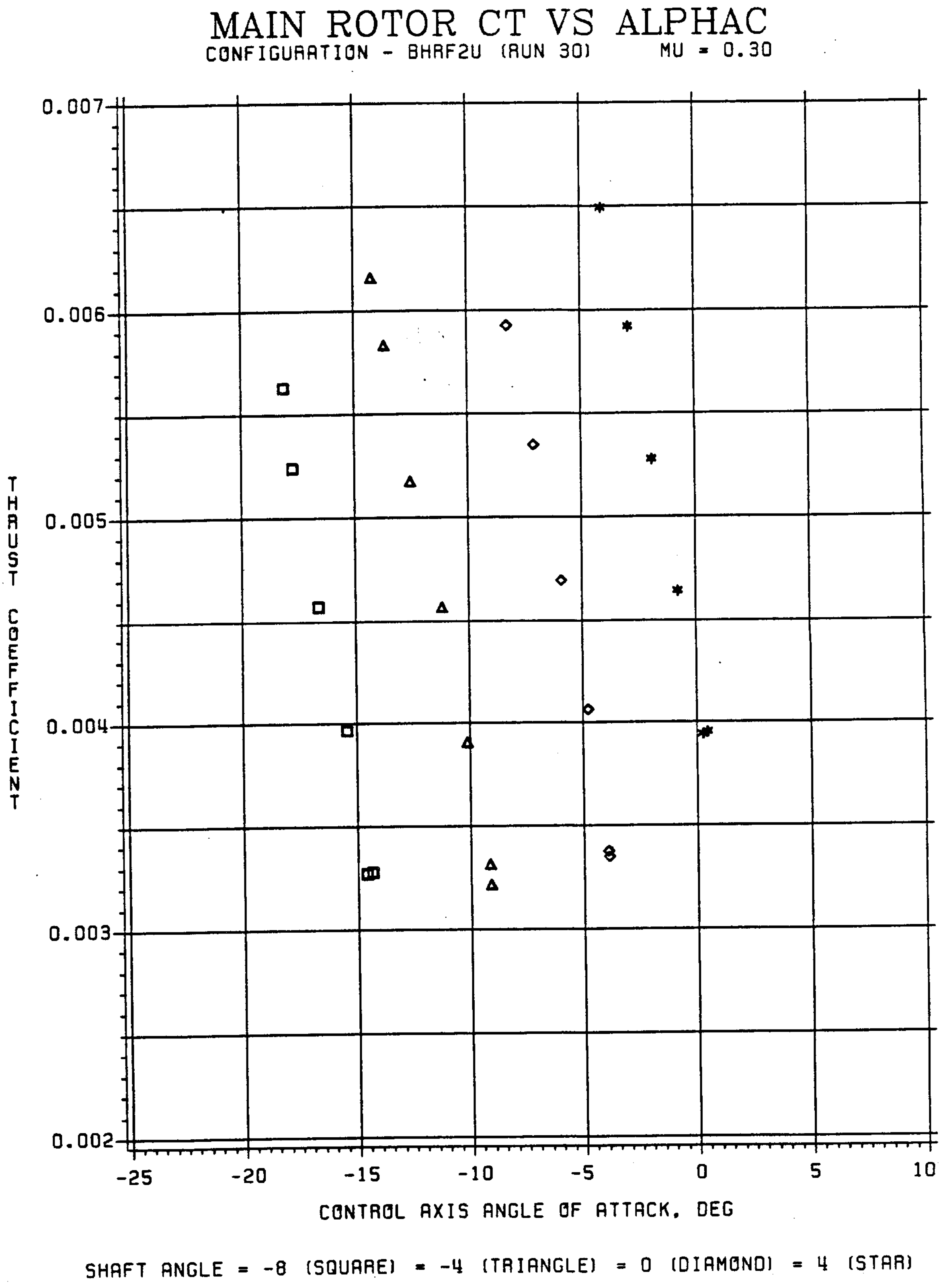


MAIN ROTOR CT VS CH

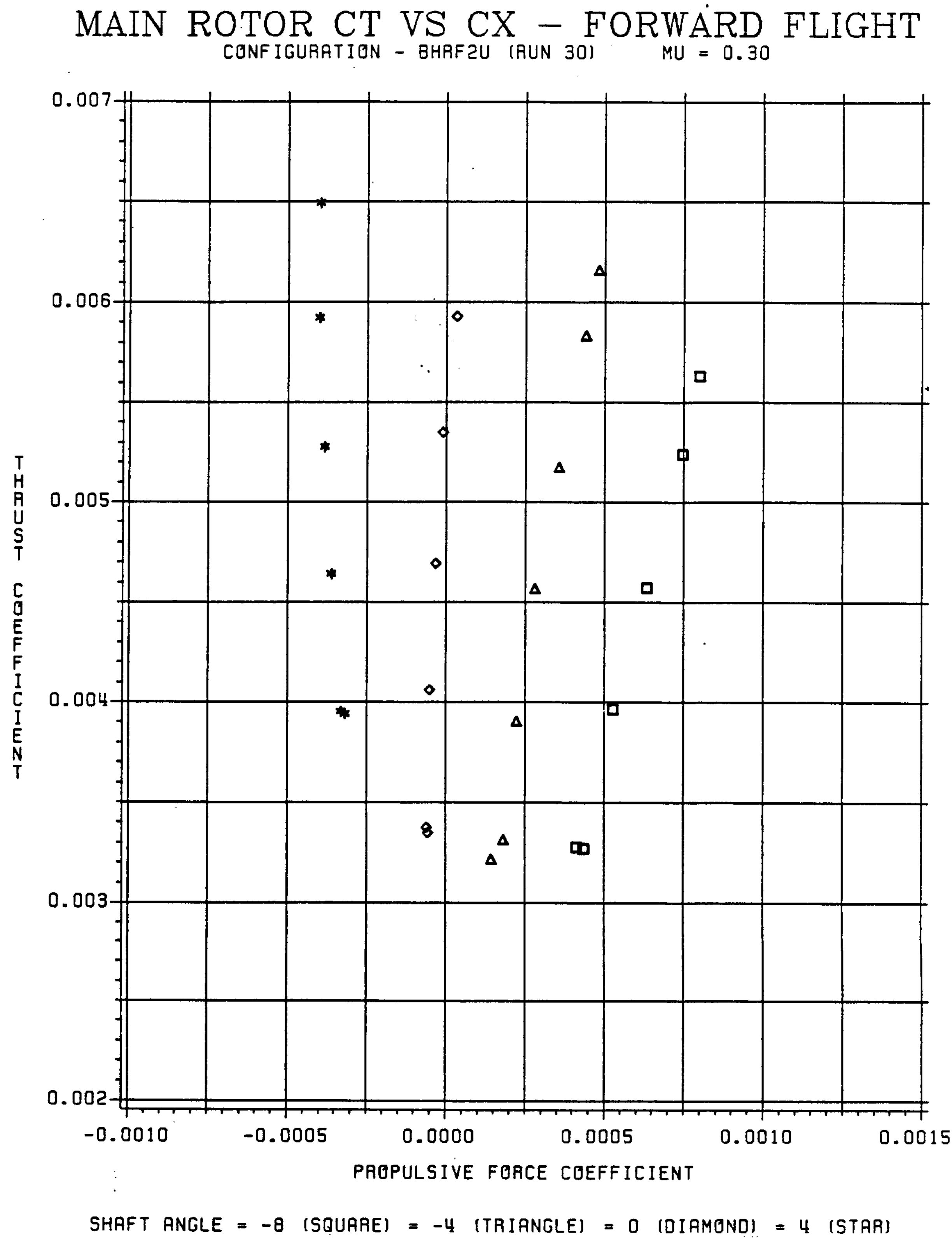
CONFIGURATION - BHAF2U (RUN 30)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

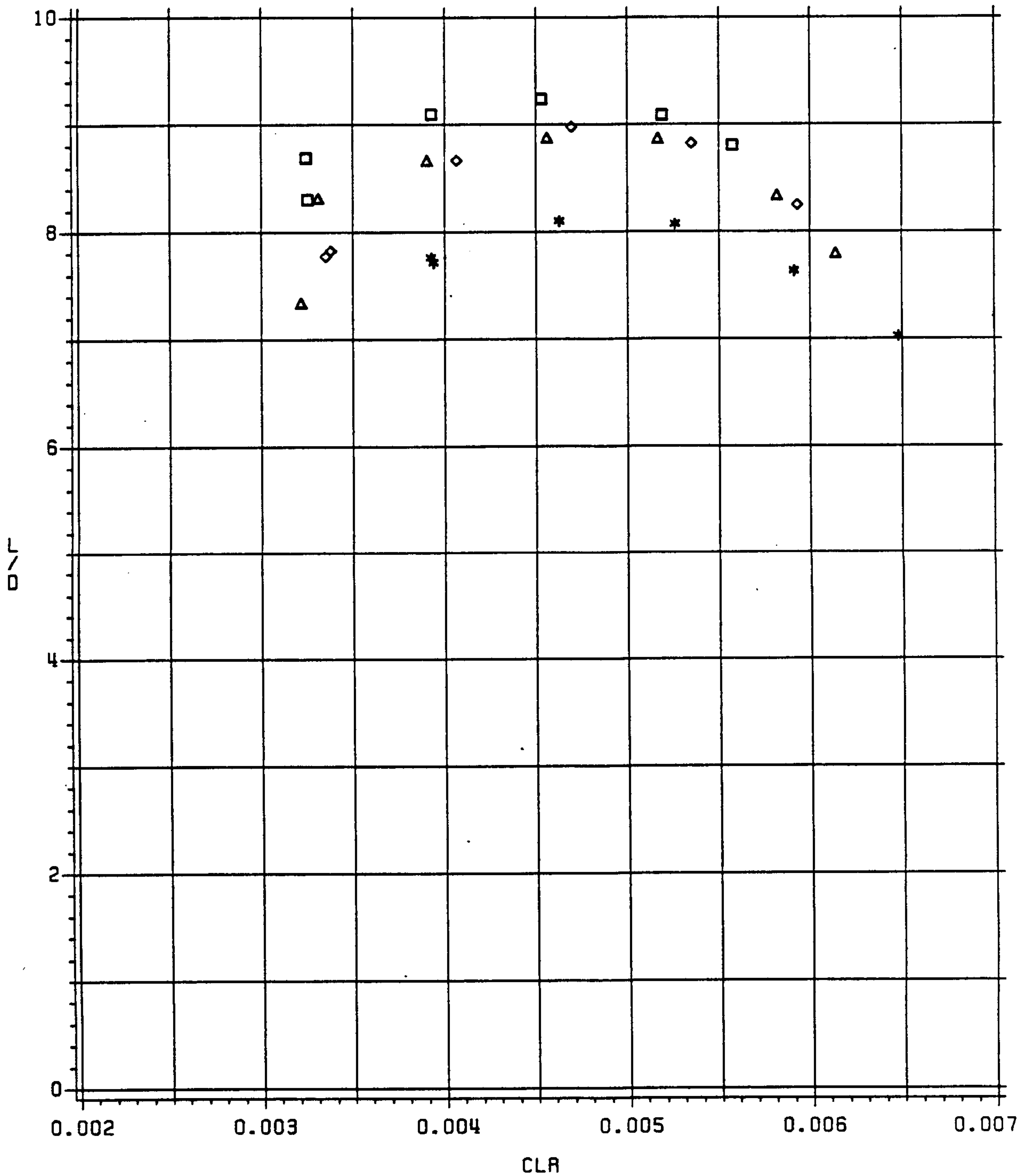


MAIN ROTOR CT VS ALPHAC
CONFIGURATION - BHRF2U (RUN 30) MU = 0.30
0.007
0.006
0.005
0.004
0.003
0.002
THRUST COEFFICIENT
-25
-20
-15
-10
-5
0
5
10
CONTROL AXIS ANGLE OF ATTACK, DEG
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)


MAIN ROTOR CT VS CX - FORWARD FLIGHT
CONFIGURATION - BHAF2U (RUN 30) MU = 0.30
0.007
0.006
0.005
0.004
0.003
0.002
THRUST COEFFICIENT
-0.0010
-0.0005
0.0000
0.0005
0.0010
0.0015
PROPULSIVE FORCE COEFFICIENT
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

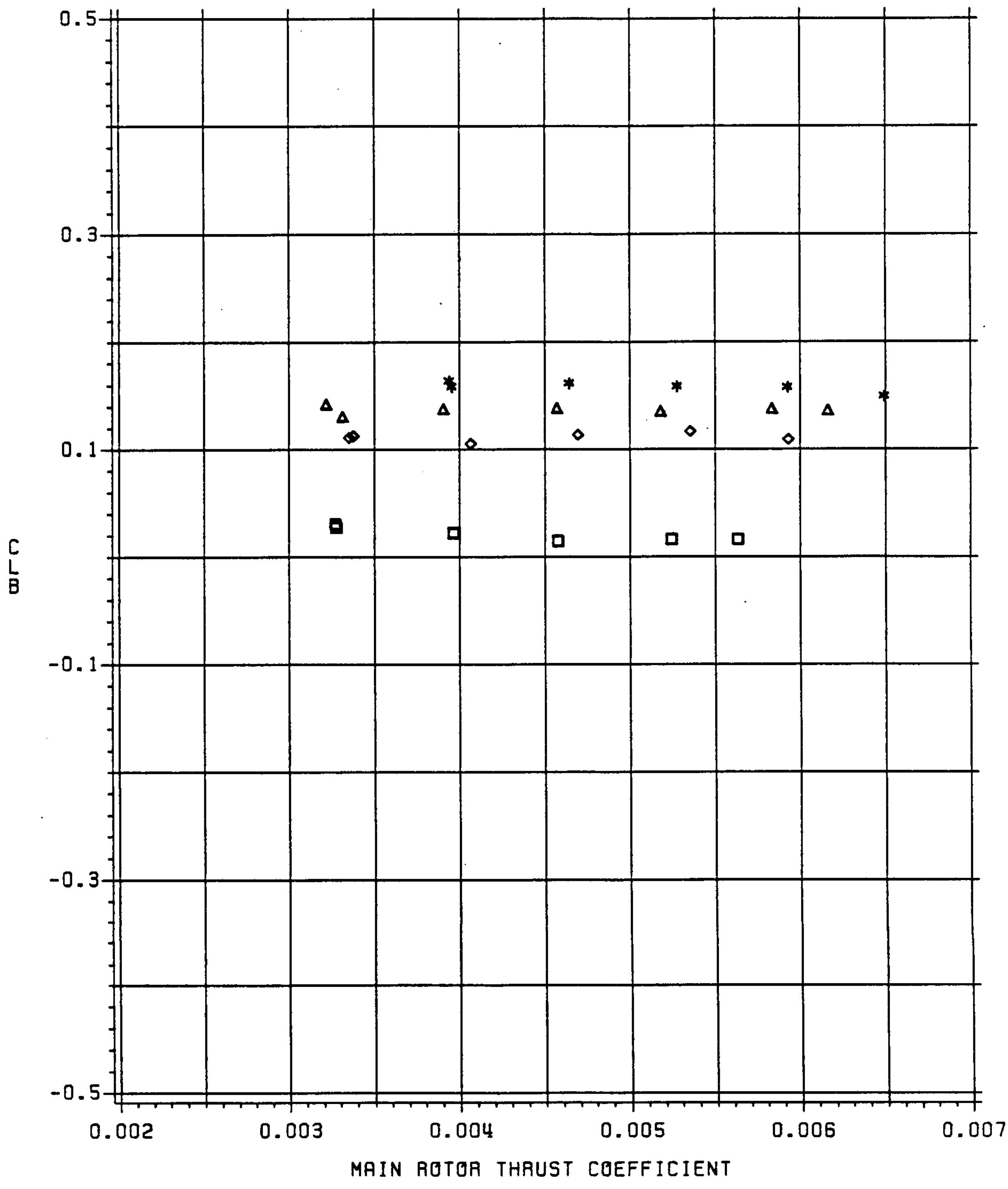
CONFIGURATION - 8HAF2U (RUN 30)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS CT

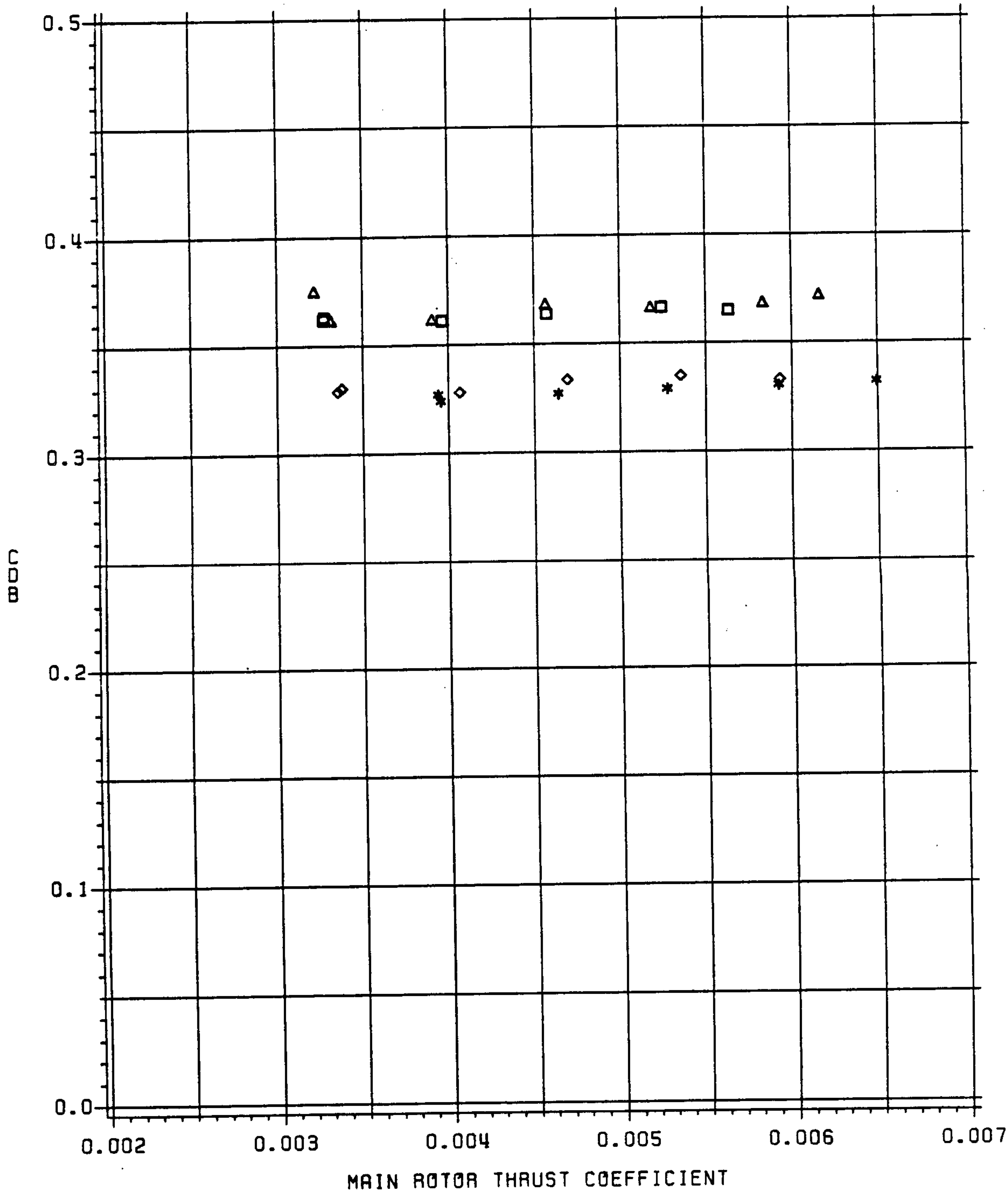
CONFIGURATION - BHRF2U (RUN 30) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY DRAG COEFFICIENT VS CT

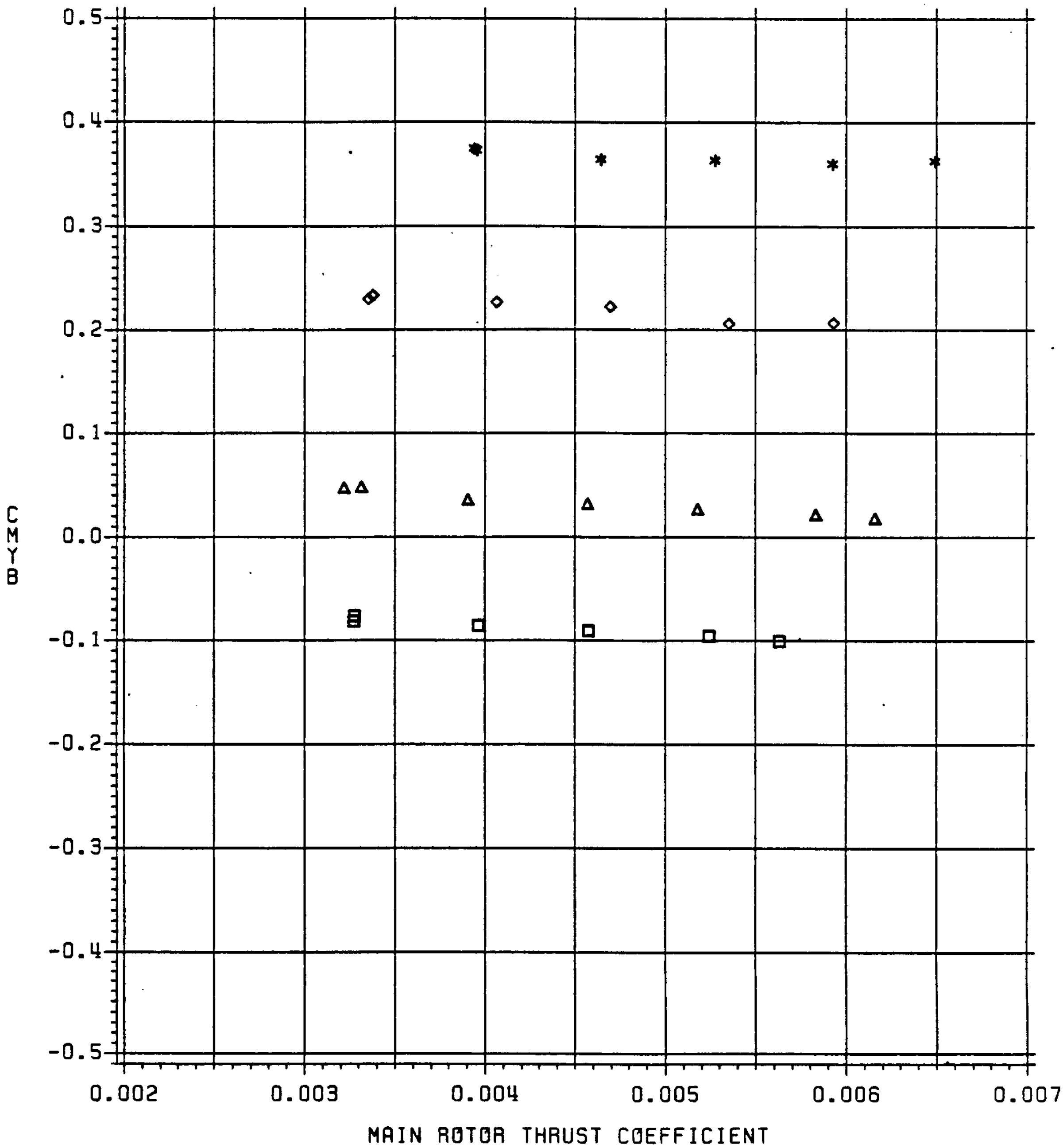
CONFIGURATION - BHAF2U (RUN 30) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY PITCHING MOMENT COEFFICIENT VS CT

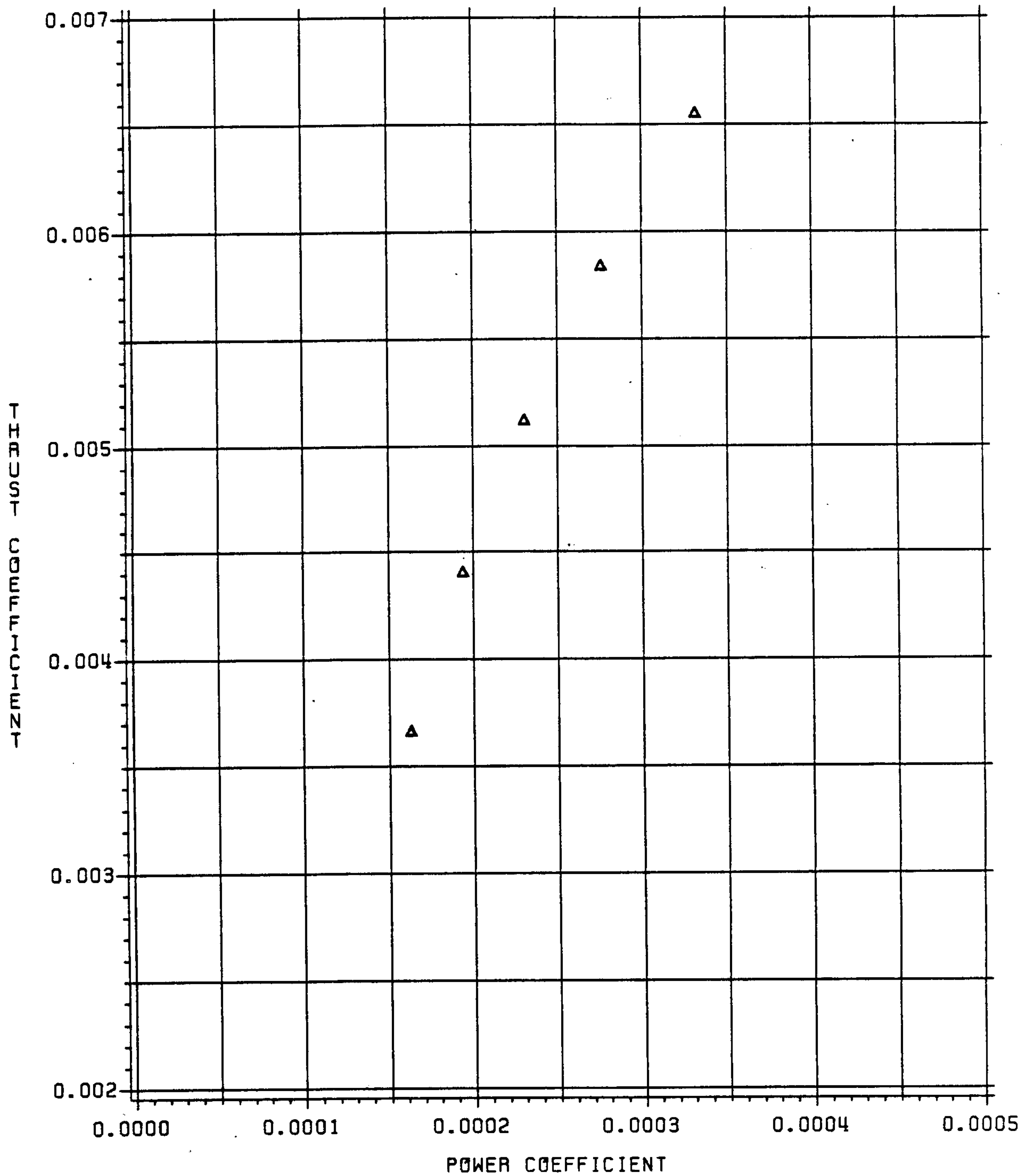
CONFIGURATION - BHAF2U (RUN 30)   MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

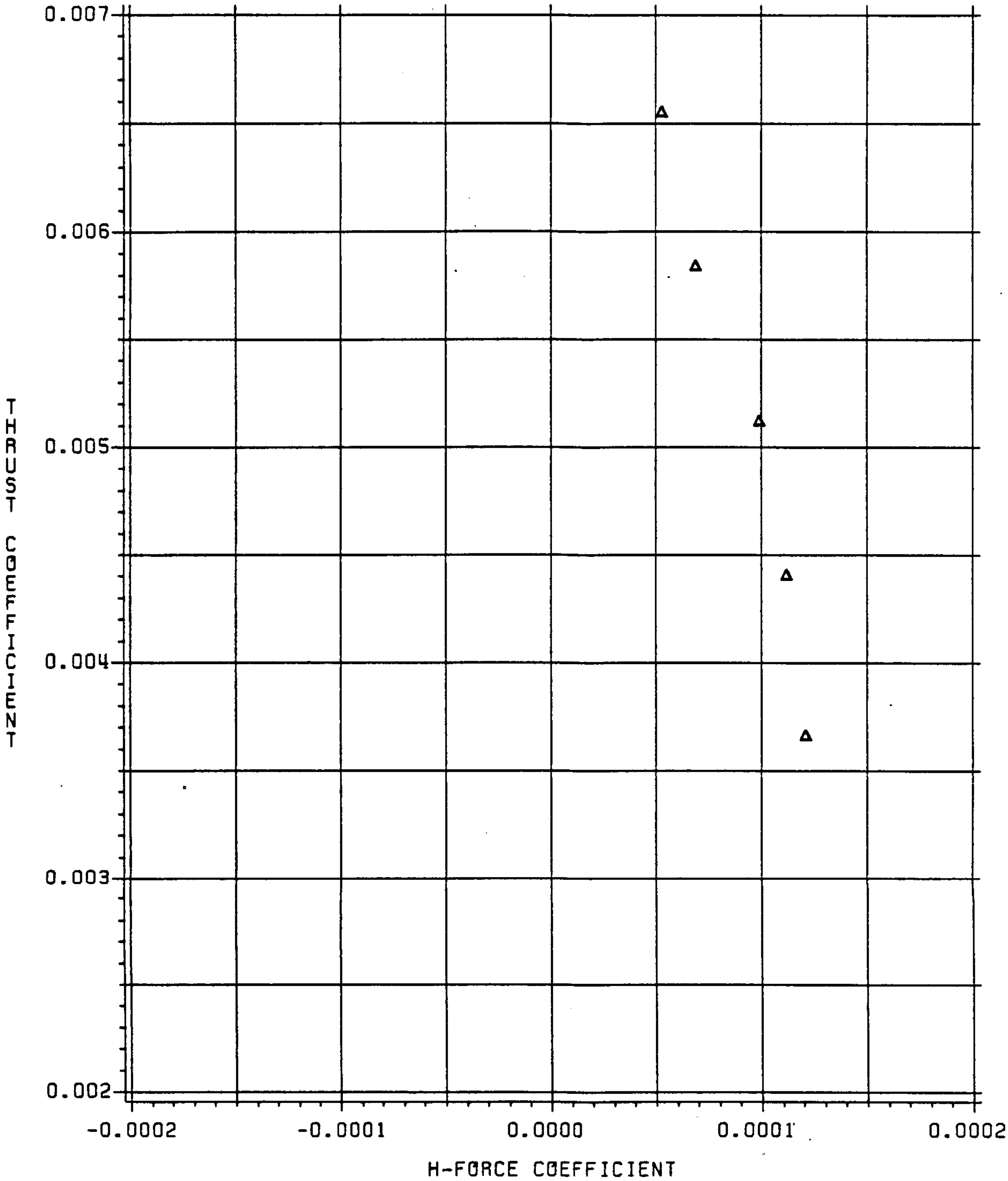
CONFIGURATION - HR (RUN 32)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

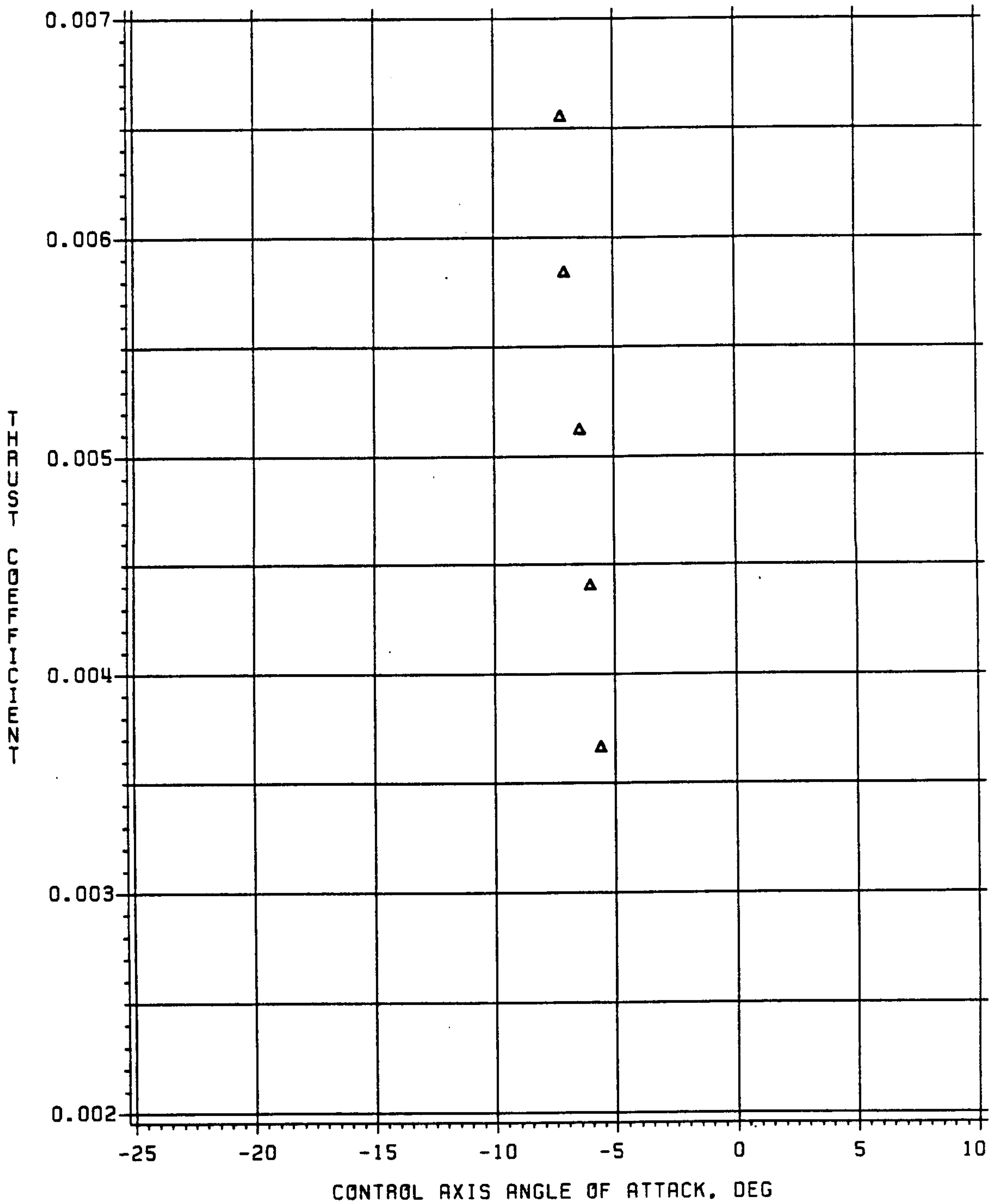
CONFIGURATION - HR (RUN 32)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

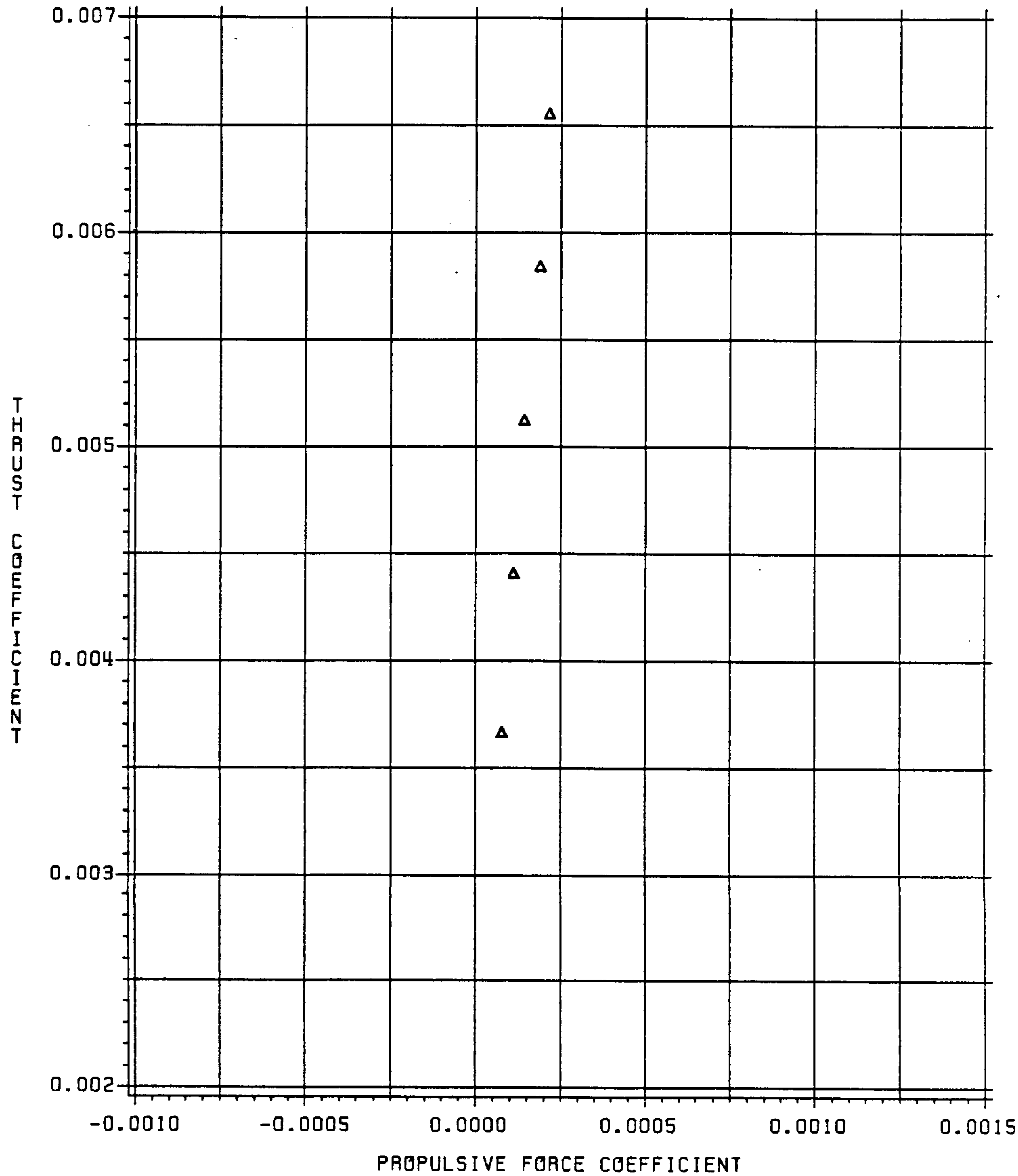
CONFIGURATION - HR (RUN 32)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX - FORWARD FLIGHT

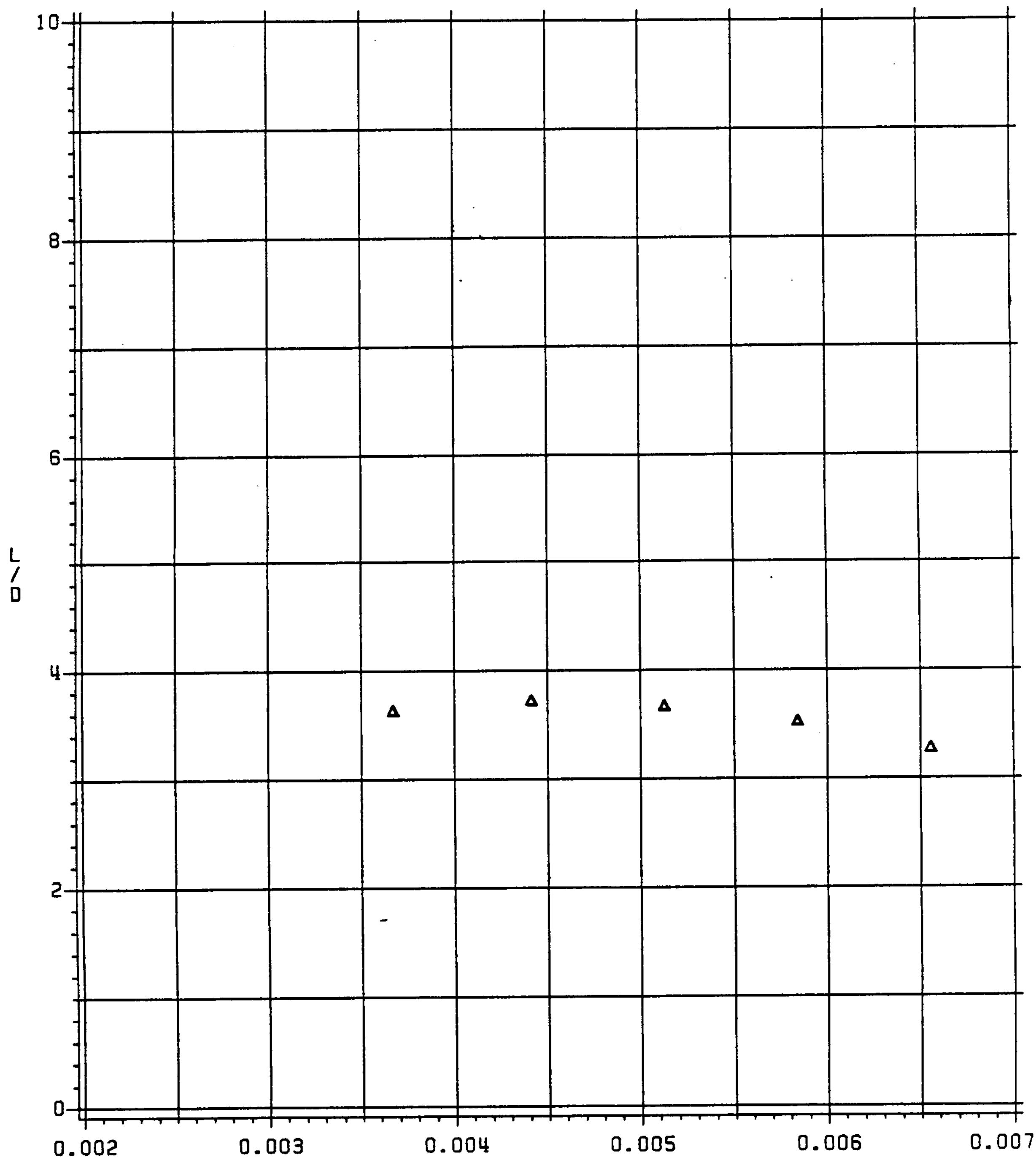
CONFIGURATION - HR (RUN 32)   MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

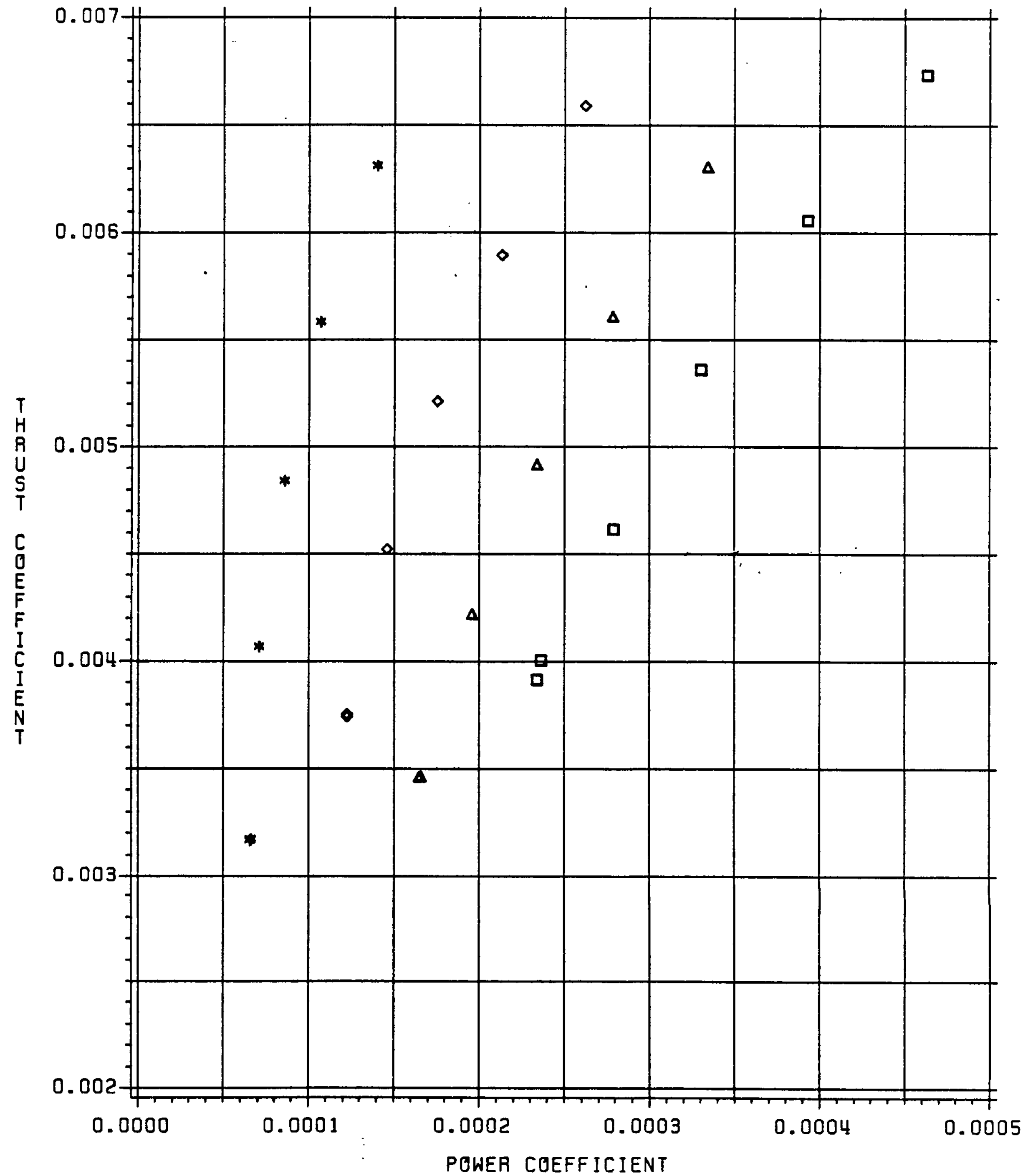
CONFIGURATION - HA (RUN 32) MU = 0.15



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CP

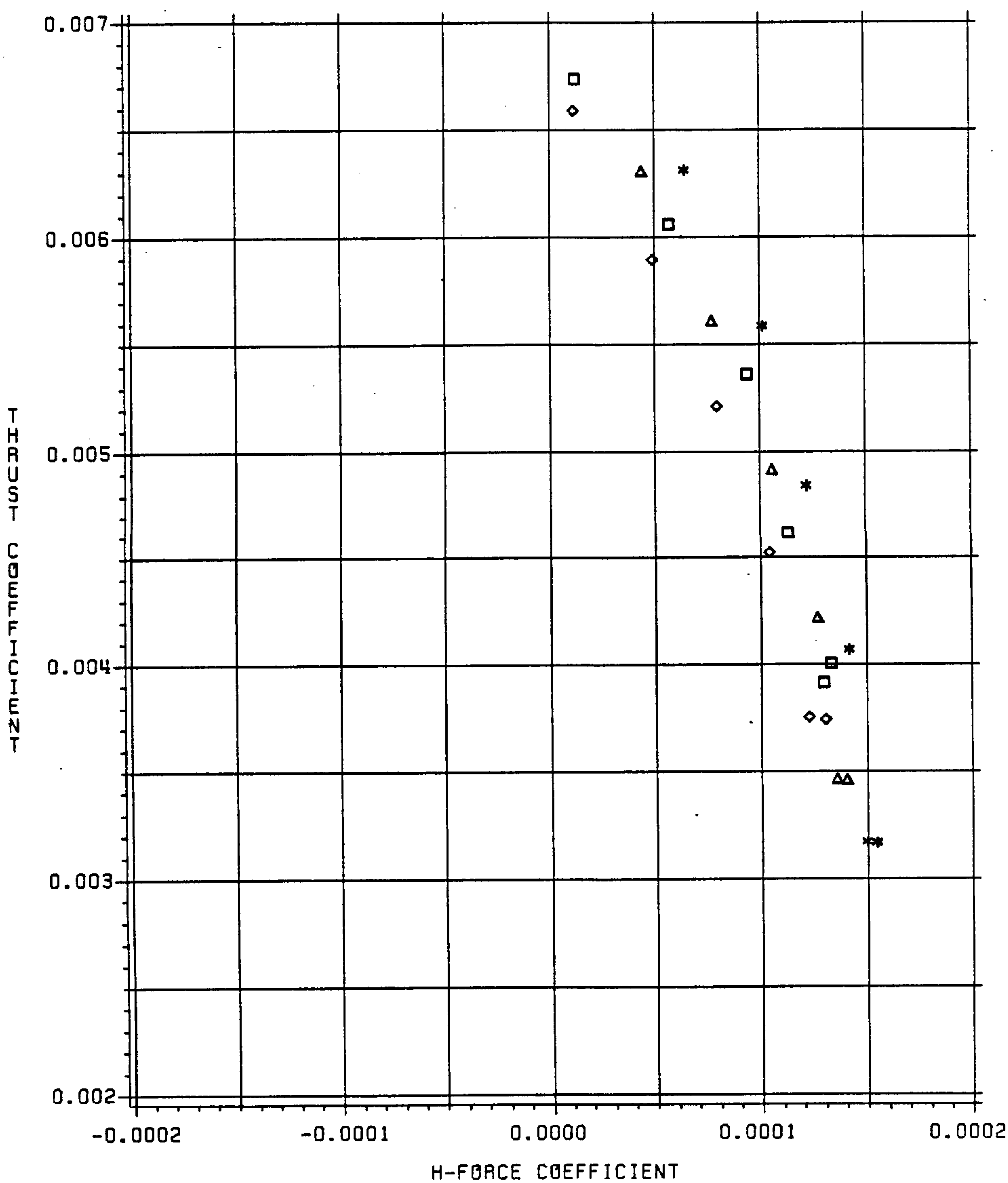
CONFIGURATION - HR (RUN 33) MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CH

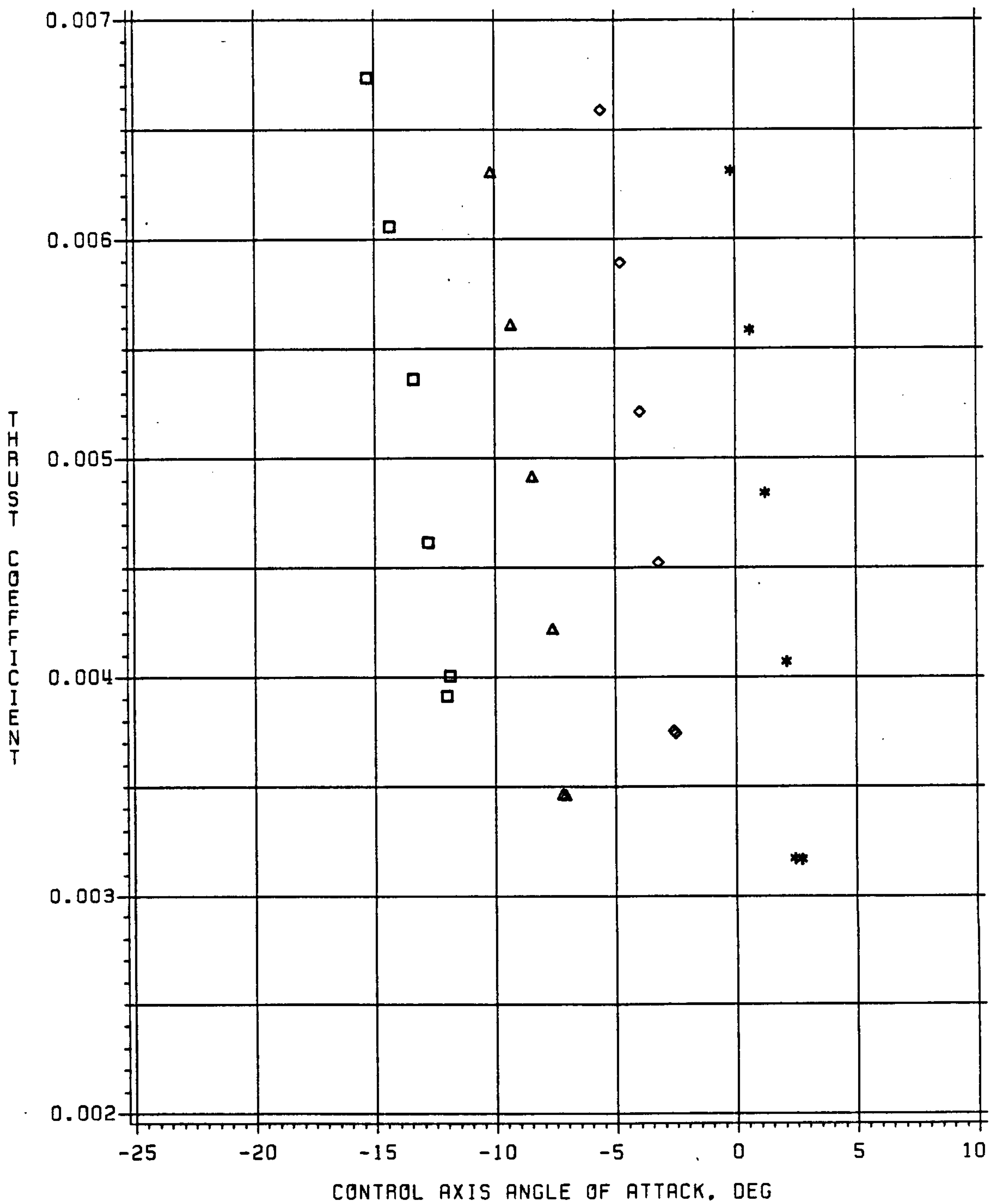
CONFIGURATION - HR (RUN 33)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS ALPHAC

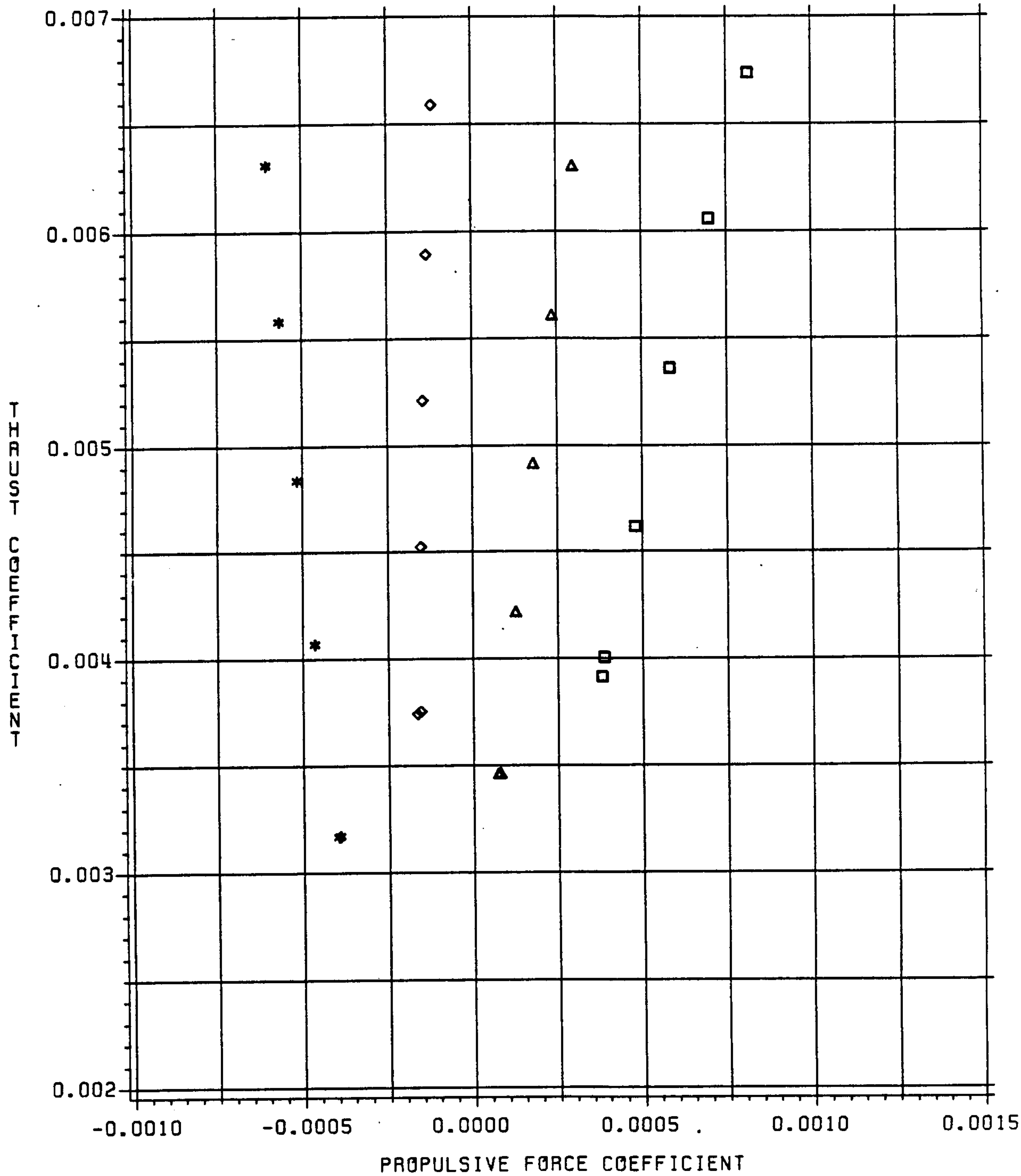
CONFIGURATION - HR (RUN 33)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

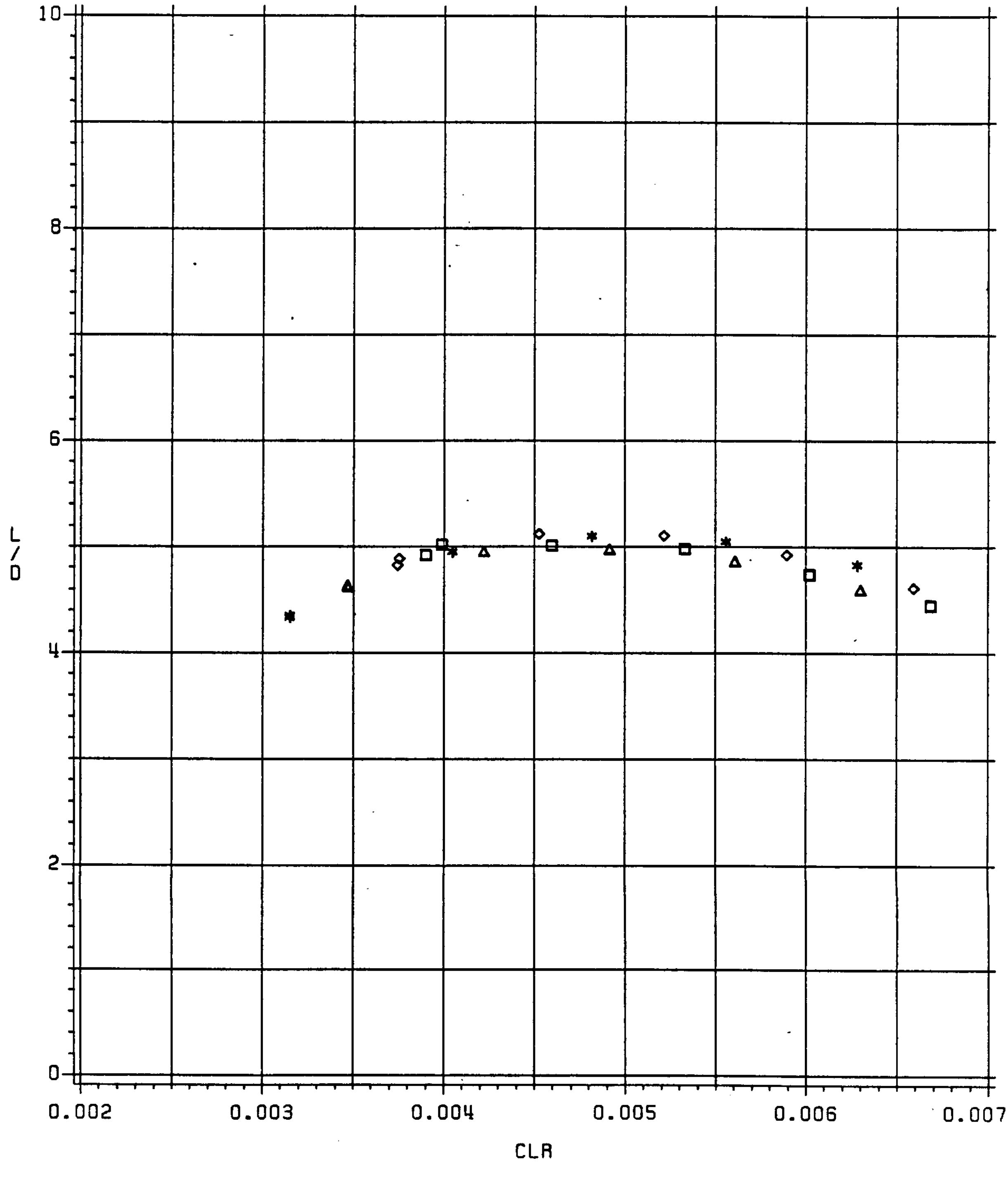
CONFIGURATION - HR (RUN 33)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

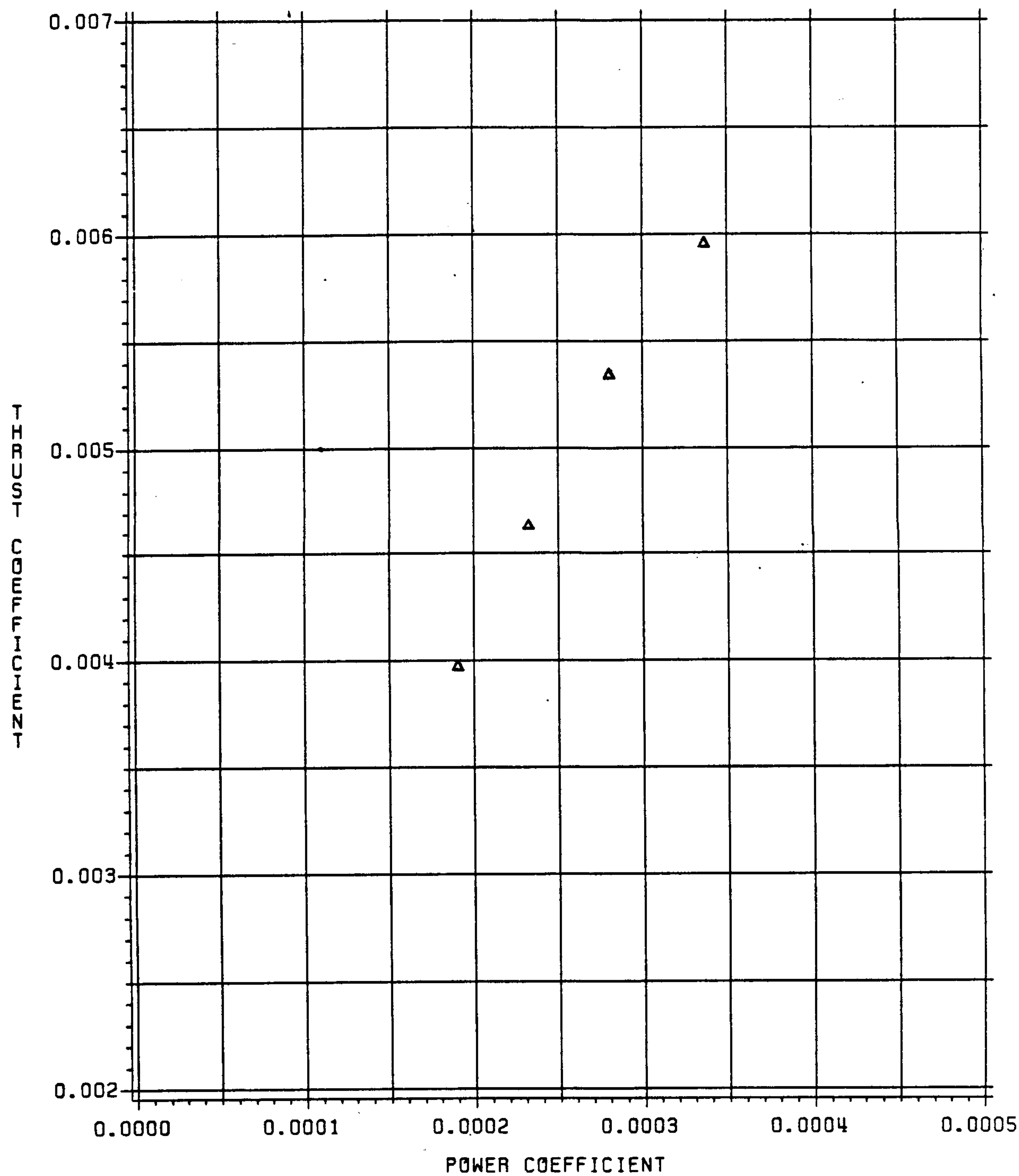
CONFIGURATION - HR (RUN 33)   MU = 0.20



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CP

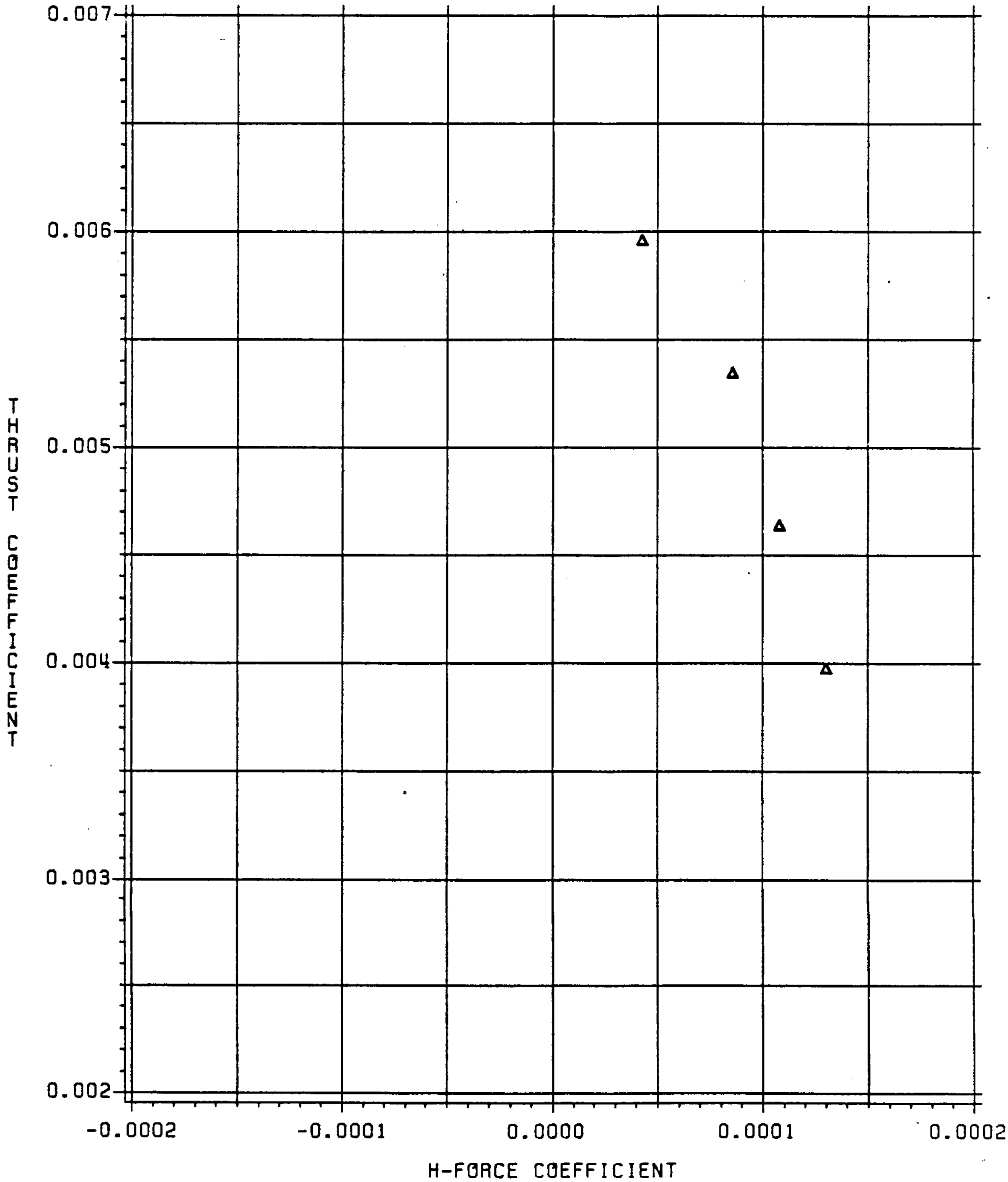
CONFIGURATION - HA (RUN 34)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CH

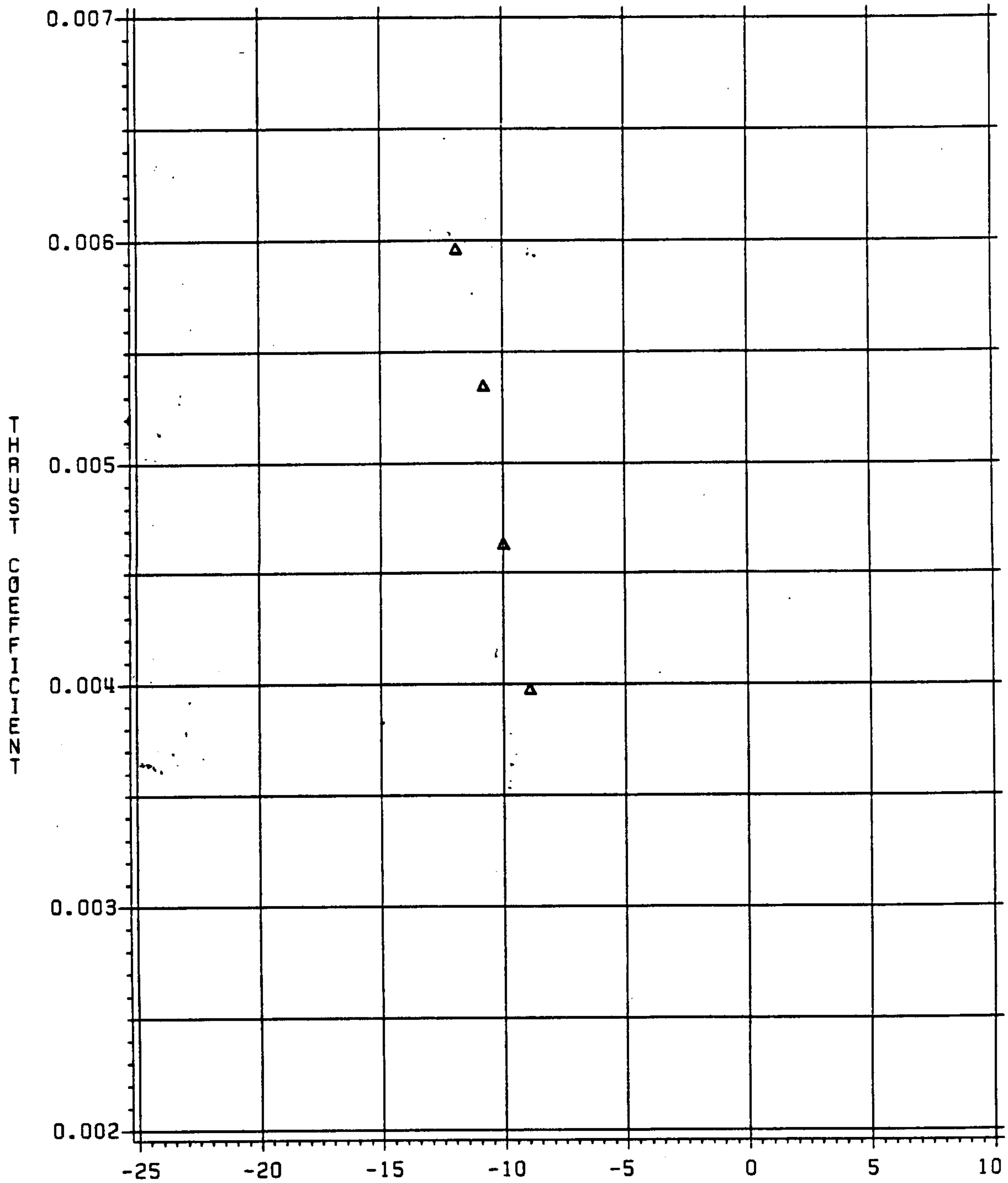
CONFIGURATION - HR (RUN 34)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS ALPHAC

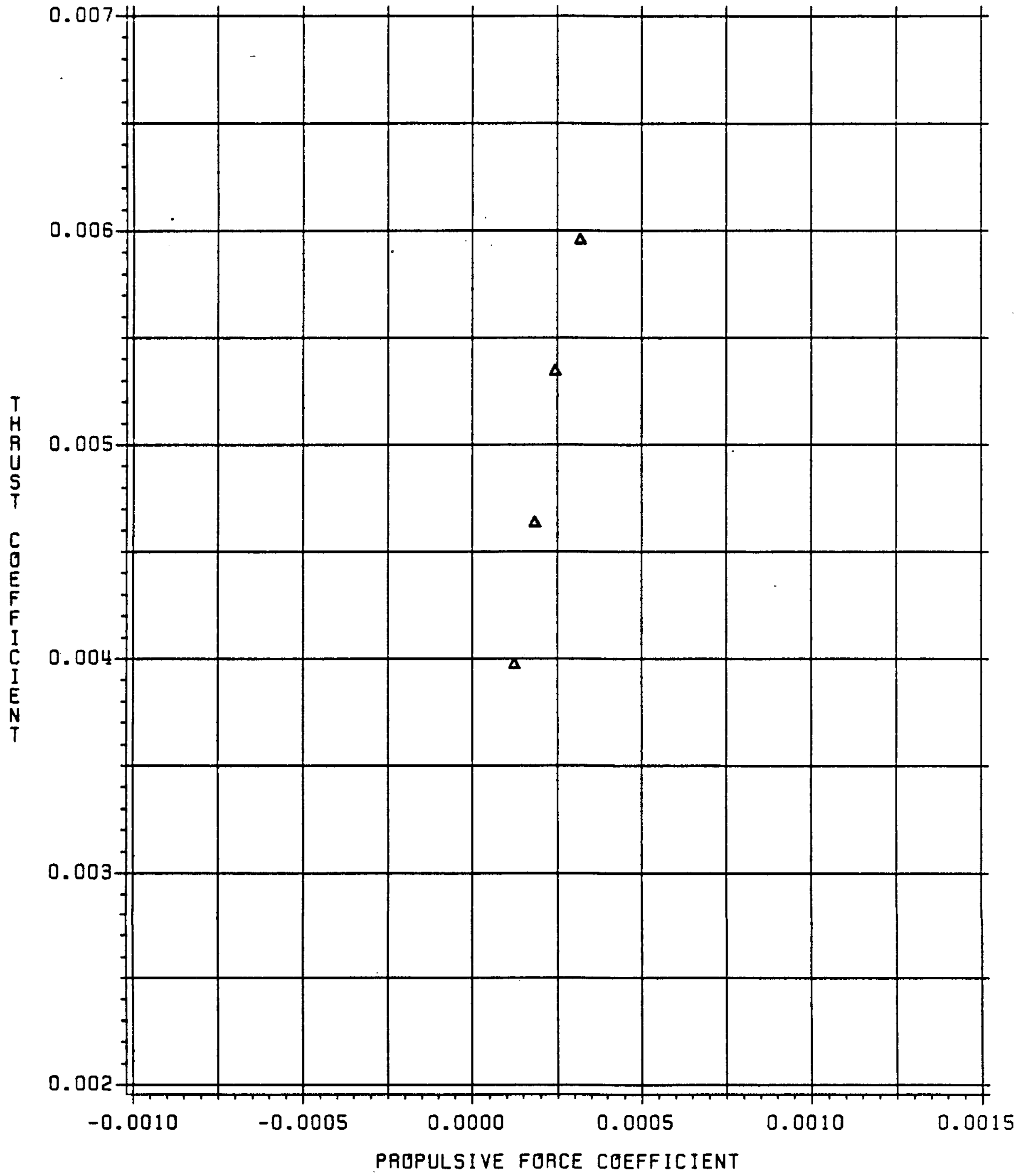
CONFIGURATION - HA (RUN 34)   MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

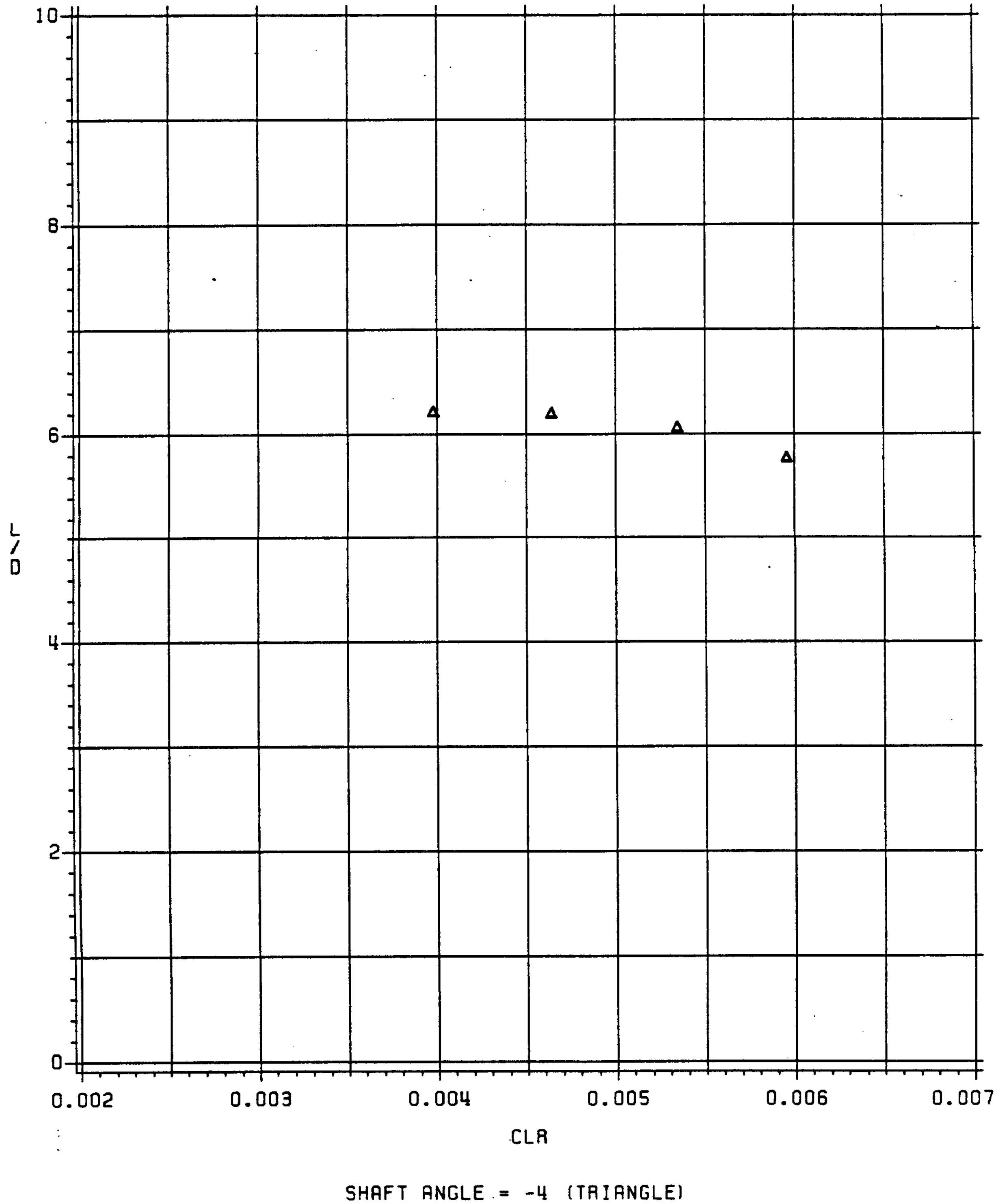
CONFIGURATION - HR (RUN 34) MU = 0.25



SHAFT ANGLE = -4 (TRIANGLE)

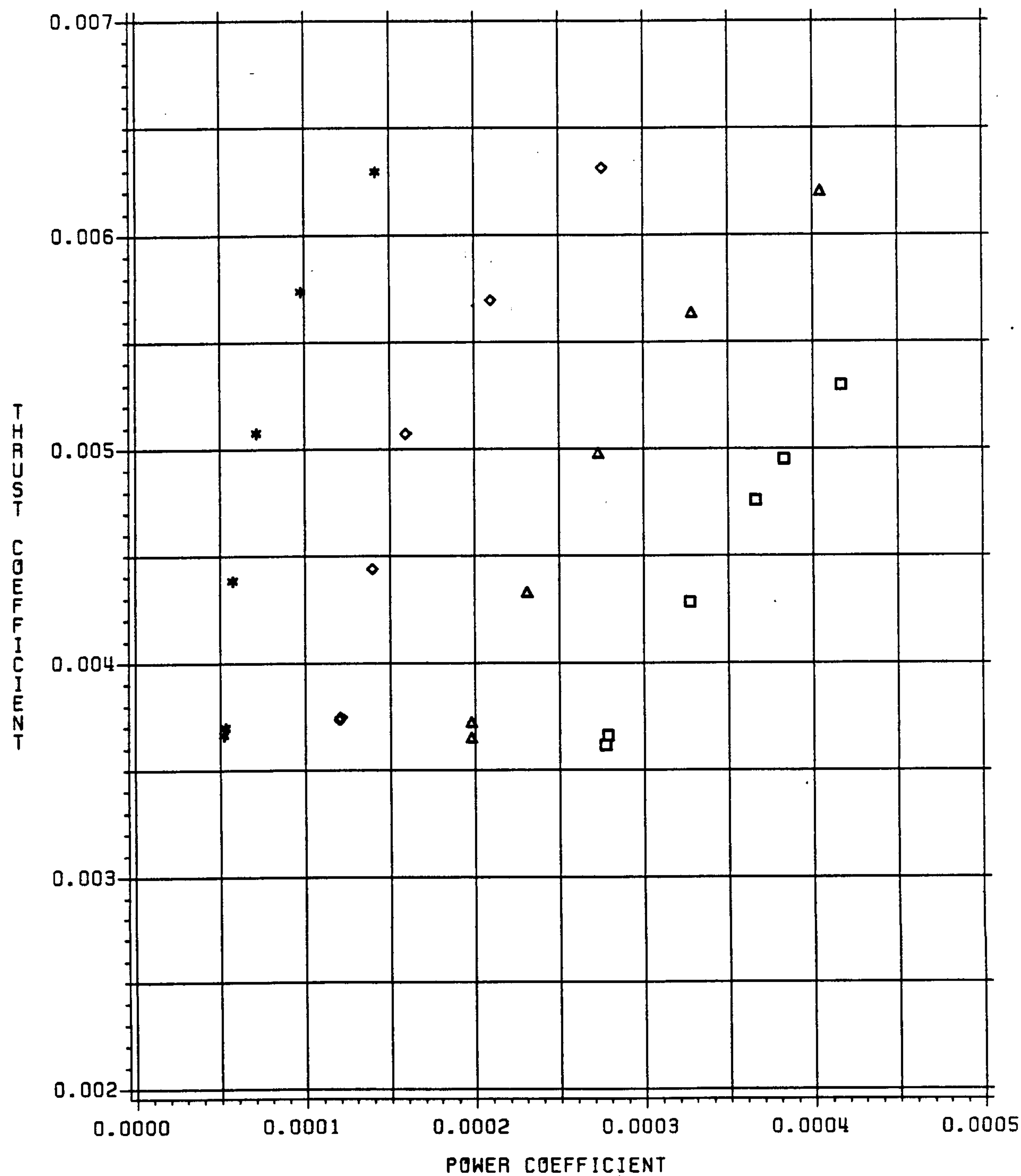
MAIN ROTOR LIFT/DRAG VS ROTOR CL

CONFIGURATION - HR (RUN 34)   MU = 0.25



MAIN ROTOR CT VS CP

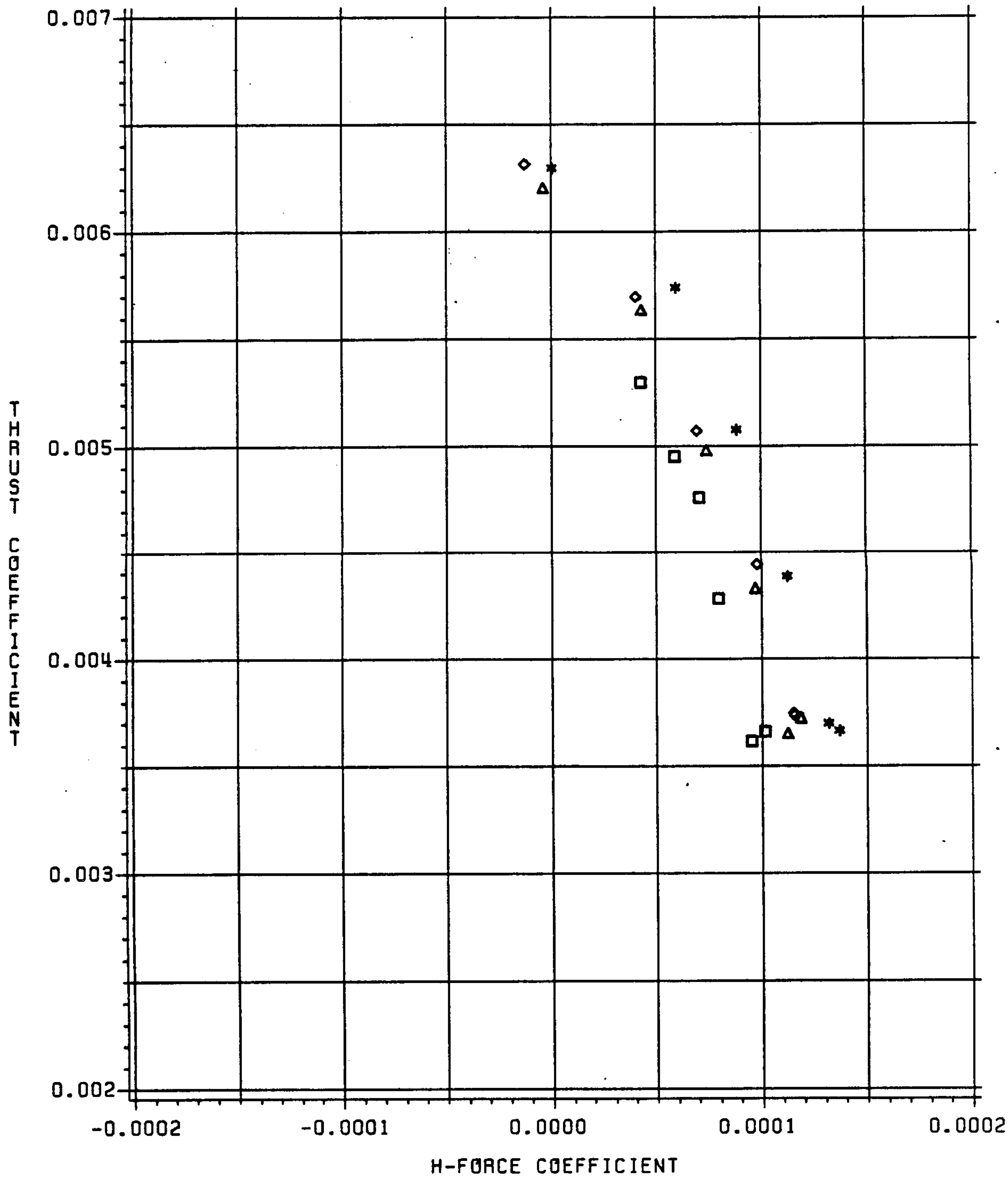
CONFIGURATION - HR (RUN 35)   MU = 0.30



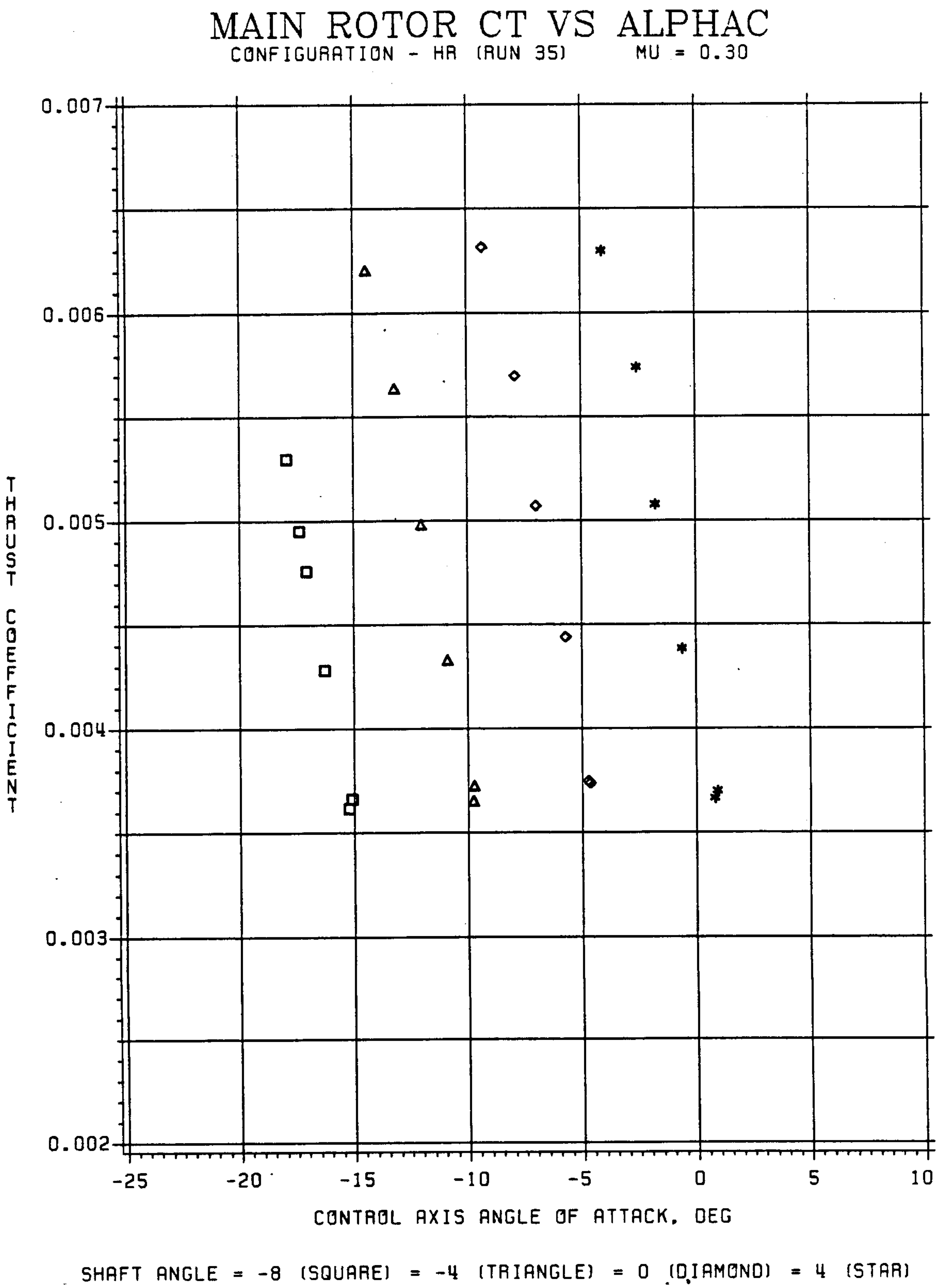
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CH

CONFIGURATION - HA (RUN 35)   MU = 0.30

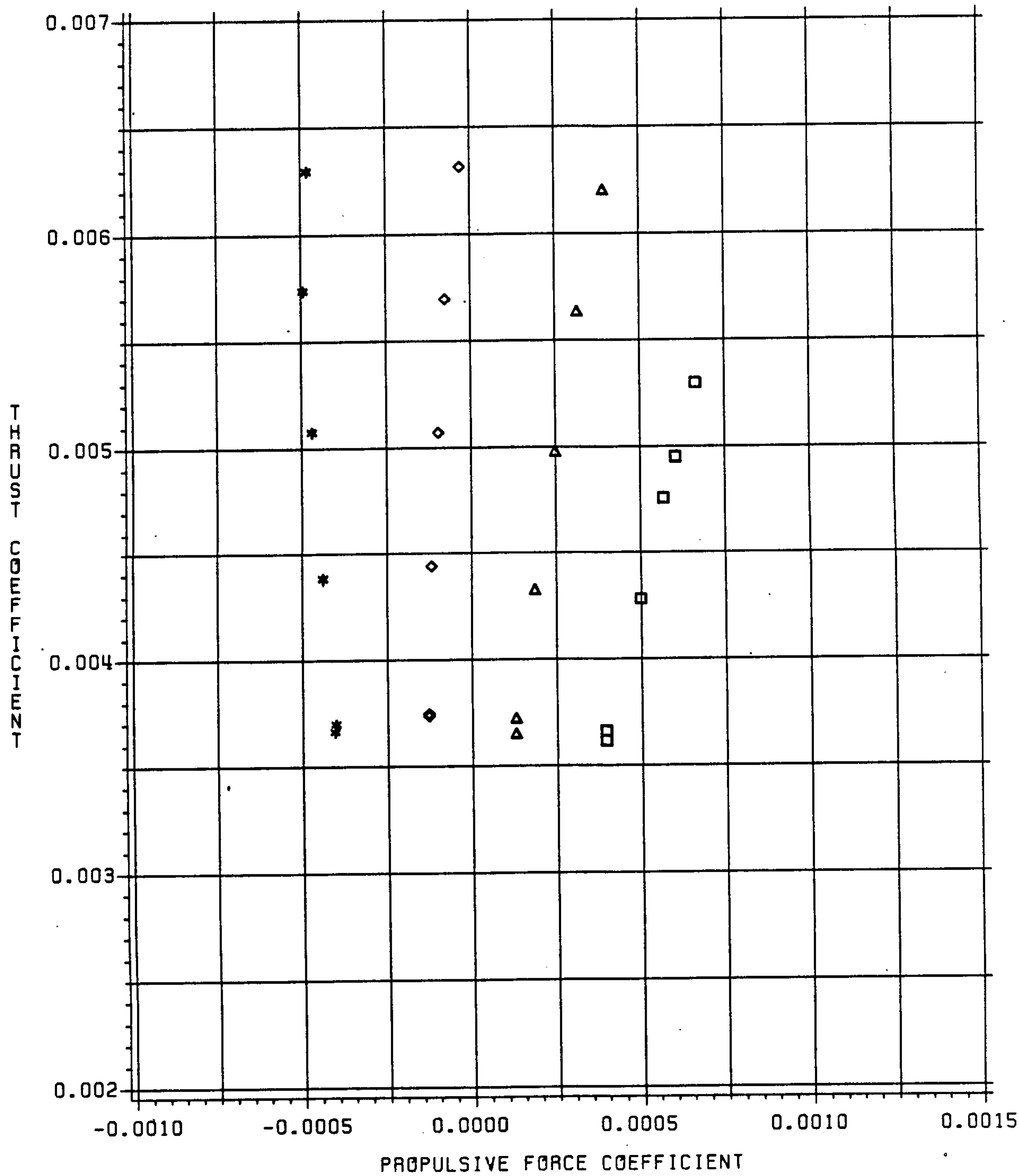


SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)


MAIN ROTOR CT VS ALPHAC
CONFIGURATION - HR (RUN 35)   MU = 0.30
0.007
0.006
0.005
0.004
0.003
0.002
THRUST COEFFICIENT
-25
-20
-15
-10
-5
0
5
10
CONTROL AXIS ANGLE OF ATTACK, DEG
SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR CT VS CX – FORWARD FLIGHT

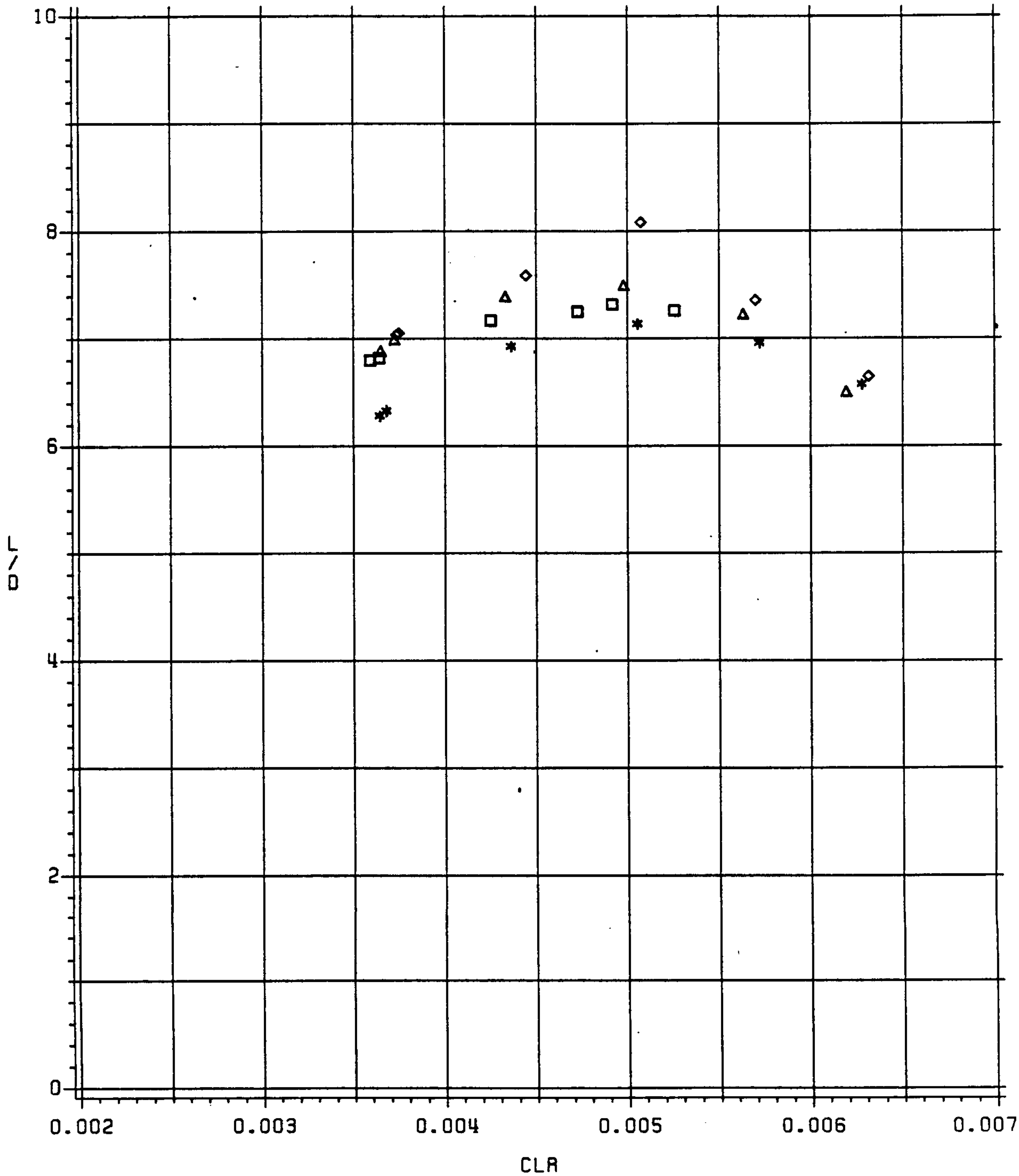
CONFIGURATION - HR (RUN 35) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

MAIN ROTOR LIFT/DRAG VS ROTOR CL

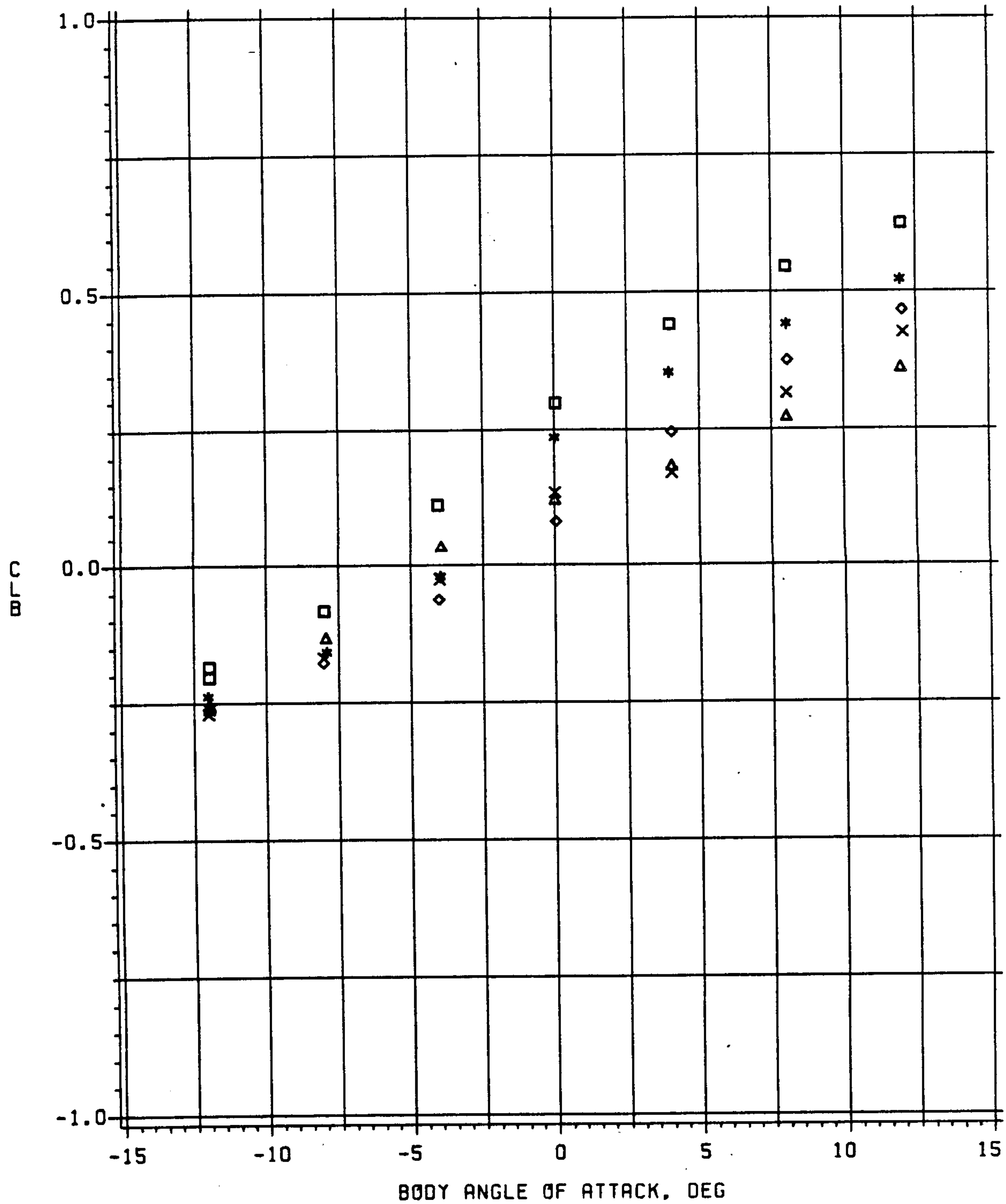
CONFIGURATION - HR (RUN 35) MU = 0.30



SHAFT ANGLE = -8 (SQUARE) = -4 (TRIANGLE) = 0 (DIAMOND) = 4 (STAR)

BODY LIFT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

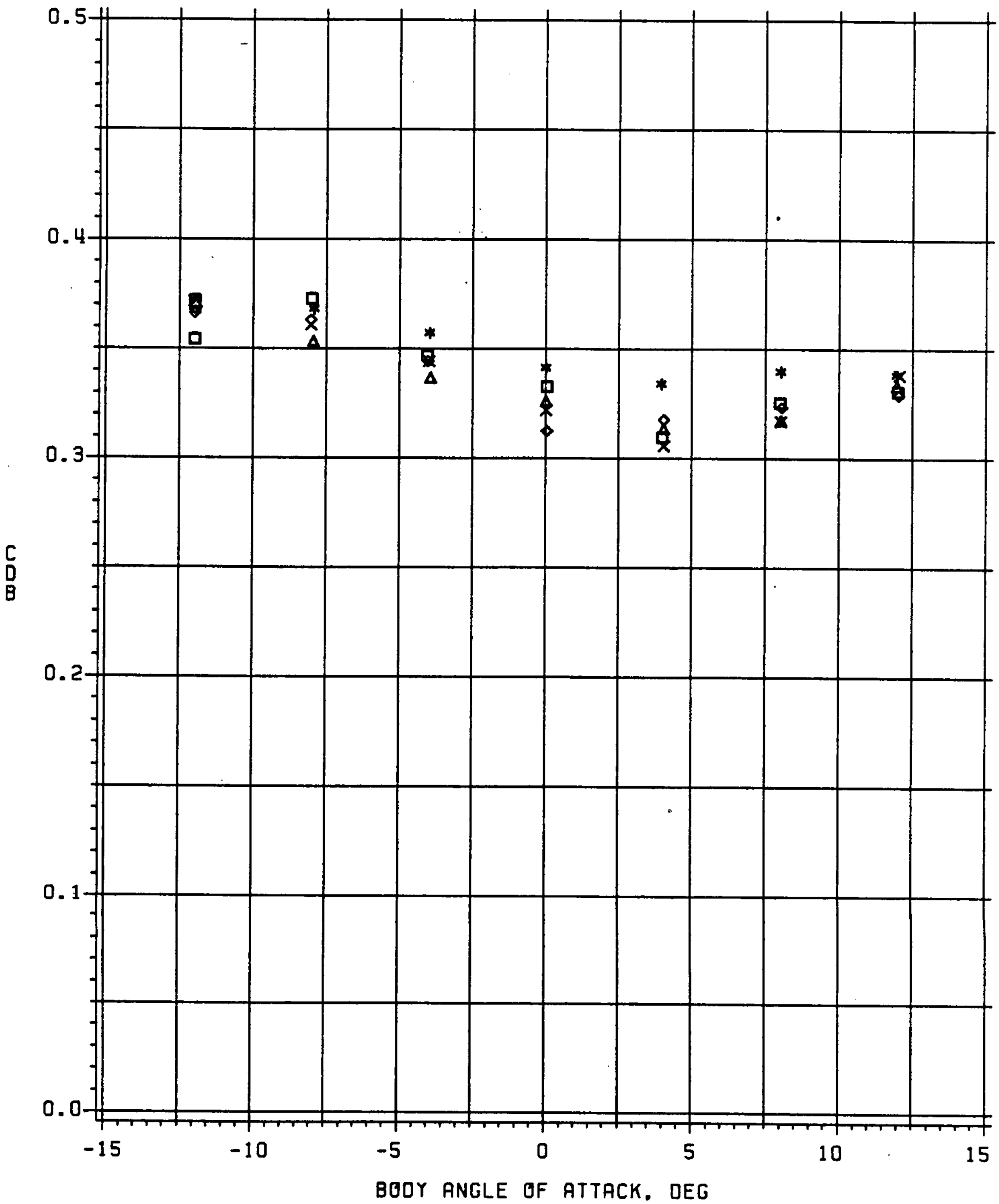
CONFIGURATION BHF2U RUN 46



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

BODY DRAG COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

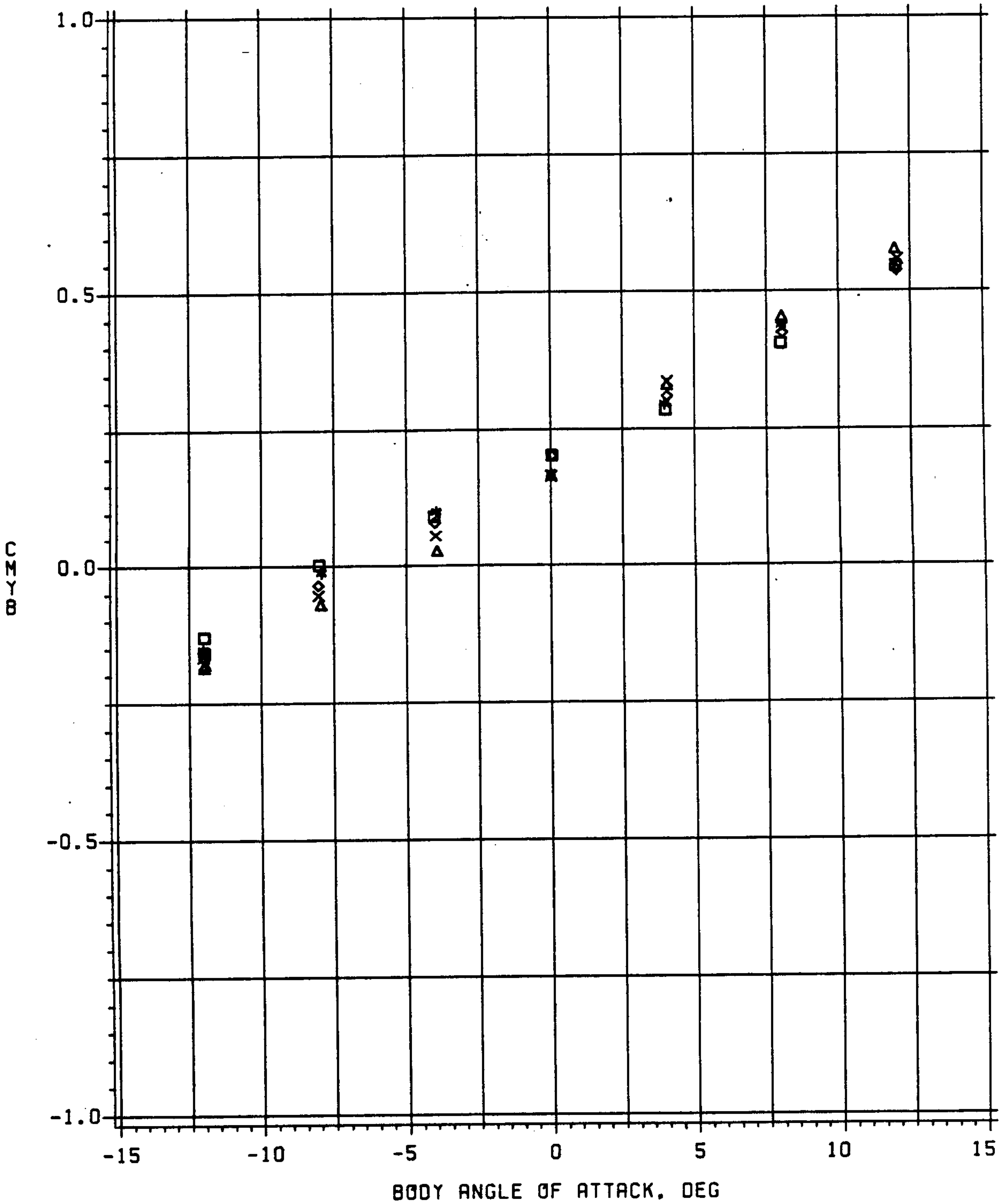
CONFIGURATION BHF2U RUN 46



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

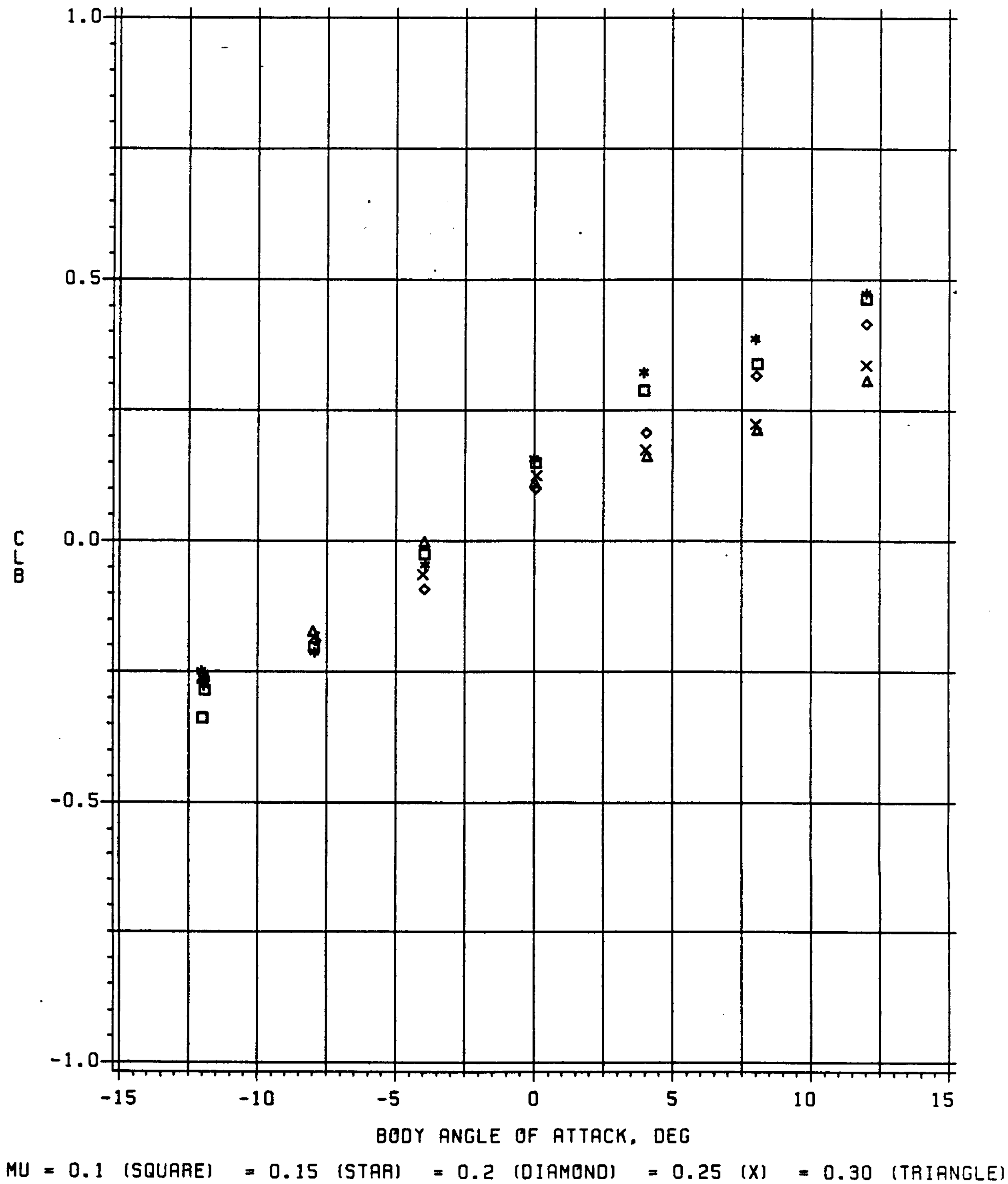
CONFIGURATION BHF2U   RUN 46



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

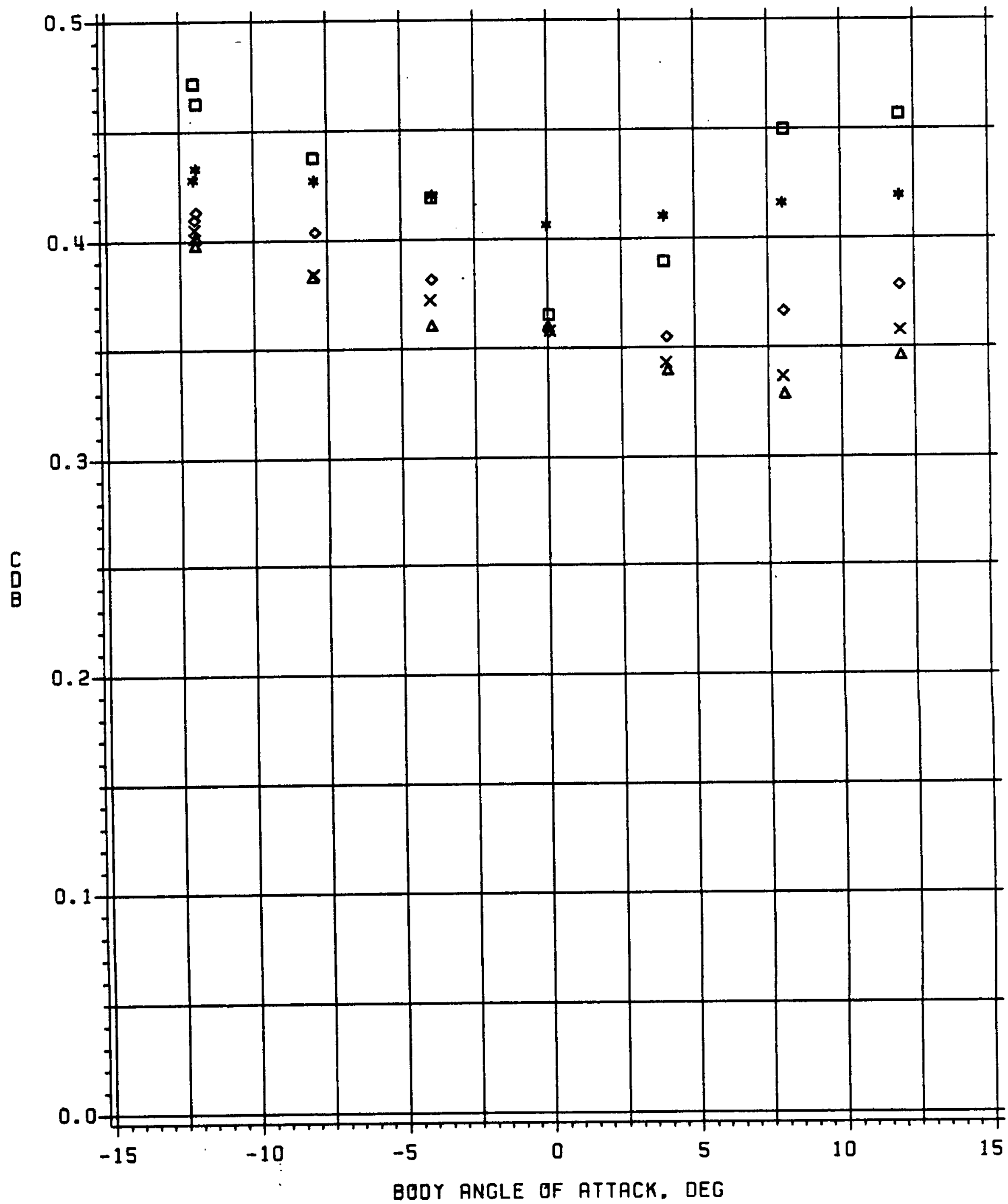
BODY LIFT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

CONFIGURATION BHF2L RUN 51



BODY DRAG COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

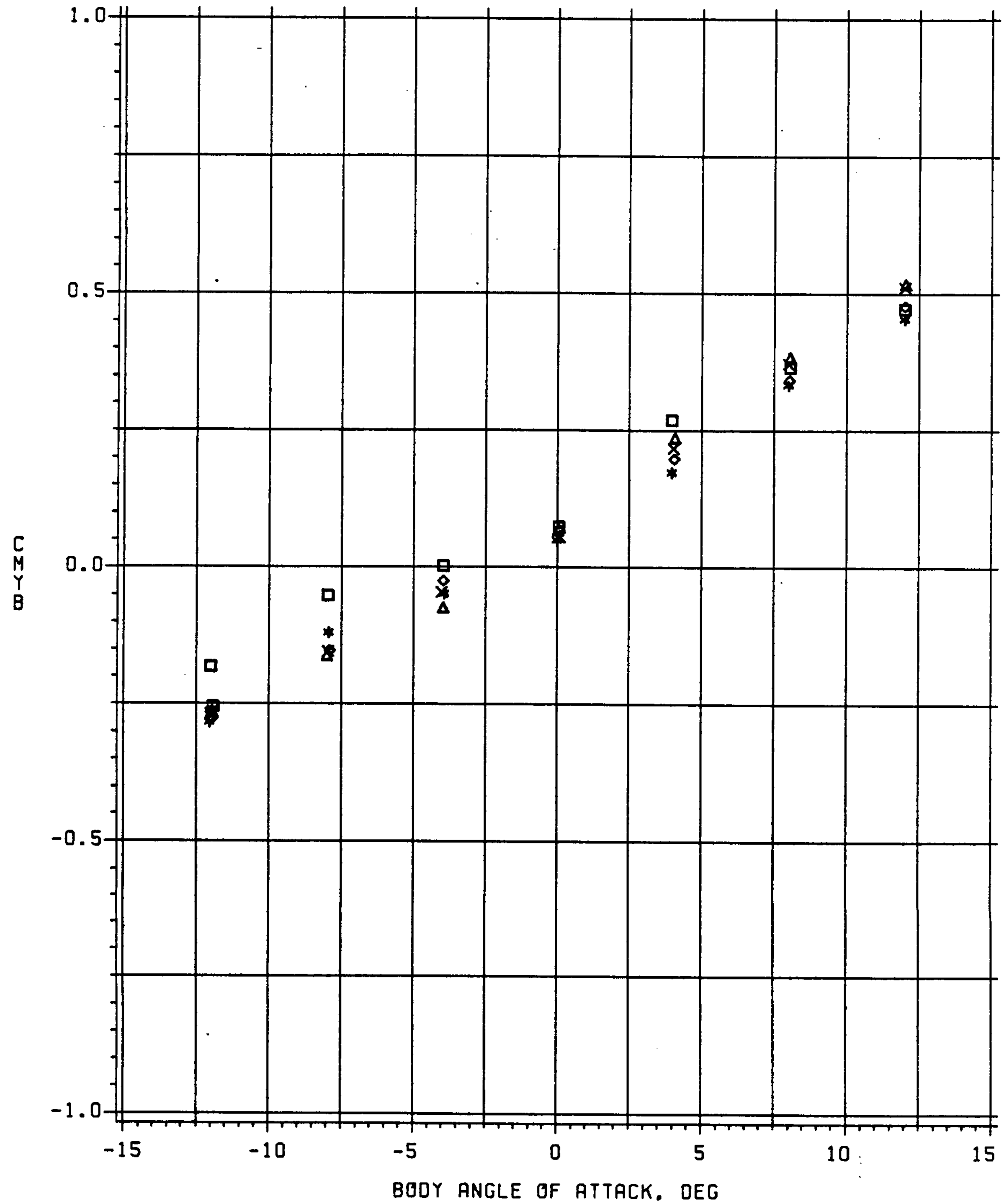
CONFIGURATION BHF2L RUN 51



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

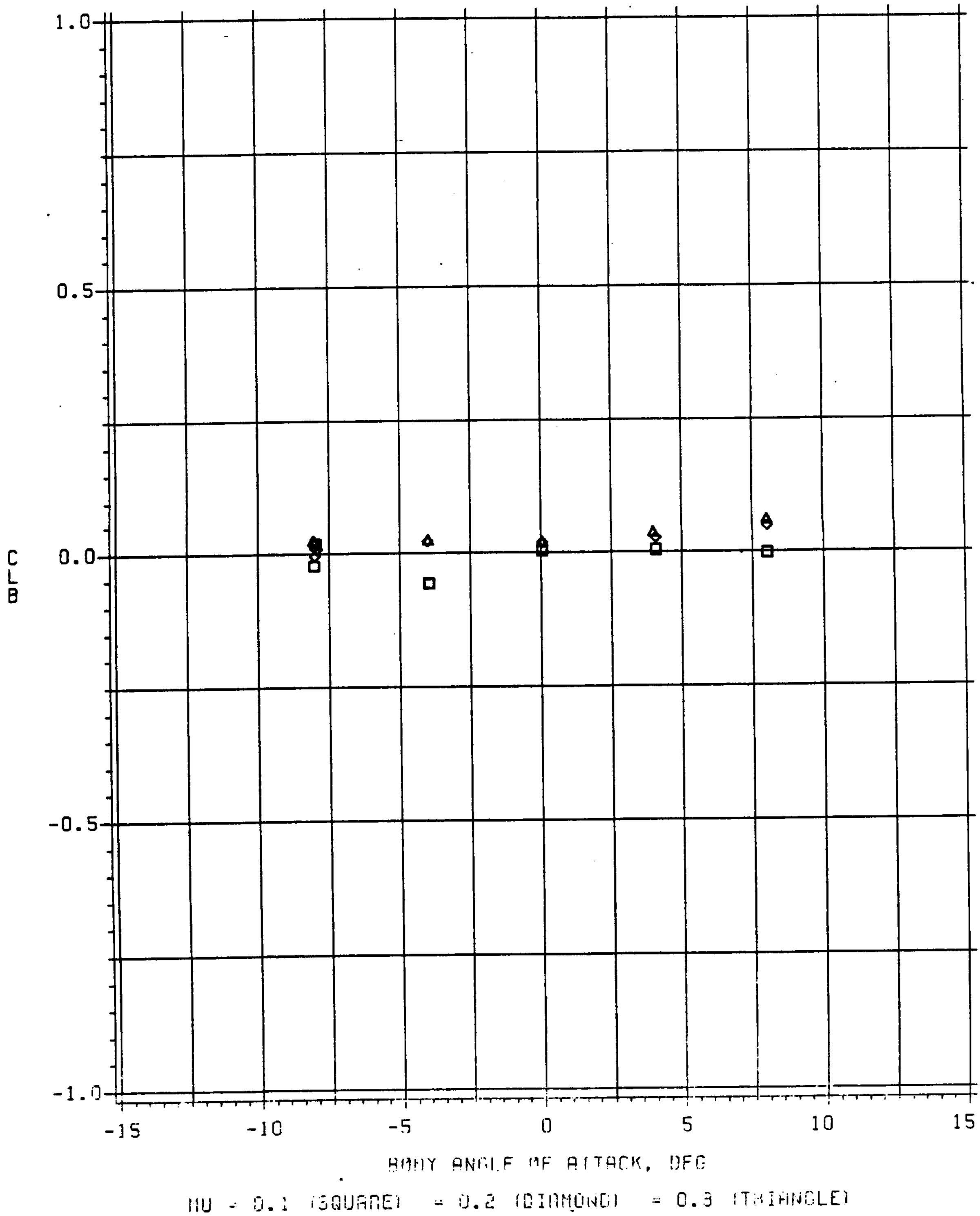
CONFIGURATION BHF2L RUN 51



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

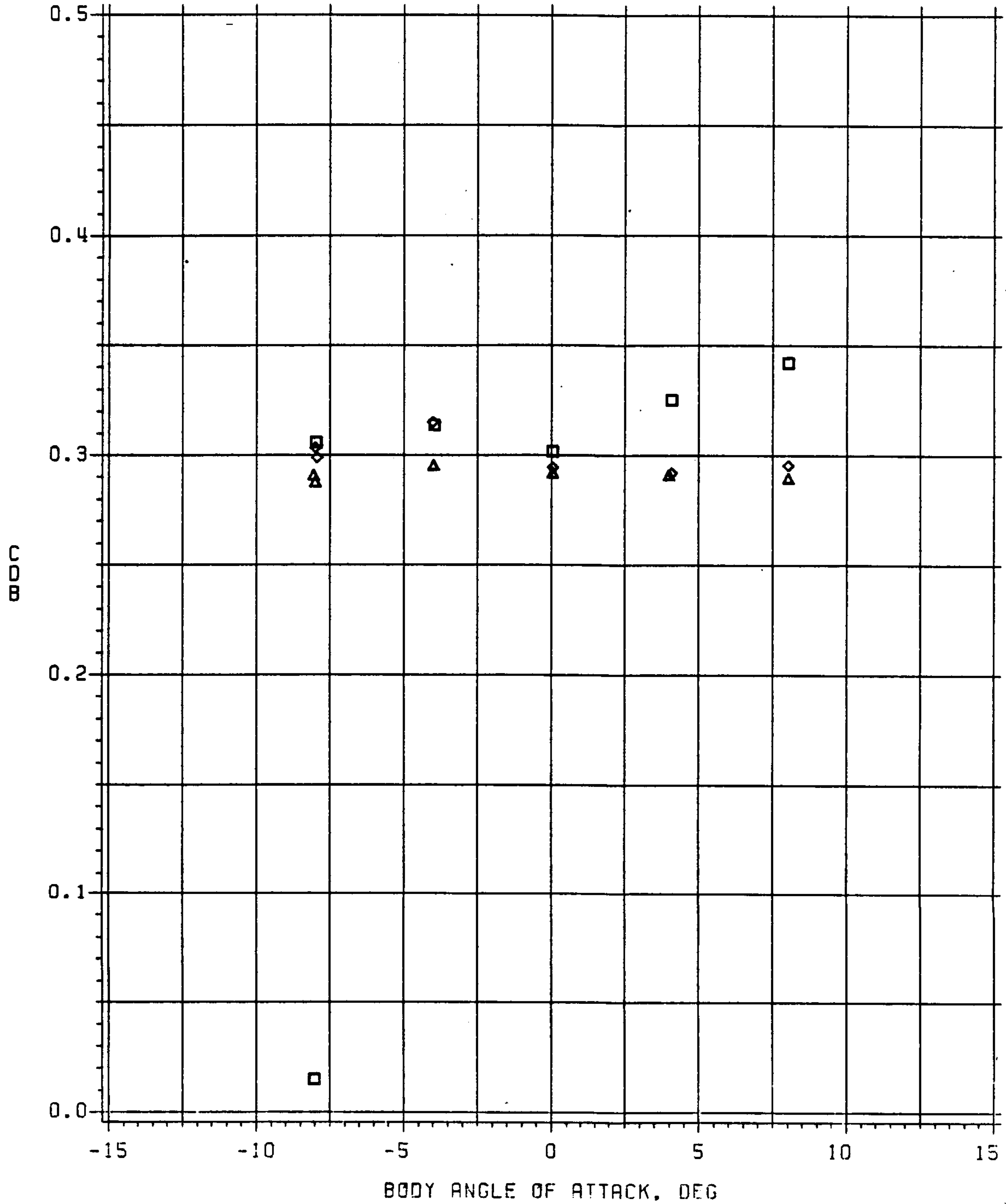
ISOLATED BODY LIFT COEFFICIENT VS ANGLE OF ATTACK

CONFIGURATION BHFWO RUN 56



ISOLATED BODY DRAG COEFFICIENT VS ANGLE OF ATTACK

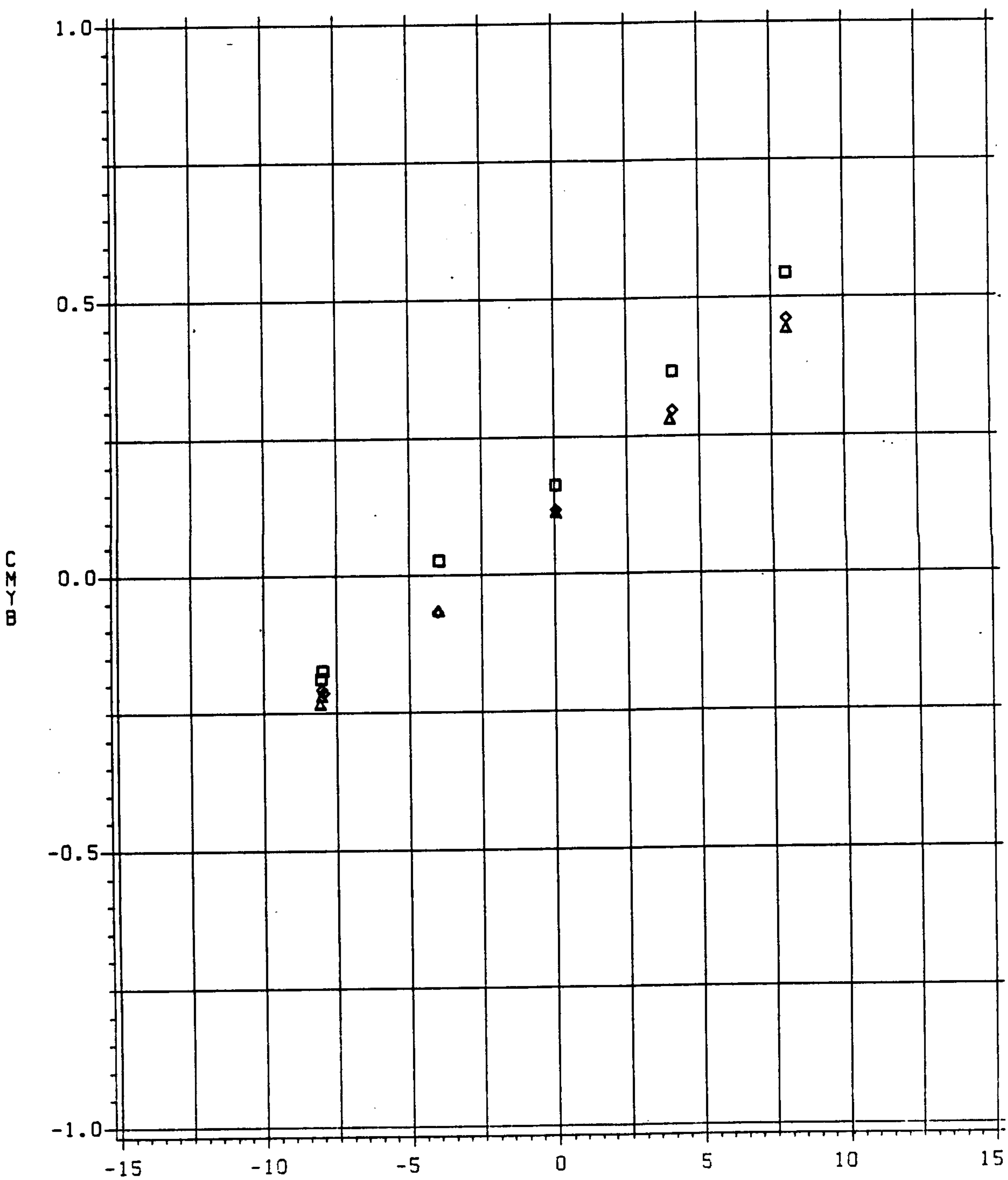
CONFIGURATION BHFWO   RUN 56



MU = 0.1 (SQUARE)   = 0.2 (DIAMOND)   = 0.3 (TRIANGLE)

ISOLATED BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK

CONFIGURATION BHFWO RUN 56

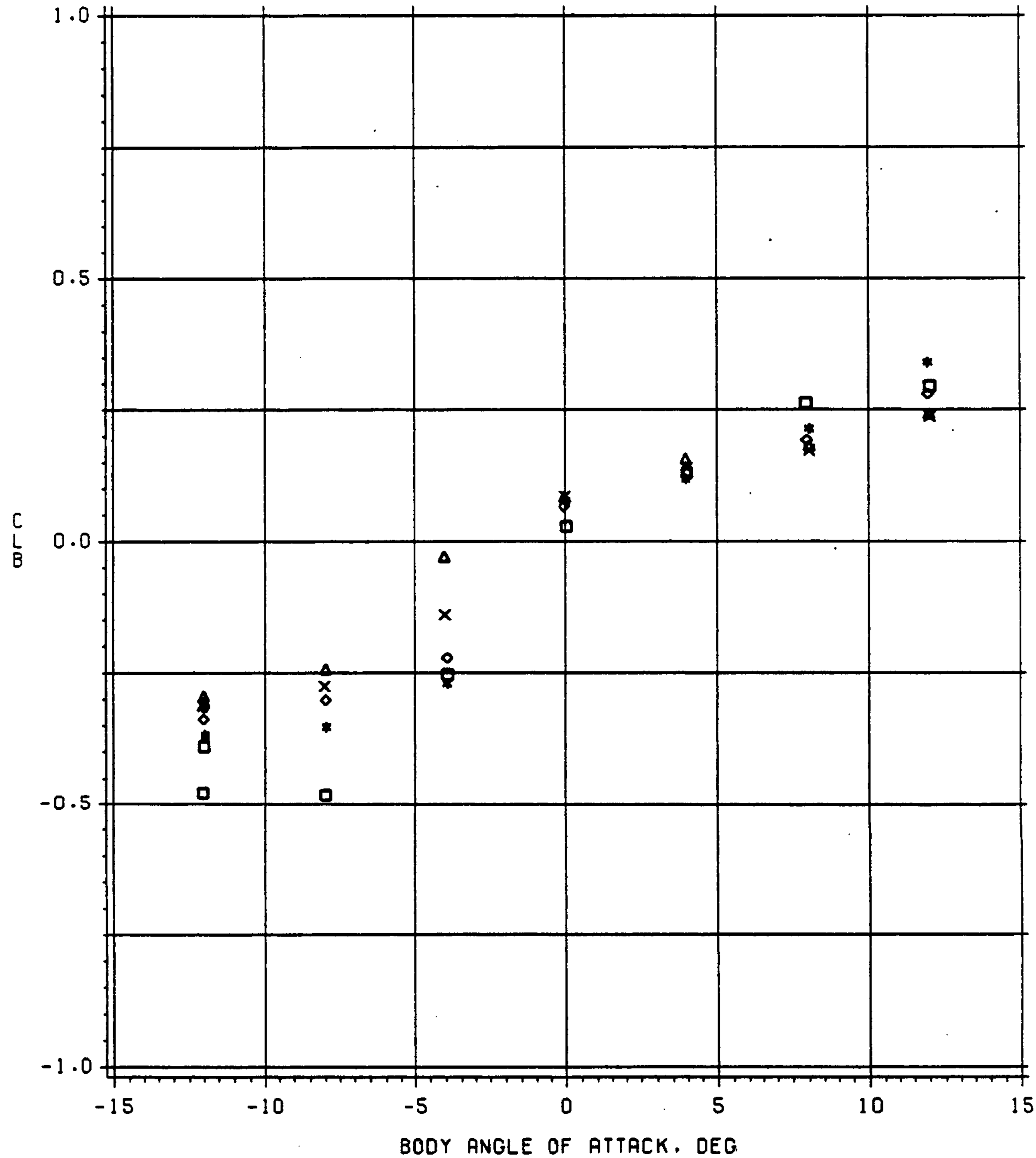


MU = 0.1 (SQUARE) = 0.2 (DIAMOND) = 0.3 (TRIANGLE)

ORIGINAL PAGE IS
OF POOR QUALITY

BODY LIFT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

CONFIGURATION BH RUN 59

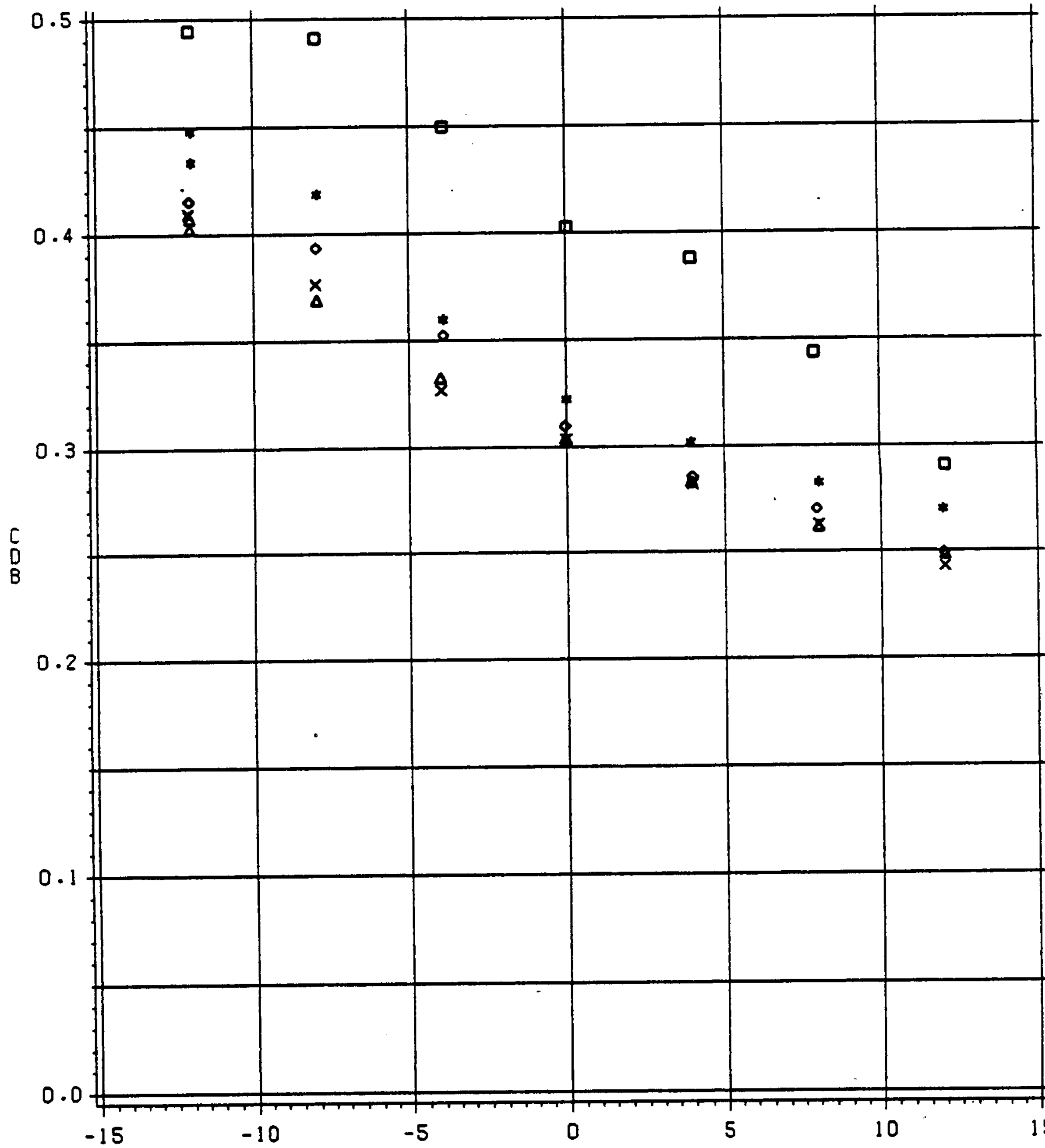


MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

ORIGINAL PAGE IS
OF POOR QUALITY

BODY DRAG COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

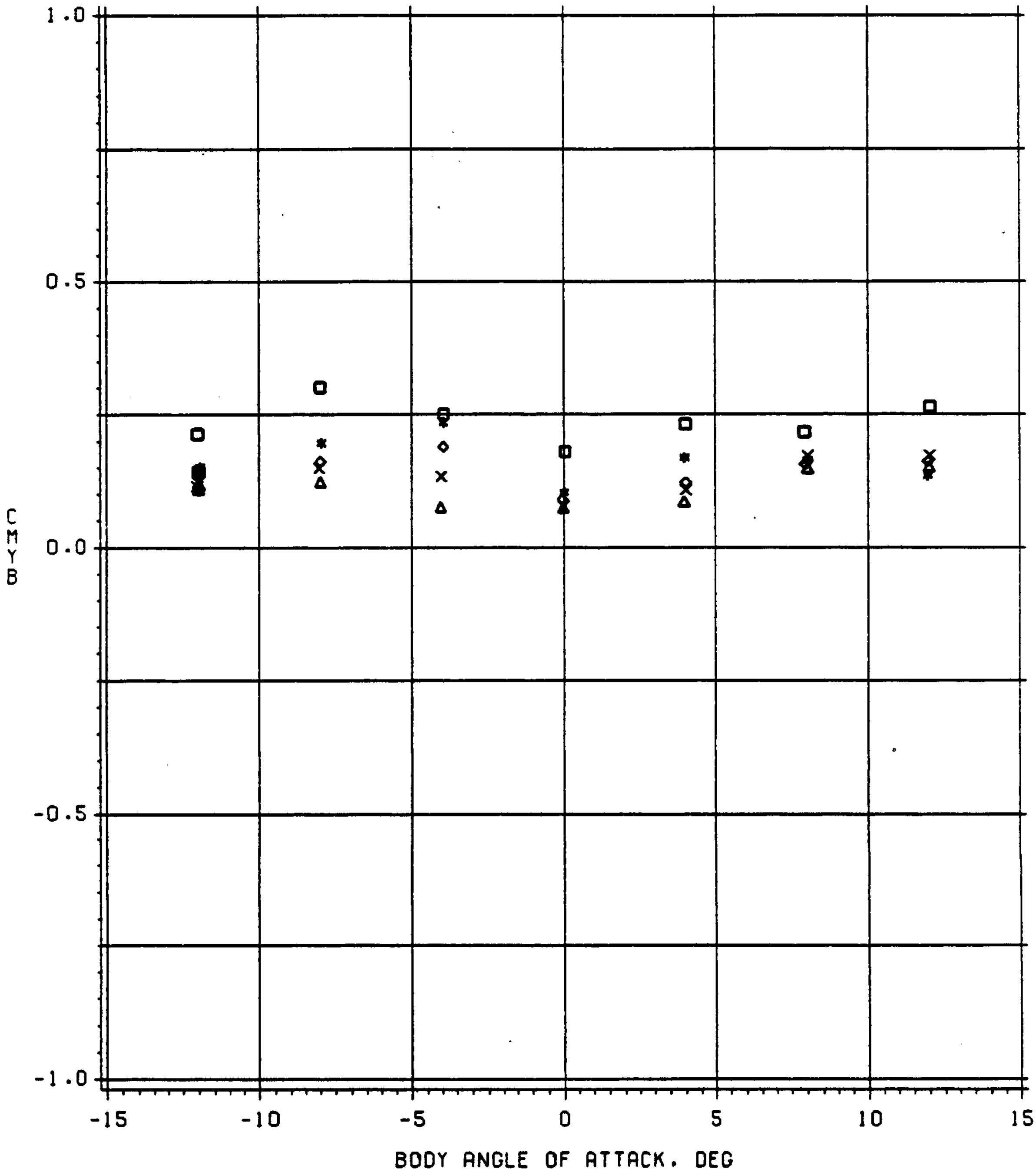
CONFIGURATION BH   RUN 59



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK (HUB ON)

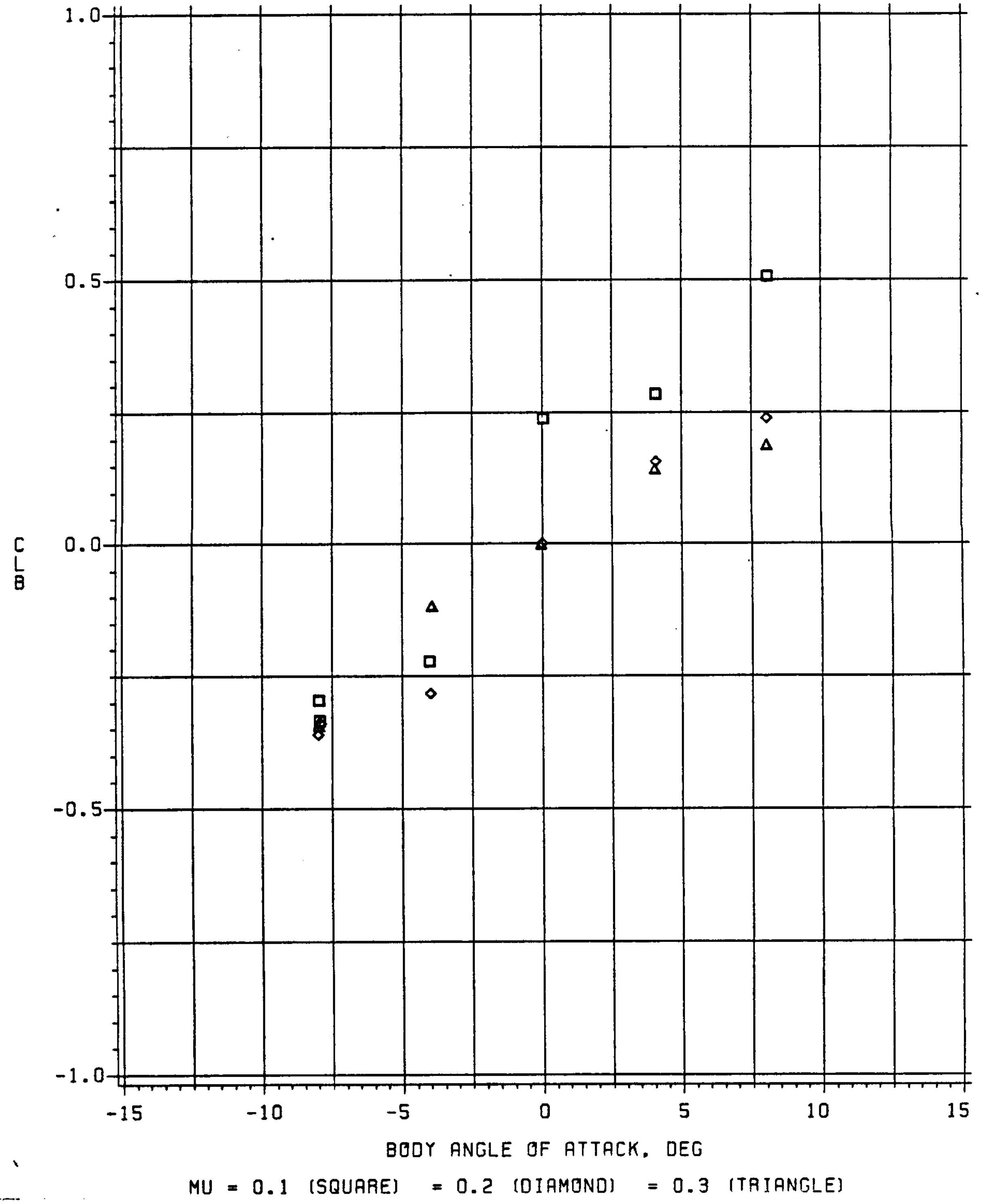
CONFIGURATION BH RUN 59



MU = 0.1 (SQUARE) = 0.15 (STAR) = 0.2 (DIAMOND) = 0.25 (X) = 0.30 (TRIANGLE)

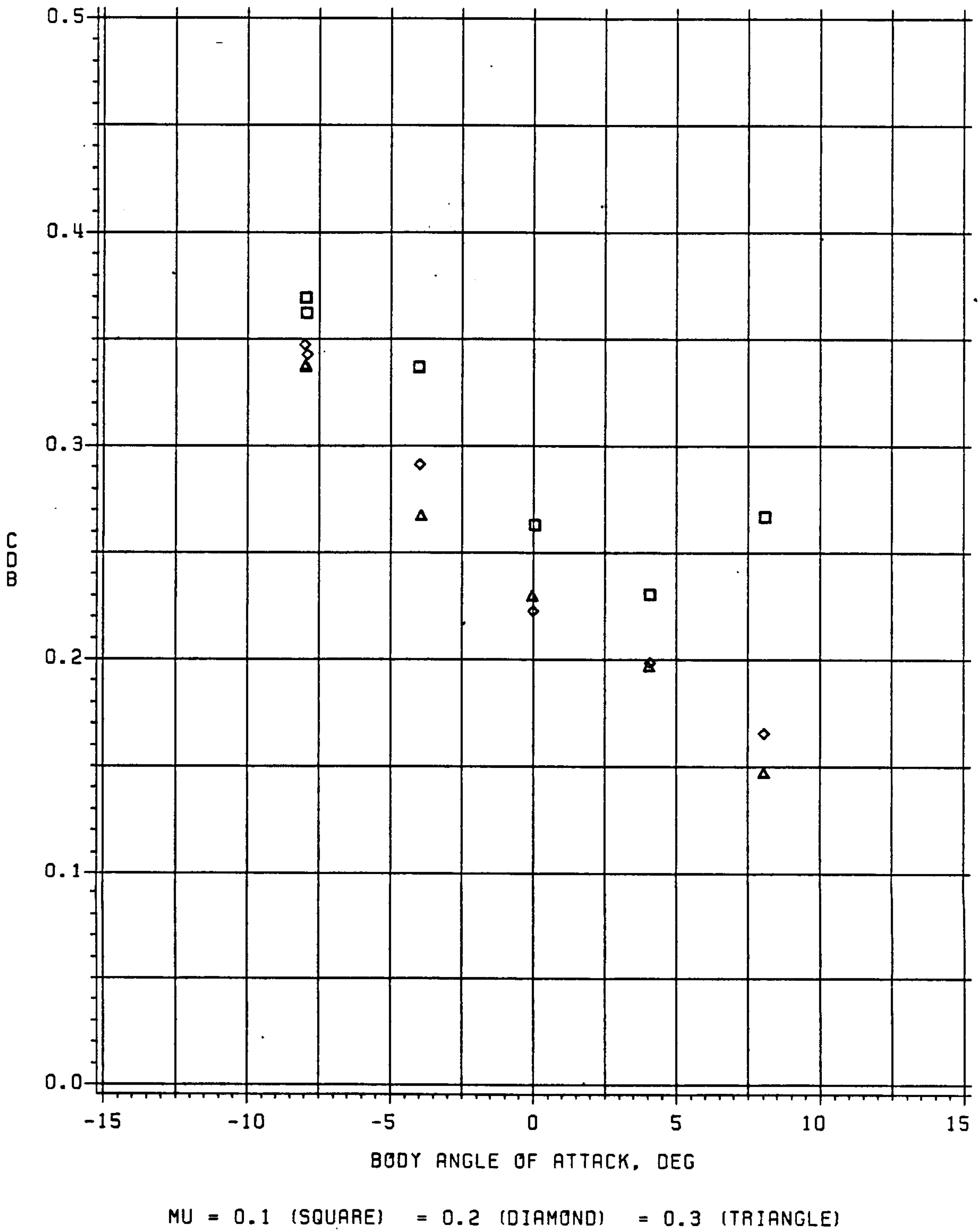
ISOLATED BODY LIFT COEFFICIENT VS ANGLE OF ATTACK

CONFIGURATION B RUN 64



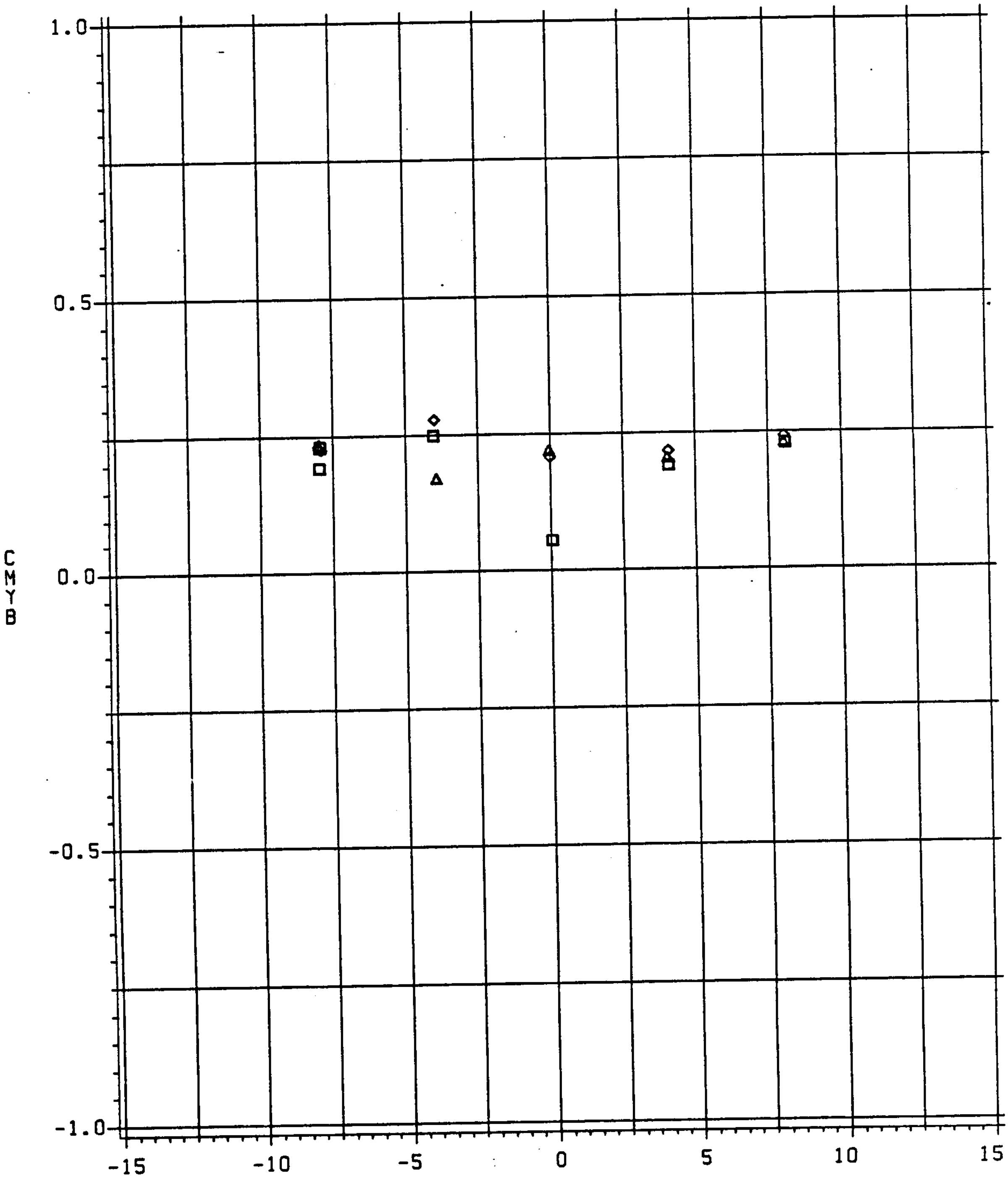
ISOLATED BODY DRAG COEFFICIENT VS ANGLE OF A[illegible]K

CONFIGURATION B RUN 64



ISOLATED BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK

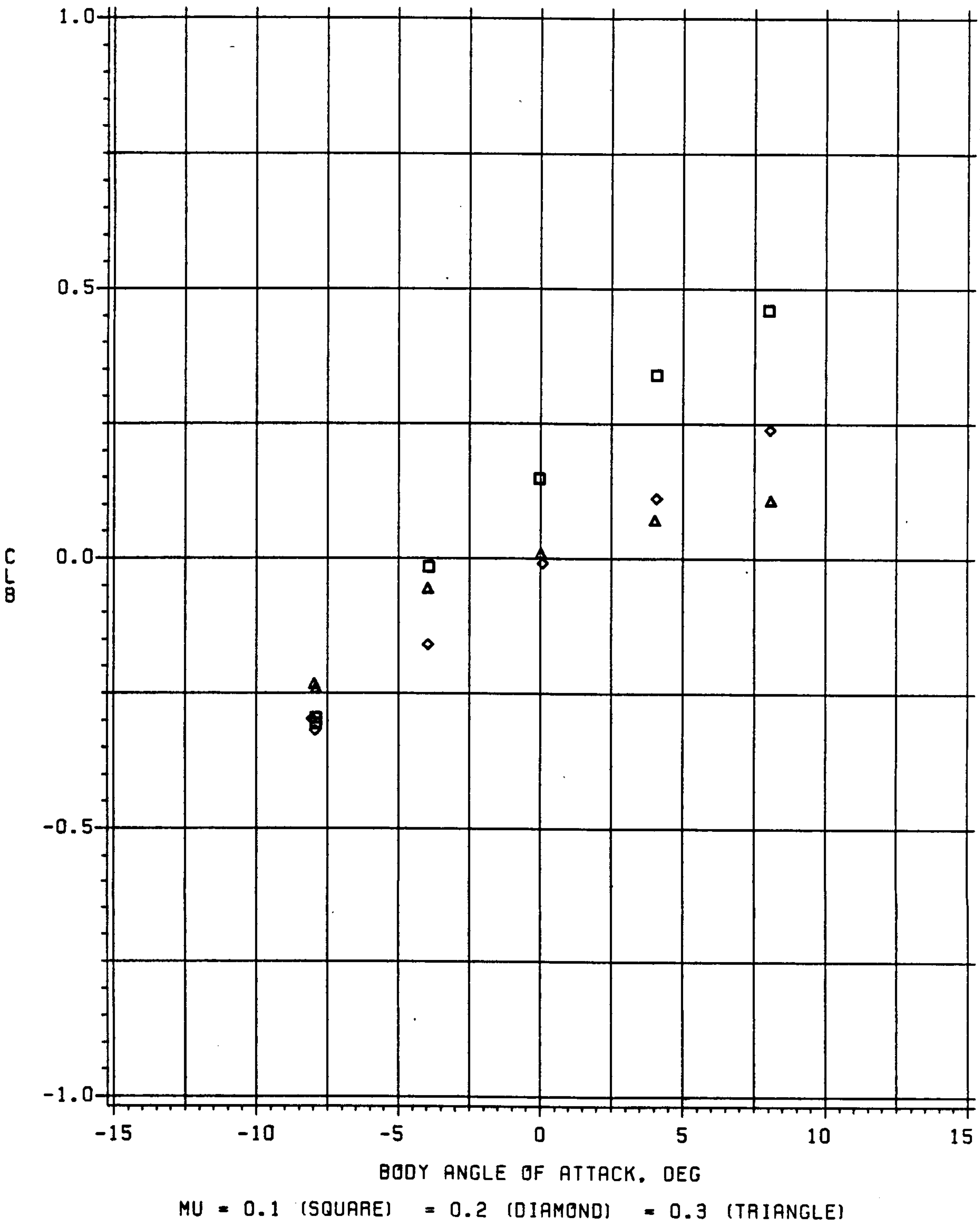
CONFIGURATION B RUN 64



MU = 0.1 (SQUARE) = 0.2 (DIAMOND) = 0.3 (TRIANGLE)

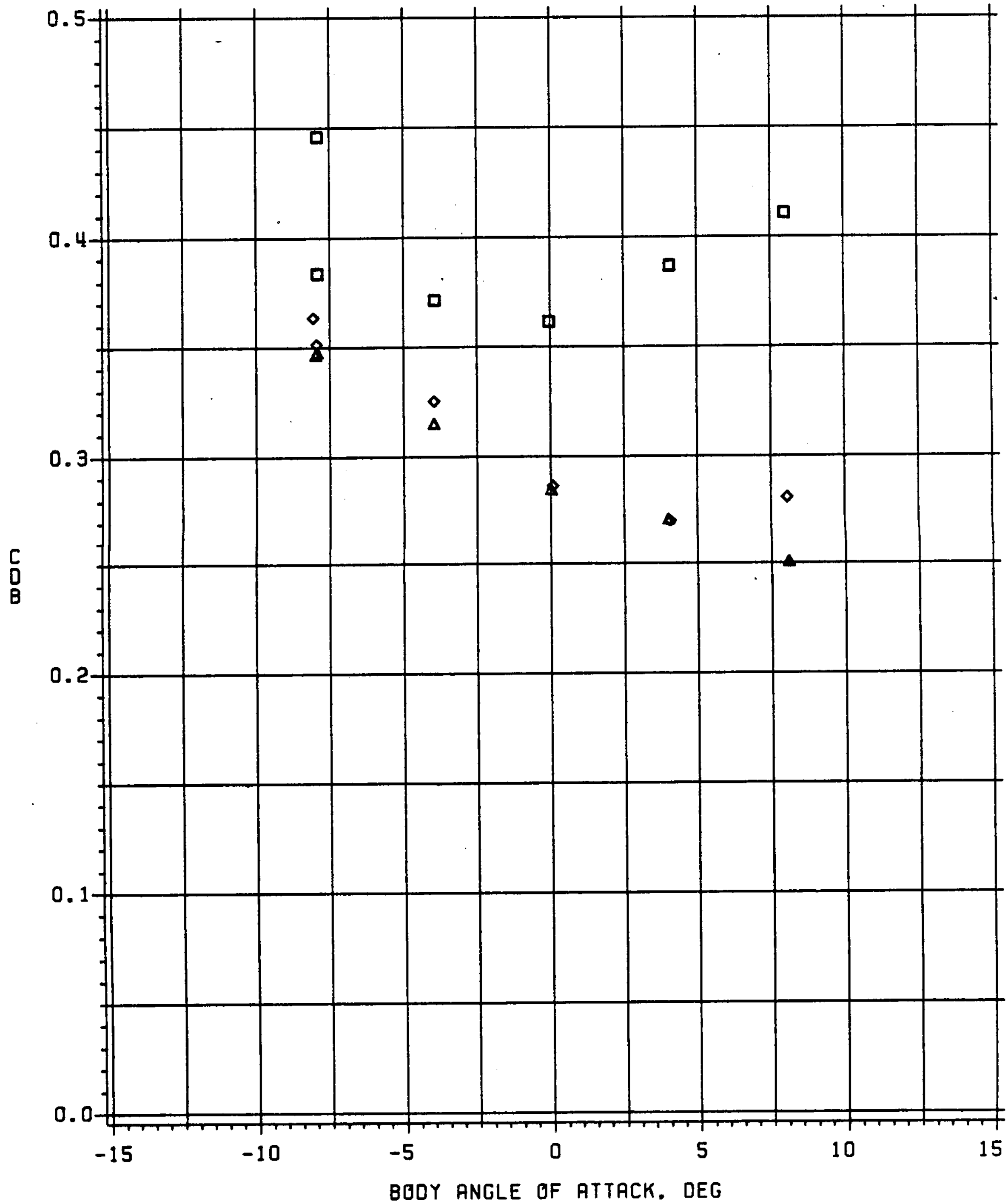
ISOLATED BODY LIFT COEFFICIENT VS ANGLE OF ATTACK

CONFIGURATION BF2L RUN 67



ISOLATED BODY DRAG COEFFICIENT VS ANGLE OF ATTACK

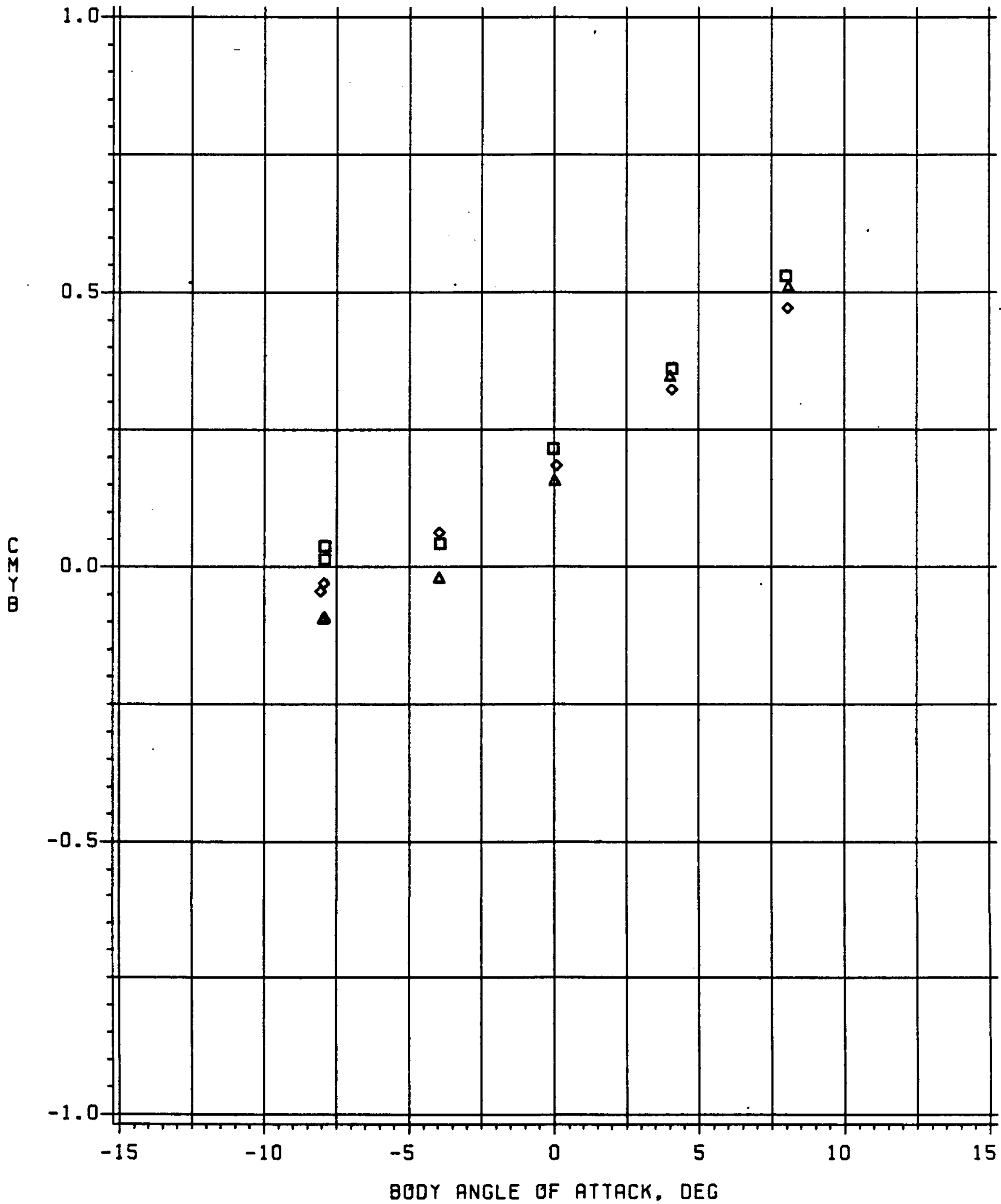
CONFIGURATION BF2L RUN 67



MU = 0.1 (SQUARE) = 0.2 (DIAMOND) = 0.3 (TRIANGLE)

ISOLATED BODY PITCHING MOMENT COEFFICIENT VS ANGLE OF ATTACK

CONFIGURATION BF2L RUN 67



MU = 0.1 (SQUARE) = 0.2 (DIAMOND) = 0.3 (TRIANGLE)

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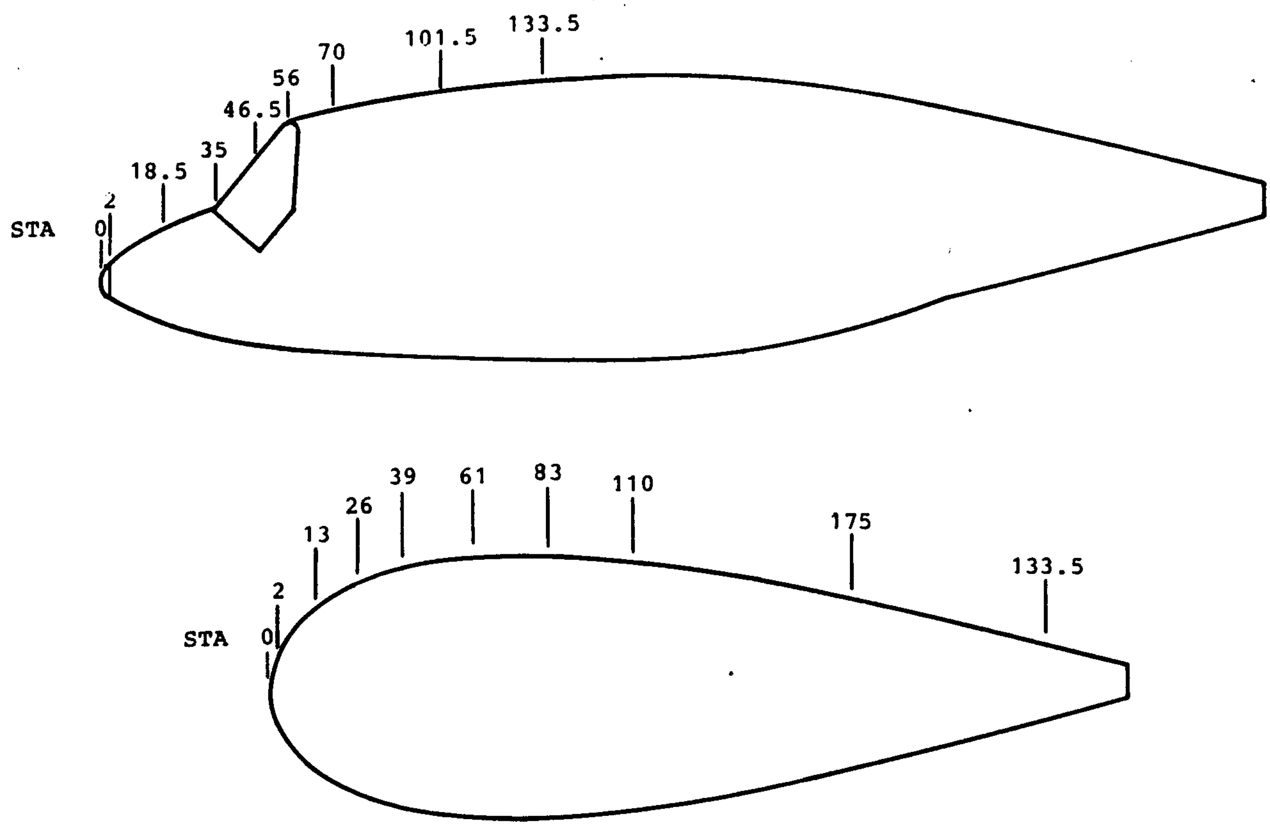
APPENDIX C

PRESSURE DATA AND BODY CONTOUR DEFINITION

This appendix is a tabulation of pressure data which was reduced for analysis and presentation in this report. The contour definitions used for pressure and off-body velocity calculations of configurations B and BF2L are also included.

The pressure data is ordered by run number. The data include configuration, record number, test condition, pressure tap number and pressure coefficient.

Figure C-1 shows the stations at which pressure taps were located on configurations B and BF2L. Tables C-1 and C-2 list the x, y, and z coordinates which define the pressure tap locations for configurations B and BF2L respectively. Tables C-3 and C-4 list the coordinates used to define respectively configuration B and BF2L contours.



NOTE: Stations are full scale.

Figure C-1. Definition of pressure tap stations for configurations B and BF2L.

Table C-1. Pressure tap locations for configuration B.

Pressure Tap Number	x/l_B*	y/l_B	z/l_B
1	0	0	0
2	.0074	0	.0369
3	.0074	0	-.0369
4	.0277	0	.0623
5	.0277	0	-.0623
6	.0480	0	.0874
7	.0480	.0437	.0757
8	.0480	0	-.0874
9	.0480	-.0437	.0757
10	.0960	0	.1152
11	.0960	.0576	.0998
12	.0960	-.0576	.0998
13	.1440	.0657	.1139
15	.1883	.0695	.1256
16	.1883	-.0695	.1256
17	.3065	0	.1470
18	.3065	.0735	.1273
19	.3065	-.0735	.1273
20	.4062	0	.1403
21	.4062	.0702	.1215
22	.4062	-.0702	.1215
23	.5281	0	.1219
24	.6094	0	.1060
25	.7682	0	.0660
26	.8642	0	.0424
27	.8642	0	.0424
28	1.0000	0	0

*All coordinates ratioed to body length where l_B = 3.385 ft.

Table C-2. Pressure tap locations for configuration BF2L.

Pressure tap Number	x/l_B*	y/l_B	z/l_B
29	0	0	-.0577
30	.0055	0	-.0426
31	.0055	0	-.0705
32	.0282	0	-
33	.0282	0	-
34	.0508	0	-.0102
35	.0508	.0577	-.0204
36	.0508	.0801	-.0342
37	.0508	.0833	-.0489
38	.0508	.0644	-.0841
39	.0508	0	-.0877
40	.0508	-.0644	-.0841
41	.0508	-.0833	-.0489
42	.0508	-.0801	-.0342
43	.0508	-.0577	-.0204
44	.0962	0	-.0001
45	.0962	.0657	-.0113
46	.0962	-.0657	-.0113
47	.1278	0	.0390
48	.1278	.0758	.0152
49	.1278	0	-.1142
50	.1278	-.0758	.0152
51	.1539	0	.0704
52	.1539	.0728	.0496
53	.1539	-.0728	.0496
54	.1923	0	.0809
55	.1923	.0817	.0596
56	.1923	0	-.0201
57	.1923	-.0817	.0596
58	.2789	0	.0945
59	.2789	.0728	.0638
60	.2789	0	-.1259
61	.2789	-.0728	.0638

*All coordinates ratioed to body length where l_B = 4.55 ft.

Table C-2. (concluded)

Pressure tap Number	x/l_B	y/l_B	z/l_B
17	.3065	0	.1094
18	.3065	.0547	.0947
19	.3065	-.0547	.0947
20	.4062	0	.1044
21	.4062	.0522	.0904
22	.4062	-.0522	.0904
23	.5281	0	.0907
24	.6094	0	.0789
25	.8275	0	.0491
26	.8990	0	.0315
27	.8990	0	.0315
28	1.0	0	0

Table C-3. Configuration B contour definition, full scale.

3D COORDINATES DISPLAY

BODY OF REVOLUTION

BODY NO. - 1 STATION NO. - 1 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	0.0	0.0	0.10000
2	0.0	0.01736	0.09848
3	0.0	0.03420	0.09397
4	0.0	0.05000	0.08660
5	0.0	0.06428	0.07660
6	0.0	0.07660	0.06428
7	0.0	0.08660	0.05000
8	0.0	0.09397	0.03420
9	0.0	0.09848	0.01737
10	0.0	0.10000	0.0
11	0.0	0.09848	-0.01737
12	0.0	0.09397	-0.03420
13	0.0	0.08660	-0.05000
14	0.0	0.07660	-0.06428
15	0.0	0.06428	-0.07660
16	0.0	0.05000	-0.08660
17	0.0	0.03420	-0.09397
18	0.0	0.01736	-0.09848
19	0.0	0.0	-0.10000

BODY NO. - 1 STATION NO. - 2 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	12.86000	0.0	23.57001
2	12.86000	4.09289	23.21191
3	12.86000	8.06141	22.14856
4	12.86000	11.78500	20.41222
5	12.86000	15.15050	18.05566
6	12.86000	18.05566	15.15052
7	12.86000	20.41222	11.78503
8	12.86000	22.14856	8.06143
9	12.86000	23.21191	4.09296
10	12.86000	23.57001	0.0
11	12.86000	23.21191	-4.09296
12	12.86000	22.14856	-8.06143
13	12.86000	20.41222	-11.78503
14	12.86000	18.05566	-15.15052
15	12.86000	15.15050	-18.05566
16	12.86000	11.78500	-20.41222
17	12.86000	8.06141	-22.14856
18	12.86000	4.09289	-23.21191
19	12.86000	0.0	-23.57001

BODY NO. - 1 STATION NO. - 3 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	25.71001	0.0	31.03999
2	25.71001	5.39003	30.56842
3	25.71001	10.61630	29.16806
4	25.71001	15.51999	26.88141
5	25.71001	19.95212	23.77802
6	25.71001	23.77800	19.95213
7	25.71001	26.88141	15.52003
8	25.71001	29.16806	10.61633
9	25.71001	30.56842	5.39007
10	25.71001	31.03999	0.0
11	25.71001	30.56842	-5.39007
12	25.71001	29.16805	-10.61633
13	25.71001	26.88141	-15.52003
14	25.71001	23.77800	-19.95213
15	25.71001	19.95212	-23.77802
16	25.71001	15.51999	-26.88141
17	25.71001	10.61630	-29.16805
18	25.71001	5.39003	-30.56842
19	25.71001	0.0	-31.03999

BODY NO. - 1 STATION NO. - 4 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	38.57001	0.0	35.64999
2	38.57001	6.19055	35.10838
3	38.57001	12.19301	33.50003
4	38.57001	17.82498	30.87381
5	38.57001	22.91536	27.30948
6	38.57001	27.30946	22.91539
7	38.57001	30.87379	17.82501
8	38.57001	33.50003	12.19304
9	38.57001	35.10838	6.19062
10	38.57001	35.64999	0.0
11	38.57001	35.10838	-6.19062
12	38.57001	33.50003	-12.19304
13	38.57001	30.87379	-17.82501
14	38.57001	27.30946	-22.91539
15	38.57001	22.91536	-27.30948
16	38.57001	17.82498	-30.87381
17	38.57001	12.19301	-33.50003
18	38.57001	6.19055	-35.10838
19	38.57001	0.0	-35.64999

BODY NO. - 1 STATION NO. - 5 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	51.42999	0.0	38.23000
2	51.42999	6.63856	37.64919
3	51.42999	13.07542	35.92444
4	51.42999	19.11499	33.10814
5	51.42999	24.57376	29.28587
6	51.42999	29.28586	24.57378
7	51.42999	33.10814	19.11501
8	51.42999	36.92444	13.07546
9	51.42999	37.64919	6.63865
10	51.42999	38.23000	0.0
11	51.42999	37.64919	-6.63865
12	51.42999	35.92444	-13.07546
13	51.42999	33.10814	-19.11501
14	51.42999	29.28586	-24.57378
15	51.42999	24.57376	-29.28587
16	51.42999	19.11499	-33.10814
17	51.48999	13.07542	-35.92444
18	51.42999	6.63856	-37.64919
19	51.48999	0.0	-38.23000

BODY NO. - 1 STATION NO. - 6 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	64.28999	0.0	39.71001
2	64.28999	6.89557	39.10672
3	64.28999	13.58162	37.31519

ORIGINAL PAGE IS
OF POOR QUALITY

Table C-3. (continued)

ORIGINAL PAGE IS
OF POOR QUALITY

4	64.28999	19.85500	34.38988
5	64.28999	25.52509	30.41963
6	64.28999	30.41962	25.52512
7	64.28999	34.38986	19.85503
8	64.28999	37.31519	13.58167
9	64.28999	39.10672	6.89559
10	64.28999	39.71001	0.0
11	64.28999	39.10672	-6.89559
12	64.28999	37.31519	-13.58167
13	64.28999	34.38986	-19.85503
14	64.28999	30.41962	-25.52512
15	64.28999	25.52509	-30.41963
16	64.28999	19.85500	-34.38988
17	64.28999	13.58162	-37.31519
18	64.28999	6.89557	-39.10672
19	64.28999	0.0	-39.71001

BODY NO.- 1 STATION NO - 7 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	77.14000	0.0	39.97000
2	77.14000	6.94071	39.36276
3	77.14000	13.67054	37.55951
4	77.14000	19.98499	34.61504
5	77.14000	25.69221	30.61879
6	77.14000	30.61879	25.69223
7	77.14000	34.61502	19.98503
8	77.14000	37.55951	13.67057
9	77.14000	39.36276	6.94075
10	77.14000	39.97000	0.0
11	77.14000	39.36276	-6.94075
12	77.14000	37.55951	-13.67057
13	77.14000	34.61502	-19.98503
14	77.14000	30.61879	-25.69223
15	77.14000	25.69221	-30.61879
16	77.14000	19.98499	-34.61504
17	77.14000	13.67054	-37.55951
18	77.14000	6.94071	-39.36276
19	77.14000	0.0	-39.97000

BODY NO.- 1 STATION NO.- 8 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	90.00000	0.0	39.75000
2	90.00000	6.90251	39.14610
3	90.00000	13.59529	37.35277
4	90.00000	19.87498	34.42451
5	90.00000	25.55080	30.45027
6	90.00000	30.45026	25.55081
7	90.00000	34.42450	19.87502
8	90.00000	37.35277	13.59534
9	90.00000	39.14610	6.90255
10	90.00000	39.75000	0.0
11	90.00000	39.14610	-6.90255
12	90.00000	37.35277	-13.59534
13	90.00000	34.42450	-19.87502
14	90.00000	30.45026	-25.55081
15	90.00000	25.55080	-30.45027
16	90.00000	19.87498	-34.42451
17	90.00000	13.59529	-37.35277
18	90.00000	6.90251	-39.14610
19	90.00000	0.0	-39.75000

BODY NO.- 1 STATION NO - 9 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	102.89999	0.0	38.75999
2	102.89999	6.73060	38.17114
3	102.89999	13.25669	36.42247
4	102.89999	19.37999	33.56714
5	102.89999	24.91443	29.69188
6	102.89999	29.69186	24.91446
7	102.89999	33.56712	19.38002
8	102.89999	36.42247	13.25674
9	102.89999	38.17113	6.73071
10	102.89999	38.75999	0.0
11	102.89999	38.17113	-6.73071
12	102.89999	36.42247	-13.25674
13	102.89999	33.56712	-19.38002
14	102.89999	29.69186	-24.91446
15	102.89999	24.91443	-29.69188
16	102.89999	19.37999	-33.56714
17	102.89999	13.25669	-36.42247
18	102.89999	6.73060	-38.17114
19	102.89999	0.0	-38.75999

BODY NO.- 1 STATION NO.-10 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	115.70000	0.0	37.56000
2	115.70000	6.52222	36.98936
3	115.70000	12.84627	35.29485
4	115.70000	18.77998	32.52791
5	115.70000	24.14308	28.77264
6	115.70000	28.77261	24.14311
7	115.70000	32.52789	18.78003
8	115.70000	35.29485	12.84630
9	115.70000	36.98936	6.52231
10	115.70000	37.56000	0.0
11	115.70000	36.98936	-6.52231
12	115.70000	35.29485	-12.84630
13	115.70000	32.52789	-18.78003
14	115.70000	28.77261	-24.14311
15	115.70000	24.14308	-28.77264
16	115.70000	18.77998	-32.52791
17	115.70000	12.84627	-35.29485
18	115.70000	6.52222	-36.98936
19	115.70000	0.0	-37.56000

BODY NO.- 1 STATION NO.-11 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	128.60001	0.0	35.77000
2	128.60001	6.21139	35.22658
3	128.60001	12.23406	33.61281
4	128.60001	17.88499	30.97774
5	128.60001	22.99251	27.40141
6	128.60001	27.40140	22.99252
7	128.60001	30.97772	17.88503
8	128.60001	33.61279	12.23411
9	128.60001	35.22656	6.21149
10	128.60001	35.77000	0.0
11	128.60001	35.22656	-6.21149
12	128.60001	33.61279	-12.23411
13	128.60001	30.97772	-17.88503
14	128.60001	27.40140	-22.99252

Table C-3. (concluded)

15	128.60001	22.99251	-27.40141
16	128.60001	17.88499	-30.97774
17	128.60001	12.23406	-33.61281
18	128.60001	6.21139	-35.22658
19	128.60001	0.0	-35.77000

BODY NO.- 1 STATION NO.-12 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	141.39999	0.0	33.53999
2	141.39999	5.82415	33.03044
3	141.39999	11.47135	31.51727
4	141.39999	16.76999	29.04648
5	141.39999	21.55908	25.69313
6	141.39999	25.69312	21.55910
7	141.39999	29.04648	16.77000
8	141.39999	31.51727	11.47139
9	141.39999	33.03044	5.82419
10	141.39999	33.53999	0.0
11	141.39999	33.03044	-5.82419
12	141.39999	31.51727	-11.47139
13	141.39999	29.04648	-16.77000
14	141.39999	25.69312	-21.55910
15	141.39999	21.55908	-25.69313
16	141.39999	16.76999	-29.04648
17	141.39999	11.47135	-31.51727
18	141.39999	5.82415	-33.03044
19	141.39999	0.0	-33.53999

BODY NO.- 1 STATION NO.-13 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	154.30000	0.0	30.96001
2	154.30000	5.37614	30.48965
3	154.30000	10.58894	29.09288
4	154.30000	15.48000	26.81215
5	154.30000	19.90070	23.71675
6	154.30000	23.71674	19.90071
7	154.30000	26.81213	15.48004
8	154.30000	29.09288	10.58898
9	154.30000	30.48964	5.37624
10	154.30000	30.96001	0.0
11	154.30000	30.48964	-5.37624
12	154.30000	29.09288	-10.58898
13	154.30000	26.81213	-15.48004
14	154.30000	23.71674	-19.90071
15	154.30000	19.90070	-23.71675
16	154.30000	15.48000	-26.81215
17	154.30000	10.58894	-29.09288
18	154.30000	5.37614	-30.48965
19	154.30000	0.0	-30.96001

BODY NO.- 1 STATION NO.-14 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	167.10001	0.0	28.13000
2	167.10001	4.88472	27.70264
3	167.10001	9.62102	26.43355
4	167.10001	14.06500	24.36130
5	167.10001	18.08160	21.54884
6	167.10001	21.54883	18.08162
7	167.10001	24.36128	14.06504
8	167.10001	26.43355	9.62106
9	167.10001	27.70264	4.88479
10	167.10001	28.13000	0.0
11	167.10001	27.70264	-4.88479
12	167.10001	26.43355	-9.62106
13	167.10001	24.36128	-14.06504
14	167.10001	21.54883	-18.08162
15	167.10001	18.08160	-21.54884
16	167.10001	14.06500	-24.36130
17	167.10001	9.62102	-26.43355
18	167.10001	4.88472	-27.70264
19	167.10001	0.0	-28.13000

BODY NO.- 1 STATION NO.-15 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	180.00000	0.0	25.10001
2	180.00000	4.35857	24.71867
3	180.00000	8.58470	23.58629
4	180.00000	12.55000	21.73723
5	180.00000	16.13396	19.22772
6	180.00000	19.22771	16.13399
7	180.00000	21.73723	12.55003
8	180.00000	23.58629	8.58472
9	180.00000	24.71867	4.35862
10	180.00000	25.10001	0.0
11	180.00000	24.71867	-4.35862
12	180.00000	23.58629	-8.58472
13	180.00000	21.73723	-12.55003
14	180.00000	19.22771	-16.13399
15	180.00000	16.13396	-19.22772
16	180.00000	12.55000	-21.73723
17	180.00000	8.58470	-23.58629
18	180.00000	4.35857	-24.71867
19	180.00000	0.0	-25.10001

BODY NO.- 1 STATION NO.-16 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	260.30005	0.0	5.00000
2	260.30005	0.86824	4.92404
3	260.30005	1.71010	4.69846
4	260.30005	2.50000	4.33013
5	260.30005	3.21394	3.83022
6	260.30005	3.83022	3.21394
7	260.30005	4.33013	2.50000
8	260.30005	4.69846	1.71010
9	260.30005	4.92404	0.86825
10	260.30005	5.00000	0.0
11	260.30005	4.92404	-0.86825
12	260.30005	4.69846	-1.71010
13	260.30005	4.33013	-2.50000
14	260.30005	3.83022	-3.21394
15	260.30005	3.21394	-3.83022
16	260.30005	2.50000	-4.33013
17	260.30005	1.71010	-4.69846
18	260.30005	0.86824	-4.92404
19	260.30005	0.0	-5.00000

HIT ENTER

Table C-4. Configuration BF2L contour definition, full scale.

3D COORDINATES DISPLAY

TEDS TEST CASE

BODY NO - 1 STATION NO - 1 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	2.00000	0.0	-15.51000
2	2.00000	3.50000	-15.51000
3	2.00000	7.00000	-15.81000
4	2.00000	10.42000	-17.59000
5	2.00000	11.33000	-20.59000
6	2.00000	10.42000	-23.84000
7	2.00000	7.00000	-25.37000
8	2.00000	3.50000	-25.67000
9	2.00000	0.0	-25.67000

BODY NO.- 1 STATION NO - 2 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	18.50000	0.0	-5.39000
2	18.50000	10.33000	-6.39000
3	18.50000	21.00000	-9.30000
4	18.50000	29.17000	-14.14000
5	18.50000	30.33000	-19.47000
6	18.50000	29.17000	-27.05000
7	18.50000	24.17000	-32.30000
8	18.50000	13.67000	-33.97000
9	18.50000	0.0	-33.97000

BODY NO.- 1 STATION NO - 3 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	35.00000	0.0	0.0
2	35.00000	12.00000	-0.85000
3	35.00000	23.92000	-4.10000
4	35.00000	35.33000	-9.94000
5	35.00000	36.83000	-16.27000
6	35.00000	34.33000	-28.27000
7	35.00000	25.67000	-37.02000
8	35.00000	14.08000	-39.19000
9	35.00000	0.0	-39.19000

BODY NO.- 2 STATION NO.- 1 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	35.00000	0.0	0.0
2	35.00000	12.00000	-0.85000
3	35.00000	23.92000	-4.10000
4	35.00000	35.33000	-9.94000
5	35.00000	36.83000	-16.27000
6	35.00000	34.33000	-28.27000
7	35.00000	25.67000	-37.02000
8	35.00000	14.08000	-39.19000
9	35.00000	0.0	-39.19000

BODY NO.- 2 STATION NO.- 2 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	46.50000	0.0	14.20000
2	46.50000	14.92000	11.62000
3	46.50000	27.58000	5.54000
4	46.50000	36.88000	-4.63000
5	46.50000	39.17000	-14.96000
6	46.50000	36.88000	-27.71001
7	46.50000	27.58000	-37.96001
8	46.50000	14.92000	-41.55000
9	46.50000	0.0	-41.55000

BODY NO.- 2 STATION NO.- 3 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	56.00000	0.0	25.11000
2	56.00000	13.17000	23.61000
3	56.00000	26.50000	18.03000
4	56.00000	36.08000	7.94000
5	56.00000	39.00000	-10.01000
6	56.00000	36.08000	-28.56000
7	56.00000	26.50000	-39.14000
8	56.00000	13.17000	-42.91000
9	56.00000	0.0	-42.91000

BODY NO.- 2 STATION NO.- 4 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	70.00000	0.0	29.45000
2	70.00000	16.25000	28.64999
3	70.00000	29.75000	21.05000
4	70.00000	37.83000	8.15000
5	70.00000	39.00000	-8.15000
6	70.00000	37.83000	-23.75000
7	70.00000	29.75000	-36.85001
8	70.00000	16.25000	-43.55000
9	70.00000	0.0	-44.00999

BODY NO.- 3 STATION NO.- 1 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	70.00000	0.0	29.45000
2	70.00000	16.25000	28.64999
3	70.00000	29.75000	21.05000
4	70.00000	37.83000	8.15000
5	70.00000	39.00000	-8.15000
6	70.00000	37.83000	-23.75000
7	70.00000	29.75000	-36.85001
8	70.00000	16.25000	-43.55000
9	70.00000	0.0	-44.00999

BODY NO.- 3 STATION NO.- 2 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	101.50000	0.0	34.50999
2	101.50000	16.20000	32.50999
3	101.50000	29.75999	23.37000
4	101.50000	37.80000	8.29000
5	101.50000	38.94000	-6.55000
6	101.50000	37.60001	-21.28999
7	101.50000	29.39999	-35.98000
8	101.50000	16.20000	-44.91000
9	101.50000	0.0	-45.83000

BODY NO.- 3 STATION NO.- 3 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	133.50000	0.0	37.50000

NOTE: The transition fairing is defined by BODY NO. 3, STATIONS 4, 5, 6, and 7 in the following table.

Table C-4. (concluded)

2	133.50000	16.20000	34.34000
3	133.50000	29.89999	24.39999
4	133.50000	38.00000	9.60000
5	133.50000	39.20000	-5.50000
6	133.50000	38.00000	-19.50000
7	133.50000	30.00000	-34.70000
8	133.50000	16.20000	-44.39999
9	133.50000	0.0	-47.25999

BODY NO - 3 STATION NO.- 4 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	154.00000	0.0	39.00000
2	154.00000	13.34000	36.64999
3	154.00000	25.07001	29.88000
4	154.00000	33.77000	19.50000
5	154.00000	38.41000	6.77000
6	154.00000	38.41000	-6.77000
7	154.00000	33.77000	-28.50000
8	154.00000	25.07001	-38.88000
9	154.00000	13.34000	-45.64999
10	154.00000	0.0	-48.00000

BODY NO.- 3 STATION NO.- 5 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	184.00000	0.0	39.66000
2	184.00000	13.56000	37.27000
3	184.00000	25.49001	30.38000
4	184.00000	34.35001	19.83000
5	184.00000	39.06000	6.89000
6	184.00000	39.06000	-6.89000
7	184.00000	34.35001	-21.87000
8	184.00000	25.49001	-35.37000
9	184.00000	13.56000	-43.08000
10	184.00000	0.0	-45.67999

BODY NO.- 3 STATION NO.- 6 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	214.00000	0.0	36.84000
2	214.00000	12.60000	34.62000
3	214.00000	23.67999	28.22000
4	214.00000	31.89999	18.42000
5	214.00000	36.28000	6.40000
6	214.00000	36.28000	-6.40000
7	214.00000	31.89999	-18.42000
8	214.00000	23.67999	-31.84000
9	214.00000	12.60000	-39.39000
10	214.00000	0.0	-41.89999

BODY NO.- 3 STATION NO.- 7 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	244.00000	0.0	31.74001
2	244.00000	10.86000	29.83000
3	244.00000	20.39999	24.31000
4	244.00000	27.49001	15.87000
5	244.00000	31.25999	5.51000
6	244.00000	31.25999	-5.51000
7	244.00000	27.49001	-15.87000
8	244.00000	20.39999	-24.31000
9	244.00000	10.86000	-31.92000
10	244.00000	0.0	-34.36000

BODY NO - 3 STATION NO - 8 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	263.80005	0.0	27.50000
2	263.80005	9.41000	25.84000
3	263.80005	17.67999	21.07001
4	263.80005	23.82001	13.75000
5	263.80005	27.08000	4.78000
6	263.80005	27.08000	-4.78000
7	263.80005	23.82001	-13.75000
8	263.80005	17.67999	-21.07001
9	263.80005	9.41000	-25.84000
10	263.80005	0.0	-27.50000

BODY NO.- 3 STATION NO - 9 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	277.43994	0.0	24.28000
2	277.43994	8.30000	22.82001
3	277.43994	15.61000	18.60001
4	277.43994	21.03000	12.14000
5	277.43994	23.91000	4.22000
6	277.43994	23.91000	-4.22000
7	277.43994	21.03000	-12.14000
8	277.43994	15.61000	-18.60001
9	277.43994	8.30000	-22.82001
10	277.43994	0.0	-24.28000

BODY NO.- 3 STATION NO.-10 TYPE- NON-LIFT

#	(X)	(Y)	(Z)
1	355.80005	0.0	5.00000
2	355.80005	1.71000	4.70000
3	355.80005	3.21000	3.83000
4	365.80005	4.33000	2.50000
5	355.80005	4.92000	0.87000
6	355.80005	4.92000	-0.87000
7	355.80005	4.33000	-2.50000
8	355.80005	3.21000	-3.83000
9	355.80005	1.71000	-4.70000
10	355.80005	0.0	-5.00000

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MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 15 CONFIGURATION BHR MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
136	-0.3	1	1.0200
136	-0.3	2	0.7828
136	-0.3	4	0.4744
136	-0.3	6	0.2135
136	-0.3	10	-.0712
136	-0.3	17	-.4867
136	-0.3	20	-.3244
136	-0.3	23	-.1622
136	-0.3	24	-.0811
136	-0.3	25	0.0406
136	-0.3	26	0.0000
136	-0.3	28	0.0811

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
259	0.0	29	0.9649
259	0.0	30	0.5648
259	0.0	32	0.3295
259	0.0	34	0.3060
259	0.0	44	0.7531
259	0.0	47	0.4001
259	0.0	51	-.8473
259	0.0	54	-.2118
259	0.0	58	-.1177
259	0.0	17	-.3621
259	0.0	20	-.2012
259	0.0	23	-.0402
259	0.0	24	0.0000
259	0.0	25	0.0805
259	0.0	26	0.1006
259	0.0	28	0.1408

MAIN ROTOR–FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
261	0.0	29	0.9414
261	0.0	30	0.5884
261	0.0	32	0.3766
261	0.0	34	0.3295
261	0.0	44	0.7531
261	0.0	47	0.4001
261	0.0	51	-.8002
261	0.0	54	-.1883
261	0.0	58	-.1177
261	0.0	17	-.3420
261	0.0	20	-.1609
261	0.0	23	-.0402
261	0.0	24	0.0000
261	0.0	25	0.1006
261	0.0	26	0.1006
261	0.0	28	0.1811

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 21 CONFIGURATION BHRF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
263	0.0	29	0.9179
263	0.0	30	0.5884
263	0.0	32	0.3766
263	0.0	34	0.3530
263	0.0	44	0.7296
263	0.0	47	0.4472
263	0.0	51	-.6825
263	0.0	54	-.1412
263	0.0	58	-.0941
263	0.0	17	-.3823
263	0.0	20	-.1811
263	0.0	23	-.0201
263	0.0	24	0.0604
263	0.0	25	0.1408
263	0.0	26	0.1408
263	0.0	28	0.1609

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
390	0.0	29	1.2097
390	0.0	30	0.7828
390	0.0	32	0.5456
390	0.0	34	0.4981
390	0.0	44	0.9488
390	0.0	47	0.5930
390	0.0	51	-.6642
390	0.0	54	-.0237
390	0.0	58	0.0949
390	0.0	17	-.3954
390	0.0	20	-.1318
390	0.0	23	-.0101
390	0.0	24	0.0507
390	0.0	25	0.1724
390	0.0	26	0.1521
390	0.0	28	0.2129

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 29 CONFIGURATION BHRF2U MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
392	0.0	29	1.1623
392	0.0	30	0.8065
392	0.0	32	0.5693
392	0.0	34	0.5456
392	0.0	44	0.9488
392	0.0	47	0.6404
392	0.0	51	-.5218
392	0.0	54	0.0474
392	0.0	58	0.0712
392	0.0	17	-.3346
392	0.0	20	-.1115
392	0.0	23	0.0101
392	0.0	24	0.1115
392	0.0	25	0.1724
392	0.0	26	0.1926
392	0.0	28	0.2737

RUN 29 CONFIGURATION BHRF2U MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
394	0.0	29	1.1860
394	0.0	30	0.8302
394	0.0	32	0.6167
394	0.0	34	0.6167
394	0.0	44	0.9963
394	0.0	47	0.6879
394	0.0	51	-.3558
394	0.0	54	0.1423
394	0.0	58	0.1186
394	0.0	17	-.3143
394	0.0	20	-.1318
394	0.0	23	0.0304
394	0.0	24	0.1318
394	0.0	25	0.2129
394	0.0	26	0.2332
394	0.0	28	0.2535

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 53 CONFIGURATION BHF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
644	0.0	29	1.1123
644	0.0	30	0.6952
644	0.0	32	0.4403
644	0.0	34	0.3939
644	0.0	44	0.8806
644	0.0	47	0.4403
644	0.0	51	-1.066
644	0.0	54	-.2549
644	0.0	58	-.0927
644	0.0	17	-.3962
644	0.0	20	-.1981
644	0.0	23	-.0792
644	0.0	24	-.0396
644	0.0	25	0.0594
644	0.0	26	0.0792
644	0.0	28	0.0792

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 61 CONFIGURATION BH MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
712	0.0	1	1.2773
712	0.0	2	0.9399
712	0.0	4	0.5061
712	0.0	6	0.2169
712	0.0	10	0.0482
712	0.0	17	-.4326
712	0.0	20	-.2678
712	0.0	23	-.1030
712	0.0	24	-.0412
712	0.0	25	0.1030
712	0.0	26	0.0824
712	0.0	28	0.1236

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 64 CONFIGURATION B MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
742	-8.0	1	1.1418
742	-8.0	2	0.9718
742	-8.0	4	0.6074
742	-8.0	6	0.2672
742	-8.0	10	0.0000
742	-8.0	17	2.9906
742	-8.0	20	-.2077
742	-8.0	23	-.1246
742	-8.0	24	-.0415
742	-8.0	25	0.1246
742	-8.0	26	0.1661
742	-8.0	28	0.1869

MAIN ROTOR–FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 64 CONFIGURATION B MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
744	0.0	1	1.1418
744	0.0	2	0.8017
744	0.0	4	0.3401
744	0.0	6	-.0243
744	0.0	10	-.2429
744	0.0	17	2.9906
744	0.0	20	-.1661
744	0.0	23	-.0623
744	0.0	24	0.0208
744	0.0	25	0.1661
744	0.0	26	0.1661
744	0.0	28	0.2077

MAIN ROTOR—FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 64 CONFIGURATION B MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
747	8.0	1	1.0447
747	8.0	2	0.5102
747	8.0	4	0.0000
747	8.0	6	-.3401
747	8.0	10	-.4373
747	8.0	17	2.9906
747	8.0	20	-.0831
747	8.0	23	0.0415
747	8.0	24	0.1038
747	8.0	25	0.2077
747	8.0	26	0.1869
747	8.0	28	0.1661

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 68 CONFIGURATION BF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
768	-8.0	29	0.9961
768	-8.0	30	1.0204
768	-8.0	32	0.7045
768	-8.0	34	0.6074
768	-8.0	44	0.9718
768	-8.0	47	0.6316
768	-8.0	51	-.7045
768	-8.0	54	-.1458
768	-8.0	58	-.0972
768	-8.0	17	3.0321
768	-8.0	20	-.1869
768	-8.0	23	-.1038
768	-8.0	24	-.0623
768	-8.0	25	0.0831
768	-8.0	26	0.1454
768	-8.0	28	0.1661

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 68 CONFIGURATION BF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
771	0.0	29	1.2633
771	0.0	30	0.7774
771	0.0	32	0.5345
771	0.0	34	0.4616
771	0.0	44	0.9475
771	0.0	47	0.4859
771	0.0	51	-1.045
771	0.0	54	-.2429
771	0.0	58	-.1215
771	0.0	17	3.0321
771	0.0	20	-.1038
771	0.0	23	0.0000
771	0.0	24	0.0415
771	0.0	25	0.1869
771	0.0	26	0.1869
771	0.0	28	0.1246

MAIN ROTOR-FUSELAGE INTERACTION TEST
CONTRACT NAS2-11268
FORWARD FLIGHT

RUN 68 CONFIGURATION BF2L MU = 0.200

RECORD	ALPHS (DEG)	TAP #	CP
773	8.0	29	0.8017
773	8.0	30	0.3401
773	8.0	32	0.2186
773	8.0	34	0.2672
773	8.0	44	0.8260
773	8.0	47	0.3401
773	8.0	51	-1.409
773	8.0	54	-.3644
773	8.0	58	-.1701
773	8.0	17	3.0529
773	8.0	20	-.0831
773	8.0	23	0.0415
773	8.0	24	0.0831
773	8.0	25	0.1869
773	8.0	26	0.1661
773	8.0	28	0.1661

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15. Supplementary Notes

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16. Abstract

Hover and forward flight tests were conducted to investigate the mutual aerodynamic interaction between the main rotor and fuselage of a conventional helicopter configoration. A 0.15-scale Model 222 two-bladed teetering rotor was combined with a 0.15-scale model of the NASA Ames 40x80-foot wind tunnel 1500 horsepower test stand fairing. Configuration effects were studied by modifying the fairing to simulate a typical helicopter forebody. Separation distance between rotor and body were also investigated. Rotor and fuselage force and moment as well as pressure data are presented in graphical and tabular format. Data was taken over a range of thrust coefficients from 0.002 to 0.007. In forward flight speed ratio was varied from 0.1 to 0.3 with shaft angle varying from +4 to -12 degrees. The data show that the rotors effect on the fuselgage may be considerably more important to total aircraft performance than the fuselages effect on the rotor.

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