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ABSTRACT

This document presents the basic test data obtained during the Lift-Propulsive Force Limit Wind Tunnel Test conducted during 1976 at the Boeing Vertol Wind Tunnel. Included are the rotor control positions, blade loads and six components of rotor force and moment, corrected for hub tares. Performance and blade loads are presented as the rotor lift limit is approached at fixed levels of rotor propulsive force coefficients and rotor tip speeds. Performance and blade load trends are presented for fixed levels of rotor lift coefficient as propulsive force is increased to the maximum obtainable by the model rotor. Test data is also included that defines the effect of stall proximity on rotor control power. This test data is presented in Volume II and III. The analysis of the data is presented in Volume I.

FOREWORD

This report was prepared by the Boeing Vertol Company for the National Aeronautics and Space Administration, Langley Research Center, under NASA contract NAS1-14317. It presents the test data and analysis from the Lift-Propulsive Force Limit Wind Tunnel Test. The analysis of the data establishes the useful flight envelope and the characteristics of a conventional rotor in high speed flight. The results are presented in three volumes.

-1 Wind Tunnel Investigation of Rotor Lift and Propulsive Force Limits at High Speed - - Data Analysis -

-2 & -3 Wind Tunnel Investigation of Rotor Lift and Propulsive Force Limits at High Speed - - Test Data Appendix -

Mr. J. L. Jenkins (NASA Langley) was the technical monitor for this work.

The Boeing Vertol Program Manager was F. J. McHugh and was assisted in the testing, data presentation and report preparation by Ross Clark, Aerodynamics Tech. Rep.

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NOMENCLATURE

Symbol	Definition	Units
A	Rotor Area (πR^2)	m^2 (ft^2)
Al, a_1	1st Harmonic Longitudinal Flapping Angle	rad(deg)
A_1	Lateral Cyclic ($-\theta$ at $\psi = 0°$)	rad(deg)
Bl, b_1	1st Harmonic Lateral Flapping Angle	rad(deg)
B_1	Longitudinal Cyclic ($-\theta$ at $\psi = 90°$)	rad(deg)
CB12	Alternating Root Chord Bending Moment at 12% Blade Radius (P+P)/2	kg-m(in-lb)
CB53	Alternating Mid Span Chord Bending Moment at 53% Blade Radius (P+P)/2	kg-m(in-lb)
CDE/SB	Rotor Effective Drag Coefficient = $DE/\rho AV_{TIP}{}^2\sigma$	
CH/SB	Rotor Longitudinal Force Coefficient = $H_{FORCE}/\rho AV_{TIP}{}^2\sigma$	
CPMB	Rotor Pitching Moment = $PM/\rho AV_{TIP}{}^2R$	
CP/SB	Rotor Power Coefficient = $Q/\rho AV_{TIP}{}^2R\sigma$	
CRMB	Rotor Rolling Moment Coefficient = $RM/\rho AV_{TIP}{}^2R$	
CT'/SB	Rotor Lift Coefficient = $L/\rho AV_{TIP}{}^2\sigma$	
CX/SB	Rotor Propulsive Force Coefficient = $X/\rho AV_{TIP}{}^2\sigma$	
CY/SB	Rotor Side Force Coefficient = $S.F./\rho AV_{TIP}{}^2\sigma$	
FB12	Alternating Root Flap Bending at 12% Blade Radius (P+P)/2	kg-m(in-lb)
FB22	Alternating Inboard Flap Bending Moment at 22% Blade Radius (P+P)/2	kg-m(in-lb)

Symbol	Definition	Units
FB48	Alternating Mid Span Flap Bending Moment at 48% Blade Radius (P+P)/2	kg-m(in-lb)
FB79	Alternating Outboard Flap Bending Moment at 79% Blade Radius (P+P)/2	kg-m(in-lb)
PM	Hub Pitching Moment	m-kg(ft-lb)
Q	Rotor Torque	kg-m(lb-ft)
R	Rotor Radius	m(ft)
RM	Hub Rolling Moment	m-kg(ft-lb)
SF	Rotor Side Force	kg(lb)
T	Rotor Thrust	kg(lb)
TB12	Alternating Root Torsion at 12% Blade Radius = (P+P)/2	kg-m(in-lb)
TB20	Alternating Inboard Torsion at 20% Blade Radius = (P+P)/2	kg-m(in-lb)
TB51	Alternating Mid Span Torsion at 51% Blade Radius = (P+P)/2	kg-m(in-lb)
TB81	Alternating Outboard Torsion at 81% Blade Radius = (P+P)/2	kg-m(in-lb)
V	Tunnel Velocity	m/s(ft/s)
V_{TIP}	Rotor Tipspeed	m/s(ft/s)
X	Rotor X Force	kg(lb)
α_s	Shaft Angle of Attack	rad(deg)
θ	Collective Pitch	rad(deg)
μ	Advance Ratio = V/V_{TIP}	

Symbol	Definition	Units
ρ	Tunnel Density	N/m^2 (slugs/ft^2)
σ	Rotor Solidity $bc/\pi R$	

A. Basic Test Data from Lift Limit Testing

As indicated in Section 5 of the main report, the lift limit testing was conducted at fixed levels of propulsive force by increasing the collective pitch, increasing the rotor shaft angle of attack and trimming the hub moment to zero with longitudinal and lateral cyclic. This was repeated at each propulsive force level and advance ratio for the basic rotor tip speed of 620 ft/sec. Similar testing was accomplished at a tip speed of 570 ft/sec.

The test data obtained for each of these test runs has been combined to show the impact of advance ratio at a fixed level of propulsive force or conversely the impact of propulsive force at a fixed advance ratio. The combinations, identified as plot sets, are defined in Table A-1 and are marked on the bottom of each sheet. Within each plot set are a series of graphs presenting the variation of each component of measured data with rotor lift coefficient The sequence of these graphs is as follows:

Rotor Lift Coefficient versus Rotor Propulsive Force Coefficient

Rotor Lift Coefficient versus Shaft Angle of Attack

Rotor Lift Coefficient versus Collective Pitch

Rotor Lift Coefficient versus Longitudinal Cyclic

Rotor Lift Coefficient versus Lateral Cyclic

Rotor Lift Coefficient versus Rotor Power Coefficient

Rotor Lift Coefficient versus Rotor Pitching Moment Coefficient

Rotor Lift Coefficient versus Rotor Rolling Moment Coefficient

Rotor Lift Coefficient versus Rotor Longitudinal Force Coefficient

Rotor Lift Coefficient versus Rotor Side Force Coefficient

Rotor Lift Coefficient versus Alternating Root Torsion TB12

Rotor Lift Coefficient versus Alternating Inboard Torsion TB20

Rotor Lift Coefficient versus Alternating Mid Span Torsion TB51

Rotor Lift Coefficient versus Alternating Outboard Torsion TB81

Rotor Lift Coefficient versus Alternating Root Flap Bending FB12

Rotor Lift Coefficient versus Alternating Inboard Flap Bending FB22

Rotor Lift Coefficient versus Alternating Mid Span Flap Bending FB48

Rotor Lift Coefficient versus Alternating Root Chord Bending CB12

Rotor Lift Coefficient versus Alternating Mid Span Chord CB53

Rotor Lift Coefficient versus Coning Angle

Rotor Lift Coefficient versus 1st Harmonic Longitudinal Flapping A1

Rotor Lift Coefficient versus 1st Harmonic Lateral Flapping B1

Rotor Lift Coefficient versus Alternating Lead-Lag Angle

Rotor Pitching Moment Coefficient versus 1st Harmonic Longitudinal Flapping A1

Rotor Rolling Moment Coefficient versus 1st Harmonic Lateral Flapping B1

TABLE A-1 DATA PLOTTING SUMMARY FOR LIFT LIMIT TESTING

PLOT SET	RUN NO.	ROTOR TIP SPEED V_T	ADVANCE RATIO μ	ROTOR LIFT COEFF. C_T/σ	ROTOR PROPULSIVE FORCE COEFF. $X/qd^2\sigma$	TUNNEL SPEED V	COMMENTS
1	22	620FPS	0	Range	-	0	Baseline hover performance and lift limit.
	23	620FPS	0	Range	-	0	
	24	620FPS	0	Range	-	0	
2	25	620FPS	.10	Range	.05	62FPS	Baseline cruise performance.
	27	620FPS	.20	Range	.05	124FPS	
	28	620FPS	.20	Range	.05	124FPS	
	29	620FPS	.30	Range	.05	186FPS	
	30	620FPS	.40	Range	.05	248FPS	
3	32	620FPS	.40	Range	.01	248FPS	
	30	620FPS	.40	Range	.05	248FPS	
	33	620FPS	.40	Range	.10	248FPS	
	34	620FPS	.40	Range	.20	248FPS	
4	35	620FPS	.45	Range	.01	279FPS	
	36	620FPS	.45	Range	.05	279FPS	
	37	620FPS	.45	Range	.10	279FPS	
	38	620FPS	.45	Range	.20	279FPS	
5	40	620FPS	.50	Range	.025	310FPS	
	39	620FPS	.50	Range	.05	310FPS	
	41	620FPS	.50	Range	.10	310FPS	
	42	620FPS	.50	Range	.20	310FPS	

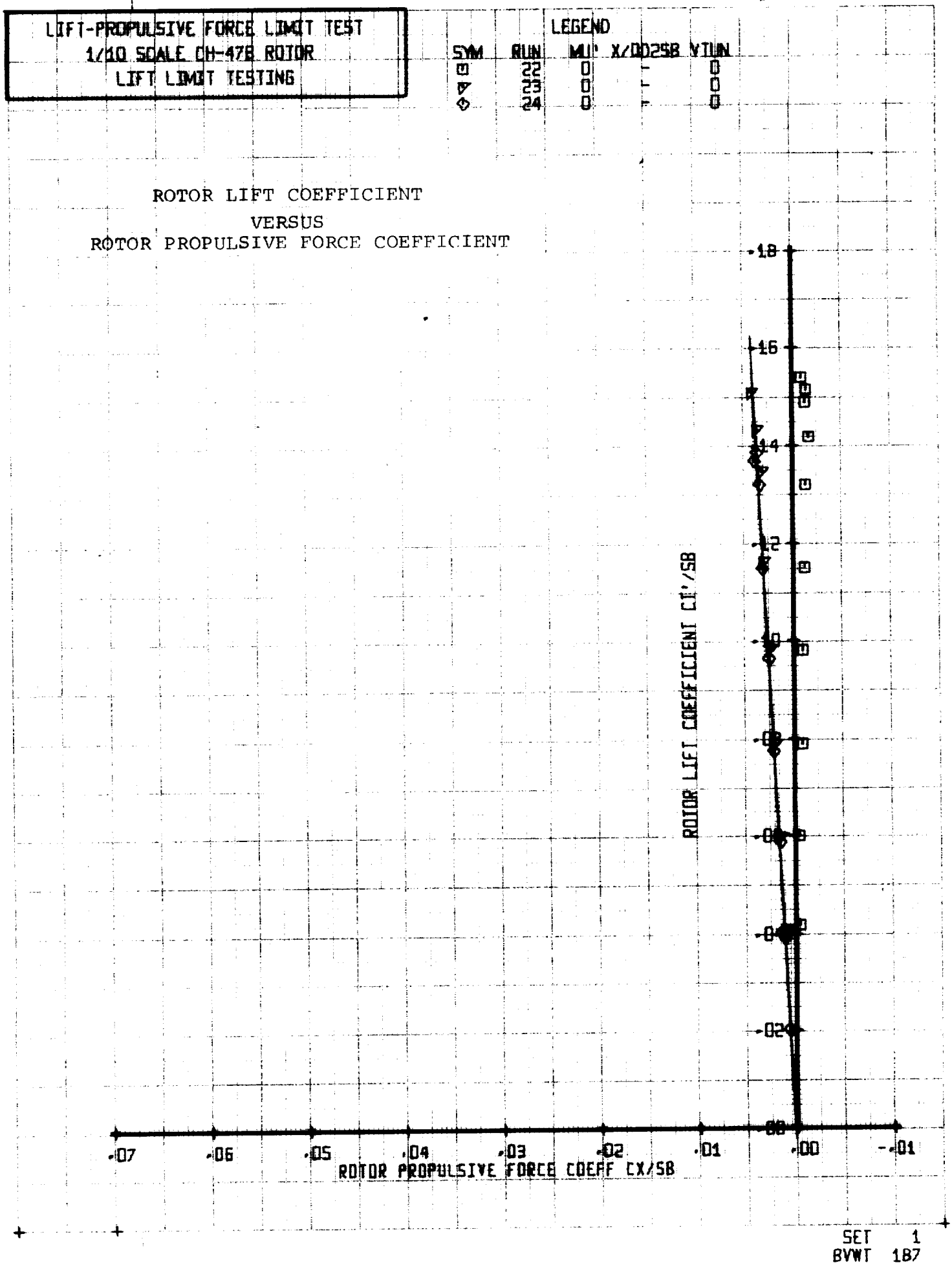
TABLE A-1 DATA PLOTTING SUMMARY FOR LIFT LIMIT TESTING
(Continued)

PLOT SET	RUN NO.	ROTOR TIP SPEED V_T	ADVANCE RATIO μ	ROTOR LIFT COEFF. G_T/σ	ROTOR PROPULSIVE FORCE COEFF. $X/qd^2\sigma$	TUNNEL SPEED V	COMMENTS
7	51	620FPS	.53	Range	.025	329FPS	Baseline cruise performance and lift limit.
	50	620FPS	.53	Range	.05	329FPS	
	52	620FPS	.53	Range	.10	329FPS	
	53	620FPS	.53	Range	.20	329FPS	
34	227	620FPS	.45	Range	.05	279FPS	Check & verification runs to insure compatibility of data from Part 1 and Part 2. Runs 225 & 227 are operating with tip stall.
	36	620FPS	.45	Range	.05	279FPS	
35	225	620FPS	.50	Range	.05	310FPS	
	39	620FPS	.50	Range	.05	310FPS	
36	225	620FPS	.50	Range	.05	310FPS	Check runs to define repeatability. Rotor operating with tip stall.
	261	620FPS	.50	Range	.05	310FPS	
	226	620FPS	.50	Range	.10	310FPS	
37	224	620FPS	.53	Range	.05	328FPS	Check runs.
	220	620FPS	.53	Range	.05	328FPS	
	221	620FPS	.53	Range	.05	328FPS	
	222	620FPS	.53	Range	.05	328FPS	
38	246	620FPS	.57	Range	.025	353FPS	Baseline cruise performance and lift limit.
	249	620FPS	.57	Range	.025	353FPS	
	228	620FPS	.57	Range	.05	353FPS	
	245	620FPS	.57	Range	.10	353FPS	

TABLE A-1 DATA PLOTTING SUMMARY FOR LIFT LIMIT TESTING
(Continued)

PLOT SET	RUN NO.	ROTOR TIP SPEED V_T	ADVANCE RATIO μ	ROTOR LIFT COEFF. G_T'/σ	ROTOR PROPULSIVE FORCE COEFF. $X/qd^2\sigma$	TUNNEL SPEED V	COMMENTS
39	229	620FPS	.61	Range	.05	378FPS	Baseline cruise performance and lift limit.
	248	620FPS	.61	Range	.075	378FPS	
40	250	570FPS	.40	Range	.05	228FPS	Baseline Cruise performance and lift limit at reduced tip speed. Comparison of operation with and without tip stall.
	256	570FPS	.40	Range	.05	228FPS	
41	251	570FPS	.45	Range	.05	256FPS	
	255	570FPS	.45	Range	.05	256FPS	
42	252	570FPS	.50	Range	.05	285FPS	
	254	570FPS	.50	Range	.05	285FPS	

Figure A-1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1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D2SB VTIP
22 0 0
23 0 0
24 0 0
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
ROTOR LIFT COEFFICIENT CT/SB
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
.0
.07
.06
.05
.04
.03
.02
.01
.00
-.01
ROTOR PROPULSIVE FORCE COEFF CX/SB
SET 1
BVWT 187
SET 1
WT 187

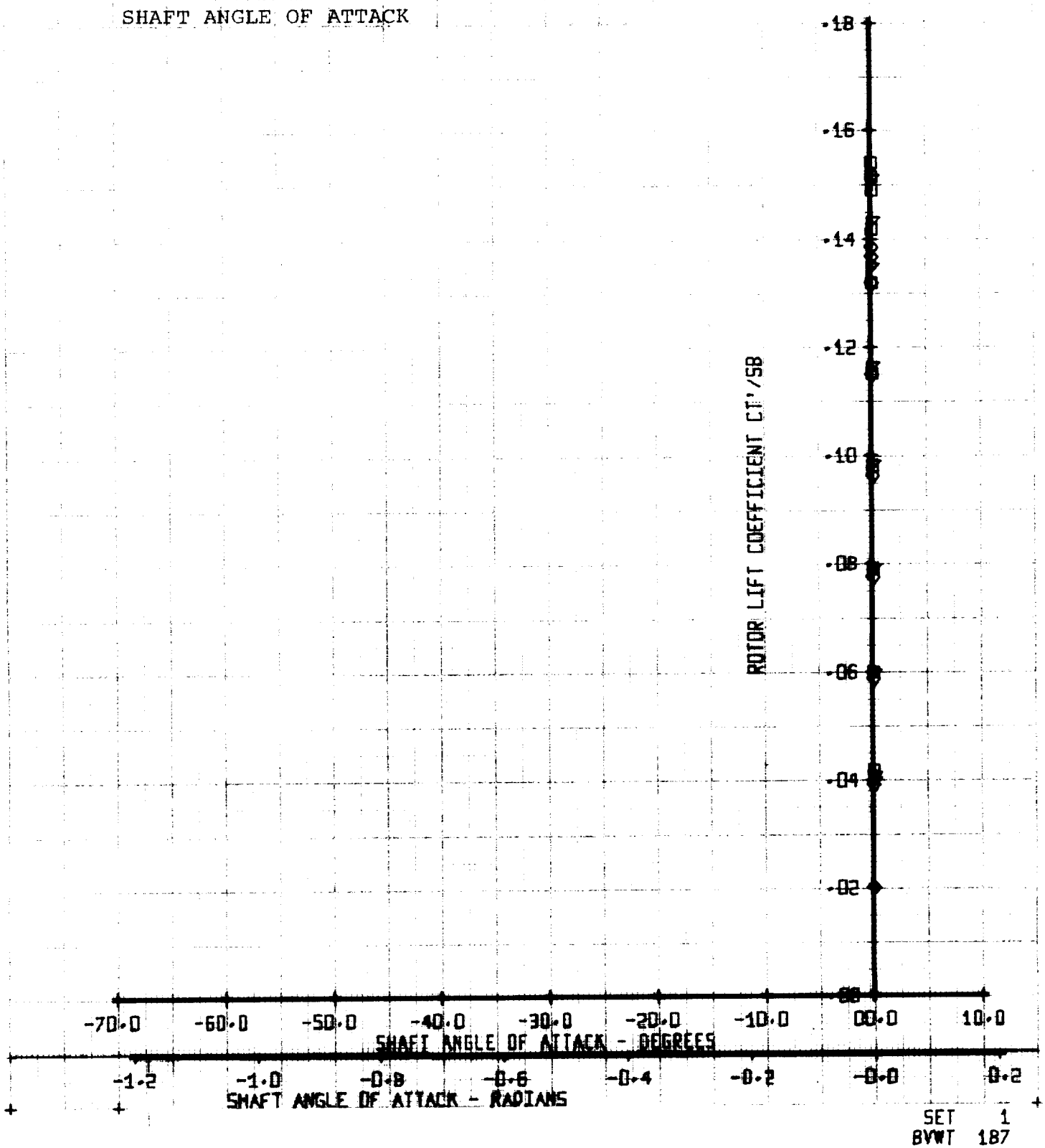
Figure A-2

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VIUN
□	22	0	-	0
△	23	0	+	0
◇	24	0	+	0

LEGEND

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 1
WT 187

SET 1
BVWT 187

Figure A-3

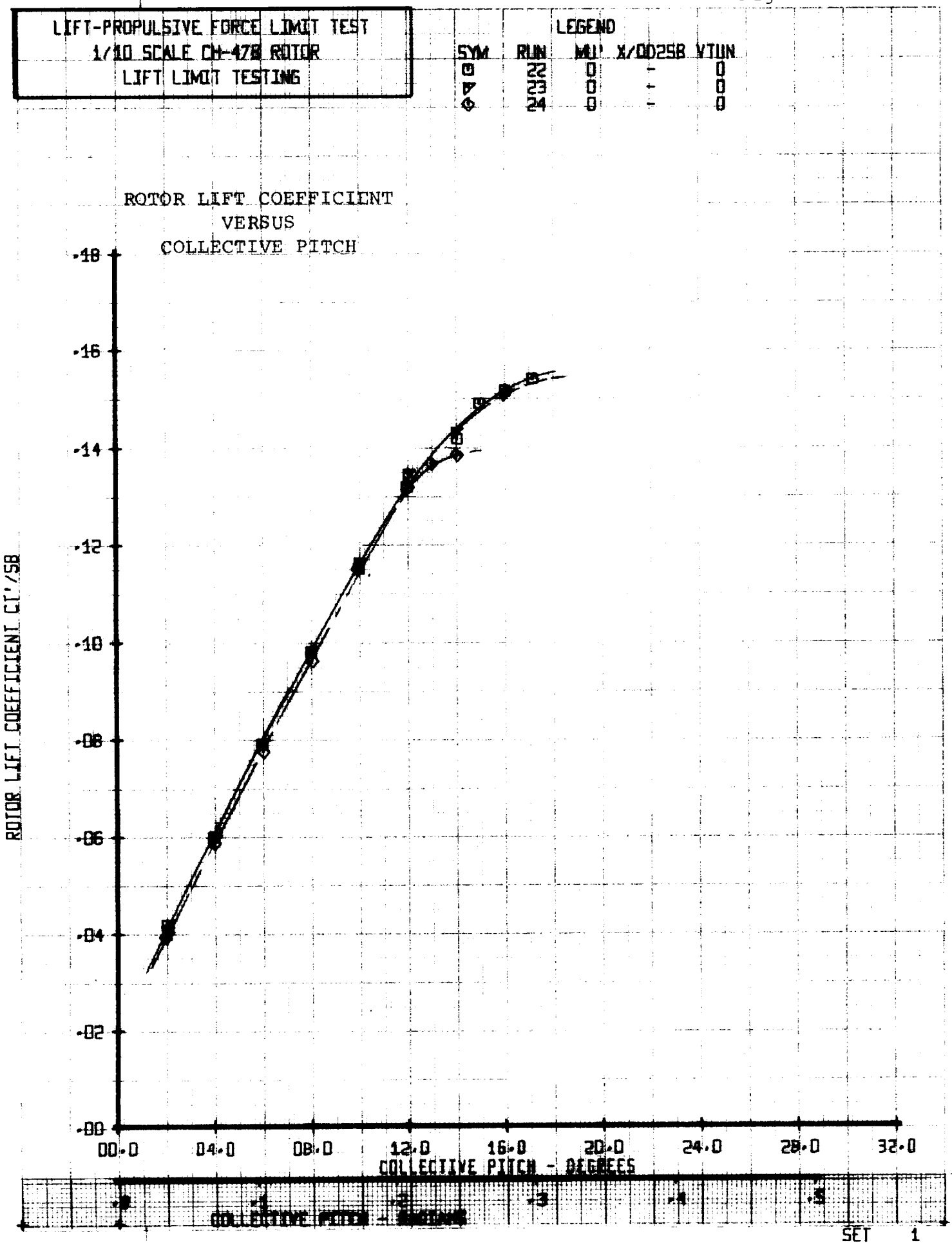

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/DD25B VTUN
22 0 - 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
COLLECTIVE PITCH - DEGREES
SET 1
BVWT 187

Figure A-4

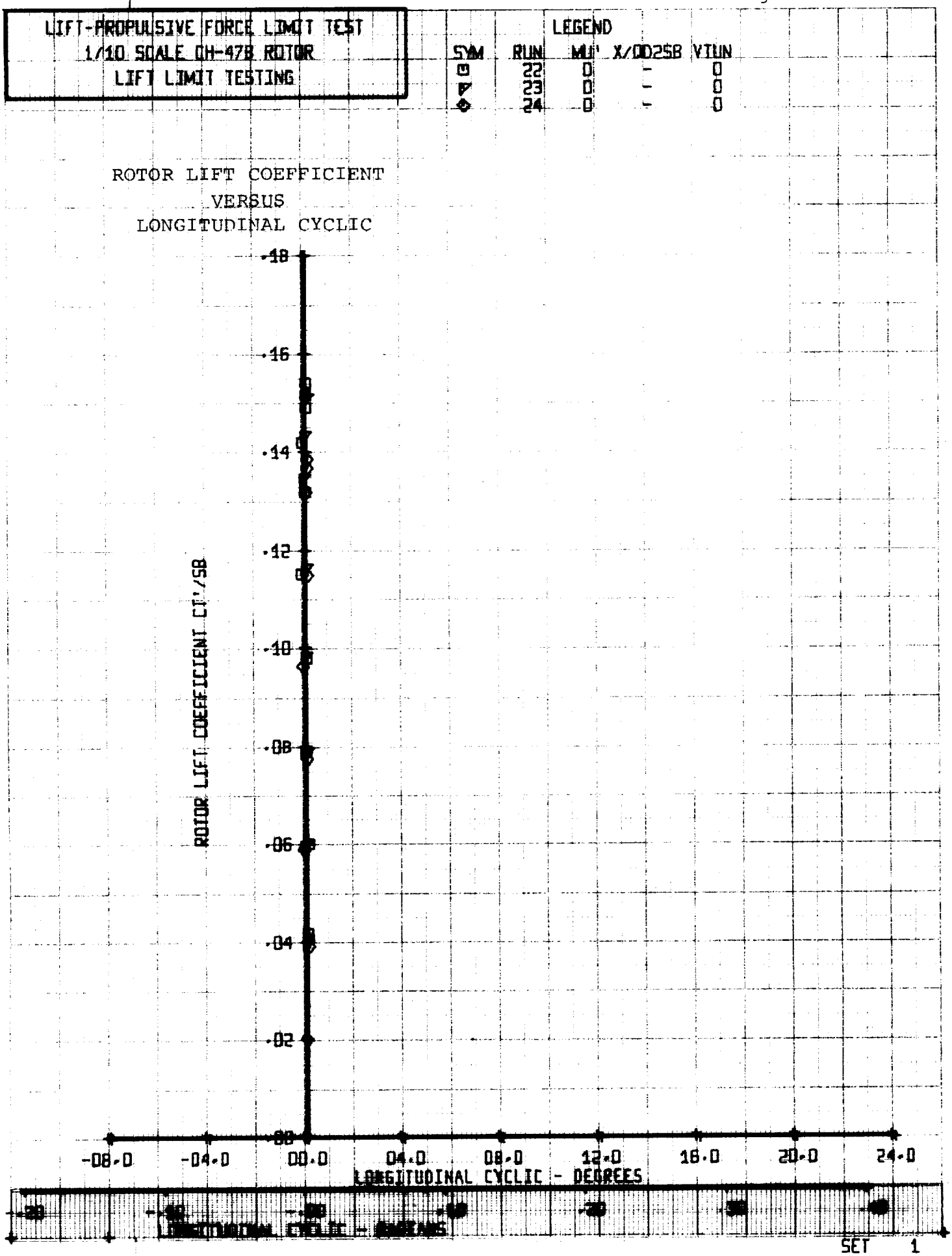
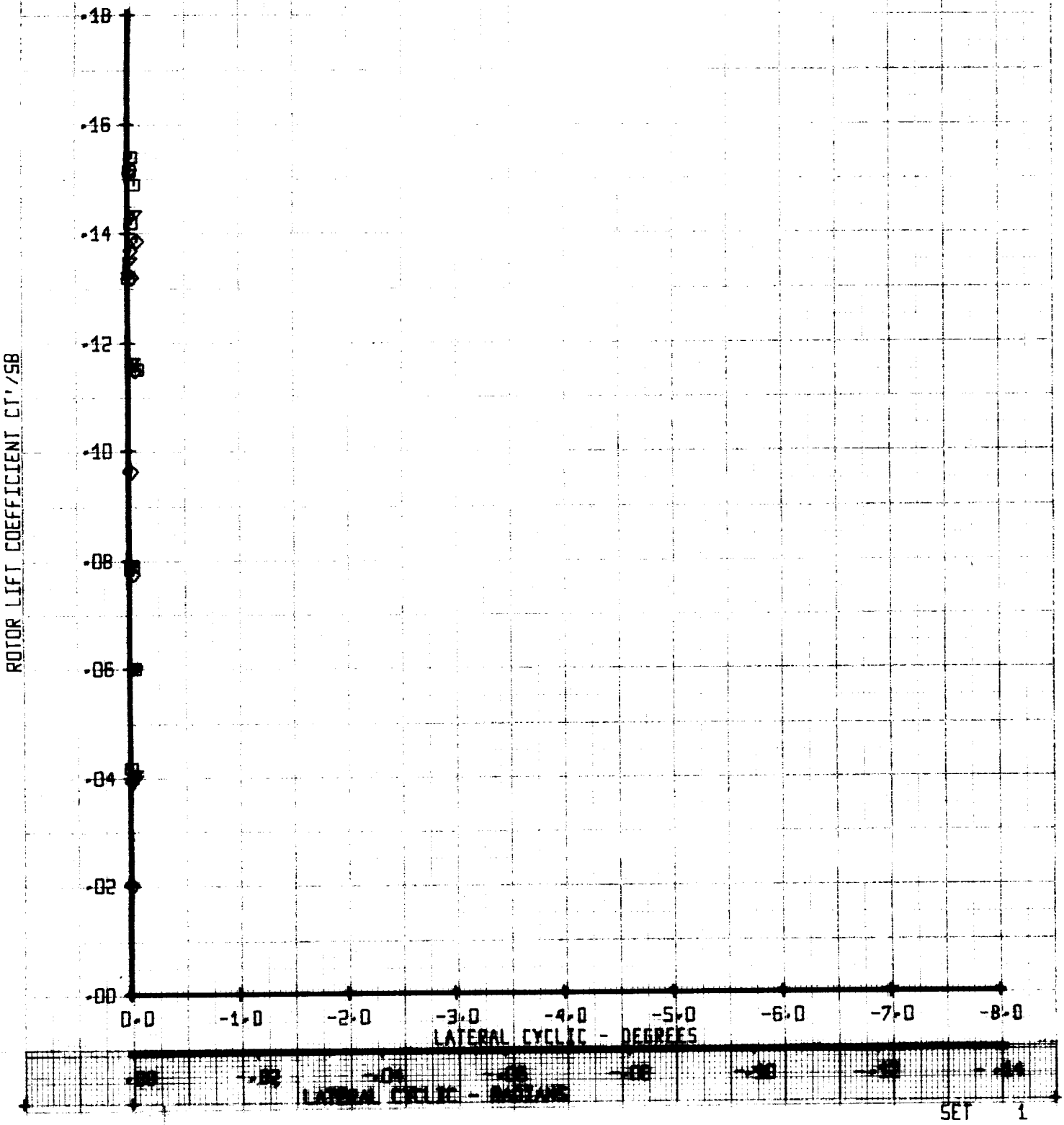

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/DD2SB VIUN
22 0 - 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-08.0
-04.0
00.0
04.0
08.0
12.0
16.0
20.0
24.0
LONGITUDINAL CYCLIC - DEGREES
SET 1
BVWT 187

Figure A-5

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/D@2SB	VTUN
□	22	0	+	0
▽	23	0	+	0
◇	24	0	+	0

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 1
WT 187

SET 1
BVWT 187

Figure A-6

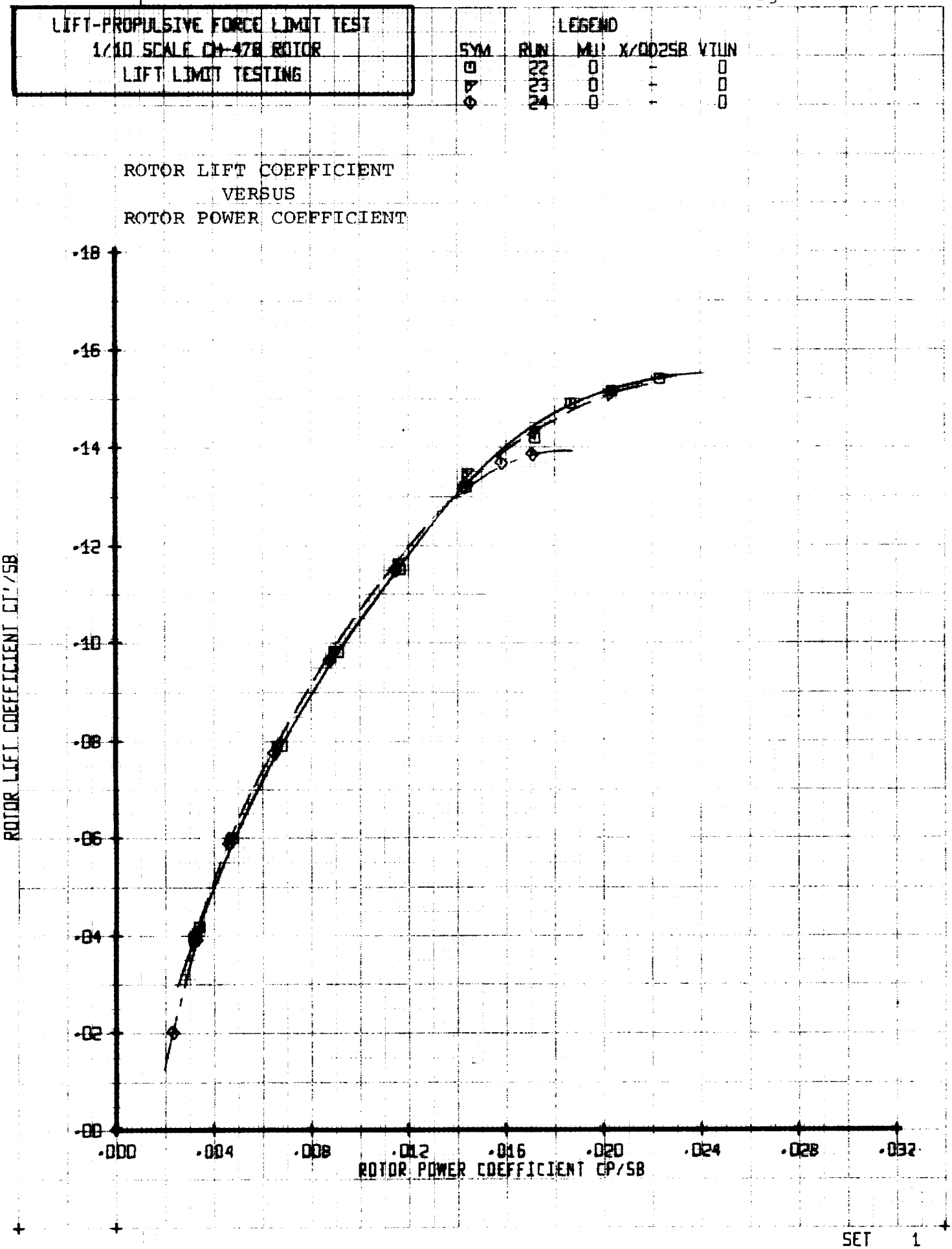
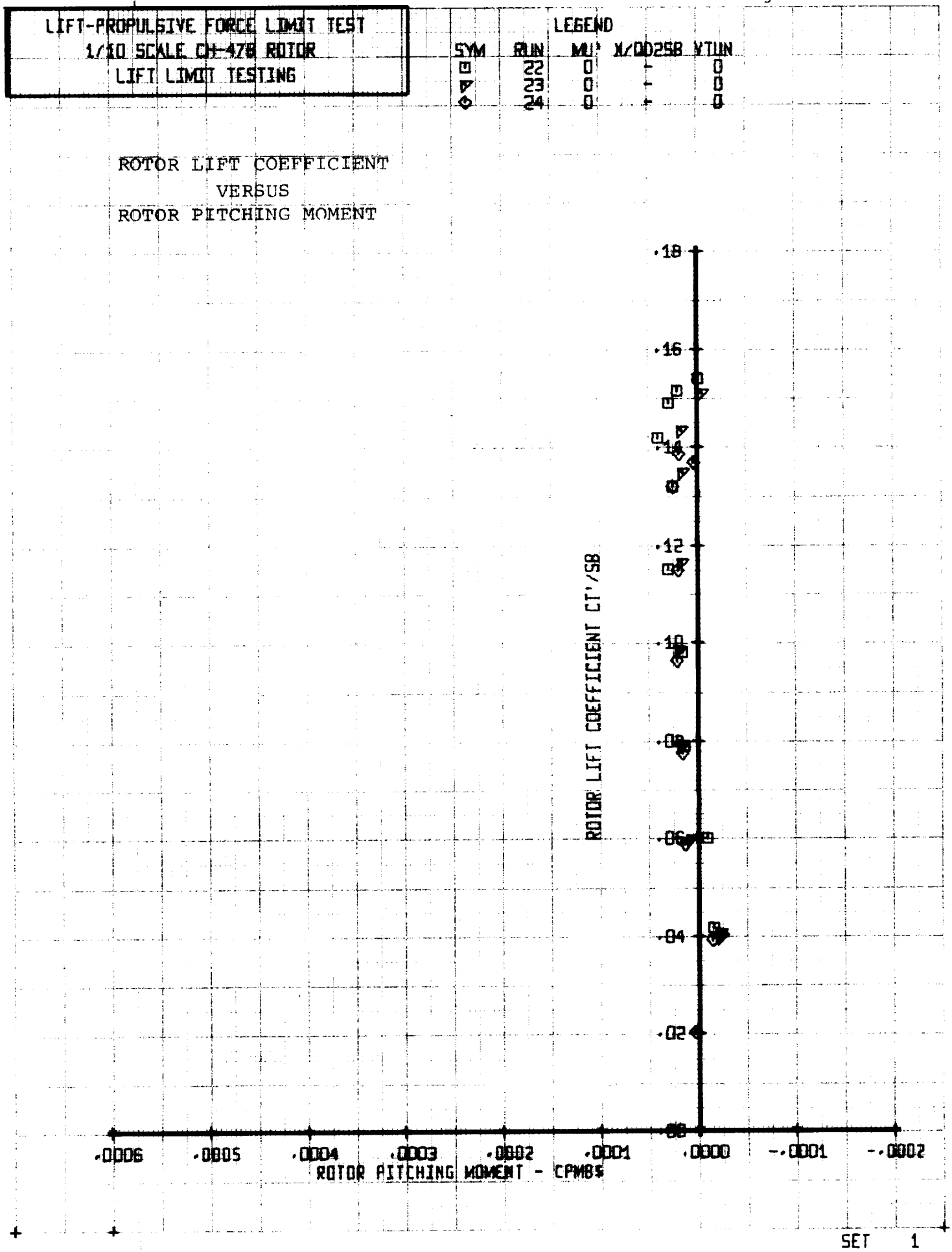
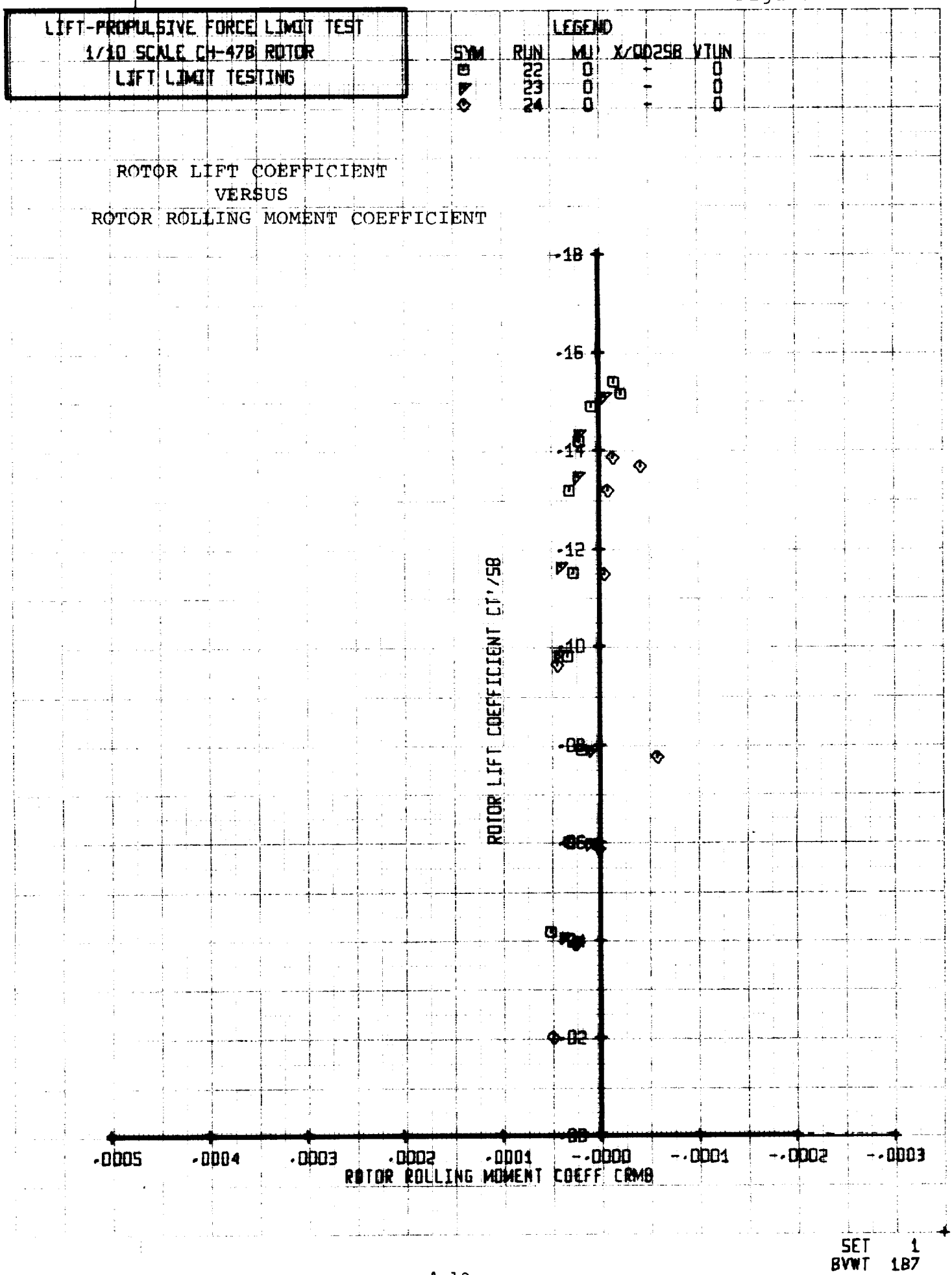

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D2SB VTUN
22 0 - 0
23 0 + 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
.000
.004
.008
.012
.016
.020
.024
.028
.032
ROTOR POWER COEFFICIENT CP/SB
ET 1
WT 187
SET 1
BVWT 187

Figure A-7

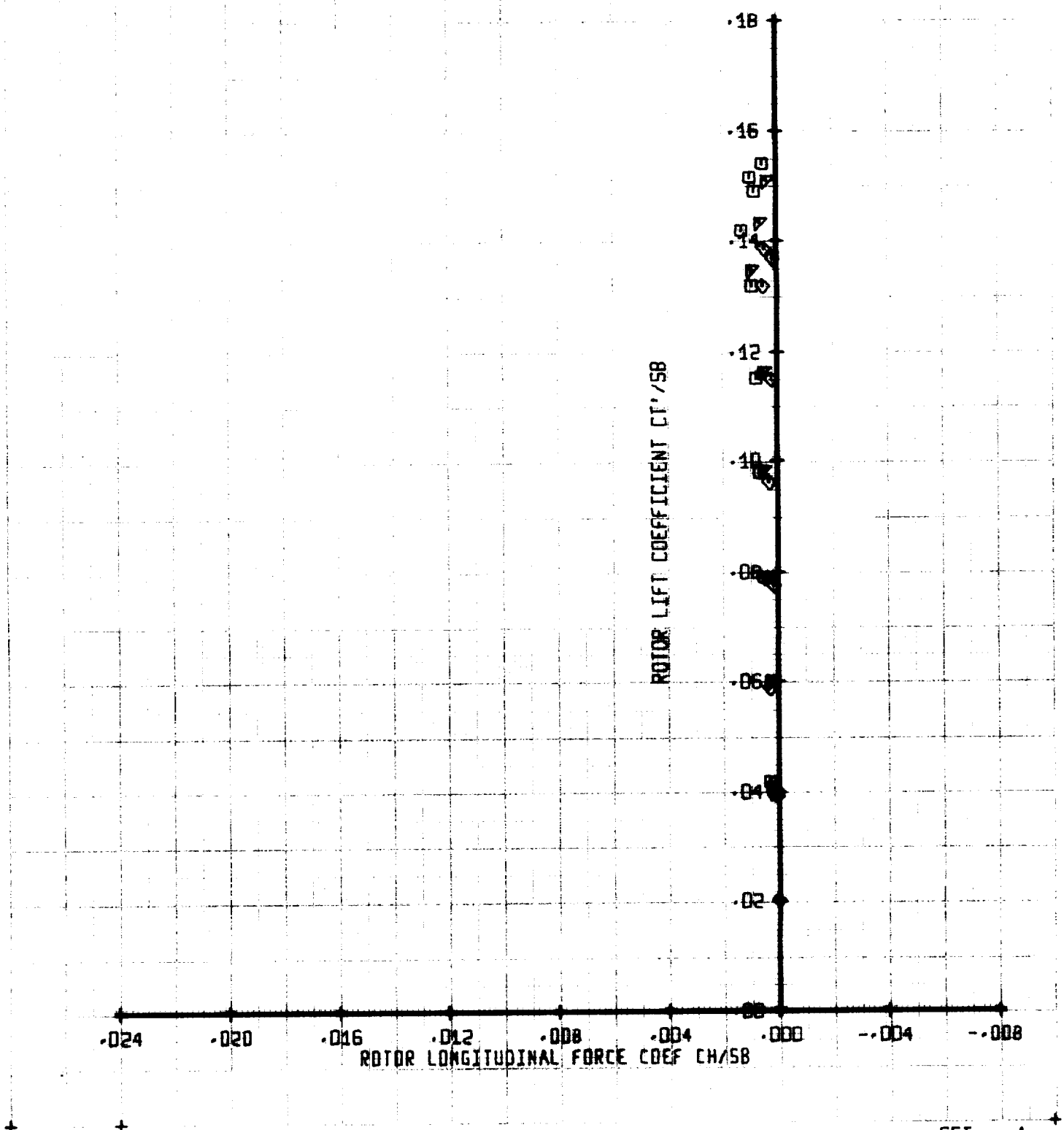

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D25B YTUN
22 0 + 0
23 0 + 0
24 0 + 0
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
.0006
.0005
.0004
.0003
.0002
.0001
.0000
-.0001
-.0002
ROTOR PITCHING MOMENT - CPMB$
ET 1
WT 187
SET 1
BVWT 187


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VTUN
22 0 + 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.02
.00
.0005
.0004
.0003
.0002
.0001
-.0000
-.0001
-.0002
-.0003
ROTOR ROLLING MOMENT COEFF CRMB
SET 1
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
▫	22	0	+	0
▽	23	0	+	0
◇	24	0	+	0

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 1
WT 187

SET 1
BVWT 187

Figure A-10

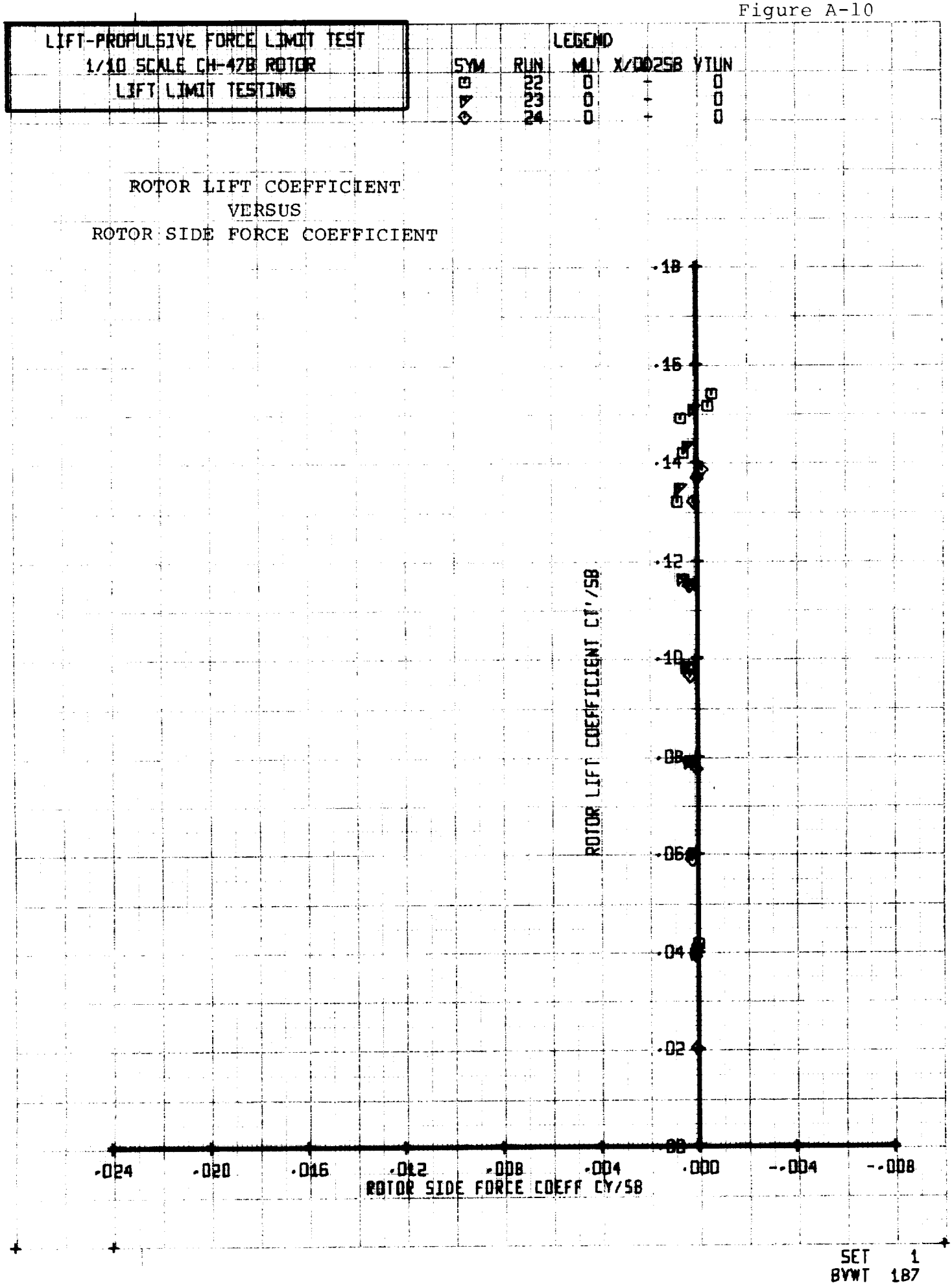
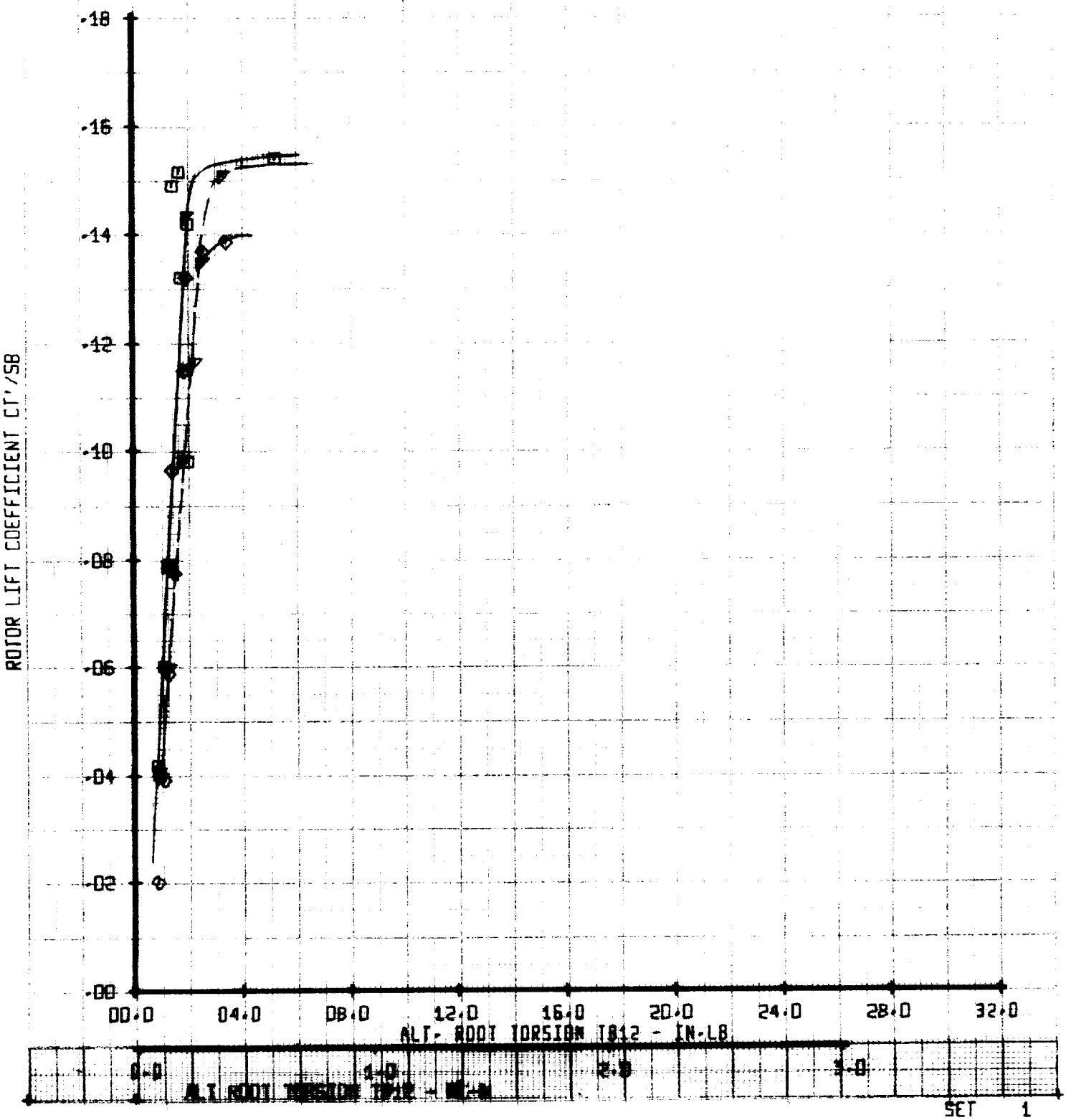

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D2SB YIUN
22 0 + 0
23 0 + 0
24 0 + 0
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-.024
-.020
-.016
-.012
-.008
-.004
.000
--.004
--.008
ROTOR SIDE FORCE COEFF CY/SB
SET 1
BVWT 187
SET 1
WT 187

Figure A-11

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/DD25B	VTUN
⊡	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 1
WT 187

SET 1
BVWT 187

Figure A-12

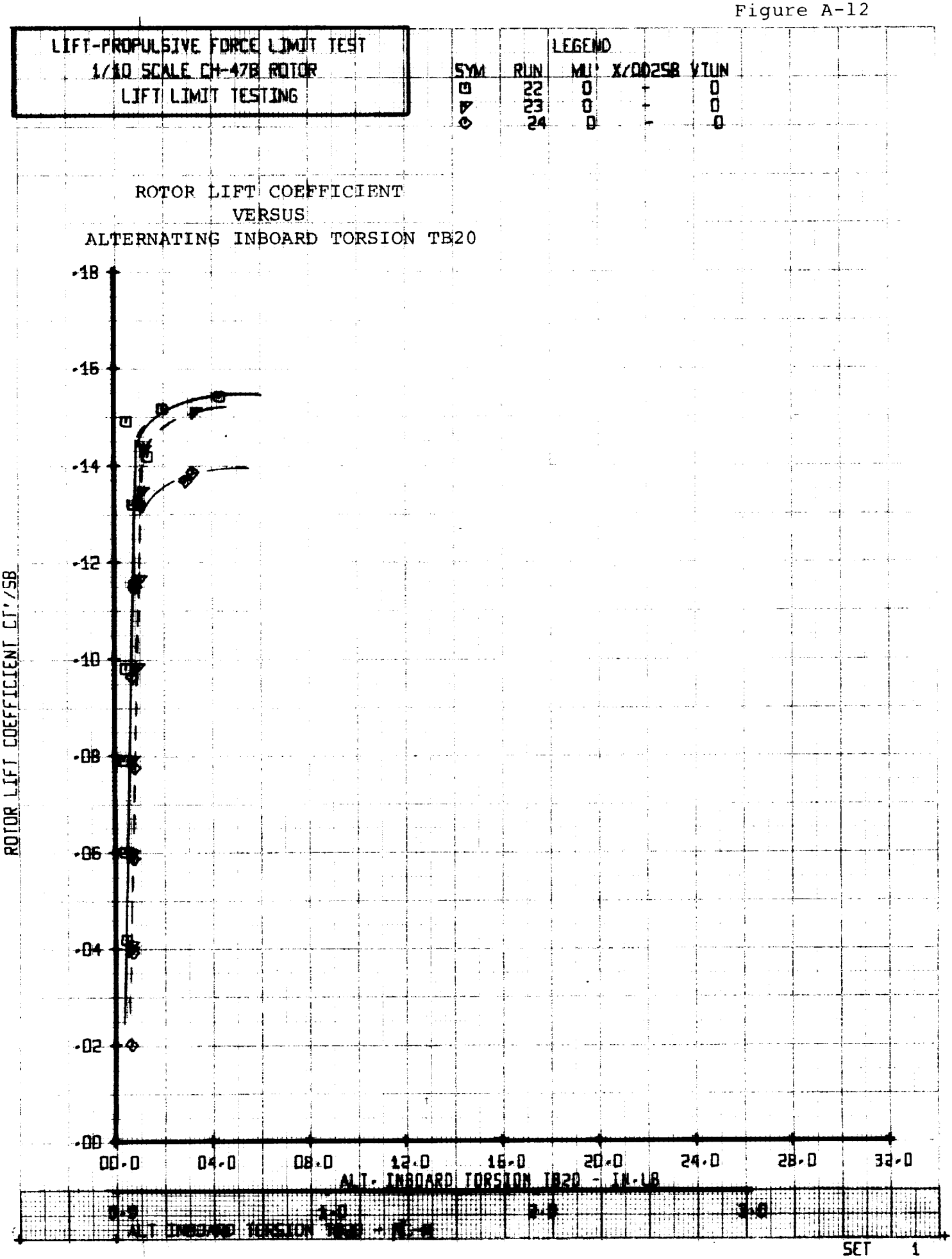
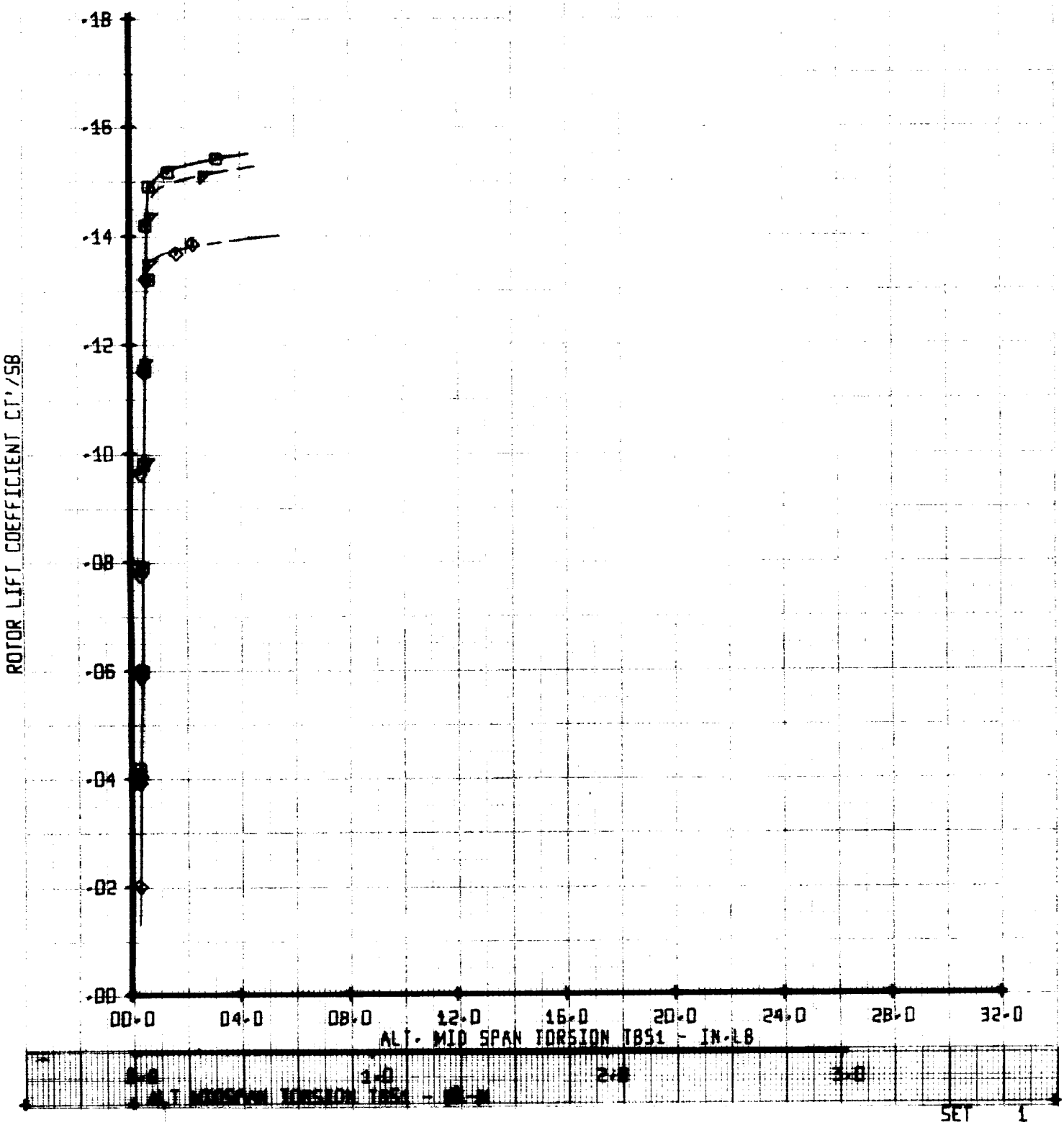

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QQ2SB VTUN
22 0 + 0
23 0 + 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
ALT. INBOARD TORSION TB20 - IN-LB
ET 1
WT 187
SET 1
BVWT 187

Figure A-13

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/DD2SB	VIUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51



ET 1
WT 187

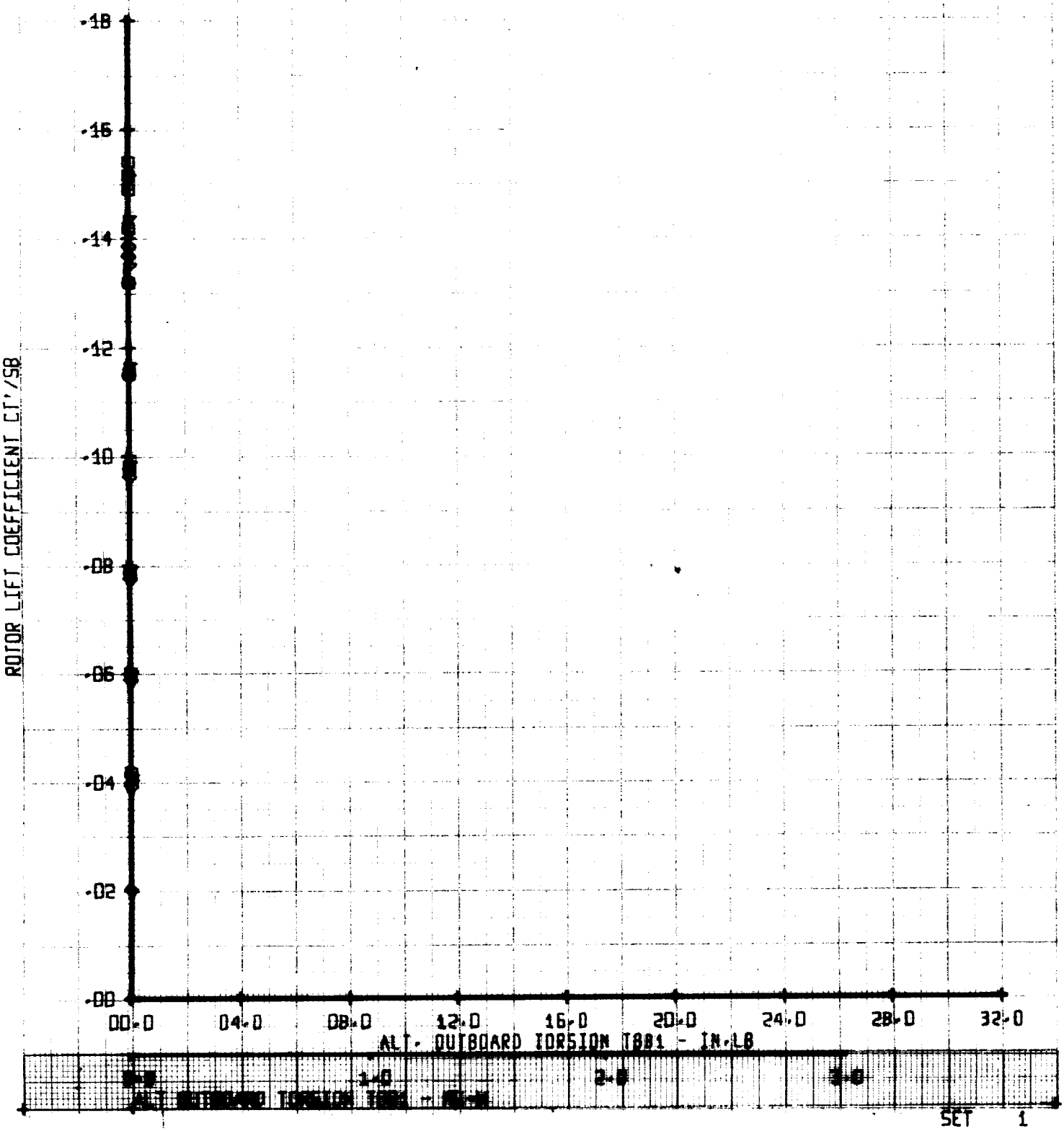
SET 1
BVWT 187

Figure A-14

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
◻	22	0	-	0
◸	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81



ET 1
WT 187

SET 1
BVWT 187

Figure A-15

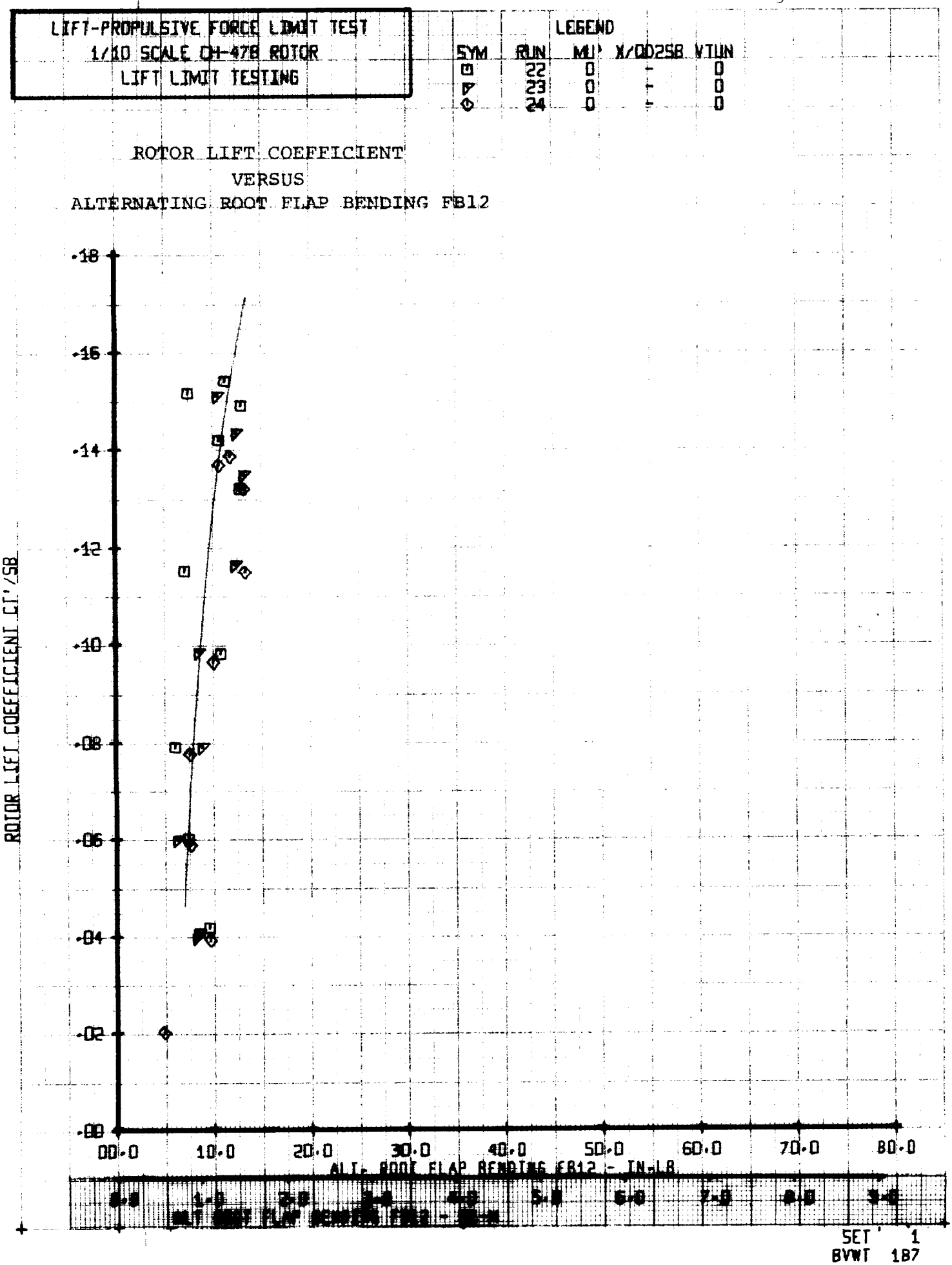
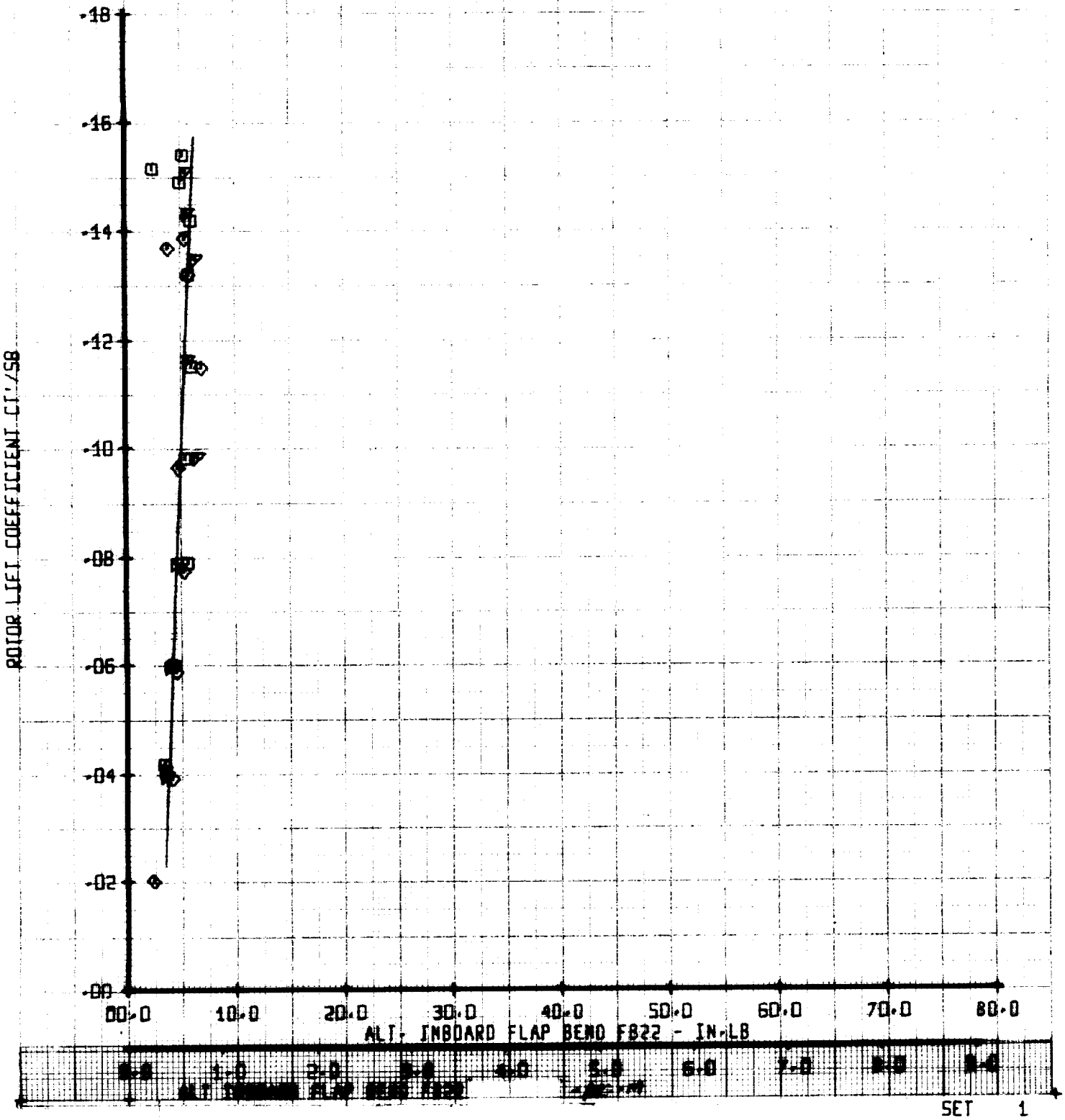

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VTUN
22 0 - 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. ROOT FLAP BENDING FB12 - IN-LB
ET 1
WT 187
SET 1
BVWT 187

Figure A-16

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND SYM	RUN	MU	X/QD2SB	XIUN
▭	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD FLAP BENDING FB22



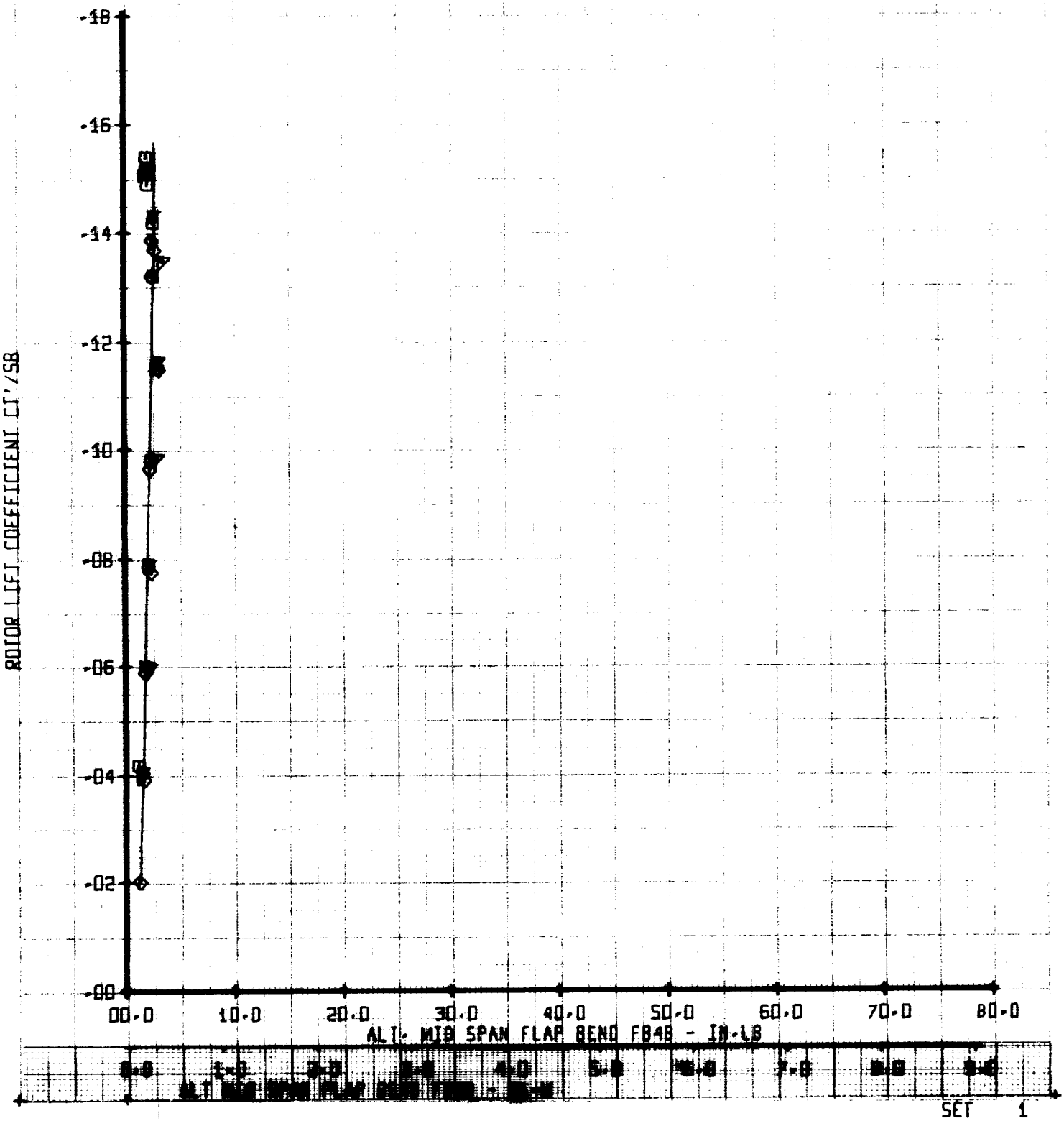
ET 1
WT 187

SET 1
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/DD2SB	VTUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB48



ET 1
WT 187

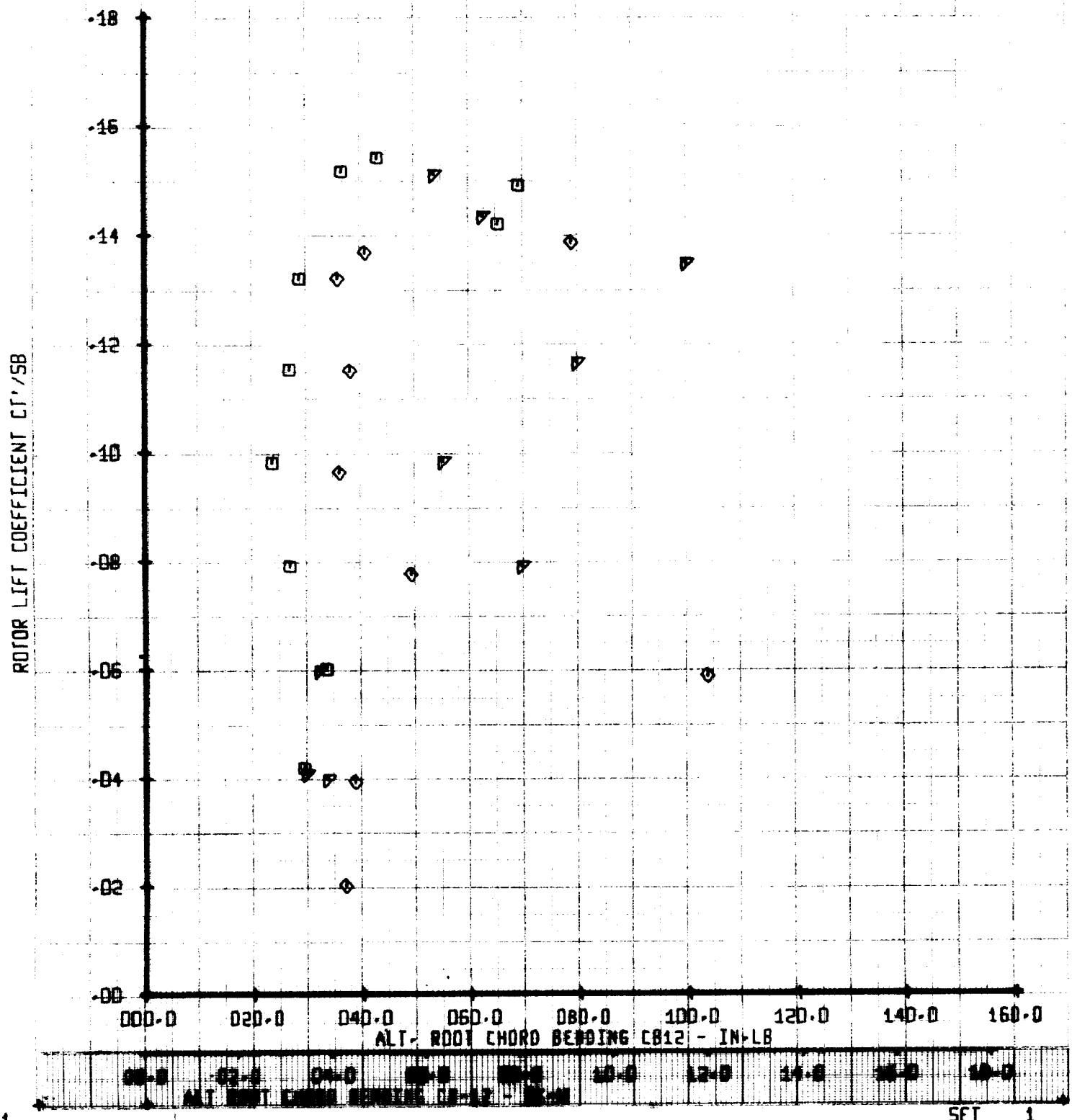
SET 1
BVWT 187

Figure A-18

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/DD2SB	VTUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12

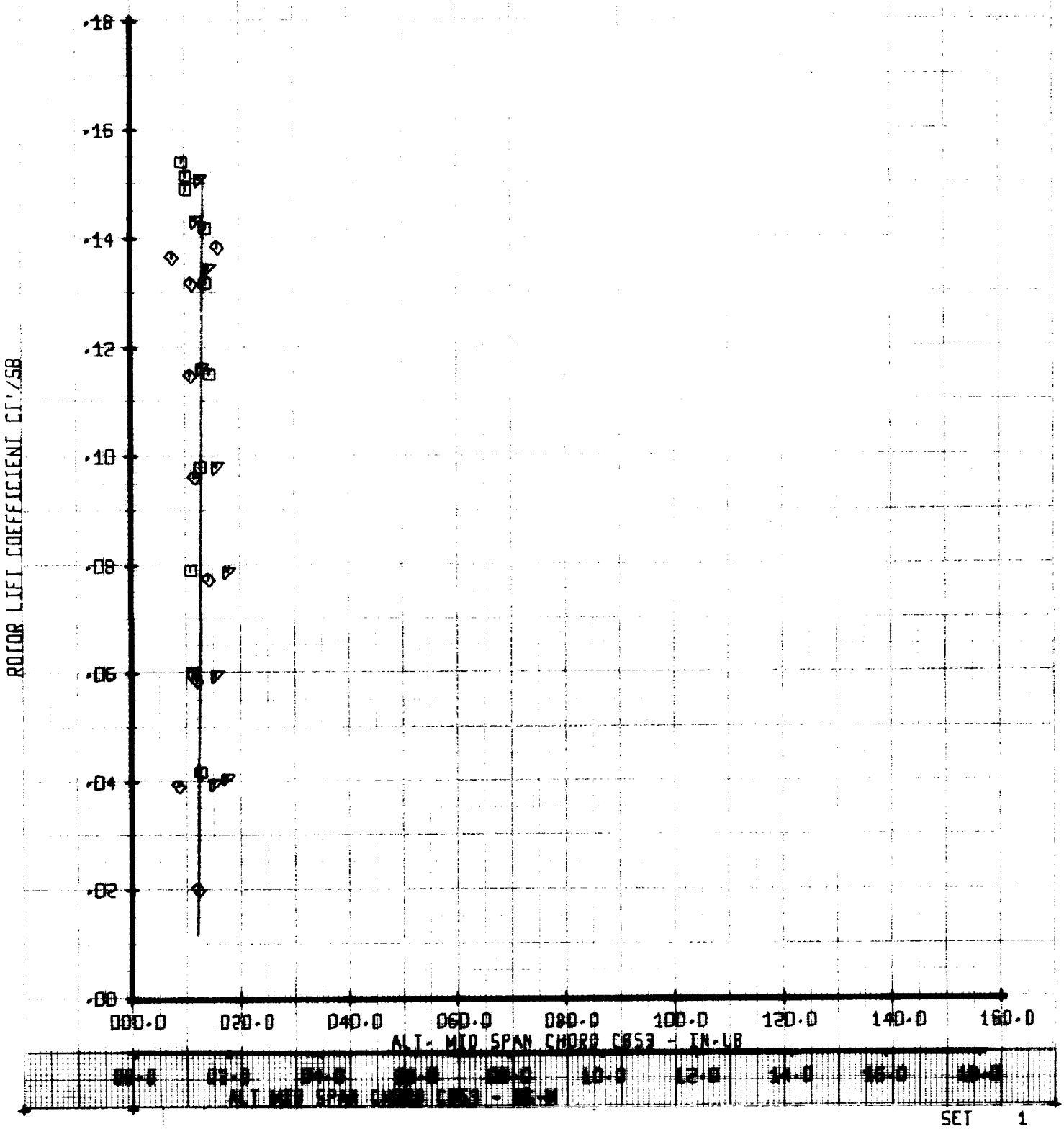


SET 1
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND SYM	RUN	MU	X/DD25B	NTUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

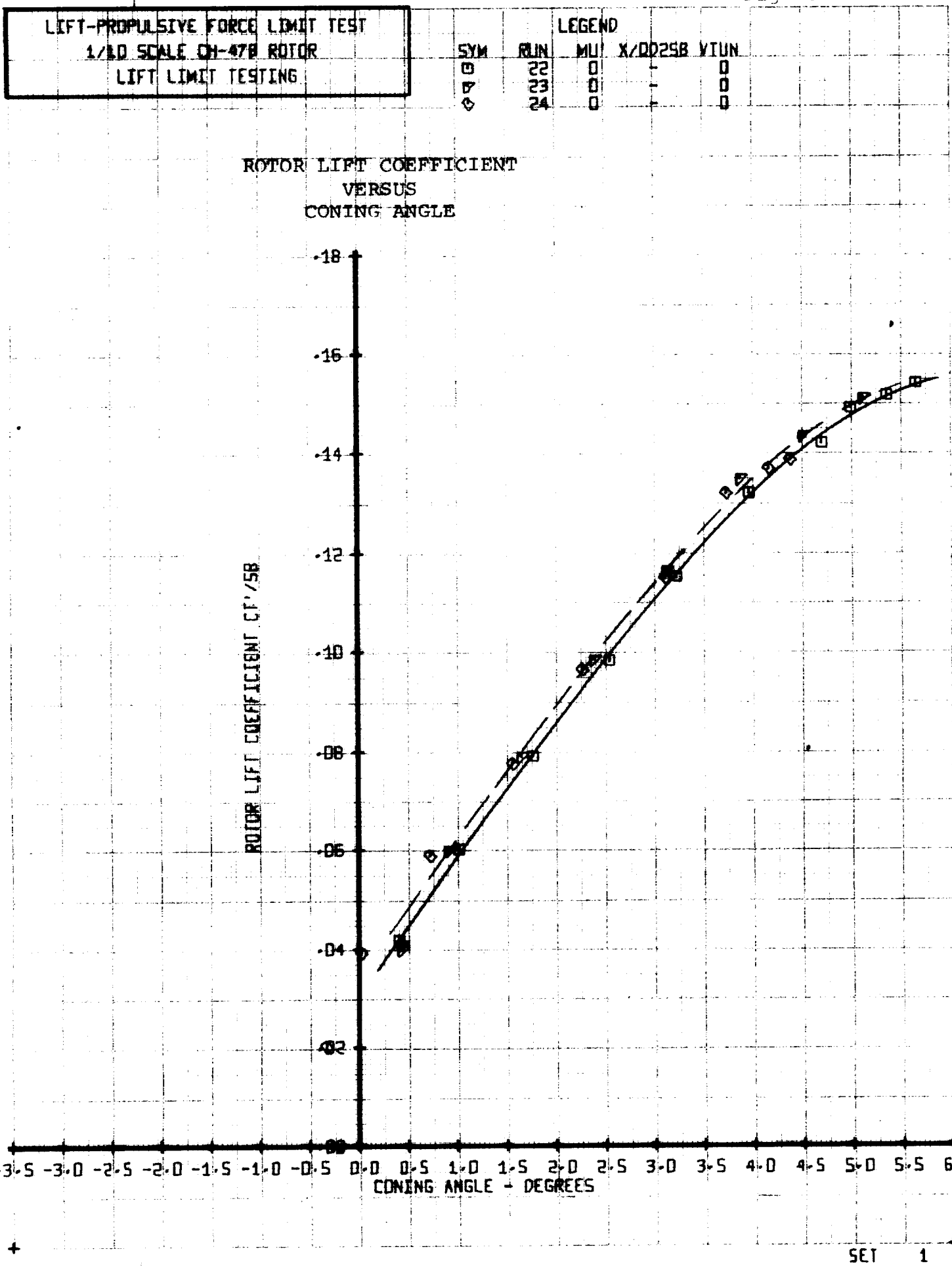
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN CHORD CB53



ET 1
WT 187

SET 1
BVWT 187

Figure A-20



ET 1
WT 187

SET 1
BVWT 187

Figure A-21

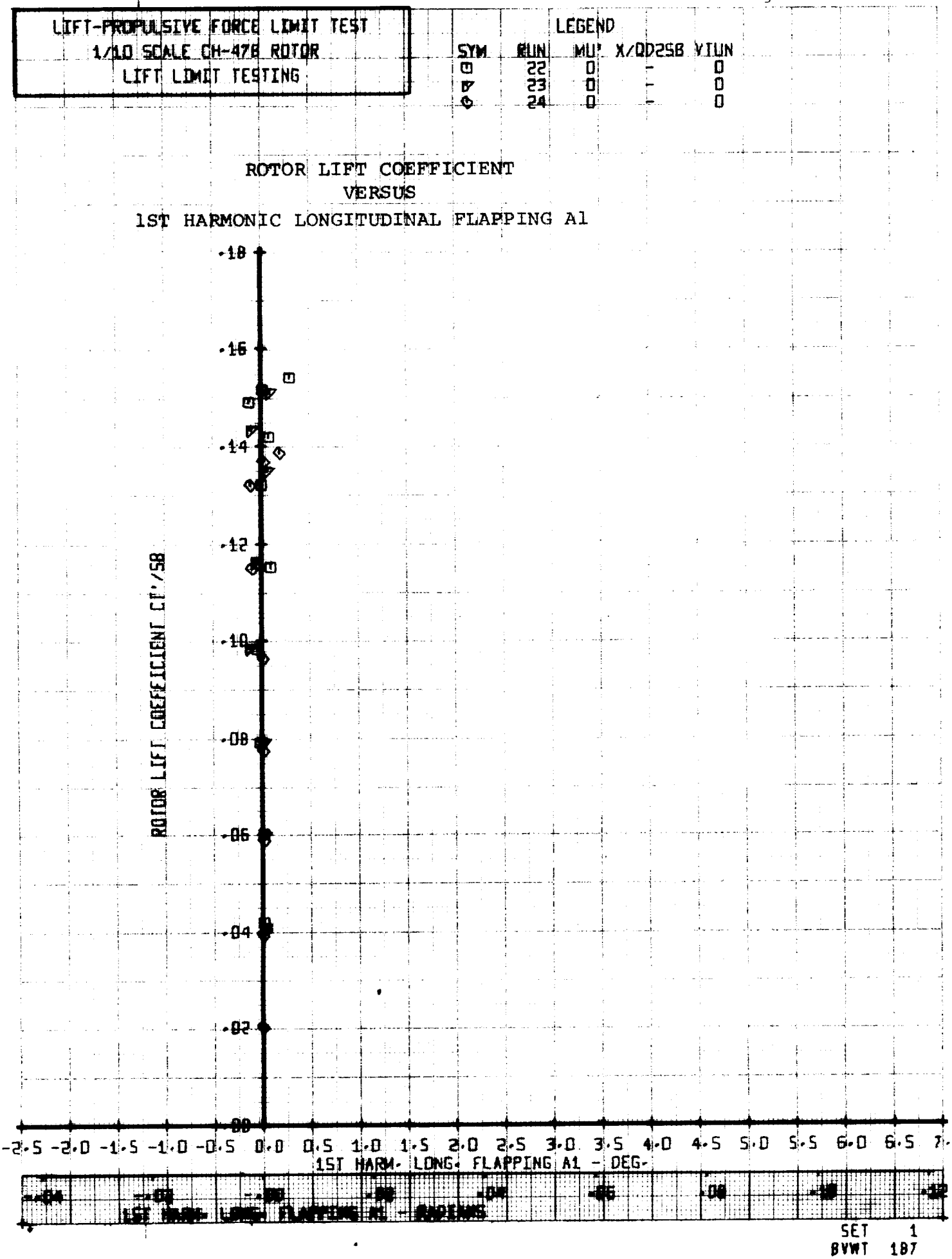

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VIUN
22 0 - 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LONG. FLAPPING A1 - DEG.
SET 1
BVWT 187
SET 1
WT 187

Figure A-22

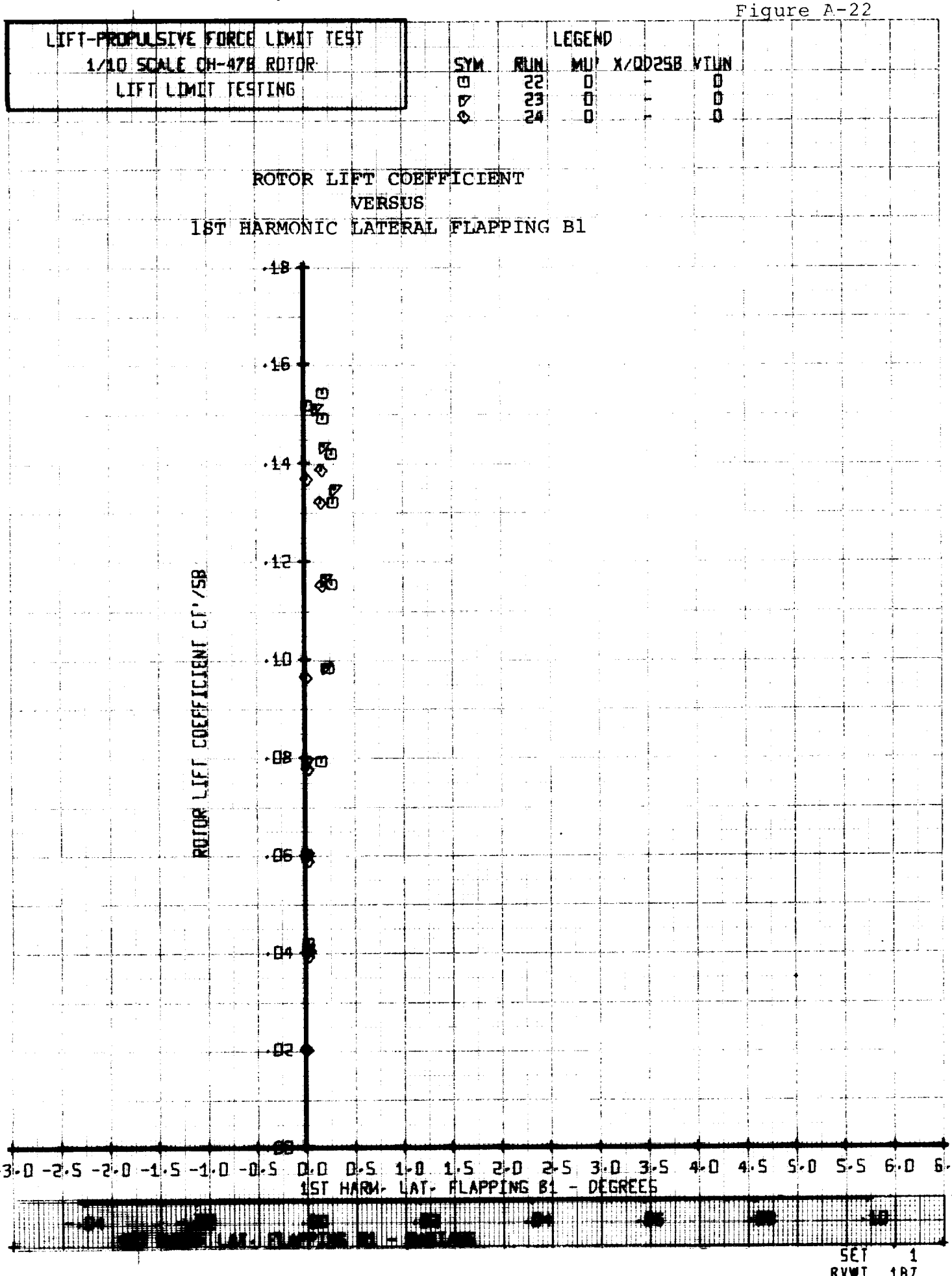
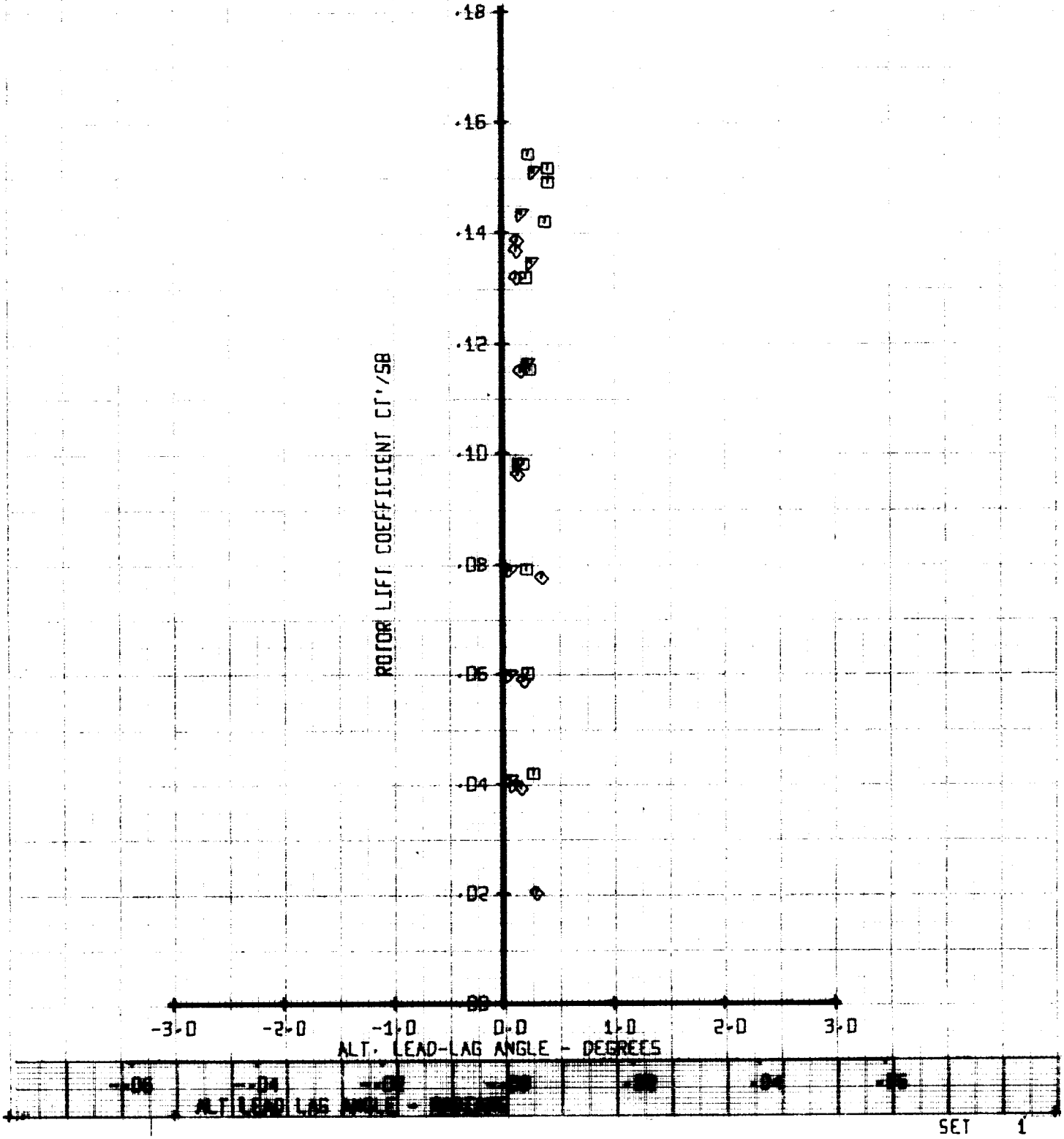

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VTUN
22 0 - 0
23 0 - 0
24 0 - 0
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
1ST HARM. LAT. FLAPPING B1 - DEGREES
ET 1
WT 187
SET 1
BVWT 187

Figure A-23

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/QD2SB	VTUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



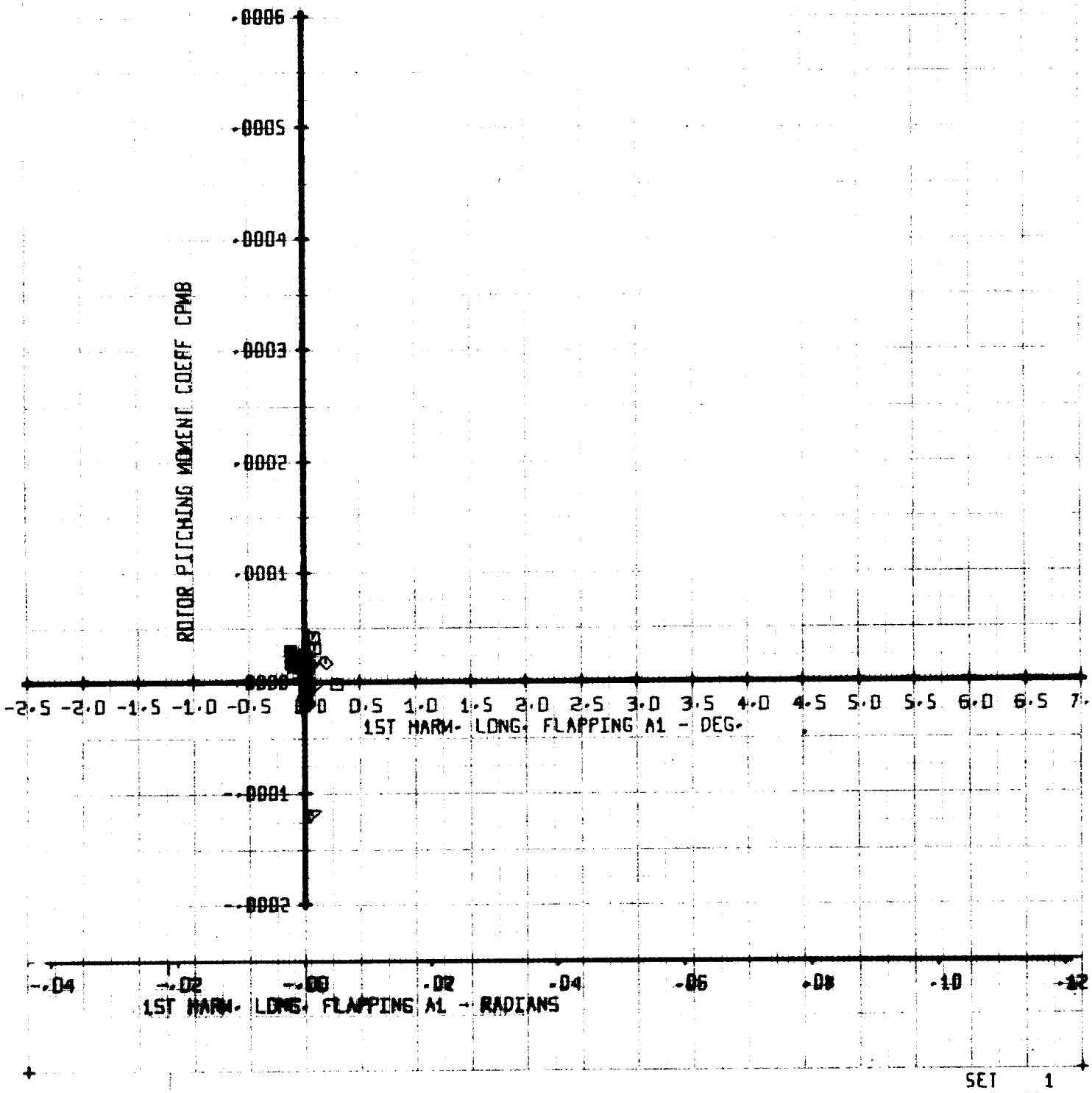
ET 1
WT 187

SET 1
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	WTUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



SET 1
WT 187

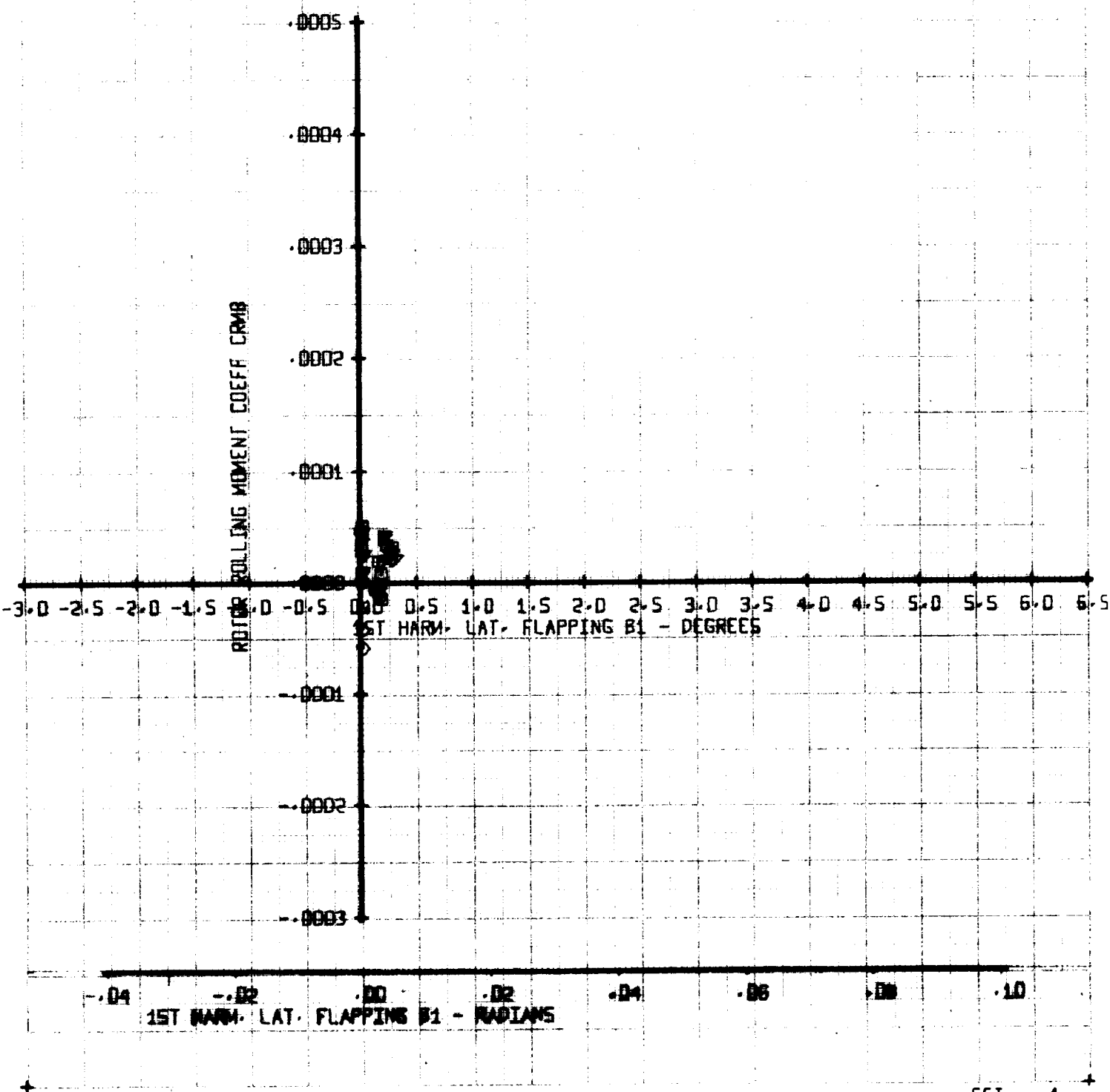
SET 1
BVWT 187

Figure A-25

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/QD2SB	VIUN
□	22	0	-	0
▽	23	0	-	0
◇	24	0	-	0

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 1
WT 187

SET 1
BVWT 187

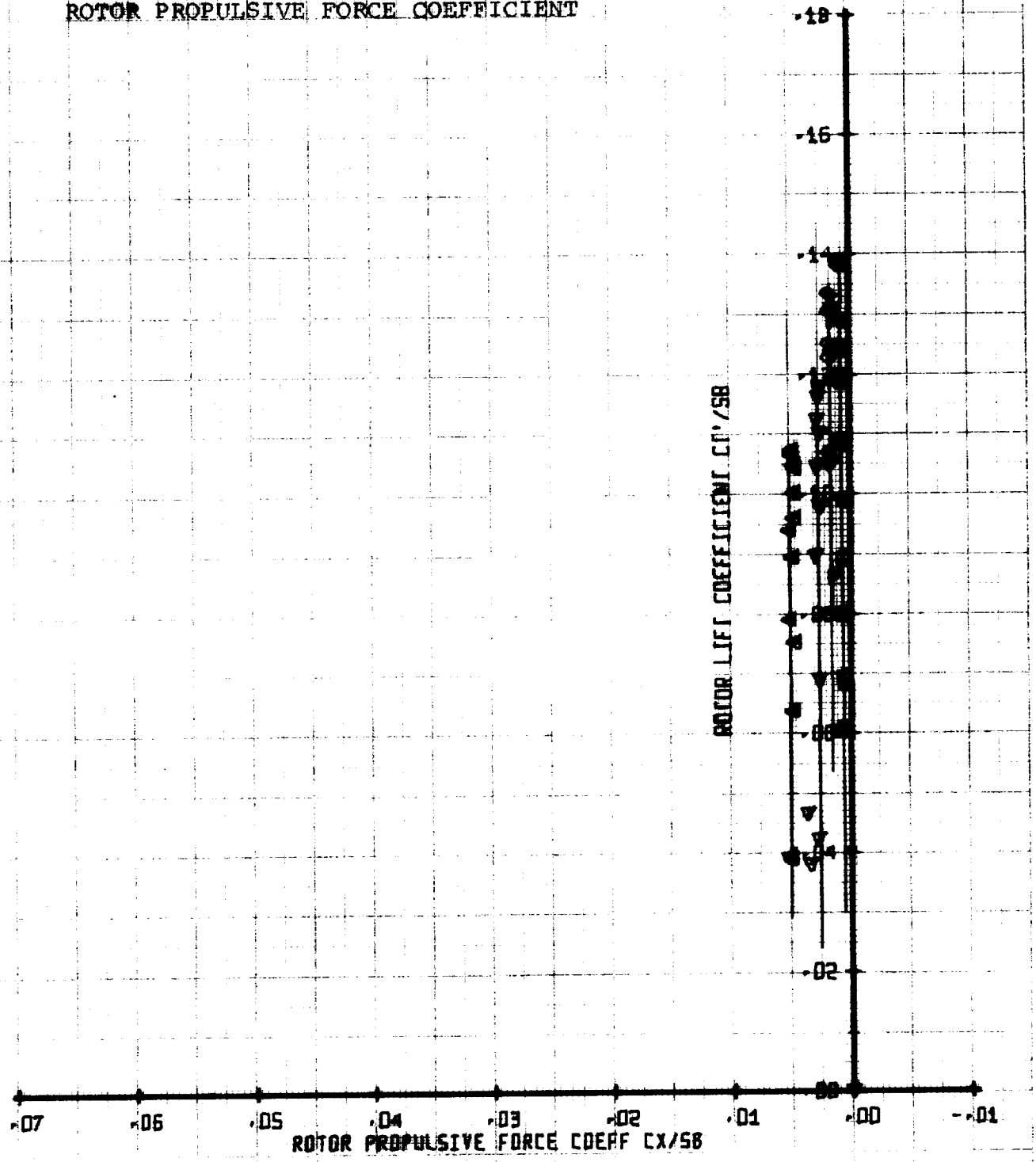
Figure A-26

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D025B	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▽	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



SET 2
WT 187

SET 2
BVWT 187

Figure A-27

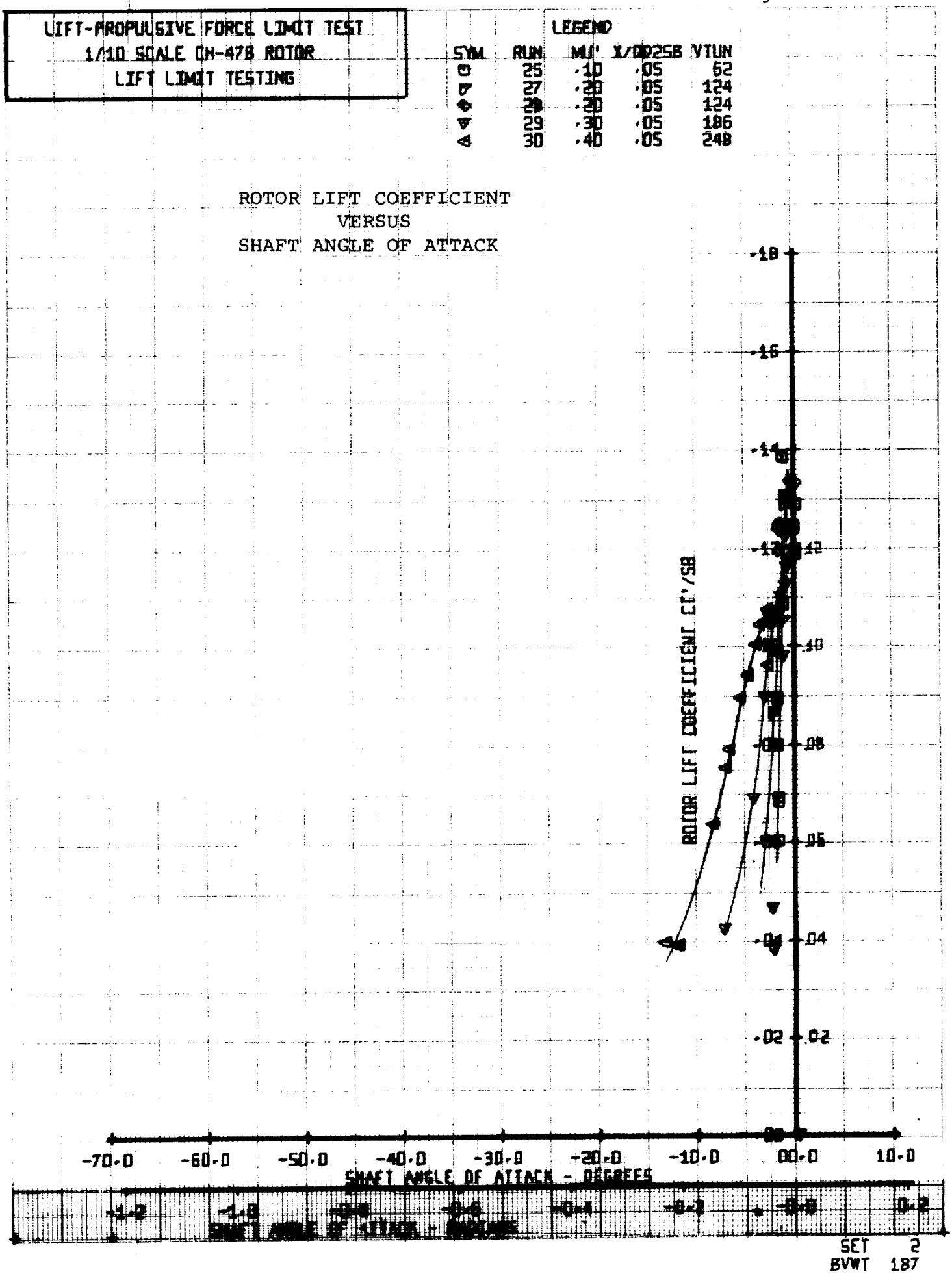
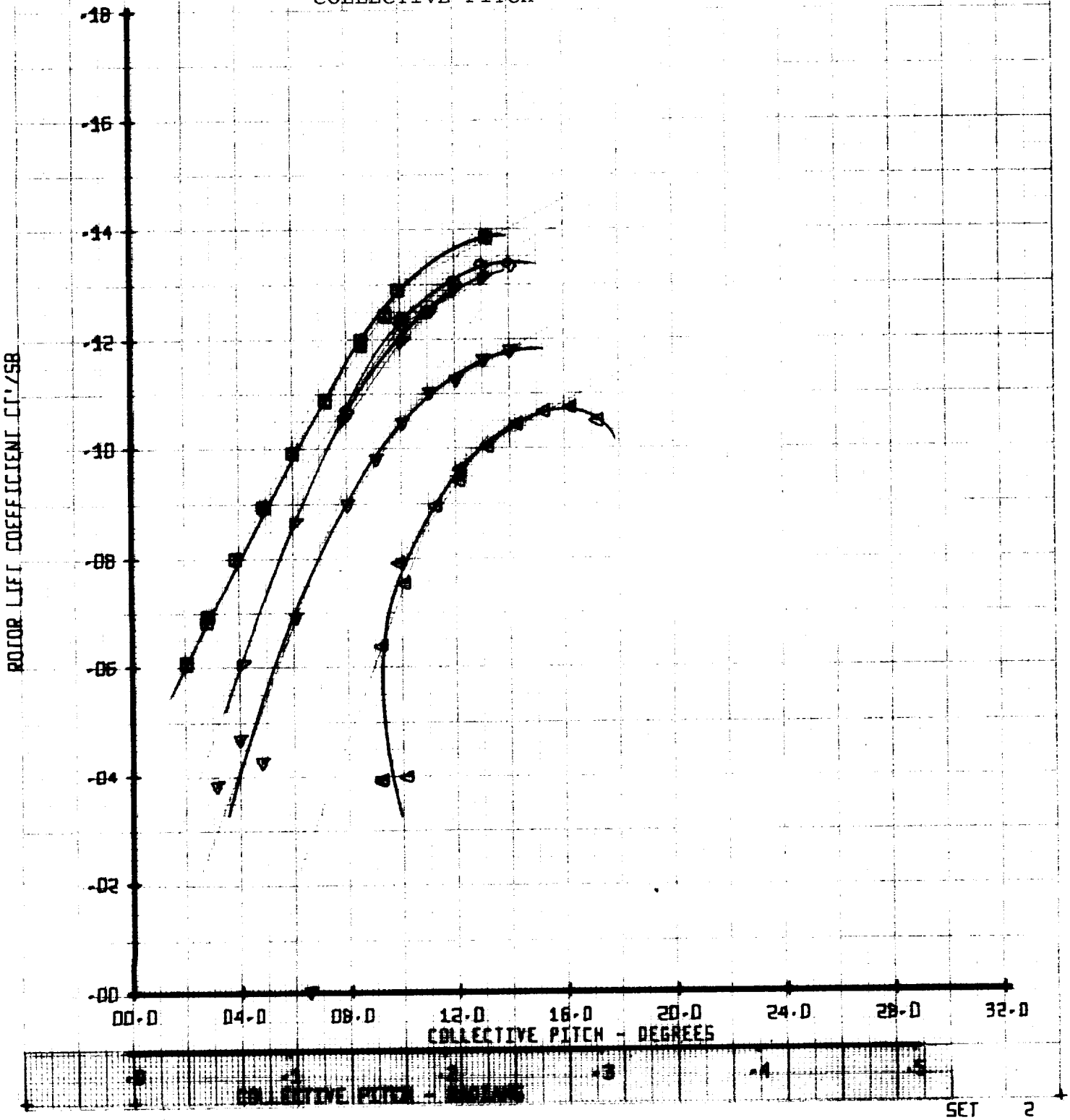

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/D25B VTUN
25 .10 .05 62
27 .20 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK
ROTOR LIFT COEFFICIENT CT/SB
-70.0 -60.0 -50.0 -40.0 -30.0 -20.0 -10.0 00.0 10.0
SHAFT ANGLE OF ATTACK - DEGREES
SET 2
BVWT 187

Figure A-28

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD25B	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▼	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



SET 2
BVWT 187

Figure A-29

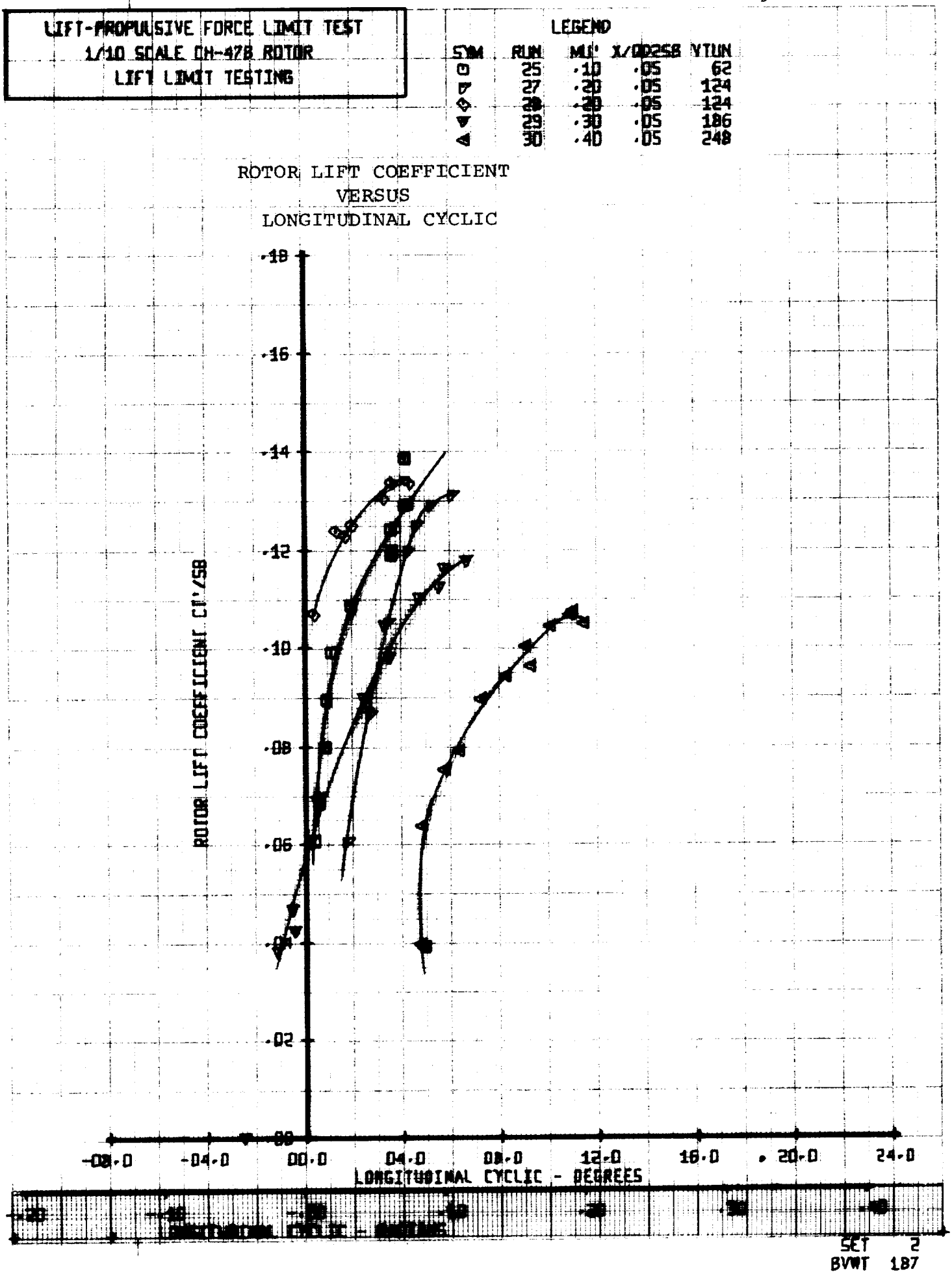

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
25 .10 .05 62
27 .20 .05 124
28 .20 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.02
-08.0
-04.0
00.0
04.0
08.0
12.0
16.0
20.0
24.0
LONGITUDINAL CYCLIC - DEGREES
SET 2
BVWT 187

Figure A-30

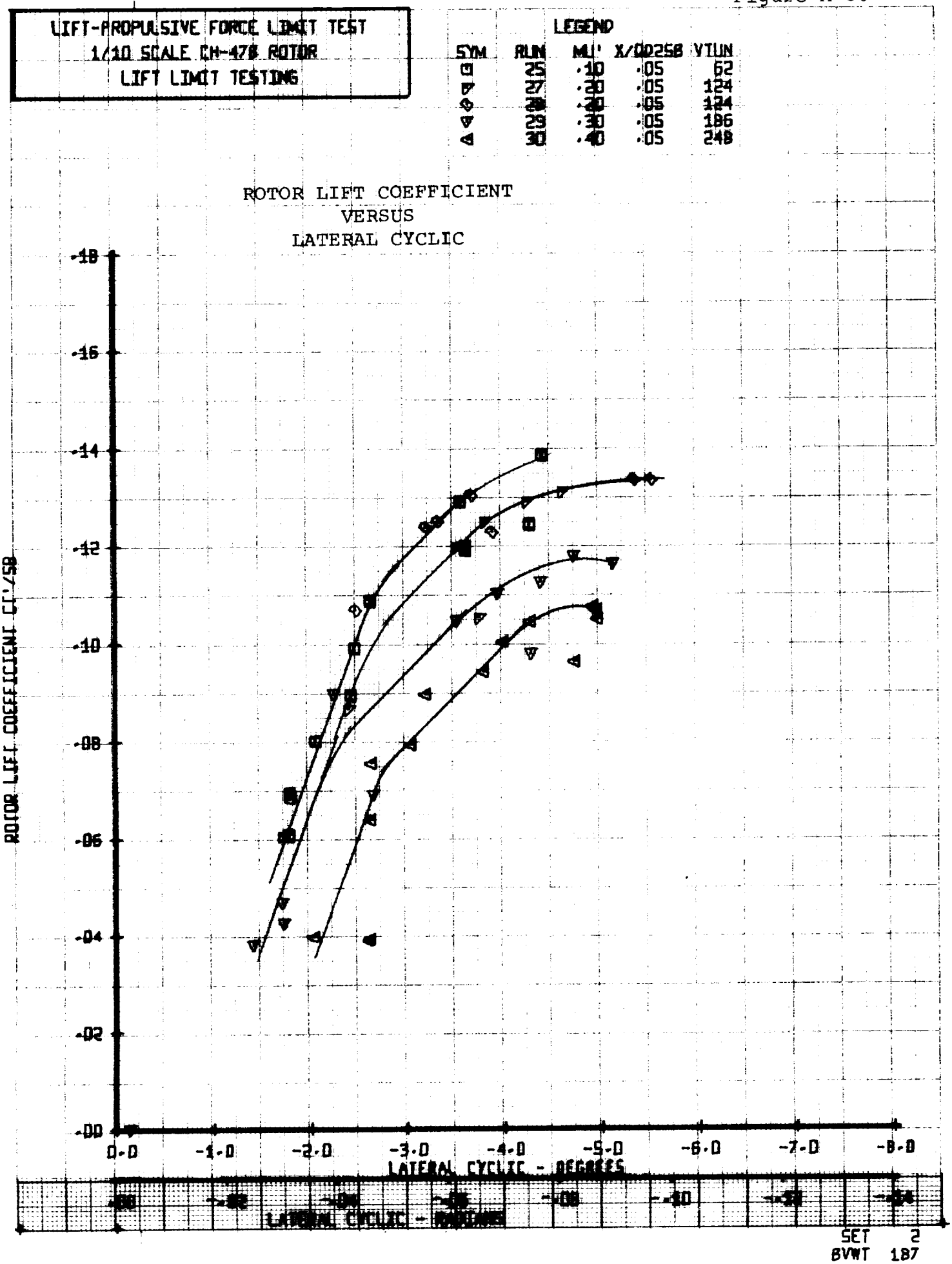

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QQ25B VTUN
25 .10 .05 62
27 .20 .05 124
.30 .05 186
.40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
LATERAL CYCLIC - DEGREES
SET 2
BVWT 187

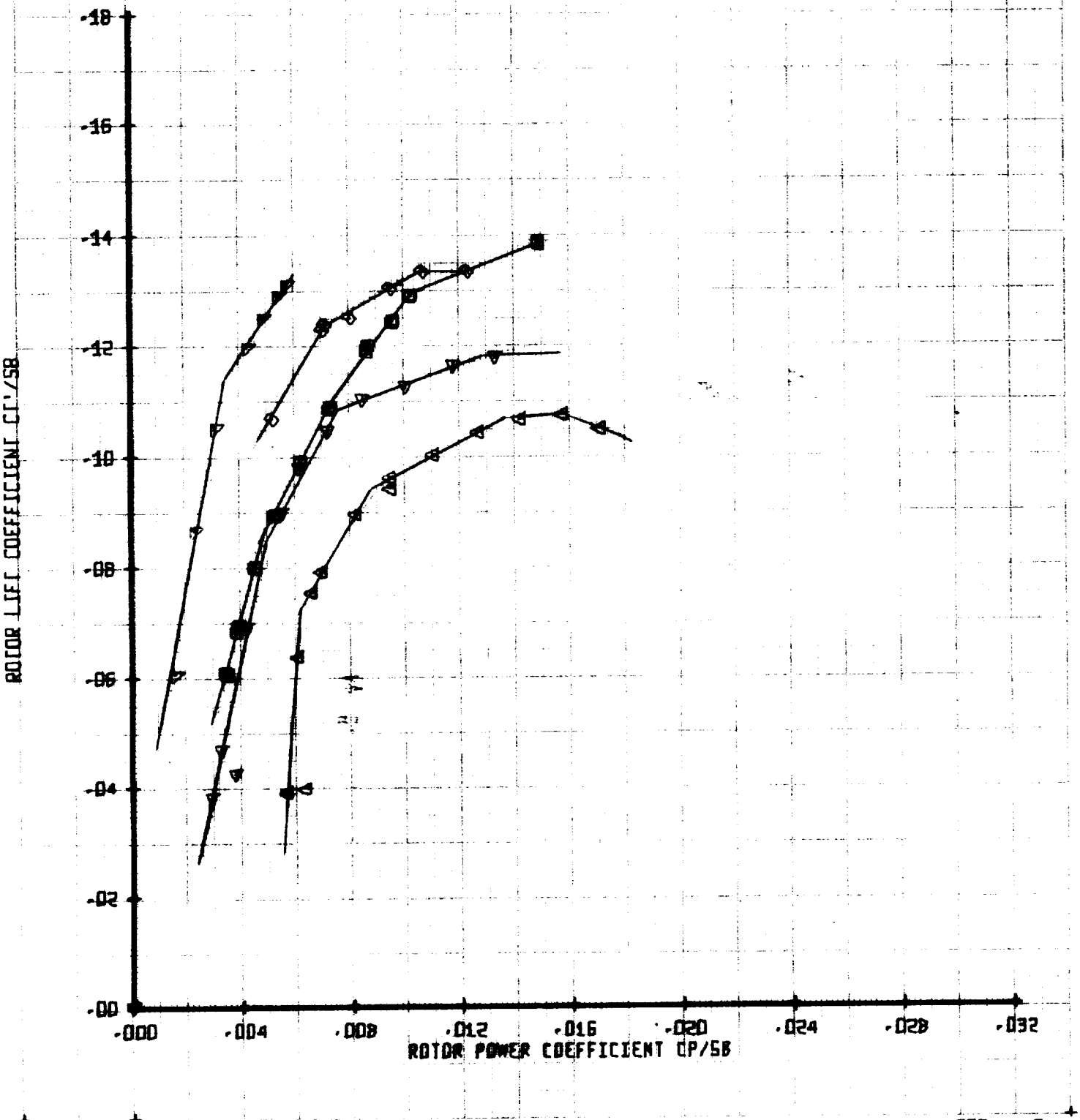
Figure A-31

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SB	YTUN
◇	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▽	29	.30	.05	186
△	30	.40	.05	248

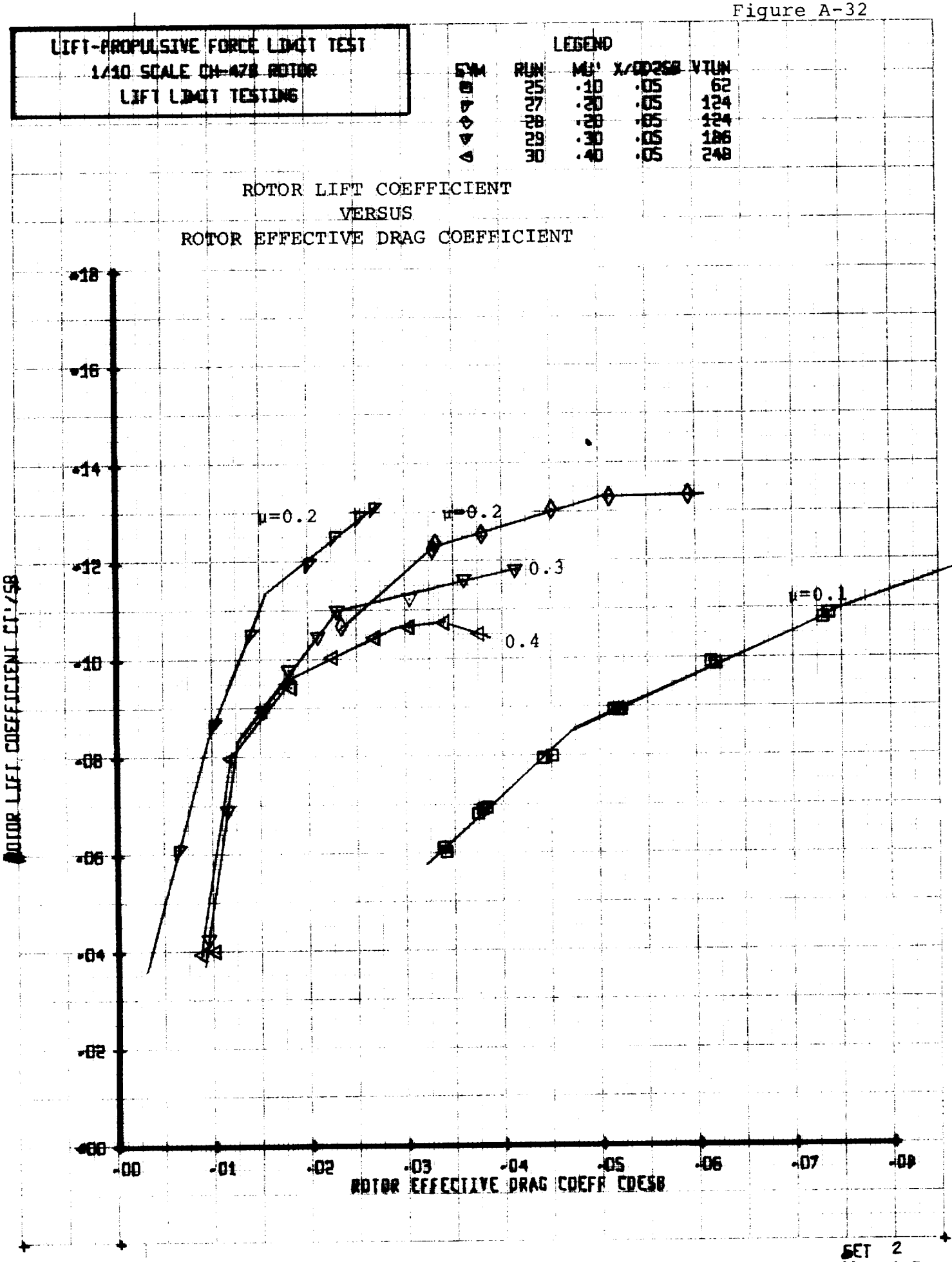
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



SET 2
BWT 187

SET 2
BWT 187

Figure A-32



SET 2
BVWT 187

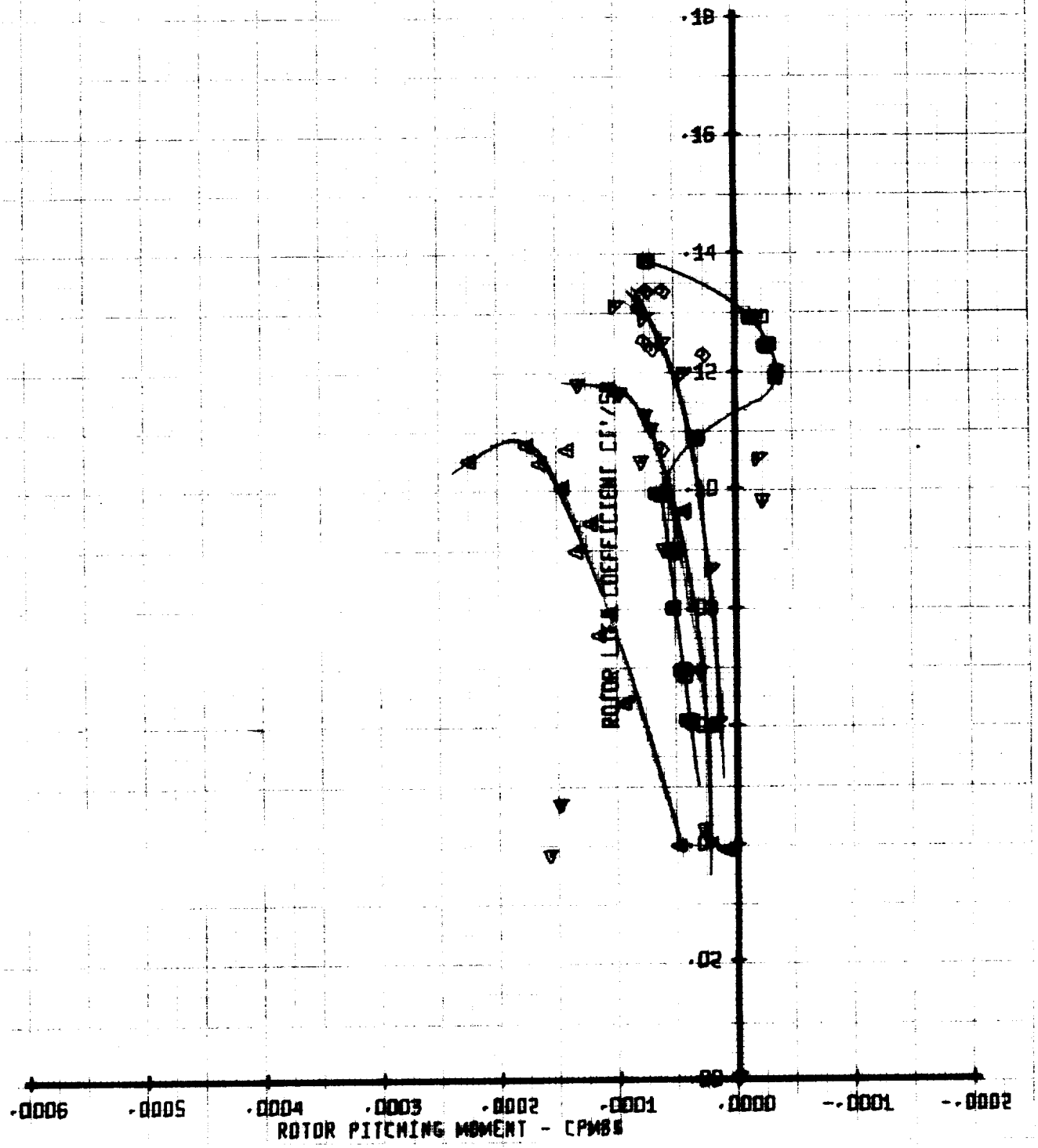
Figure A-33

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YIUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▽	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 2
WT 187

SET 2
BVWT 187

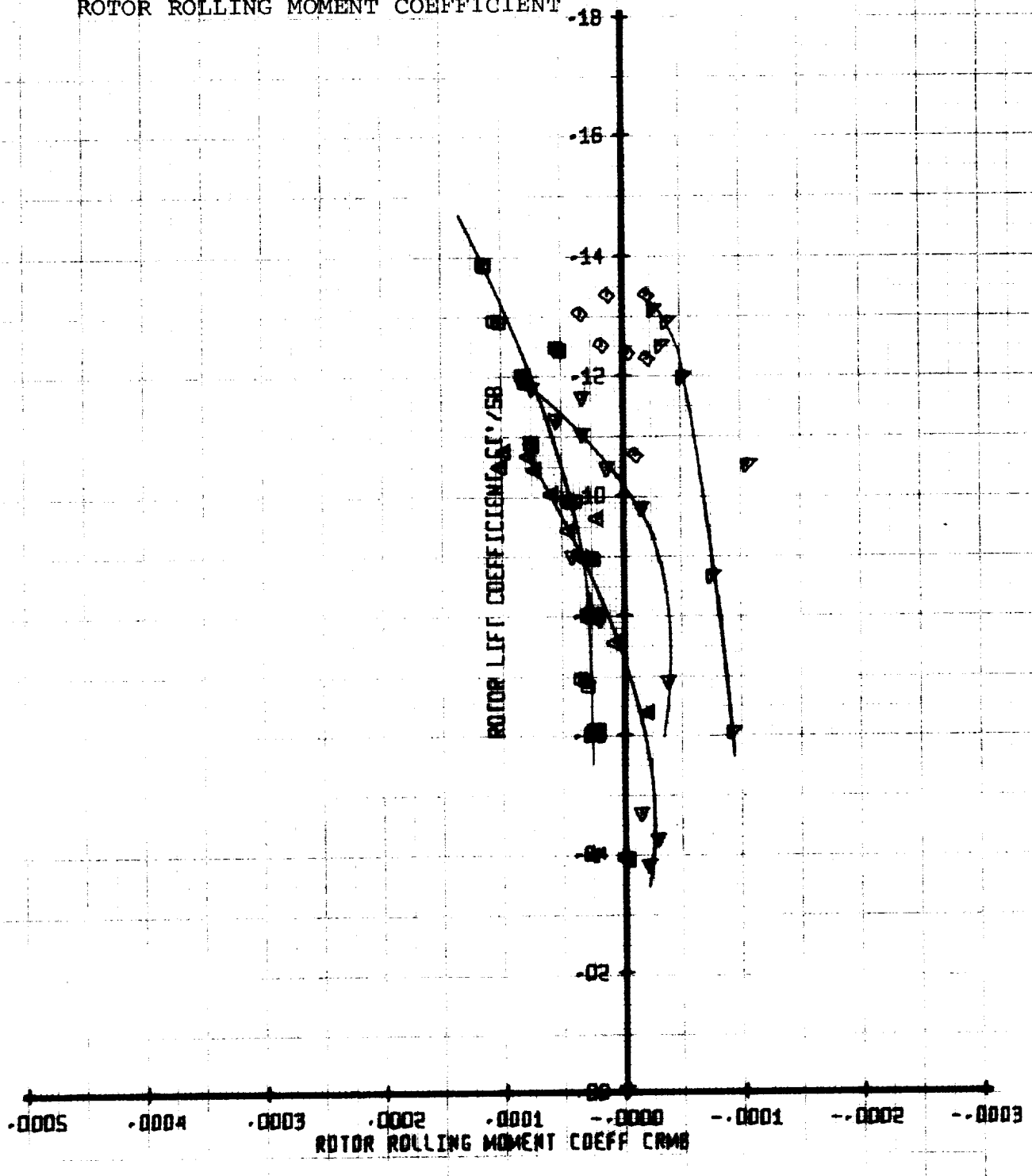
Figure A-34

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▽	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



SET 2
BVWT 187

SET 2
BVWT 187

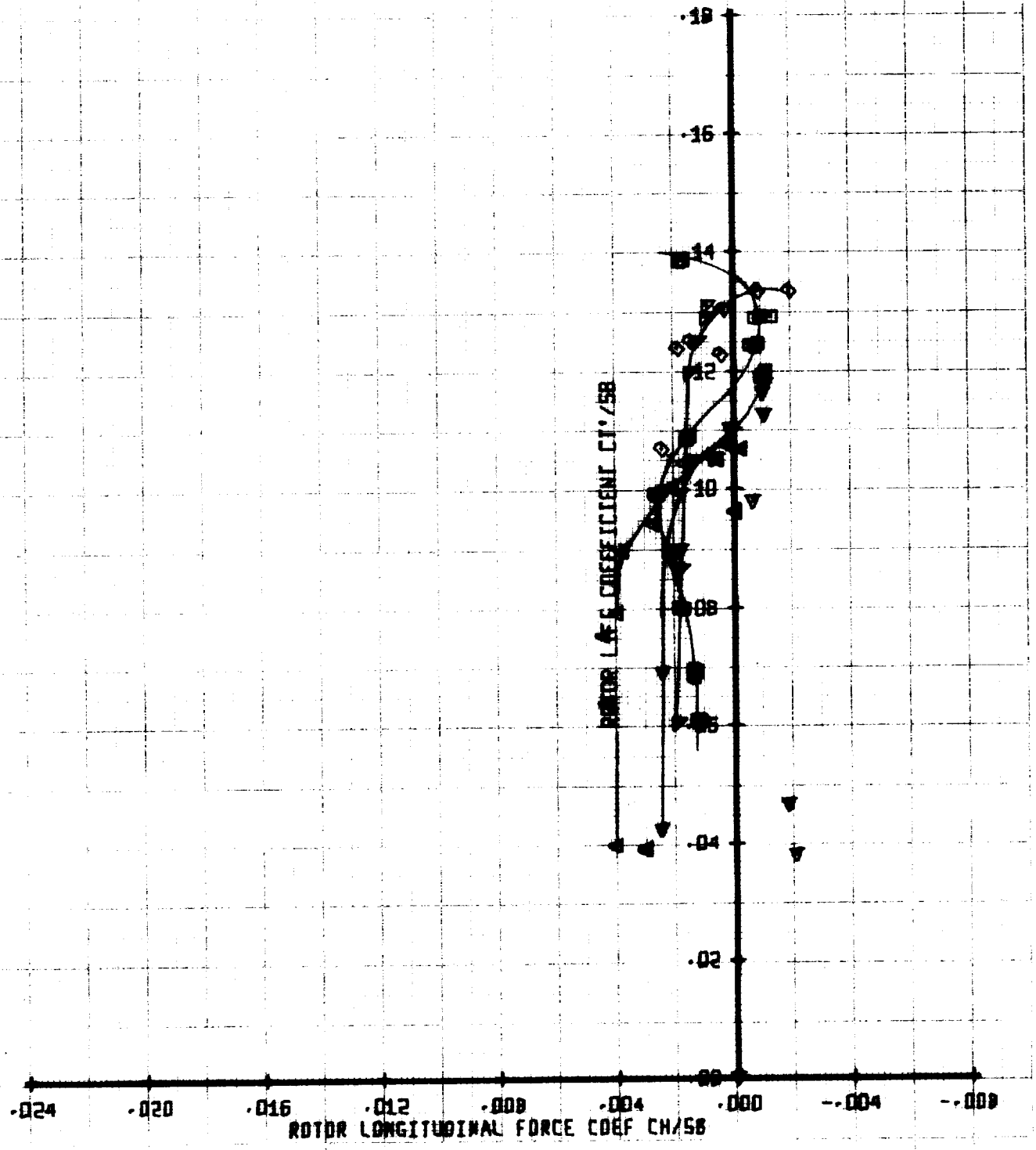
Figure A-35

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SR	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▼	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



SET 2
BVWT 187

SET 2
BVWT 187

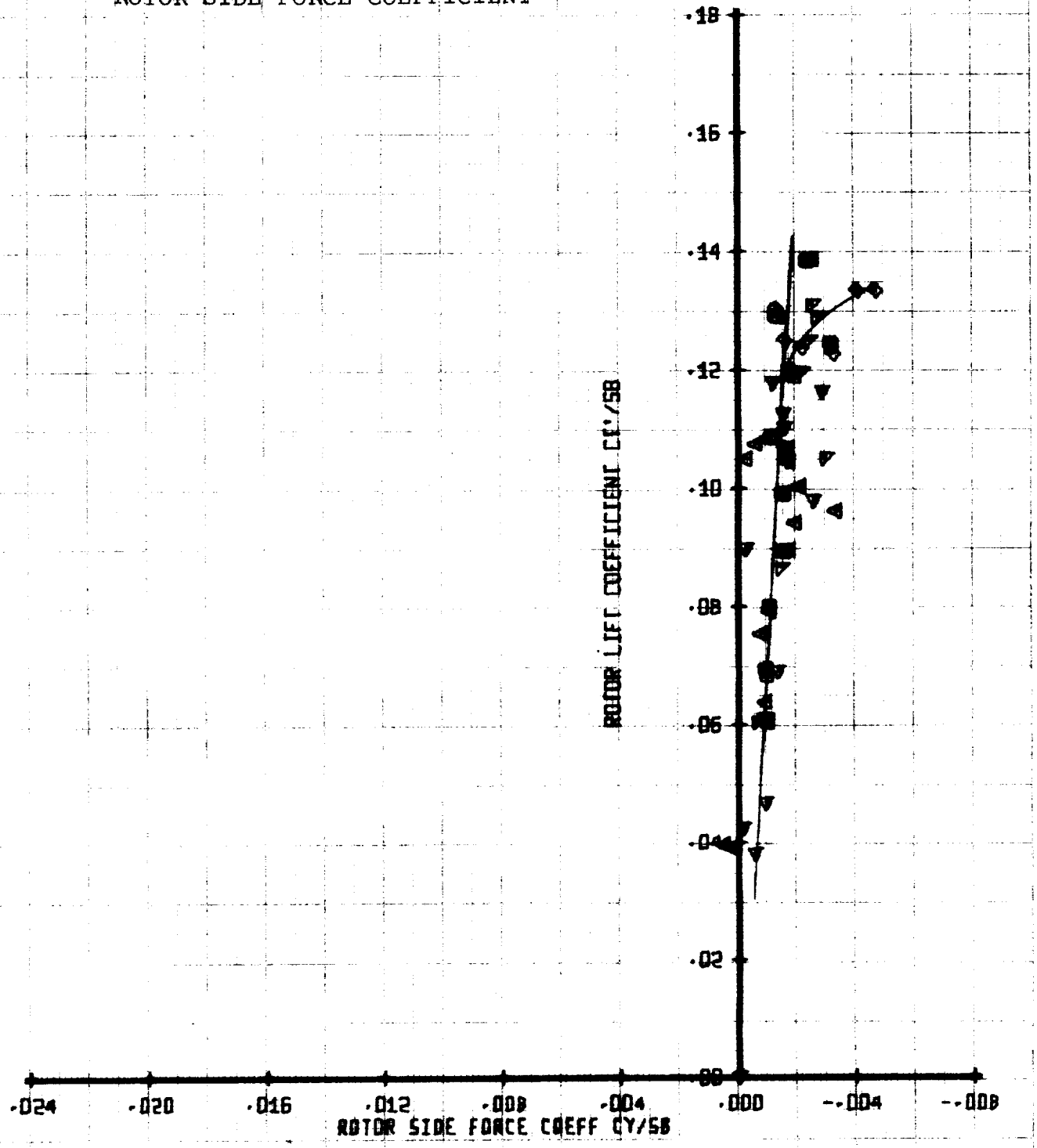
Figure A-36

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD25B	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.30	.05	124
◁	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



SET 2
BVWT 187

Figure A-37

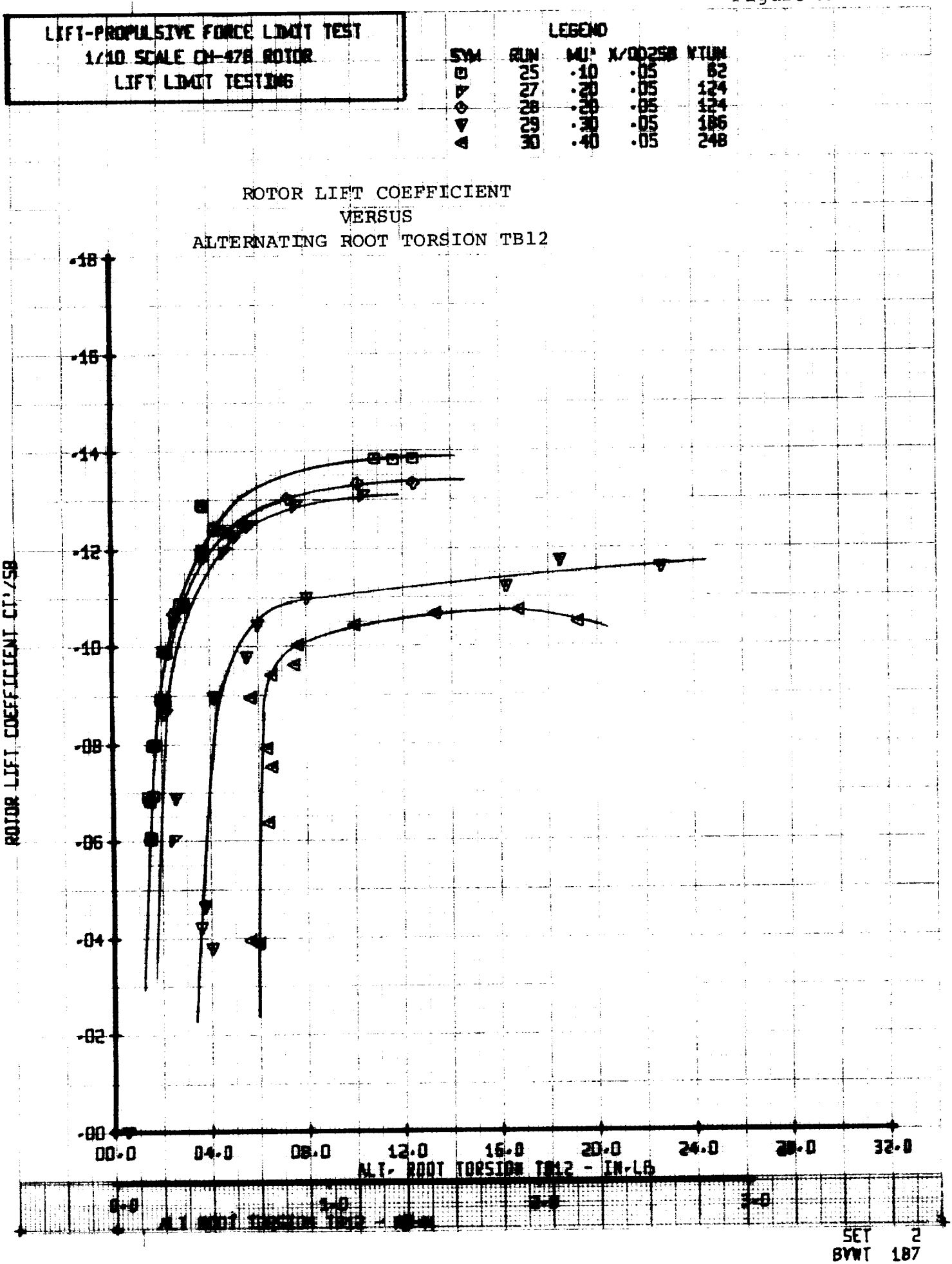

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB KTUN
25 .10 .05 62
27 .20 .05 124
28 .30 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
ALT. ROOT TORSION TB12 - IN-LB
ET 2
WT 187
SET 2
BVWT 187

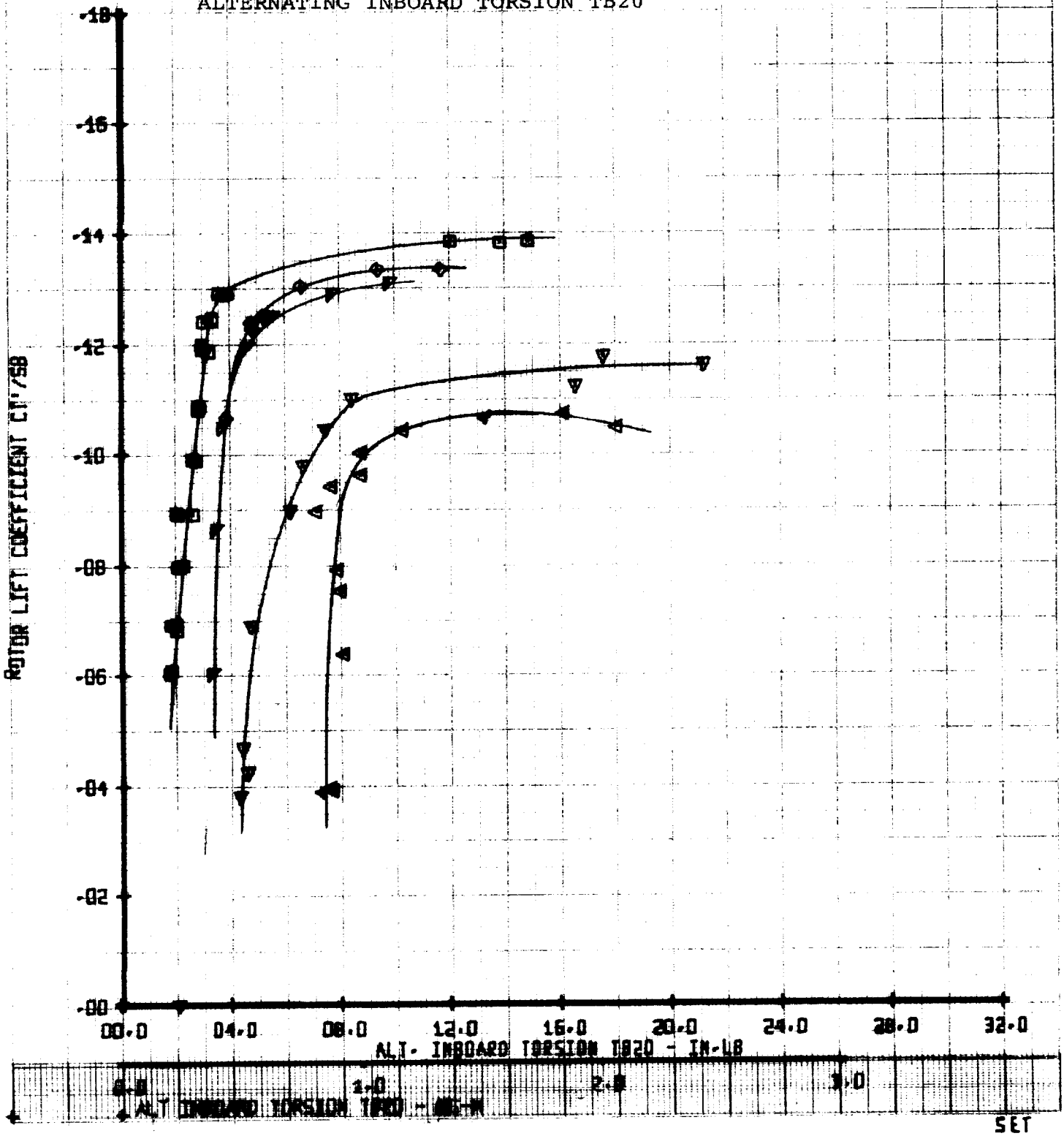
Figure A-38

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD2SB	VTUN
⊡	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▼	29	.30	.05	186
◁	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20



ET 2
WT 187

SET
BVWT 18

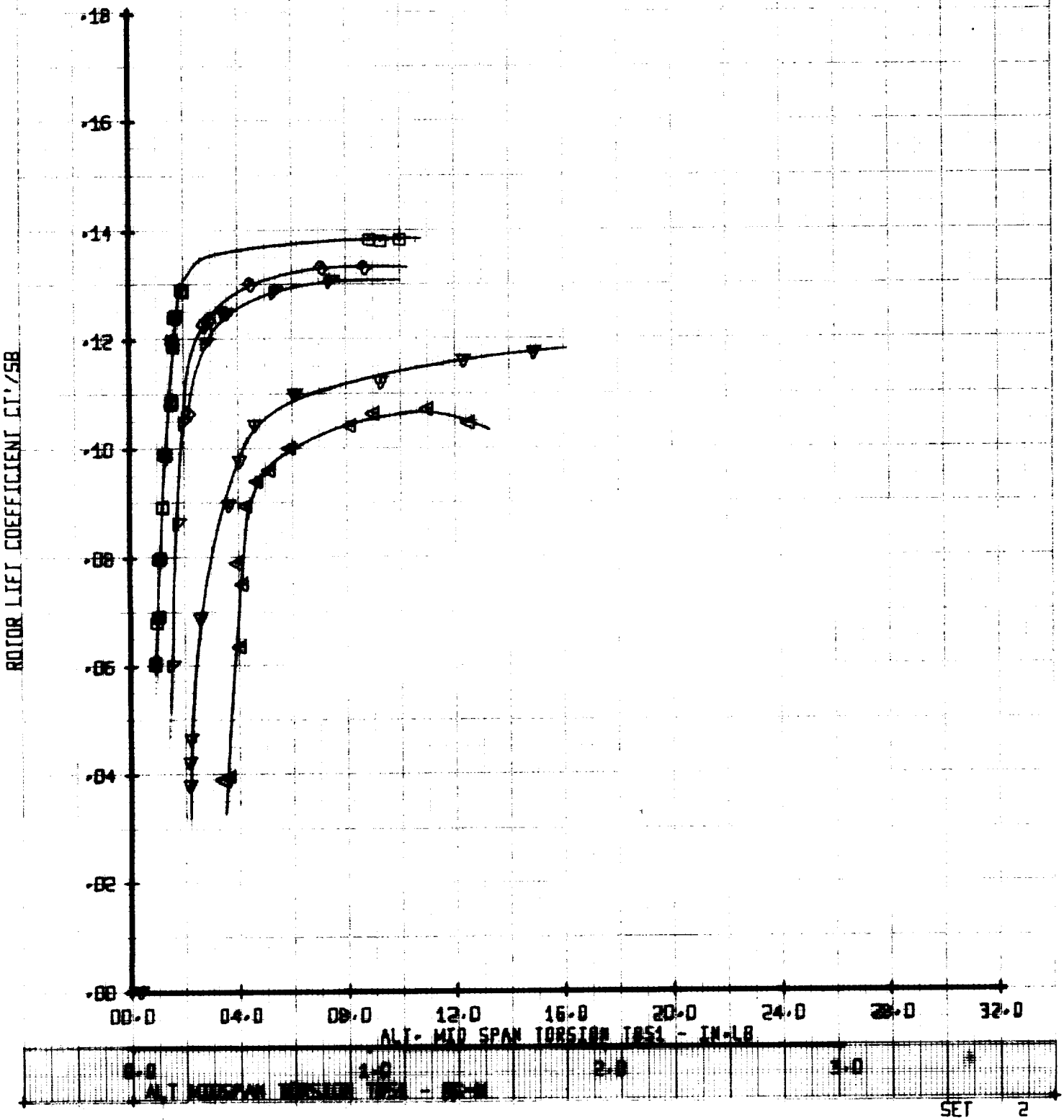
Figure A-39

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.28	.05	124
▼	29	.30	.05	186
◁	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51



ET 2
WT 187

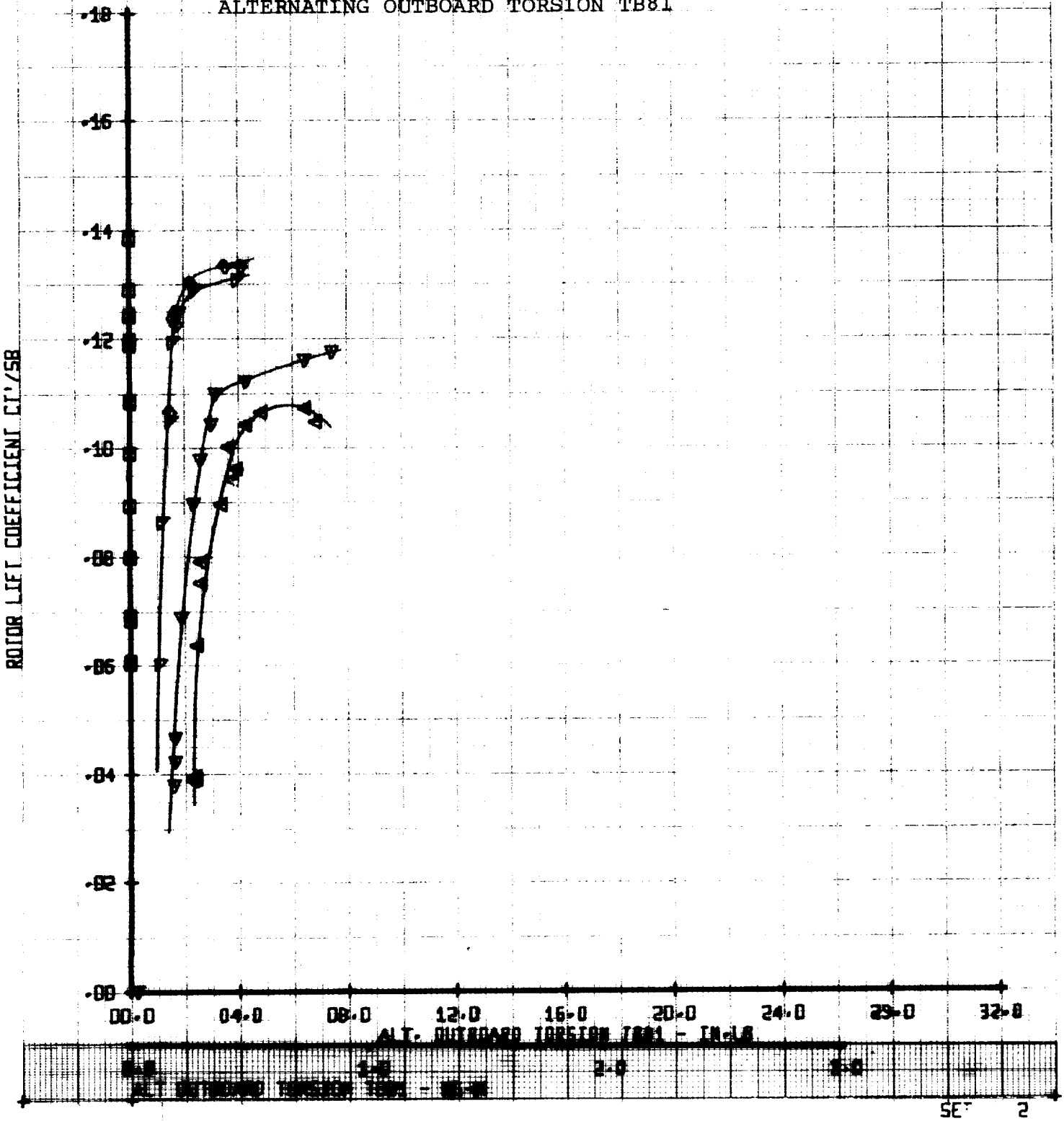
SET 2
BVWT 187

Figure A-40

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND SYM	RUN	MU	X/QQ2SB	MTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▼	29	.30	.05	186
◁	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81



SET 2
RUN 187

SET 2
RUN 187

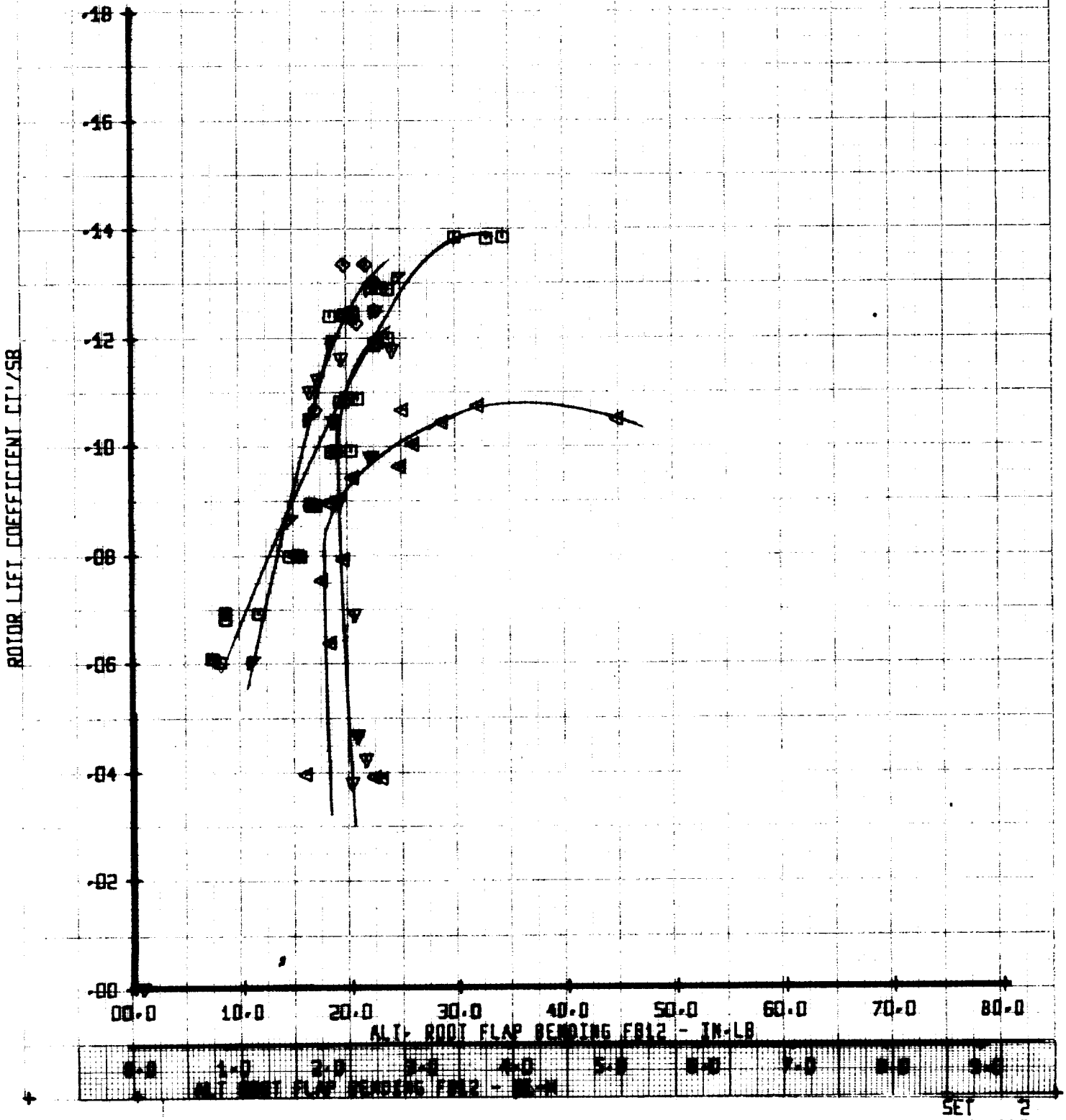
Figure A-41

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	VTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.30	.05	174
▽	29	.30	.05	186
◁	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



SET 2
BVWT 187

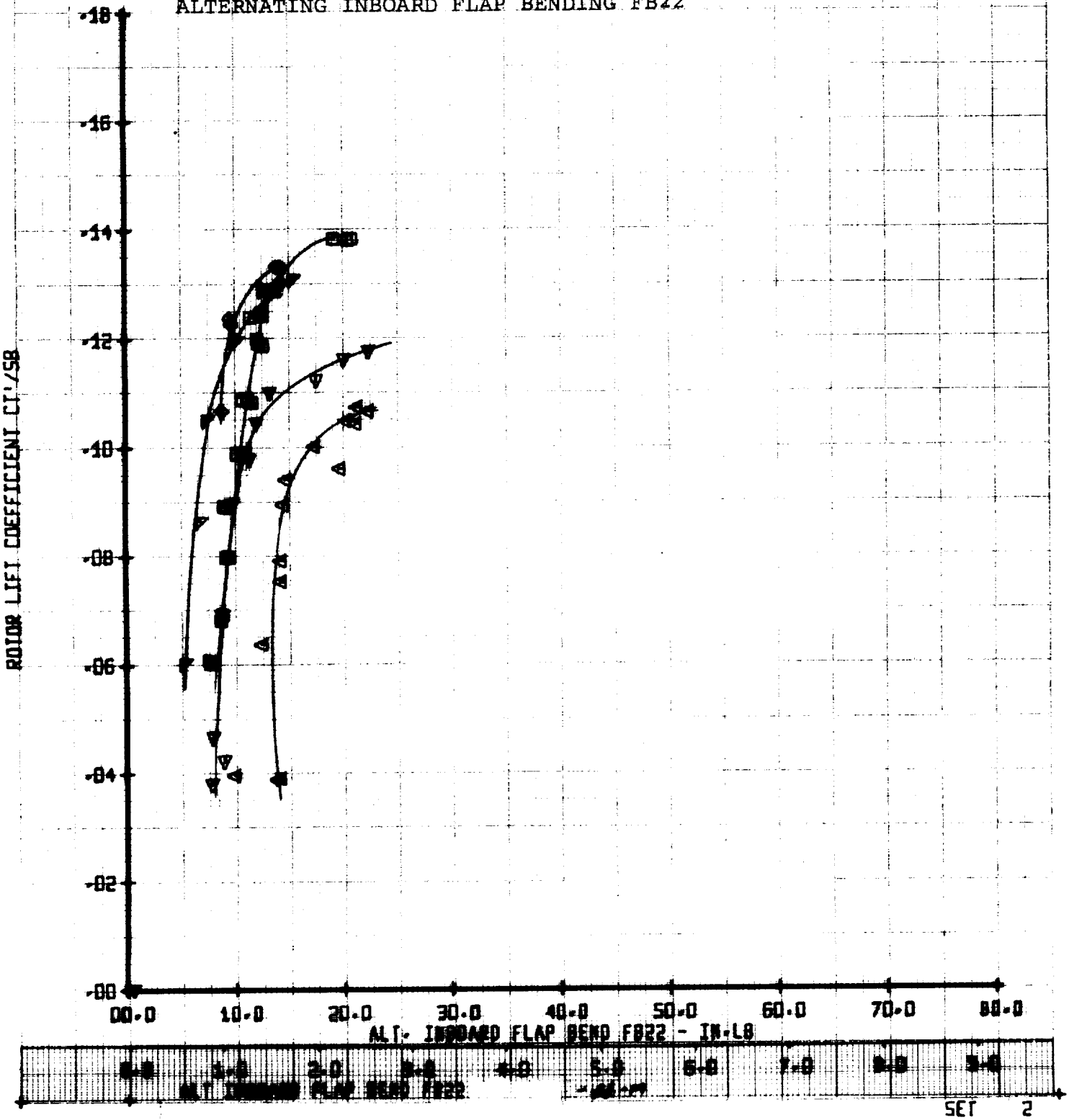
Figure A-42

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
■	25	.10	.05	62
▼	27	.20	.05	124
◆	28	.28	.05	174
▼	29	.30	.05	186
◀	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD FLAP BENDING FB22



ET 2
WT 187

SET 2
BVWT 187

Figure A-43

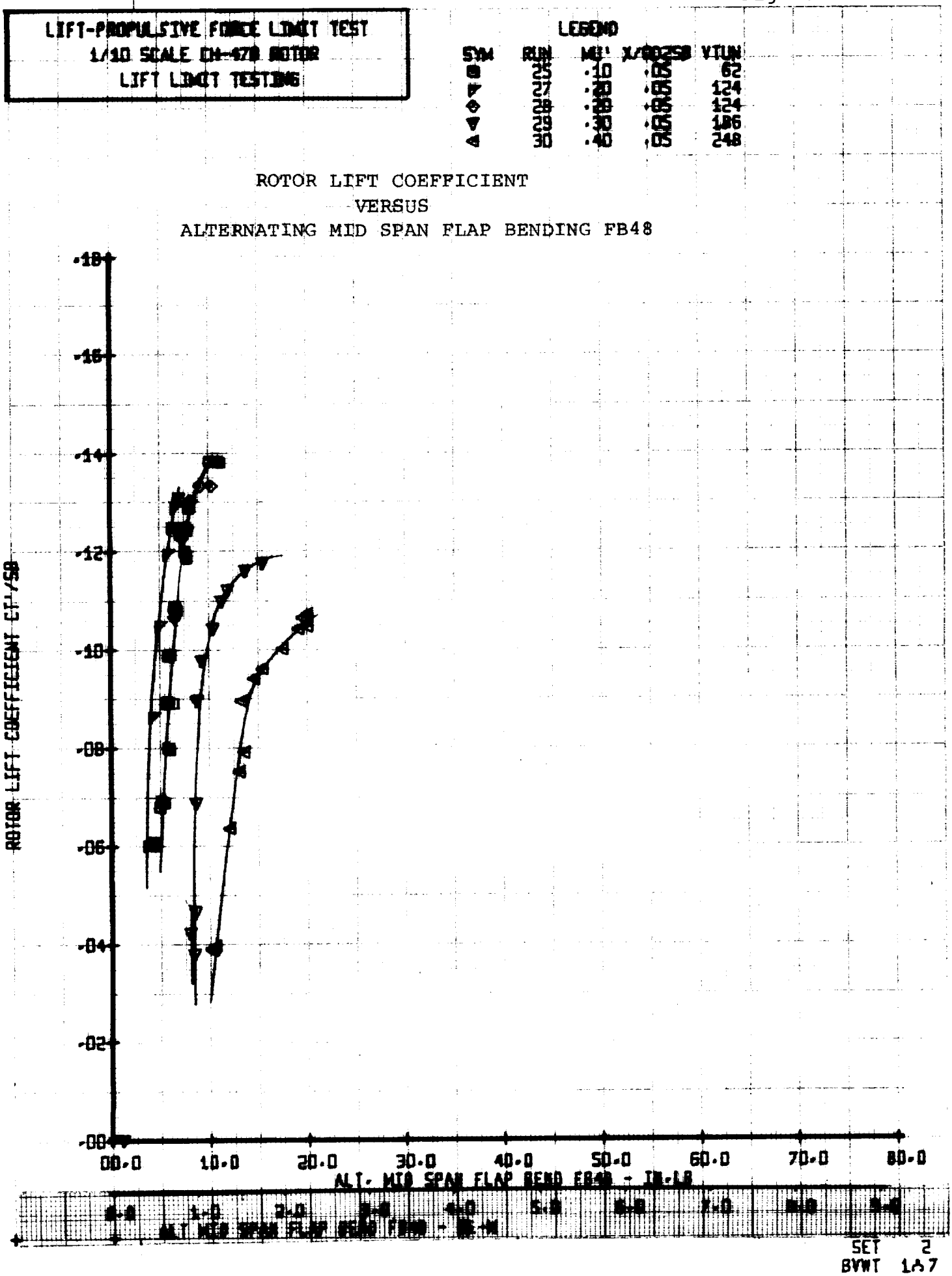

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QBZSB VTUN
25 .10 62
27 .20 124
28 .30 124
29 .40 186
30 .45 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB48
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. MID SPAN FLAP BEND FB48 - IN-LB
ET 2
WT 187
SET 2
BVWT 187

Figure A-44

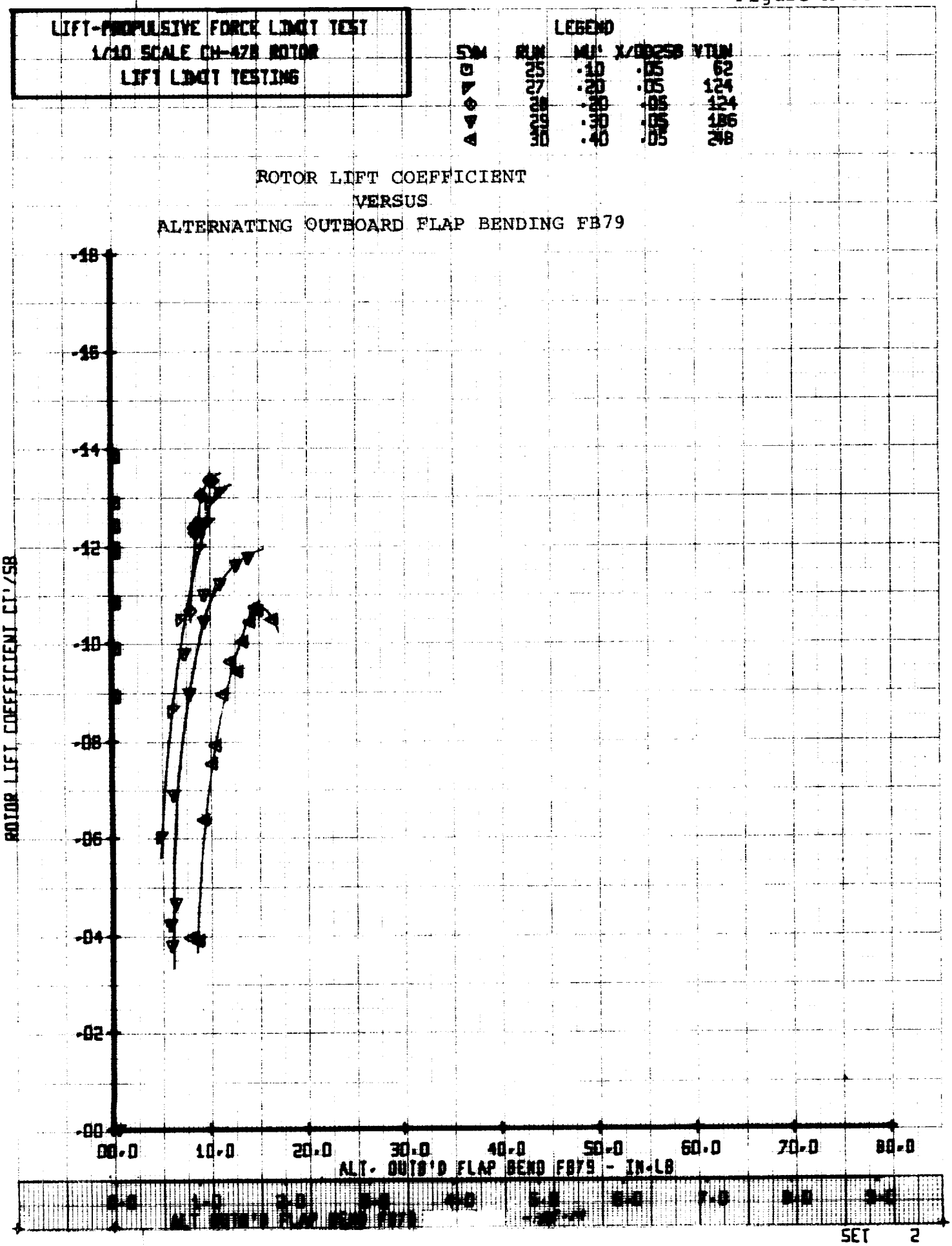
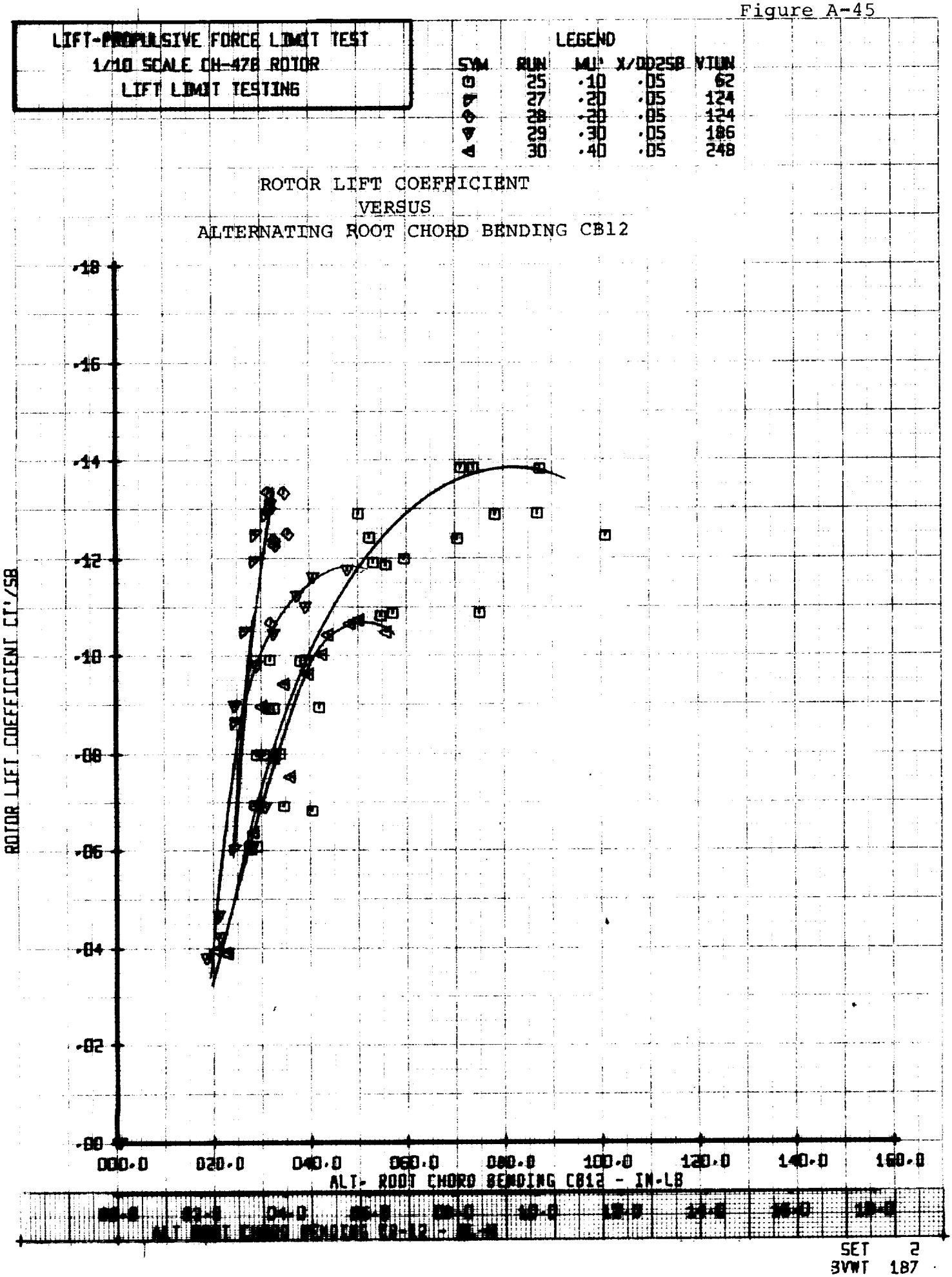
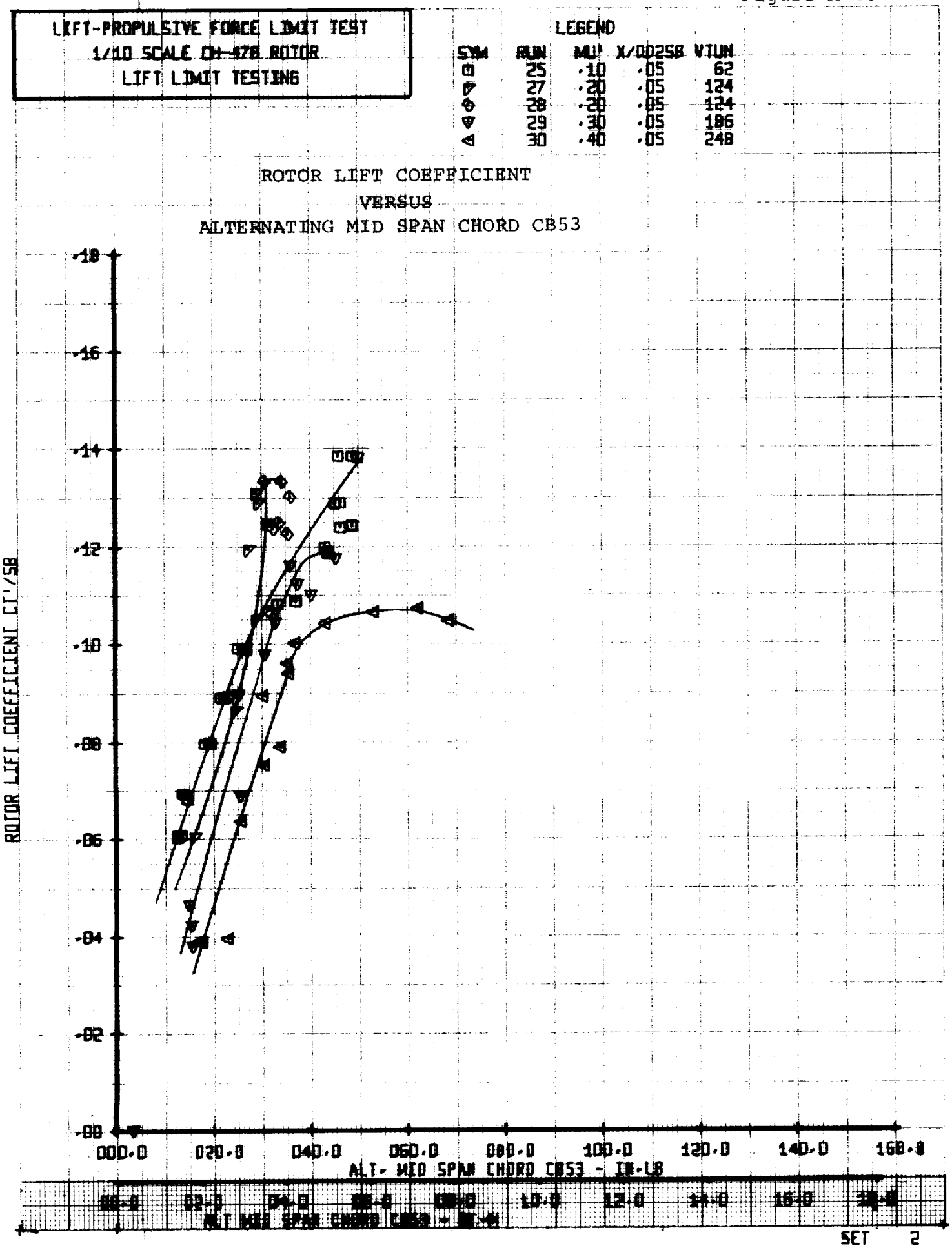

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QSQB YTUN
25 .10 .05 62
27 .20 .05 124
28 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB79
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. OUTB'D FLAP BEND FB79 - IN-LB
ET 2
WT 187
SET 2
BWT 187

Figure A-45



SET 2
WT 187

Figure A-46



ET 2
WT 187

SET 2
BVWT 187

Figure A-47

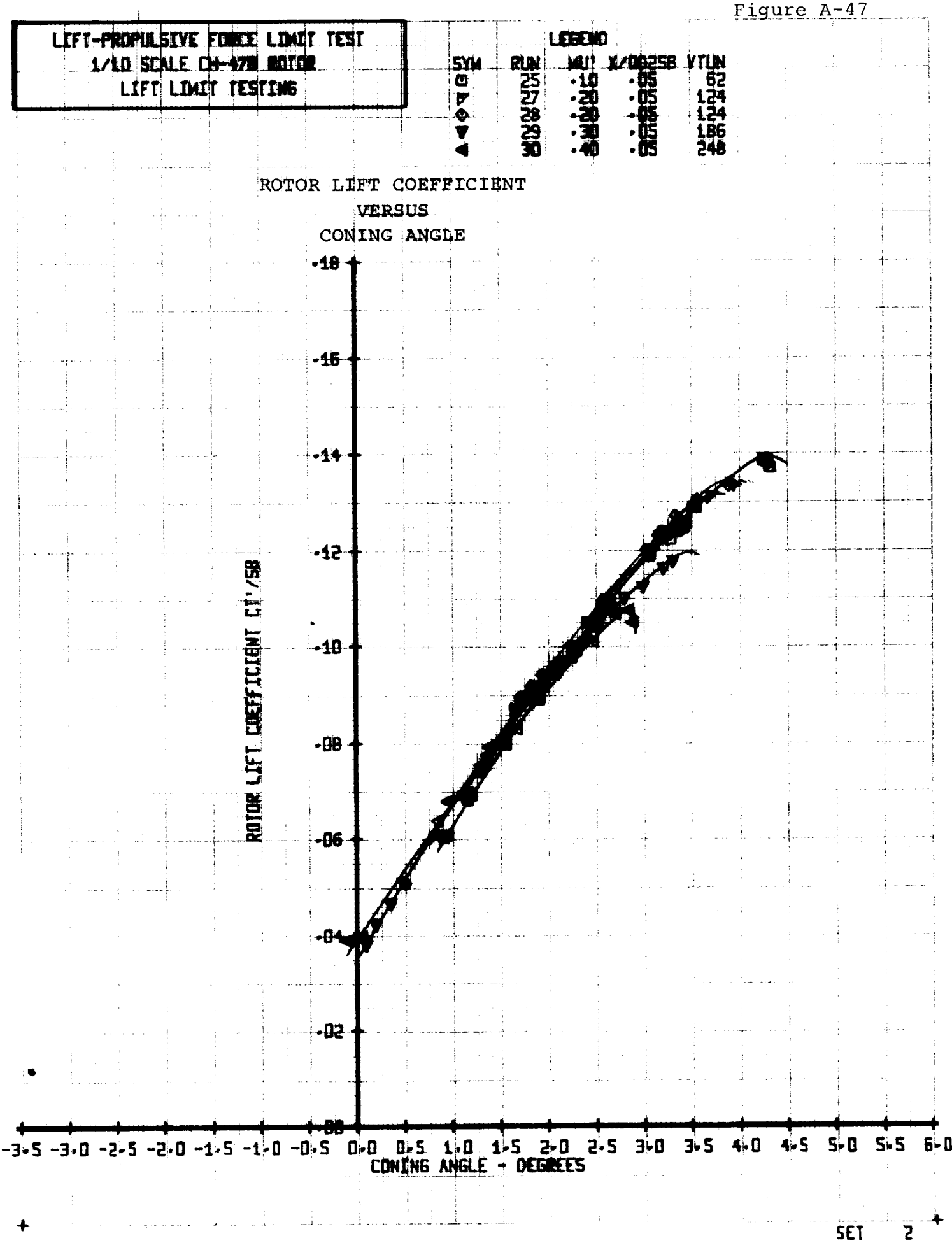

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MUT X/0025B VTUN
25 .10 .05 62
27 .20 .05 124
28 .30 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
CONING ANGLE - DEGREES
ET 2
WT 187
SET 2
BAWT 187

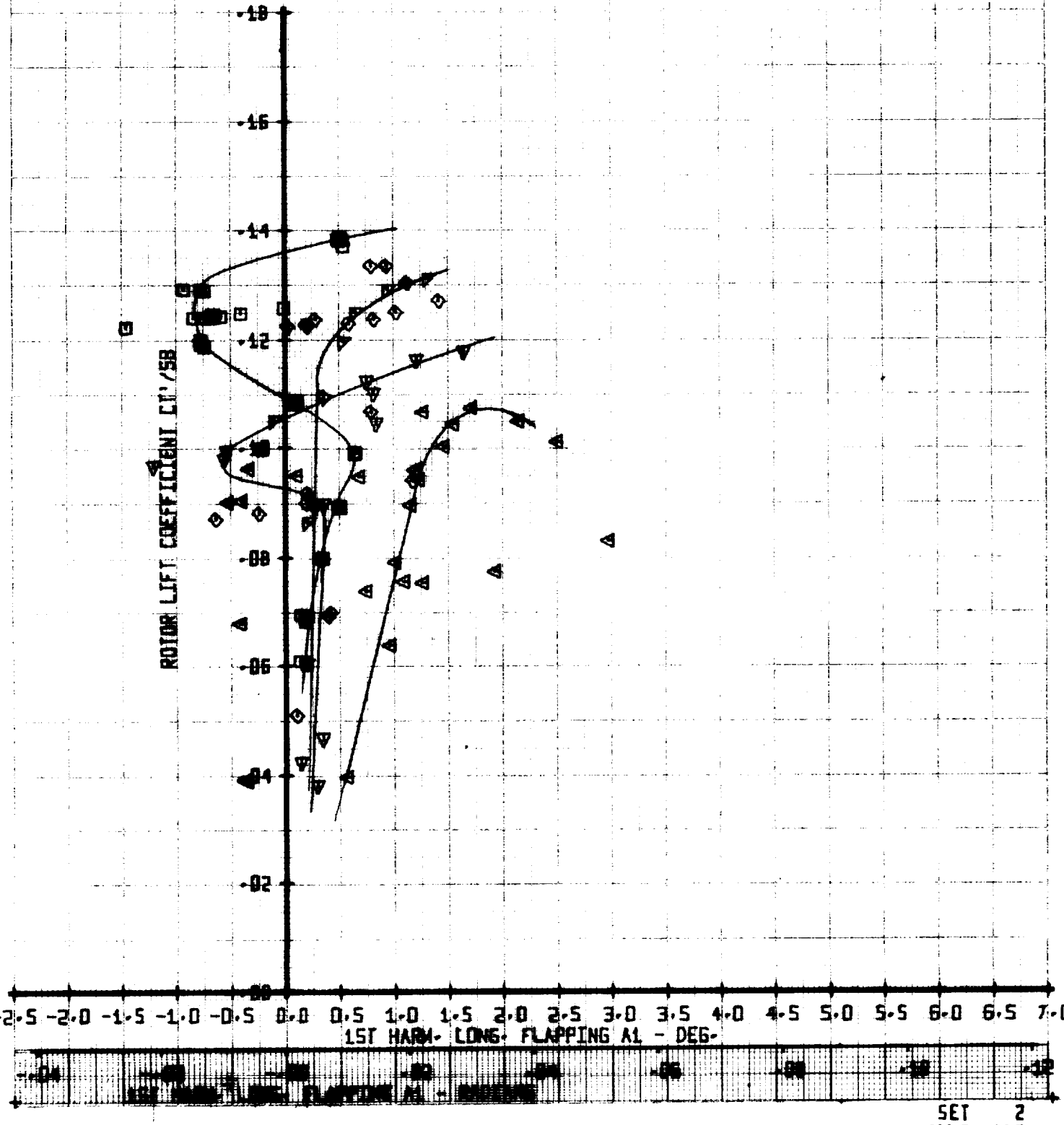
Figure A-48

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	YTUN
⊡	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.30	.05	124
▽	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



SET 2
WT 187

SET 2
BWT 187

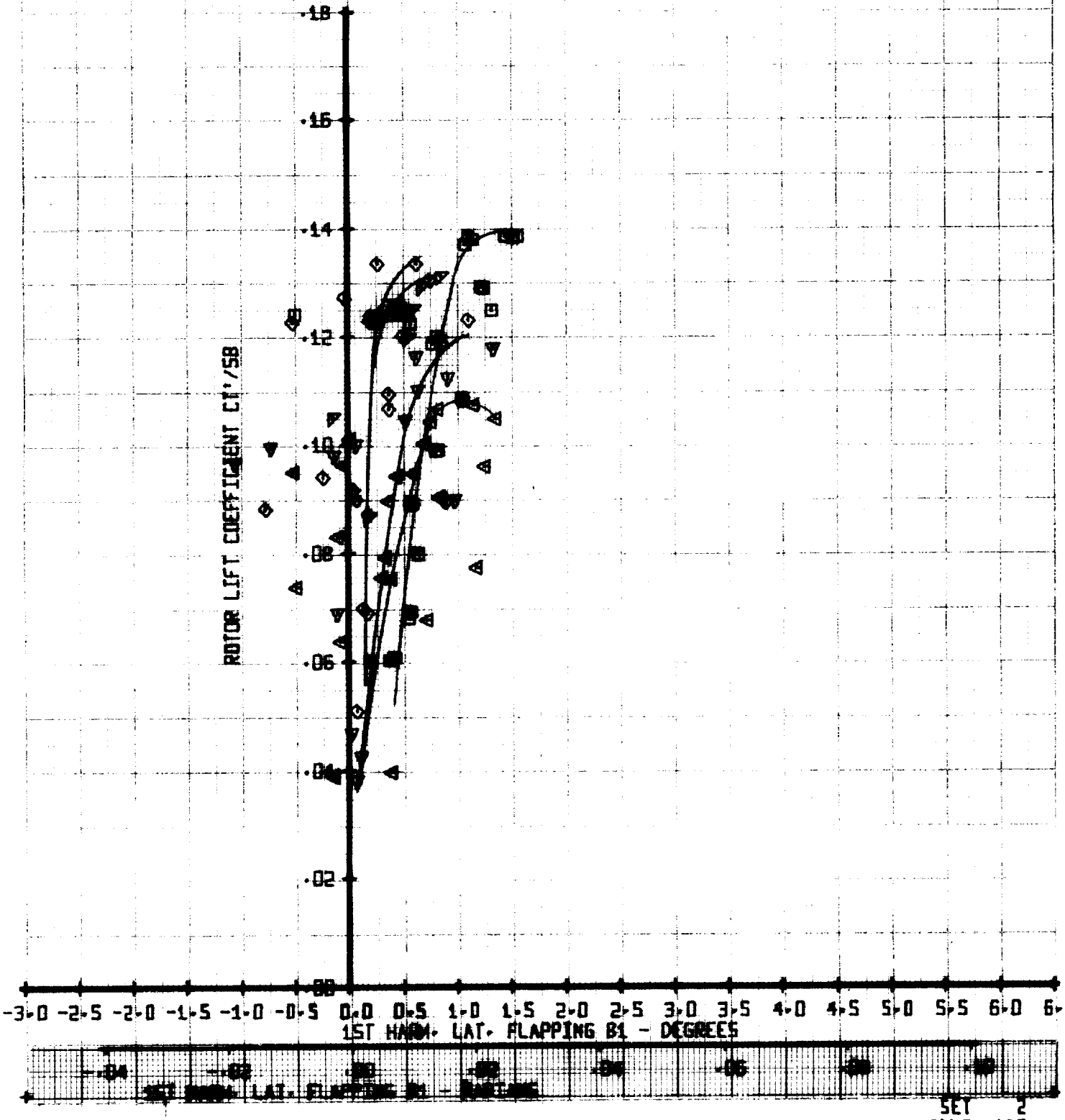
Figure A-49

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D0258	YTUN
□	25	.10	.05	62
▽	27	.20	.05	124
◇	28	.20	.05	124
▼	29	.30	.05	186
△	30	.40	.05	248

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 2
WT 187

SET 2
BYWT 187

Figure A-50

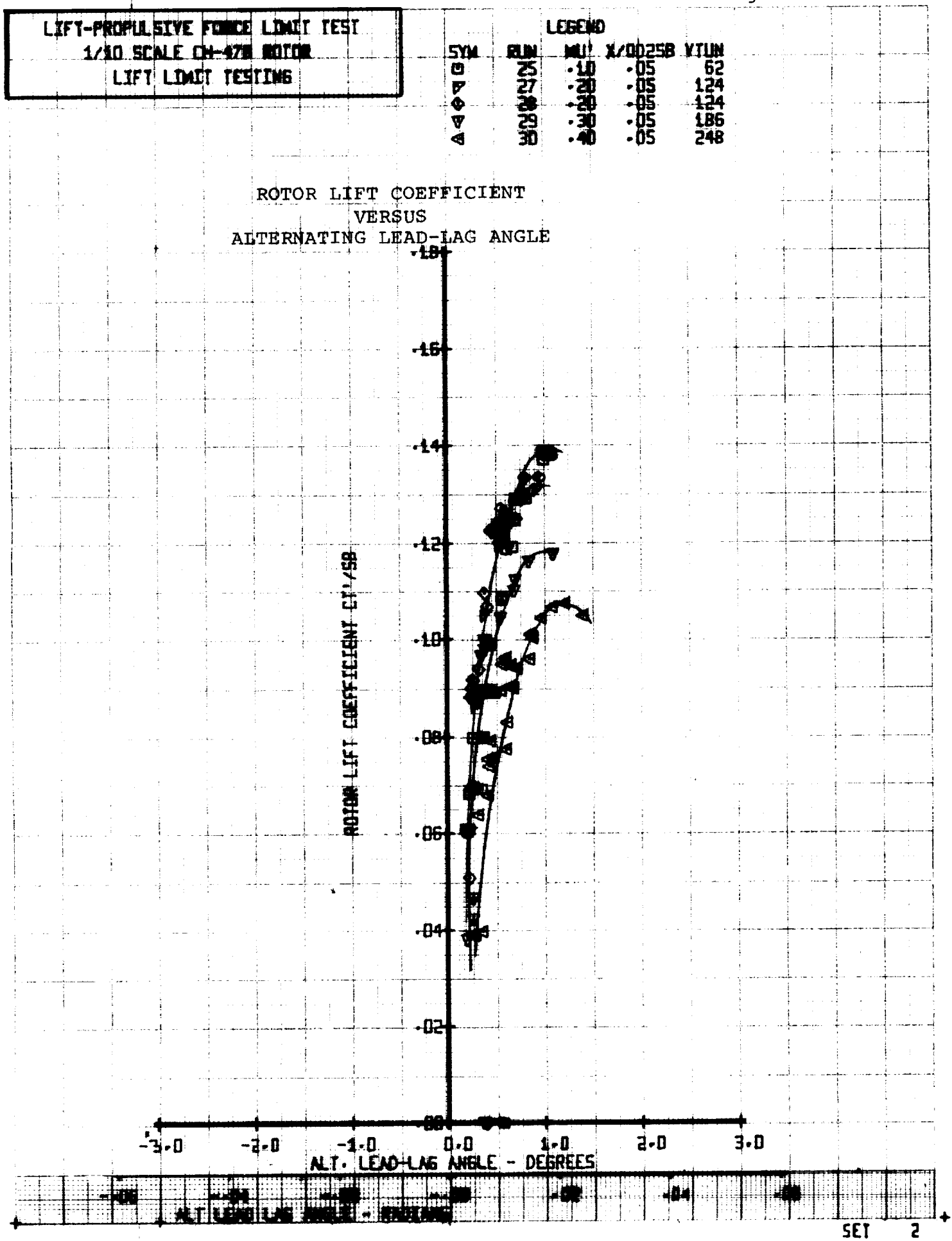
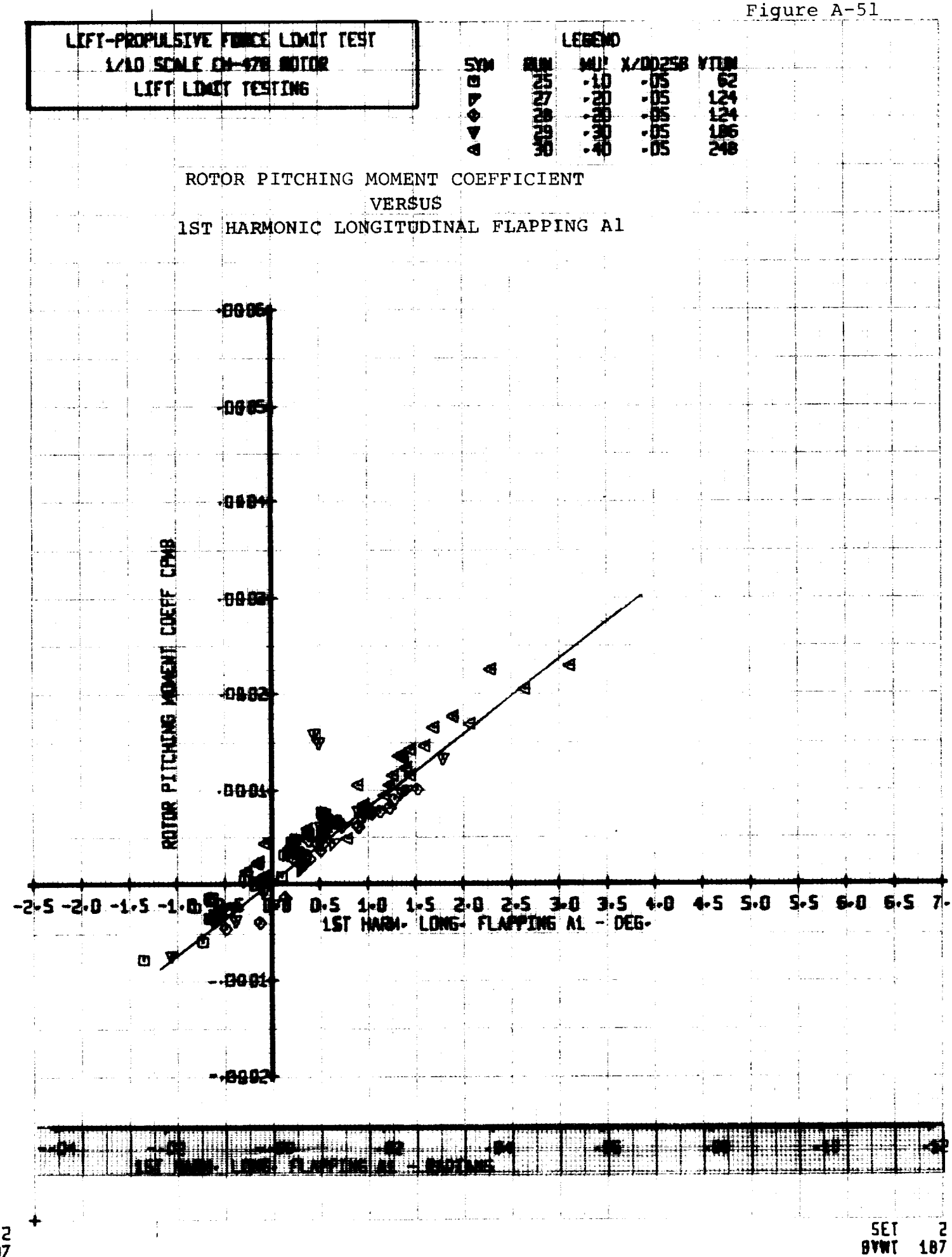

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D025B VTUN
25 .10 .05 62
27 .20 .05 124
28 .20 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
ALT. LEAD-LAG ANGLE - DEGREES
ET 2
WT 187
SET 2
BWWT 187

Figure A-51



ET 2
WT 187

SET 2
BWT 187

Figure A-52

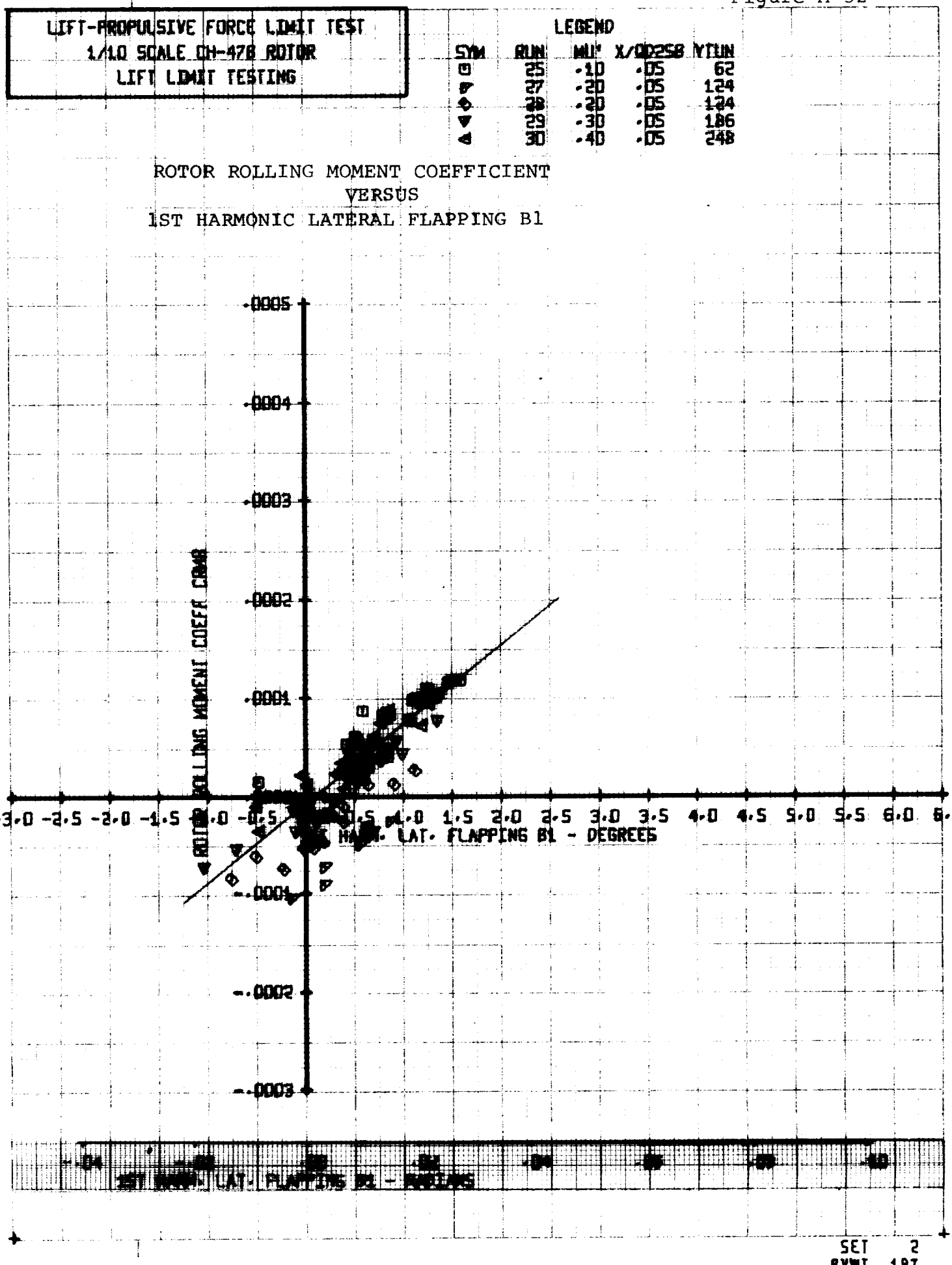

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU* X/QD2SB YTUN
25 .10 .05 62
27 .20 .05 124
28 .20 .05 124
29 .30 .05 186
30 .40 .05 248
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
.0005
.0004
.0003
.0002
.0001
-.0001
-.0002
-.0003
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
HARM. LAT. FLAPPING B1 - DEGREES
SET 2
BVWT 187

Figure A-53

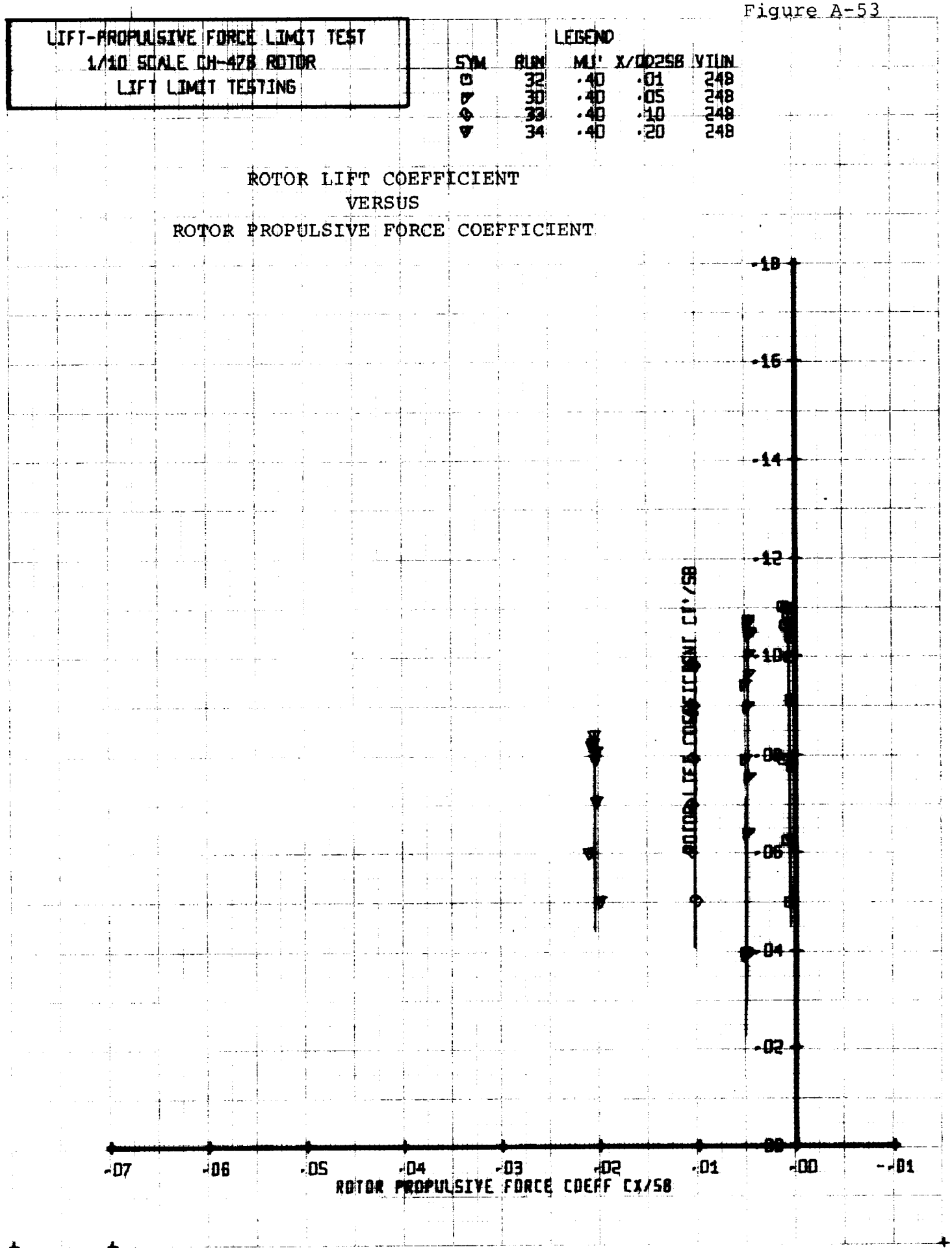

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/D2SB VTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
ROTOR LIFT COEFFICIENT CL'/SB
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
.0
-.07
-.06
-.05
-.04
-.03
-.02
-.01
.00
.01
ROTOR PROPULSIVE FORCE COEFF CX/SB
SET 3
BVWT 187

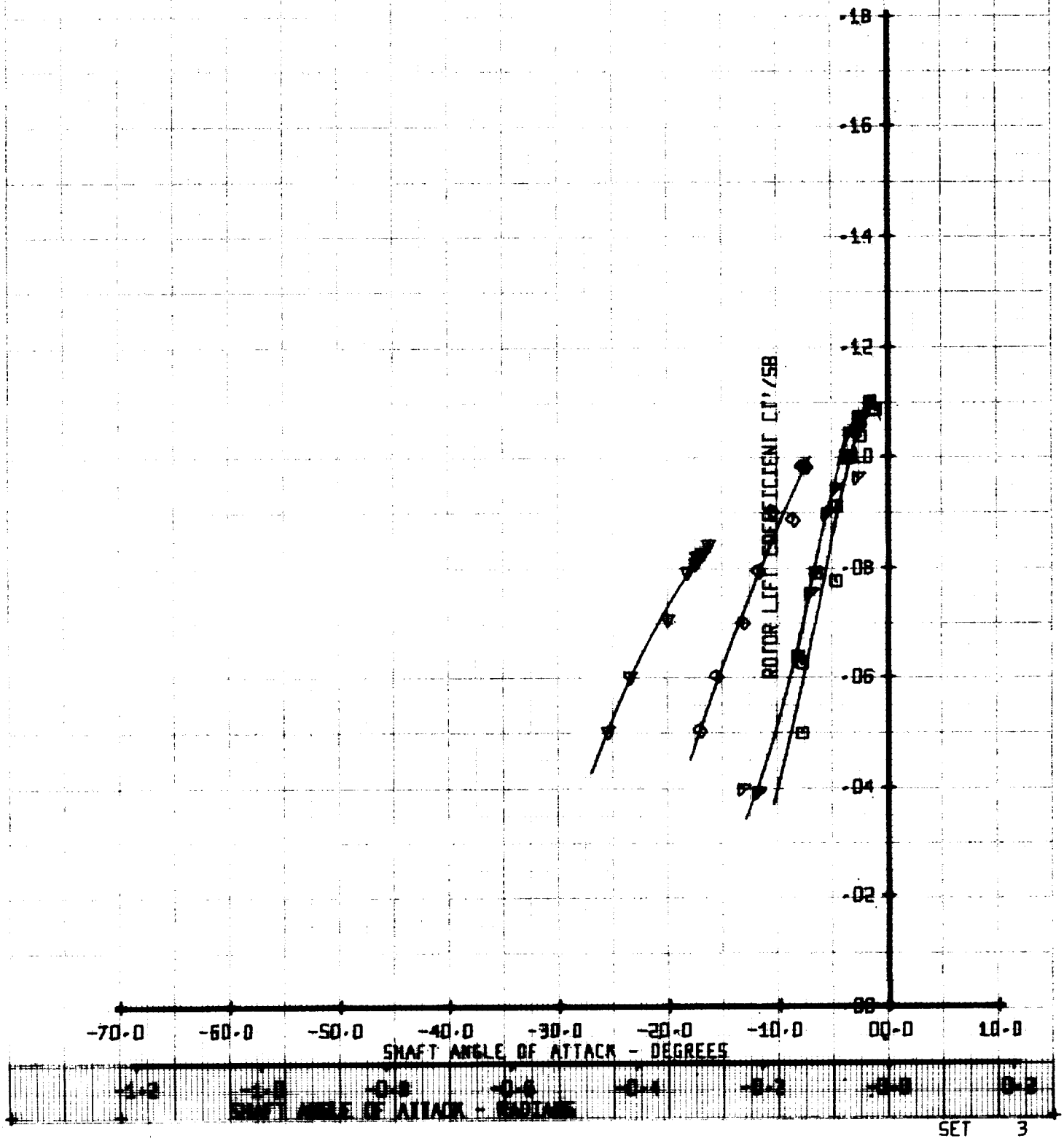
Figure A-54

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



SET 3
BVWT 187

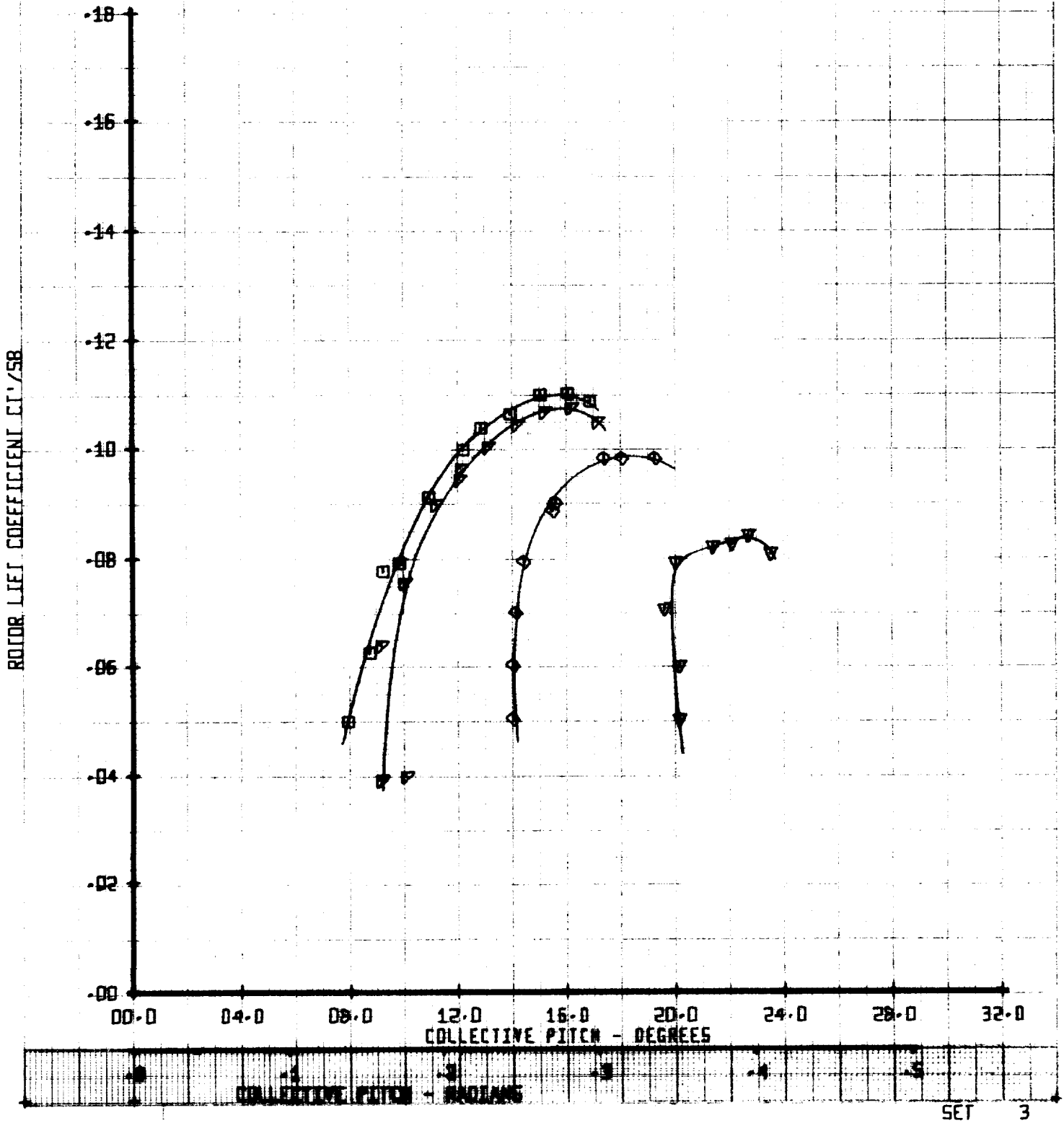
Figure A-55

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YTLN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



SET 3
BVWT 187

Figure A-56

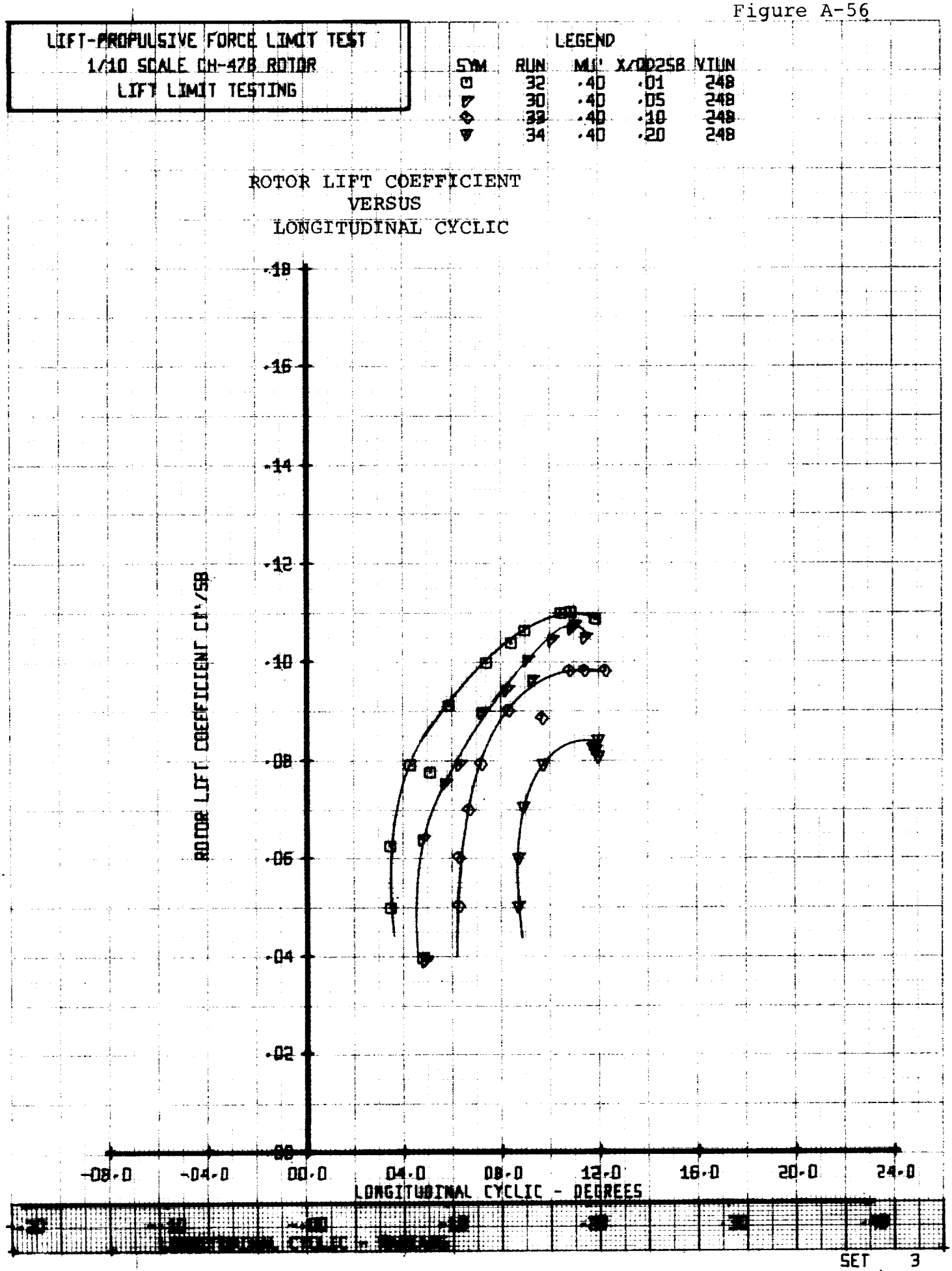

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB VTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-08.0
-04.0
00.0
04.0
08.0
12.0
16.0
20.0
24.0
LONGITUDINAL CYCLIC - DEGREES
SET 3
BWT 187

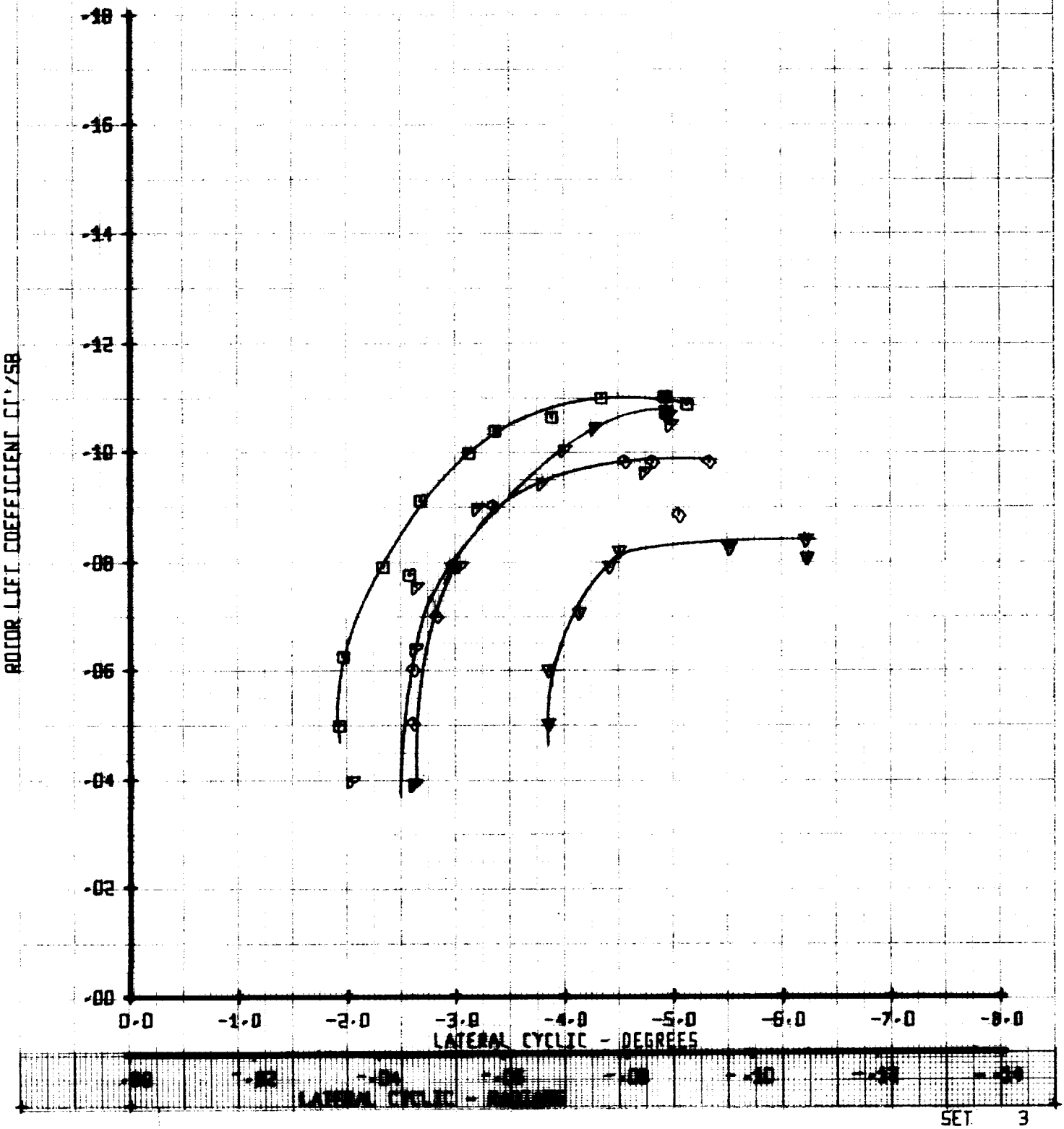
Figure A-57

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▼	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



SET 3
BVWT 187

SET 3
BVWT 187

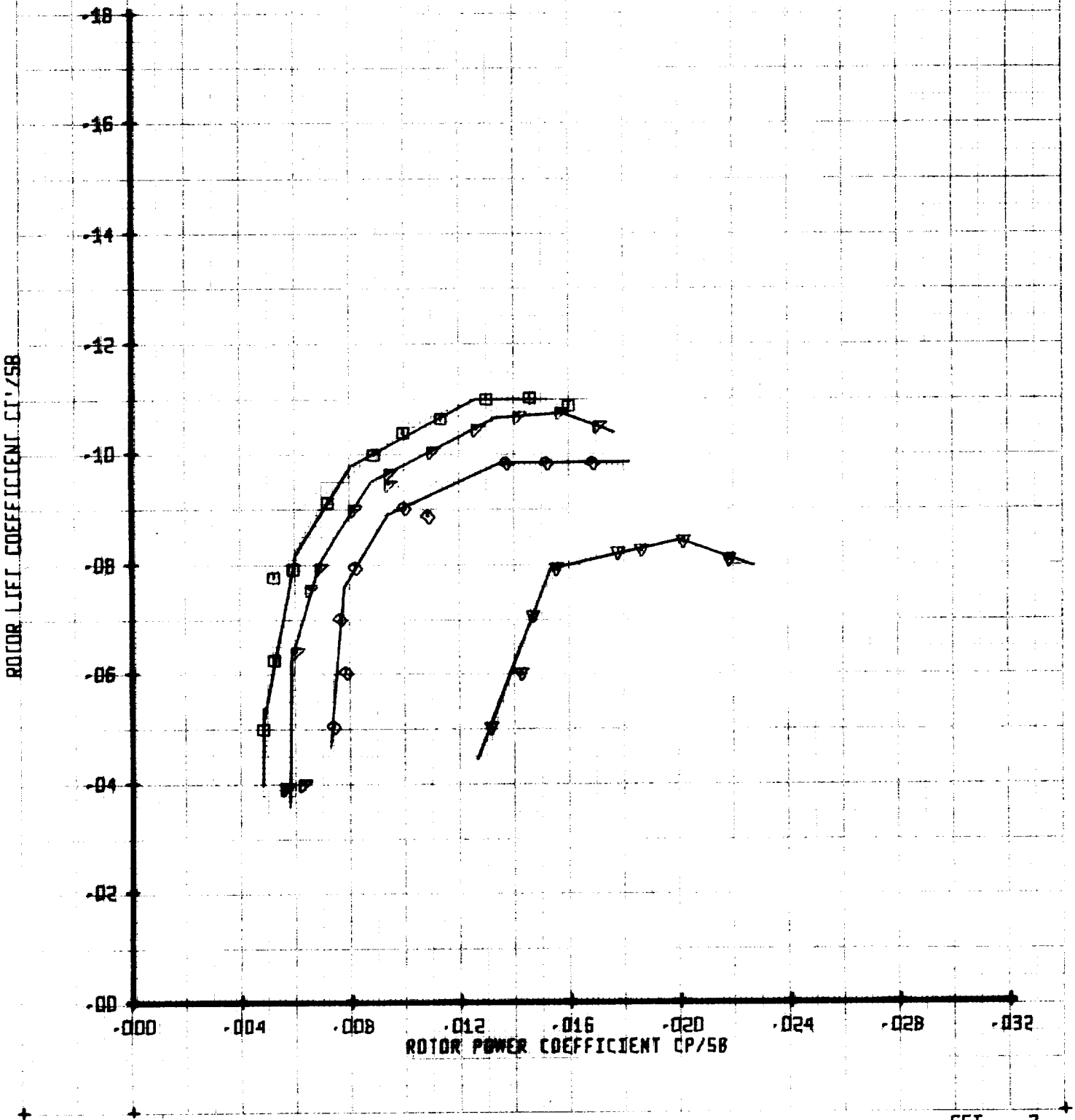
Figure A-58

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

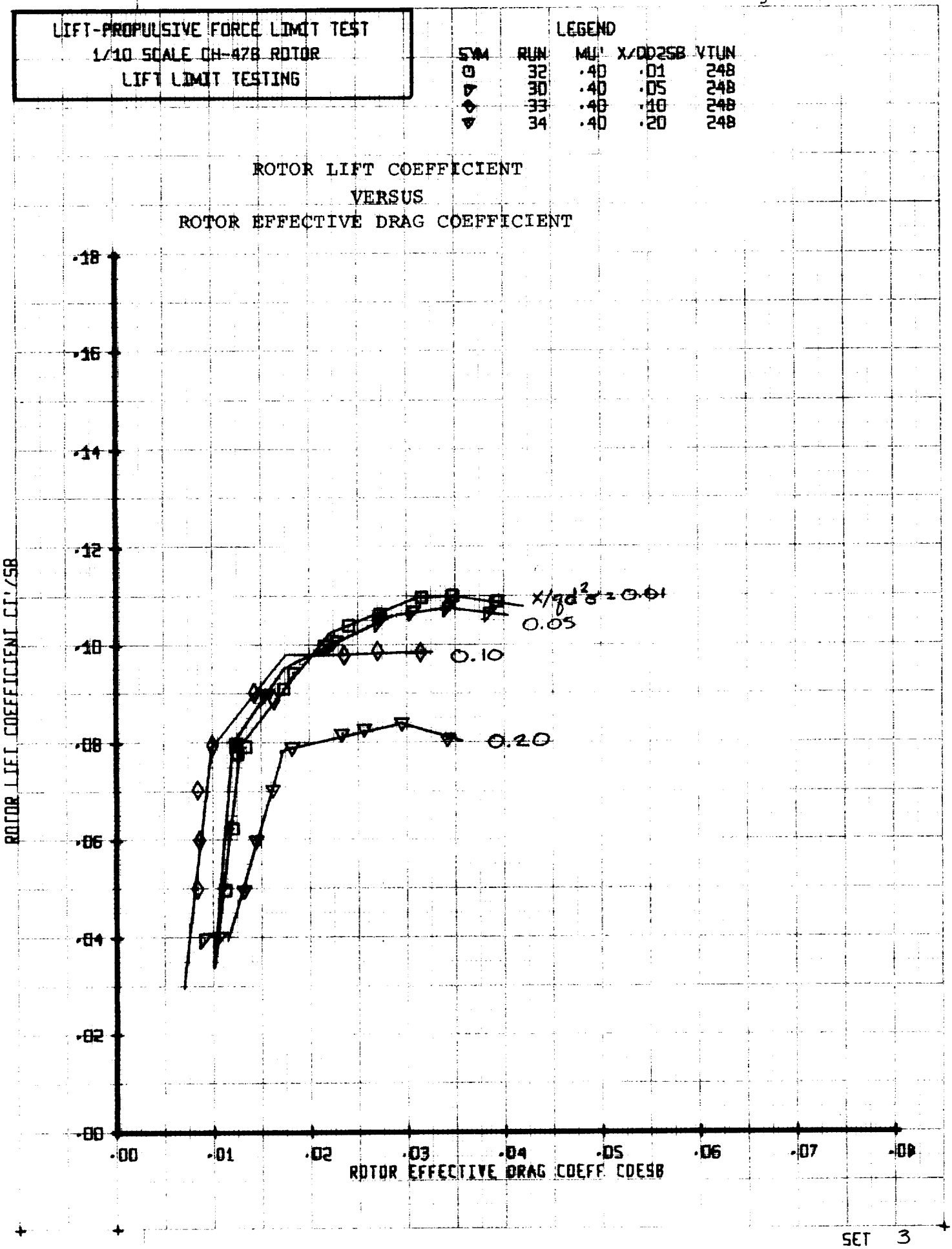
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



SET 3
BVWT 187

SET 3
BVWT 187

Figure A-59



SET
WT 187

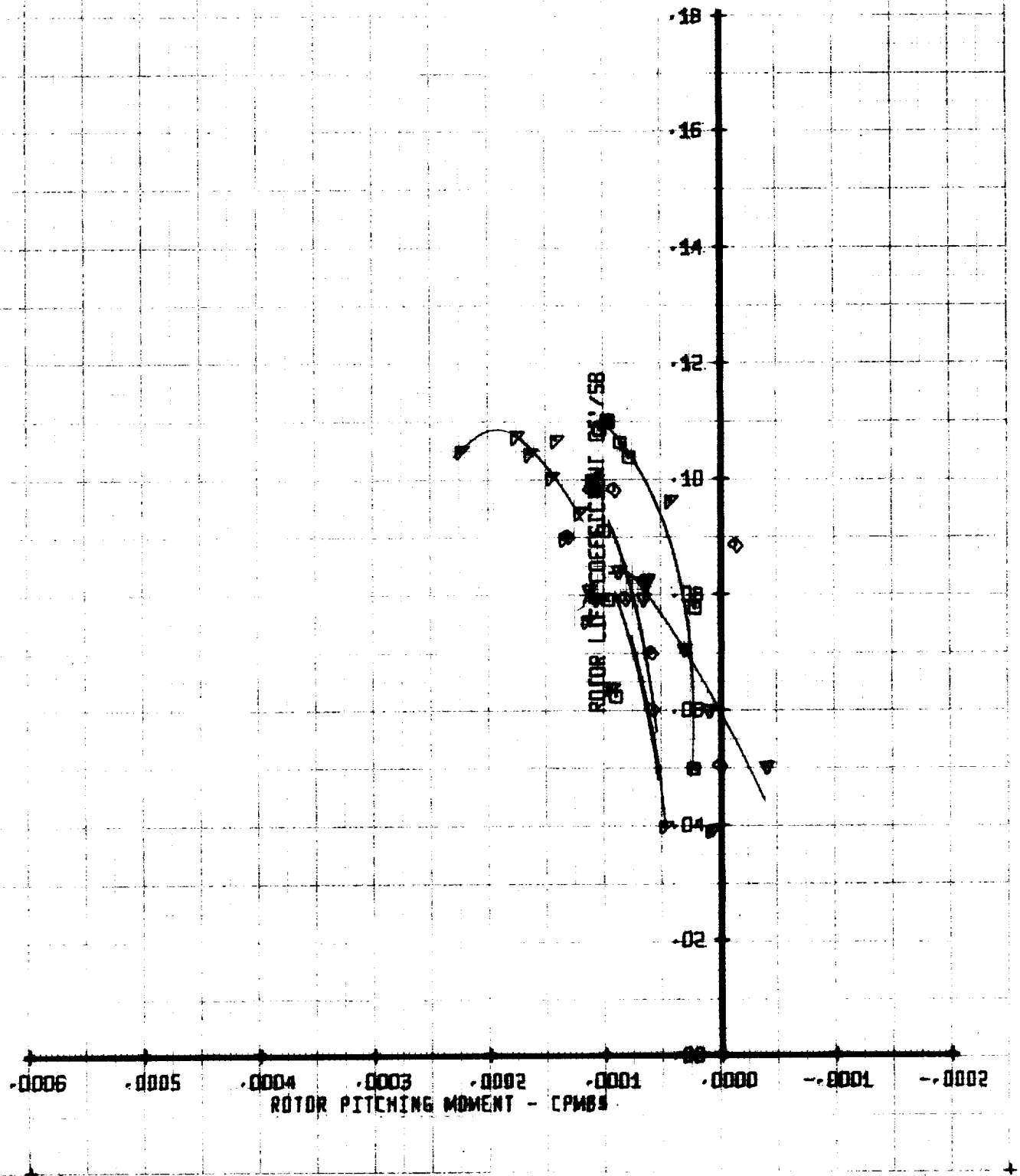
Figure A-60

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 3
WT 187

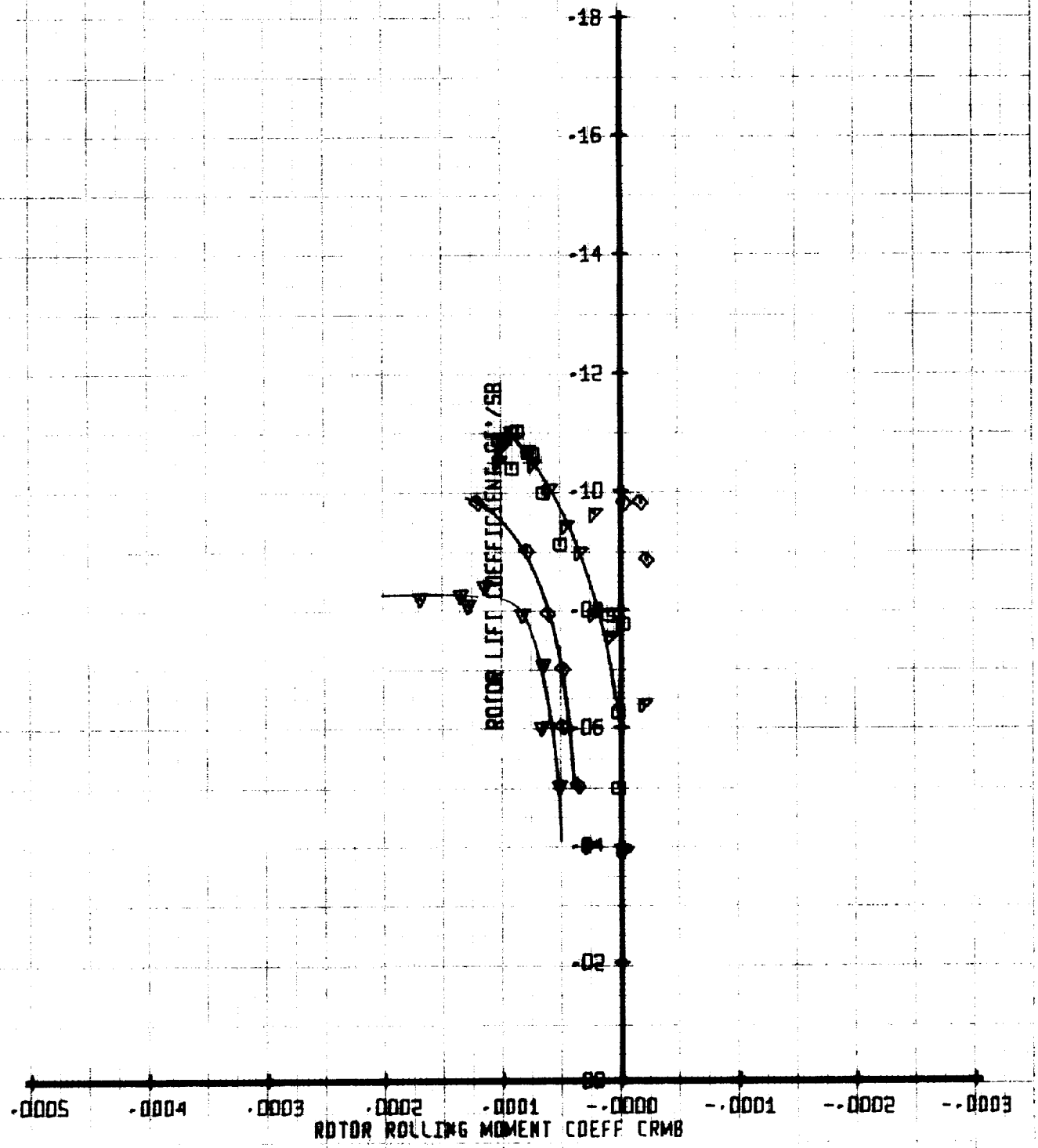
SET 3
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QQ2SB	YTUN
▫	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



SET 3
BWT 187

SET 3
BWT 187

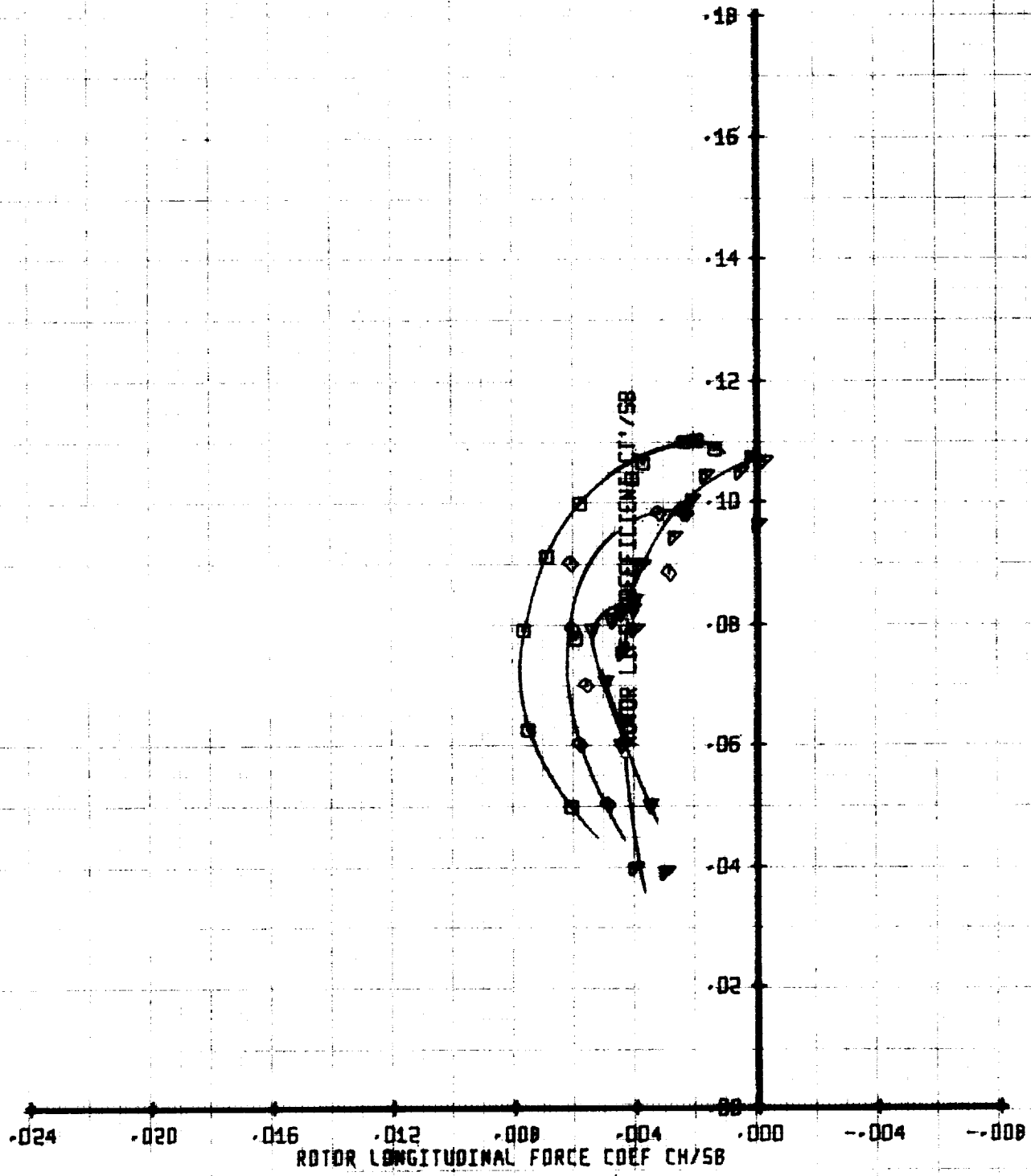
Figure A-62

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D025B	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



SET 3
BVWT 187

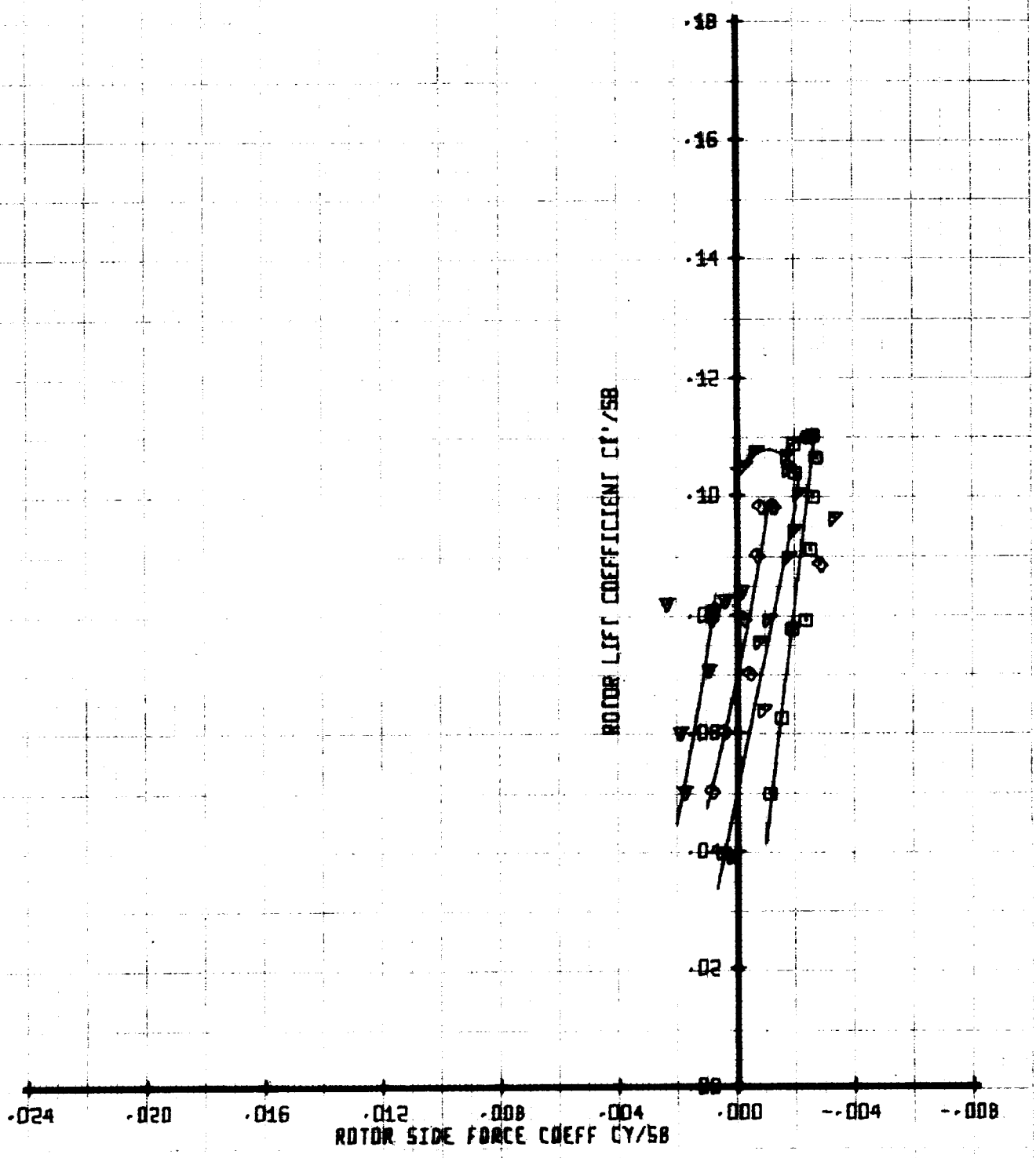
SET 3
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



SET 3
WT 187

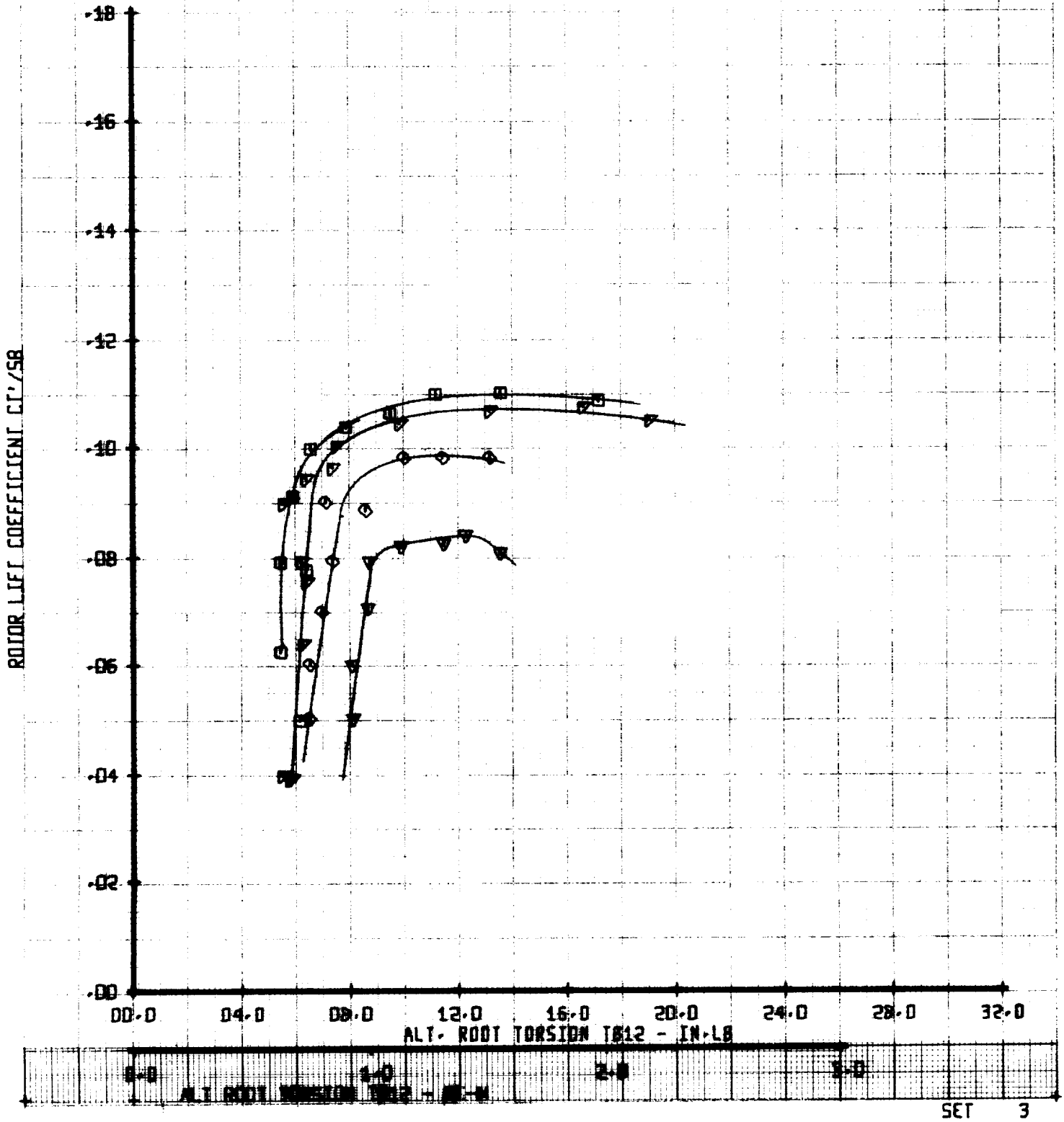
SET 3
BVWT 187

Figure A-64

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	YTUN
⊡	32	.40	.01	248
◤	30	.40	.05	248
◈	33	.40	.10	248
▼	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 3
WT 187

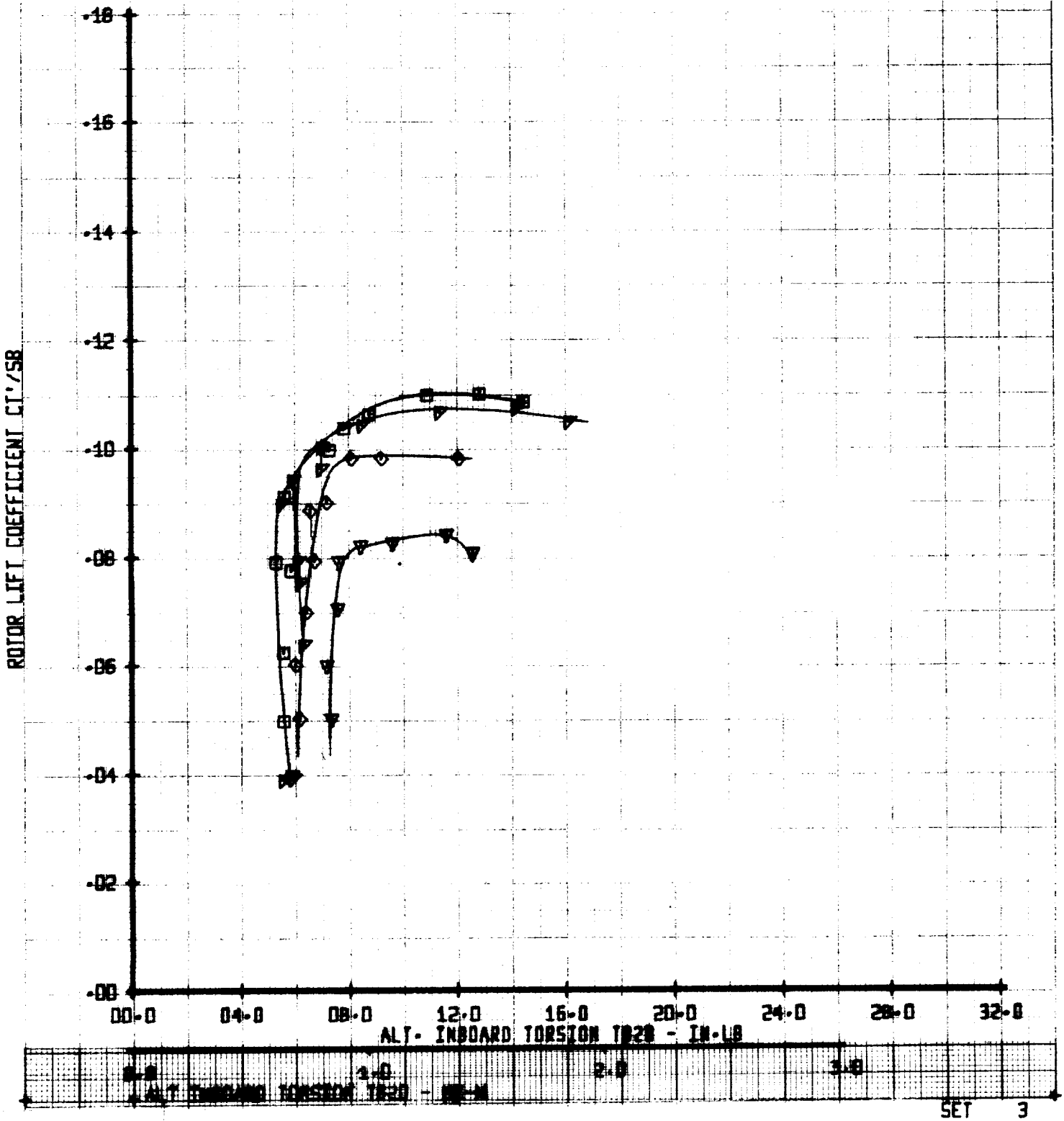
SET 3
BVWT 187

Figure A-65

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/DD25B	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20



ET 3
WT 187

SET 3
BVWT 187

Figure A-66

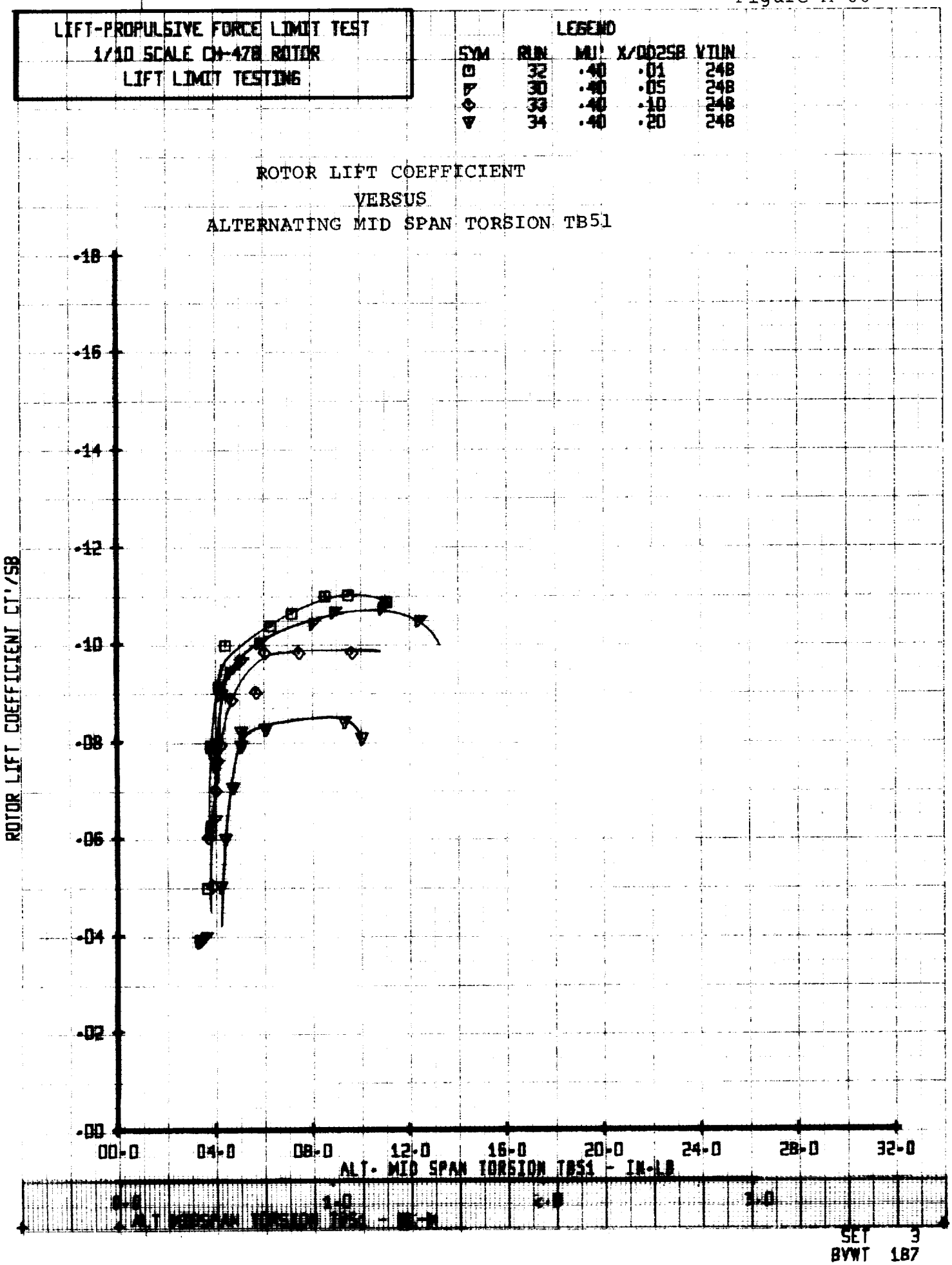

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/DD2SB VTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
ALT. MID SPAN TORSION TB51 - IN-LB
ET 3
WT 187
SET 3
BVWT 187

Figure A-67

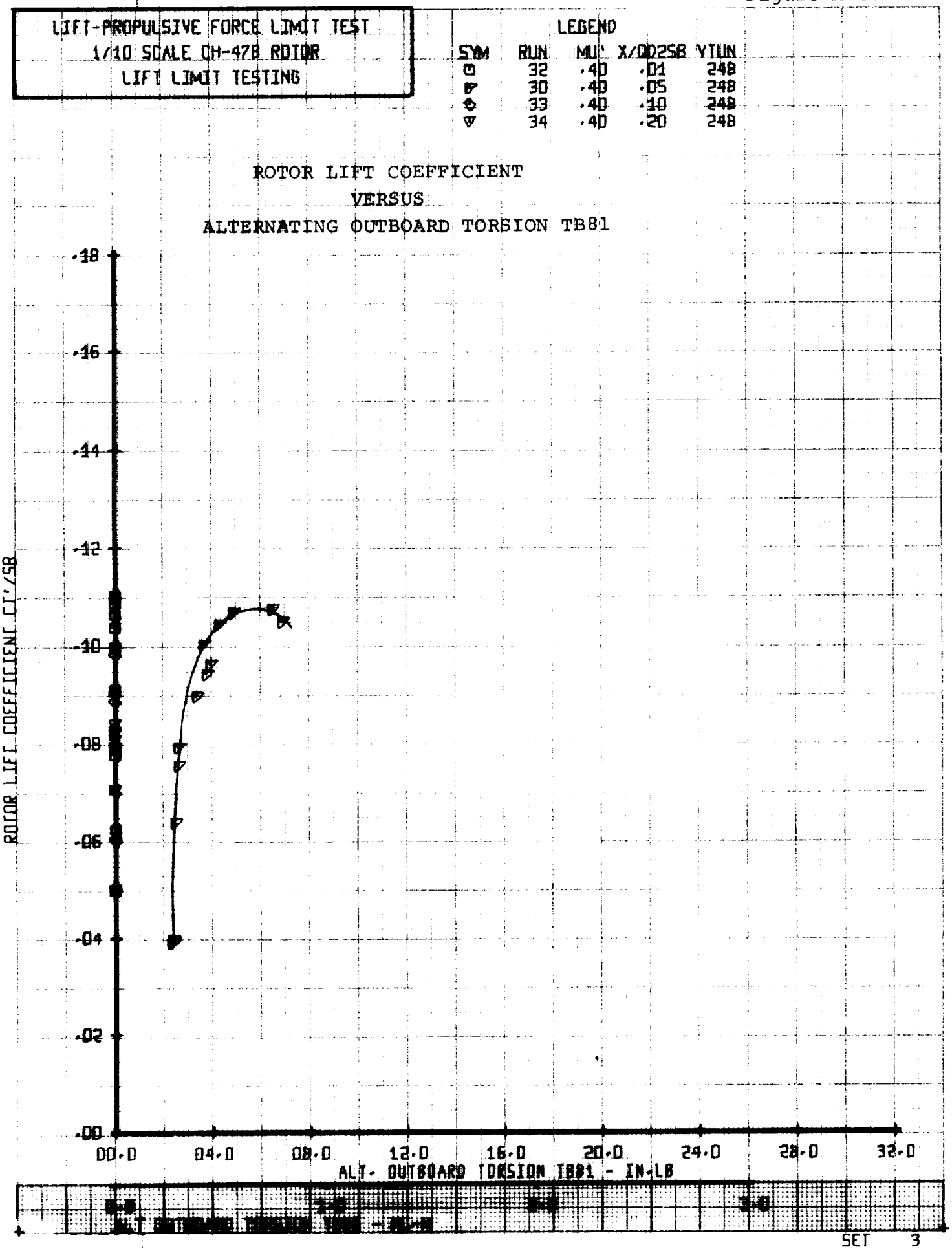
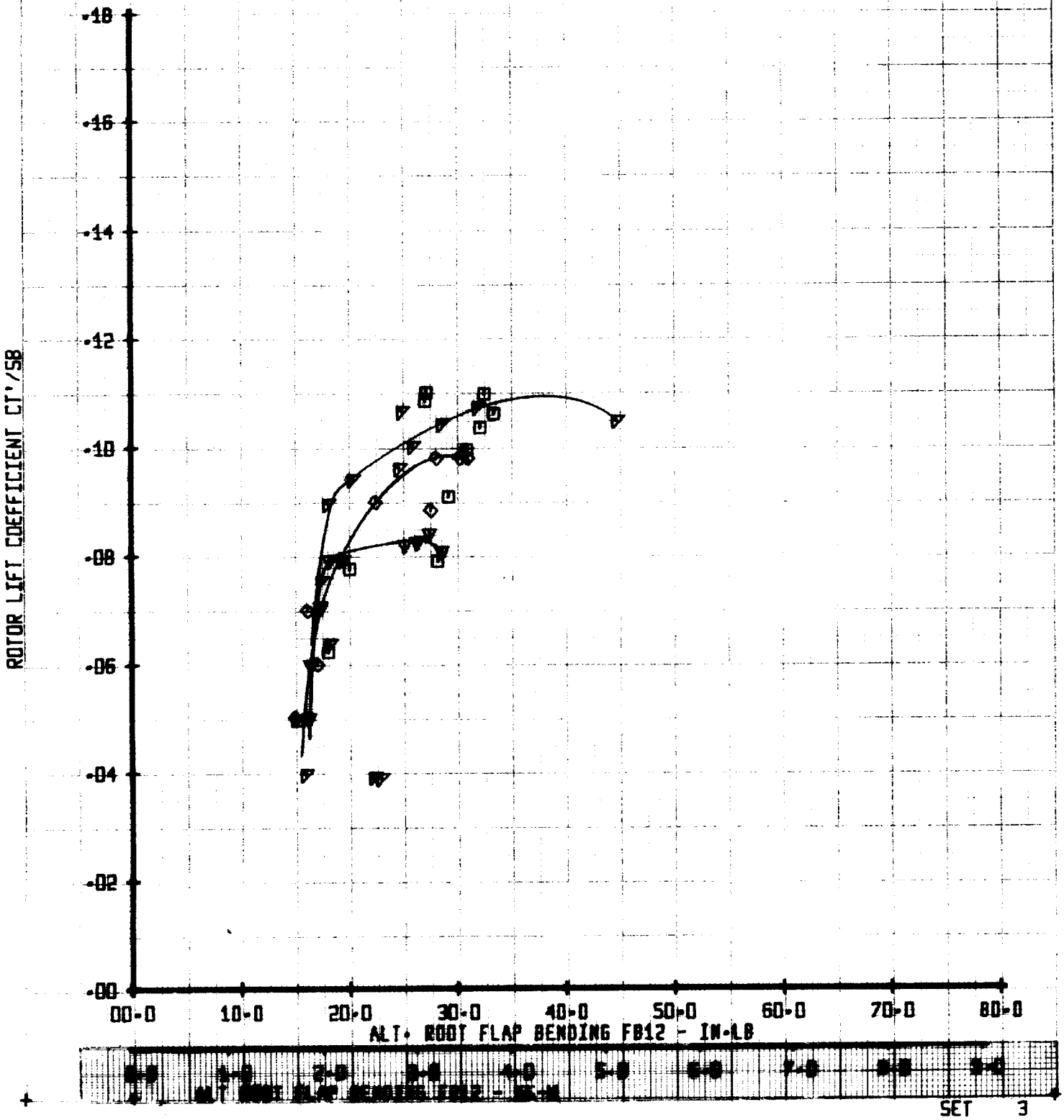

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QQ2SB VTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
ALT. OUTBOARD TORSION TB81 - IN-LB
SET 3
BWT 187

Figure A-68

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/D0258	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



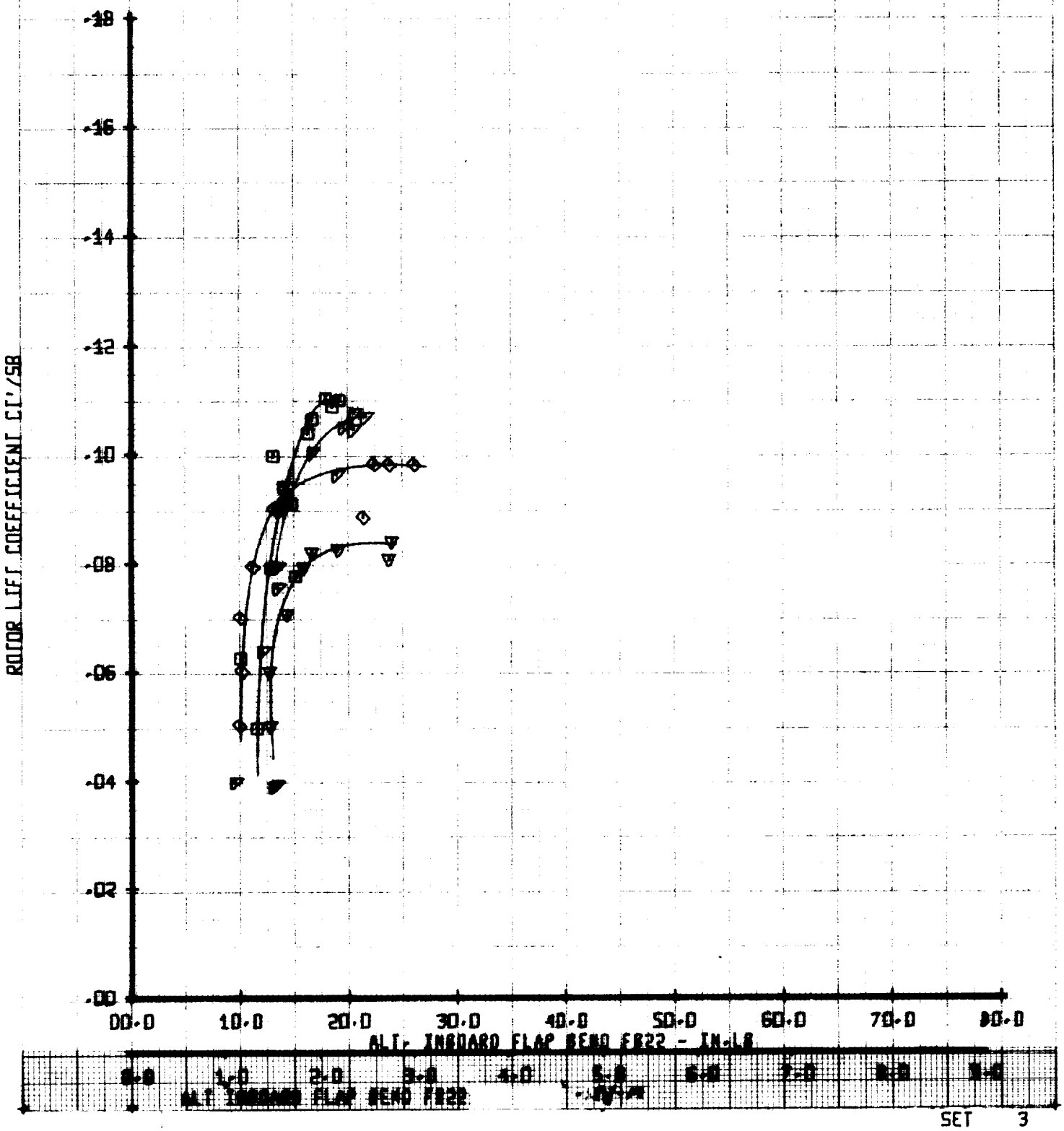
SET 3
BYWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD25B	YTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD FLAP BENDING FB22



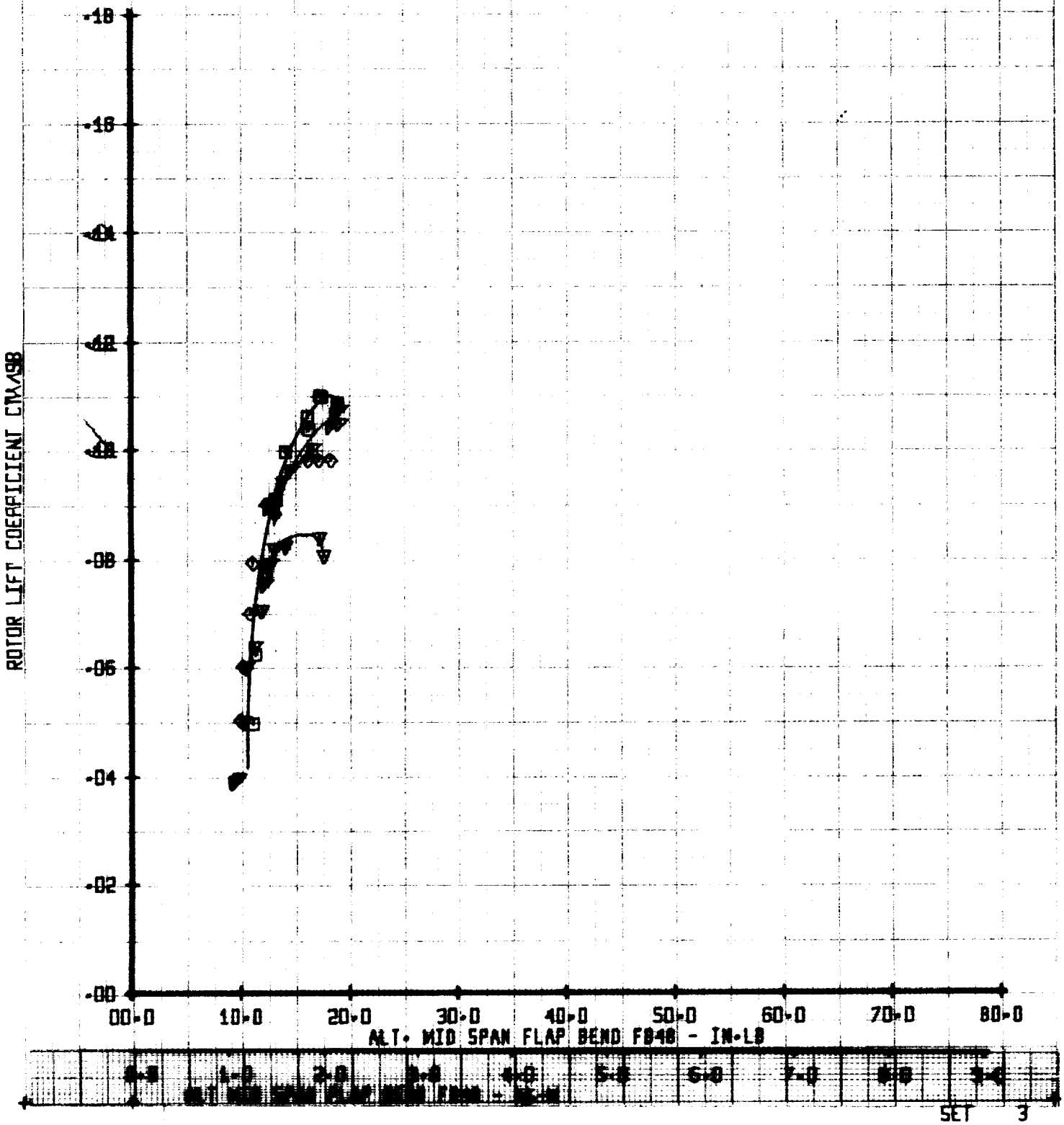
SET 3
BVWT 187

Figure A-70

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QB25B	VTUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

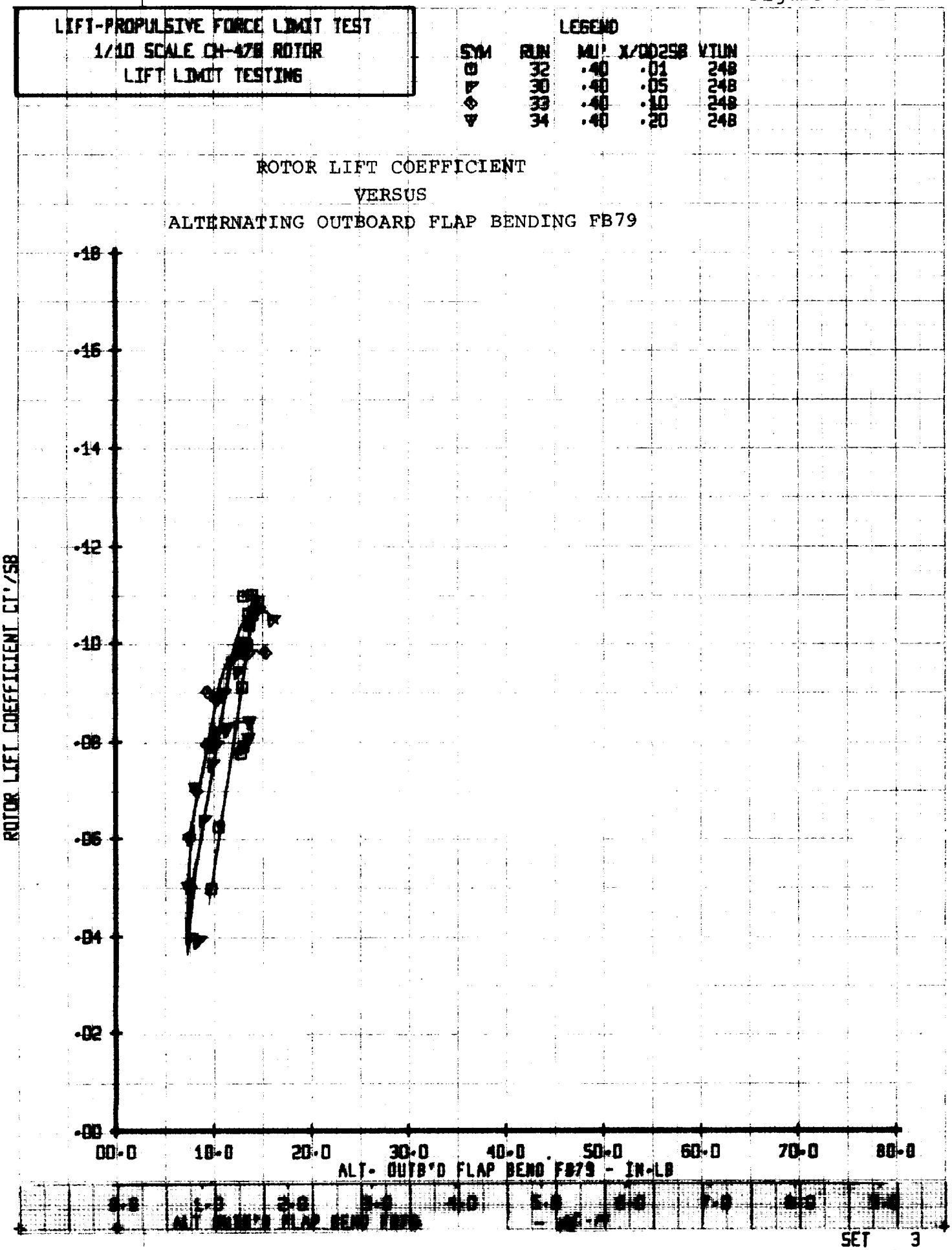
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB48



ET 3
WT 187

SET 3
BVWT 187

Figure A-71



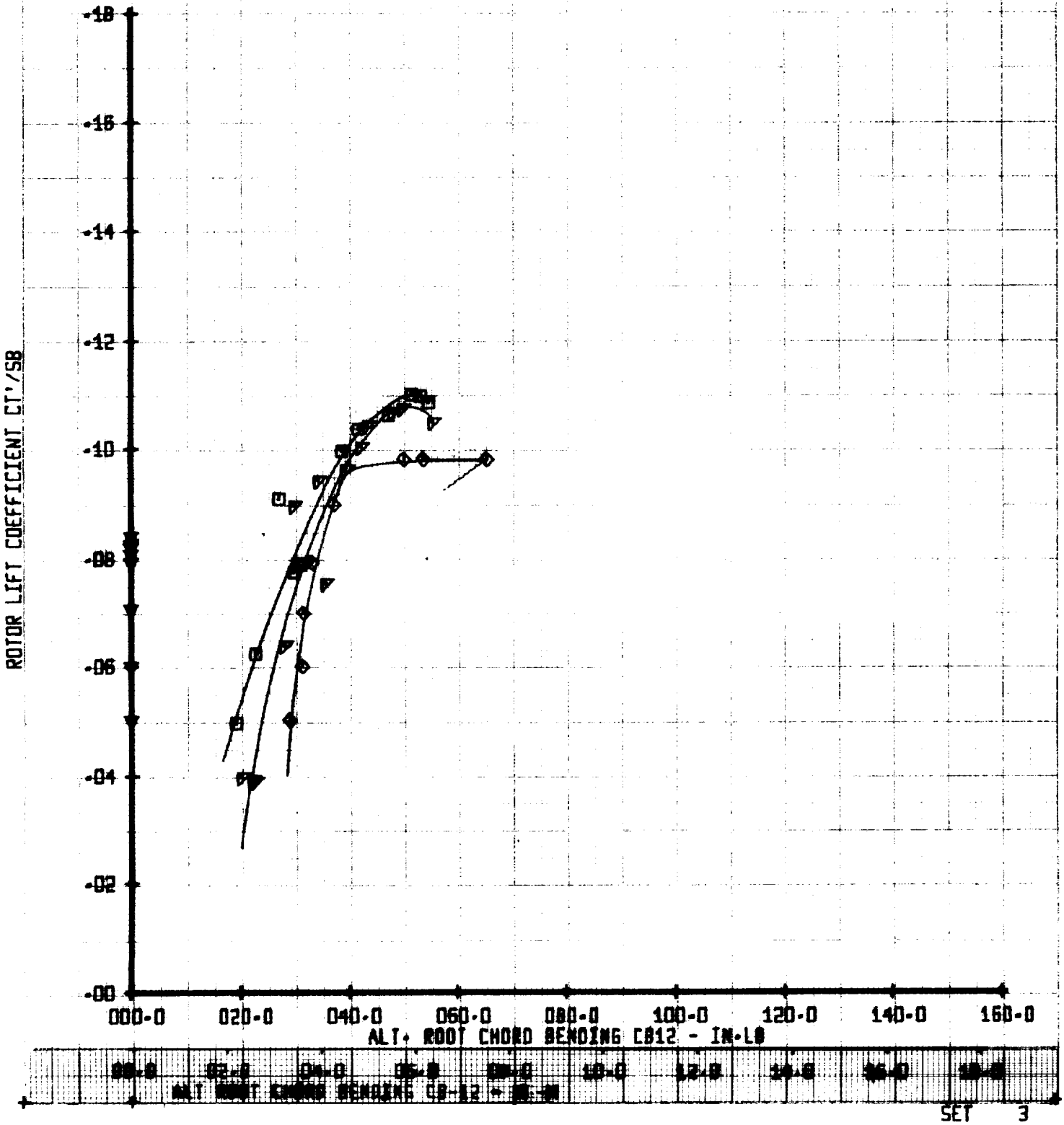
ET 3
WT 187

SET 3
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND SYM	RUN	MU'	X/QQ2SB	VIUN
□	32	.40	.01	248
▷	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 3
WT 187

SET 3
BVWT 187

Figure A-73

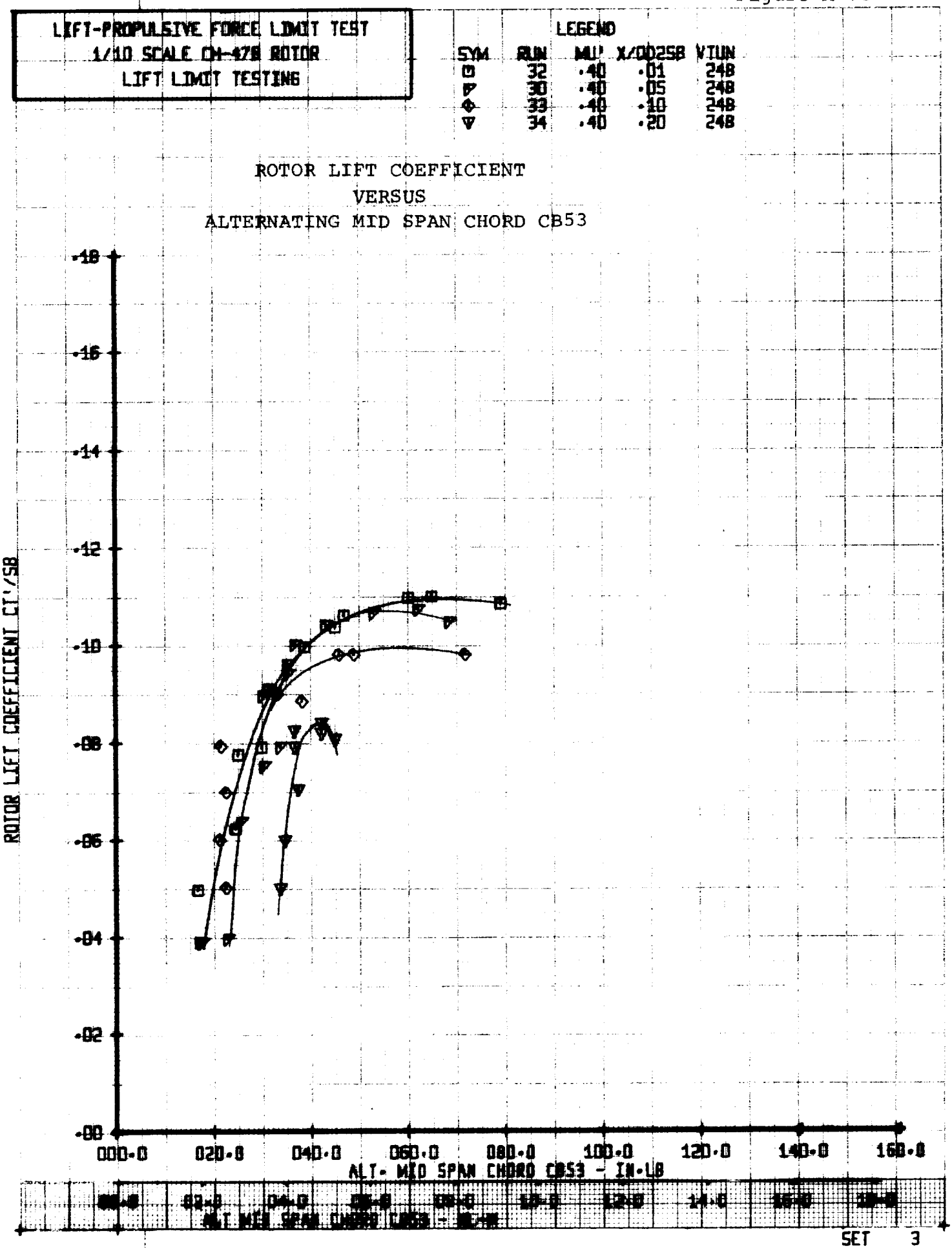

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN CHORD CB53
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
000.0
020.0
040.0
060.0
080.0
100.0
120.0
140.0
160.0
ALT. MID SPAN CHORD CB53 - IN-LB
ET 3
WT 187
SET 3
BVWT 187

Figure A-74

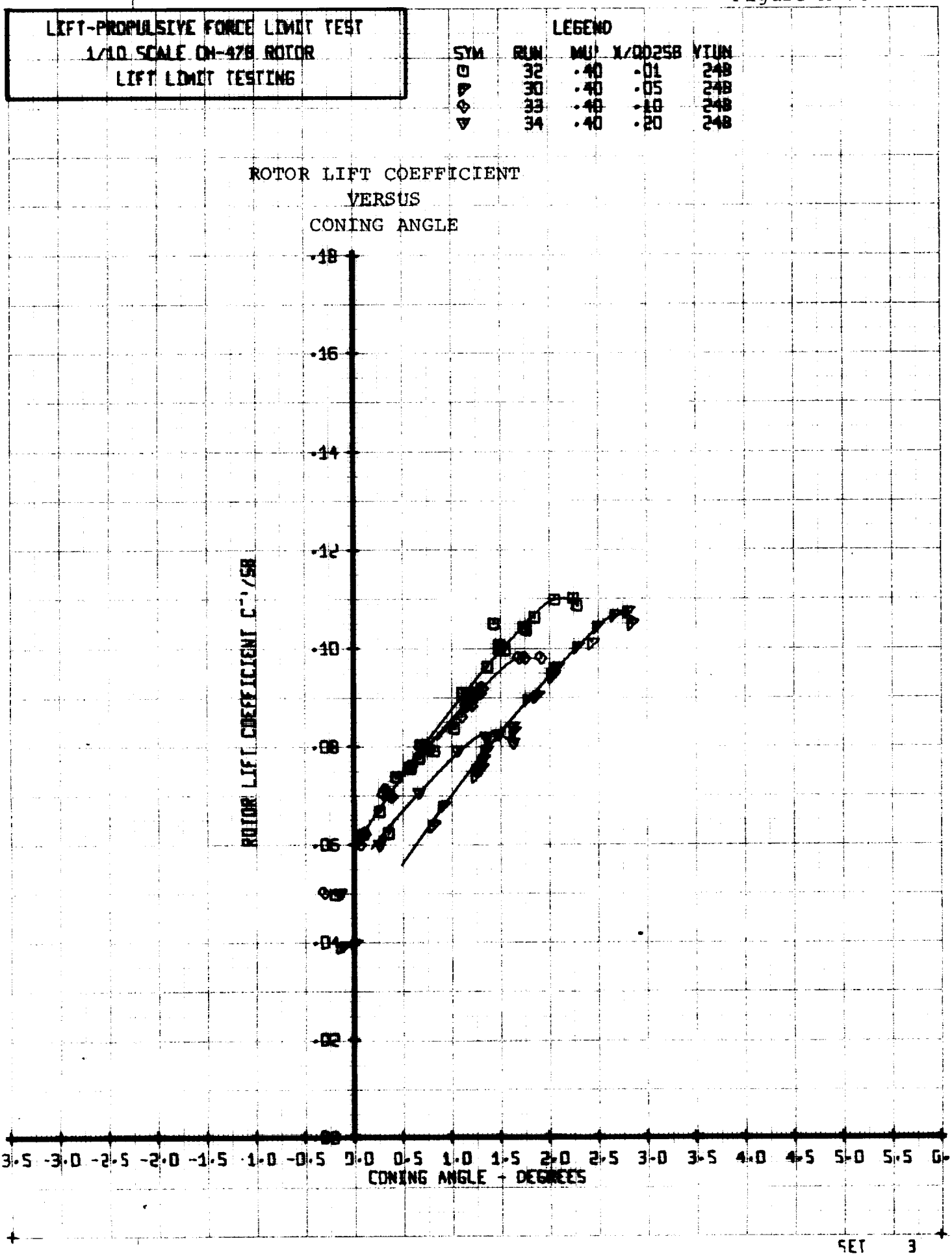

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE ON-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB YIUN
32 .40 .01 24B
30 .40 .05 24B
33 .40 .10 24B
34 .40 .20 24B
ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
CONING ANGLE - DEGREES
SET 3
BWWT 187

Figure A-75

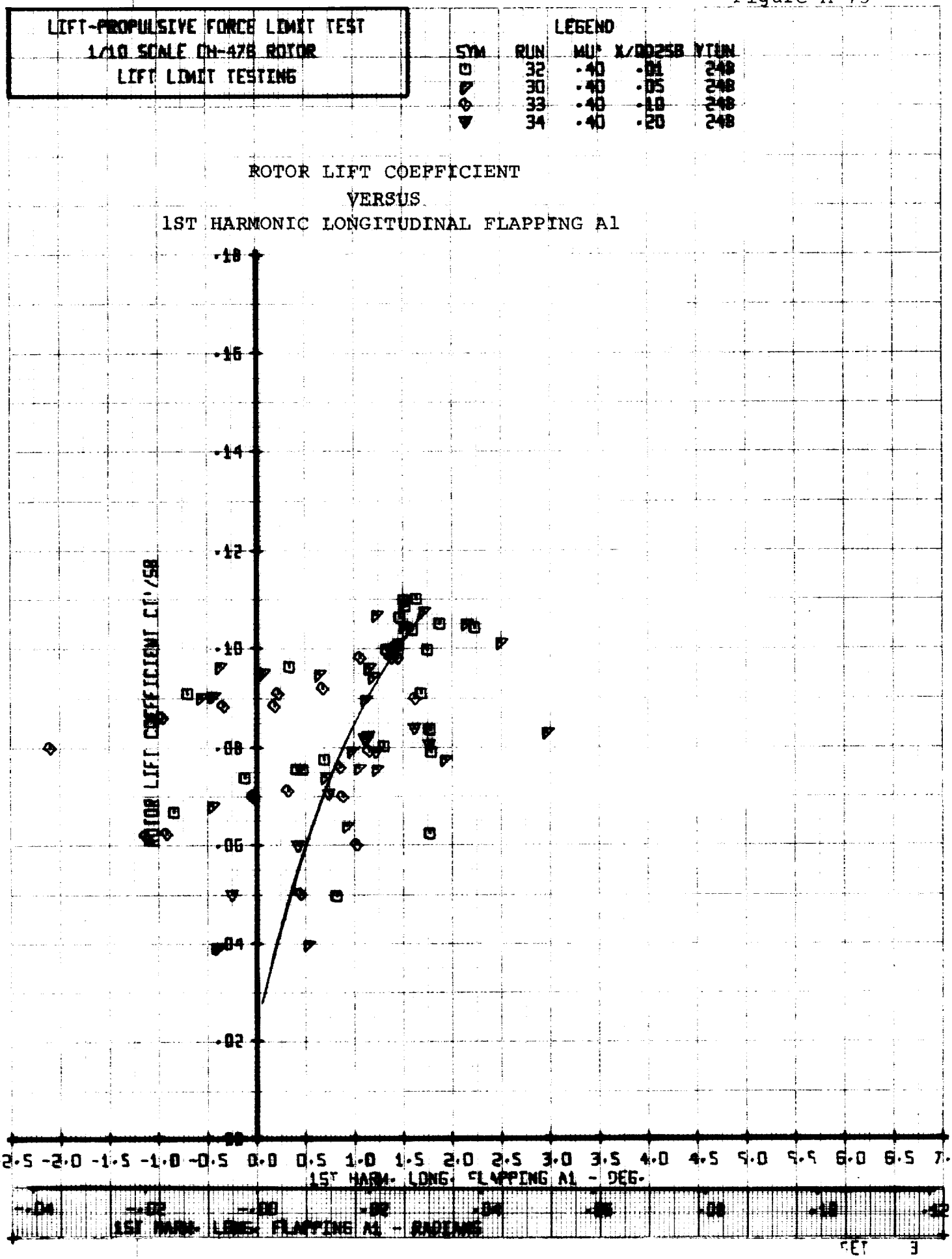
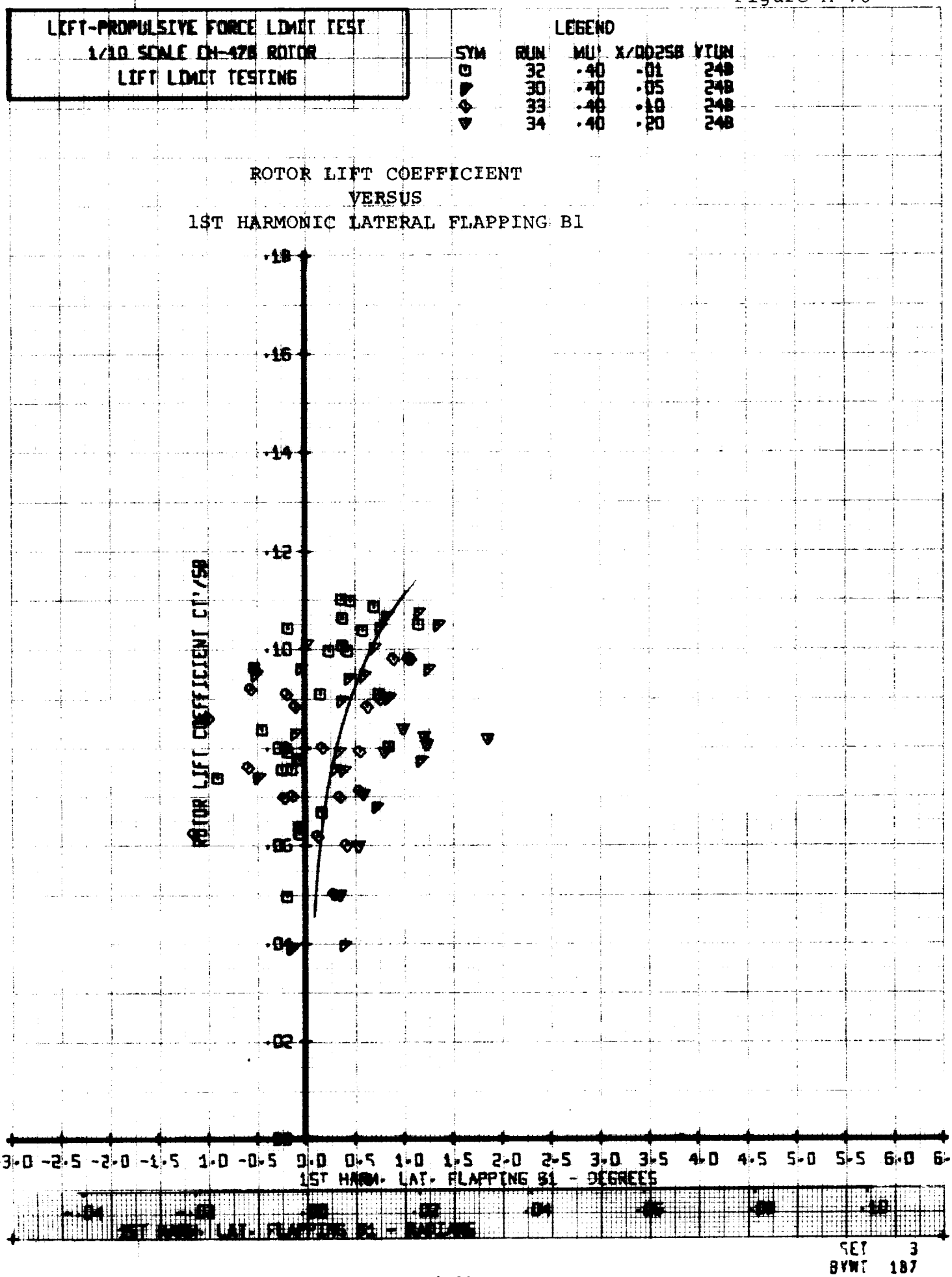

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/DD25B VTIN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
1ST HARM. LONG. FLAPPING A1 - DEG.
1ST HARM. LONG. FLAPPING A1 - RADIANS

Figure A-76



SET 3
BWT 187

Figure A-77

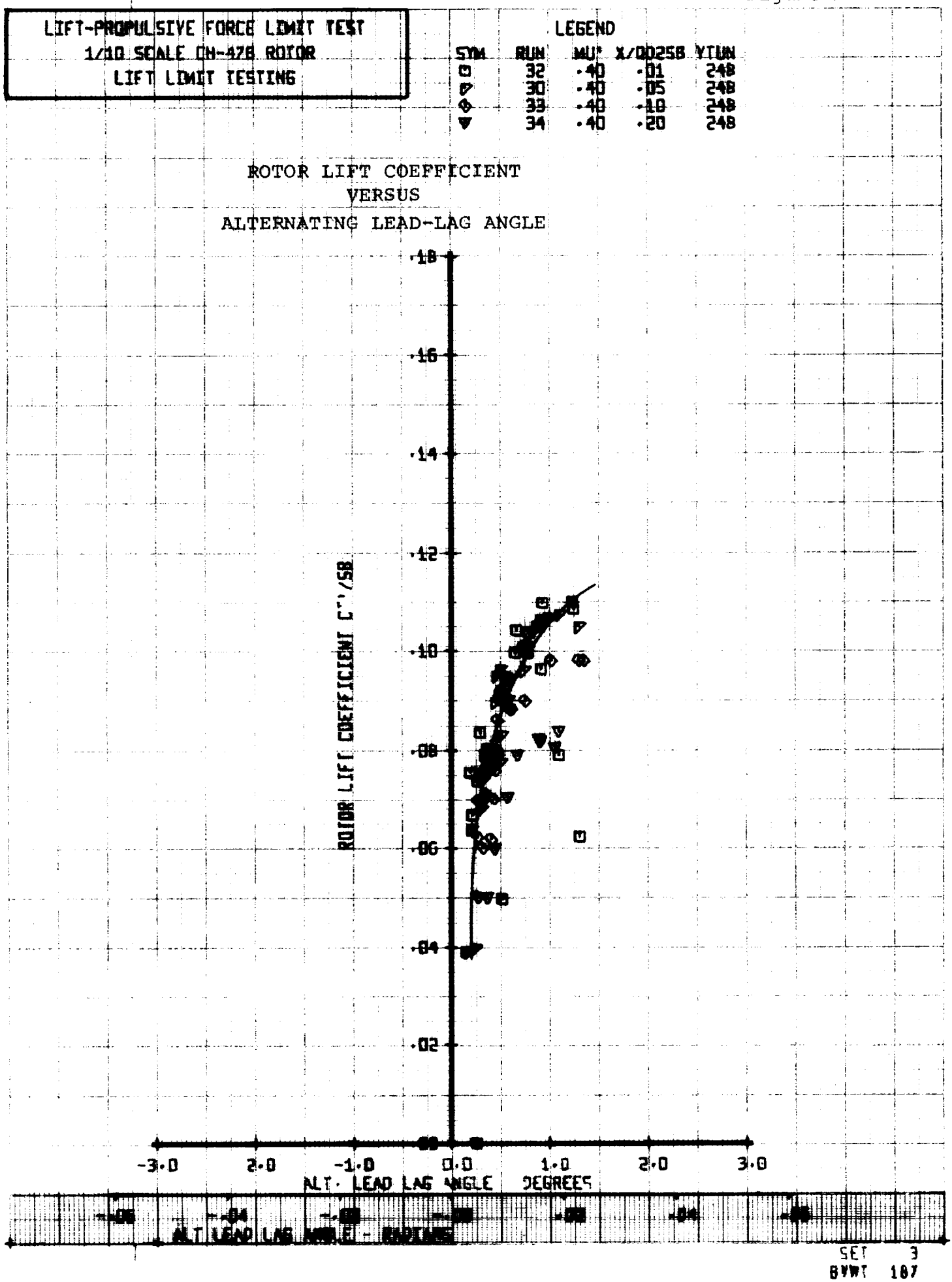
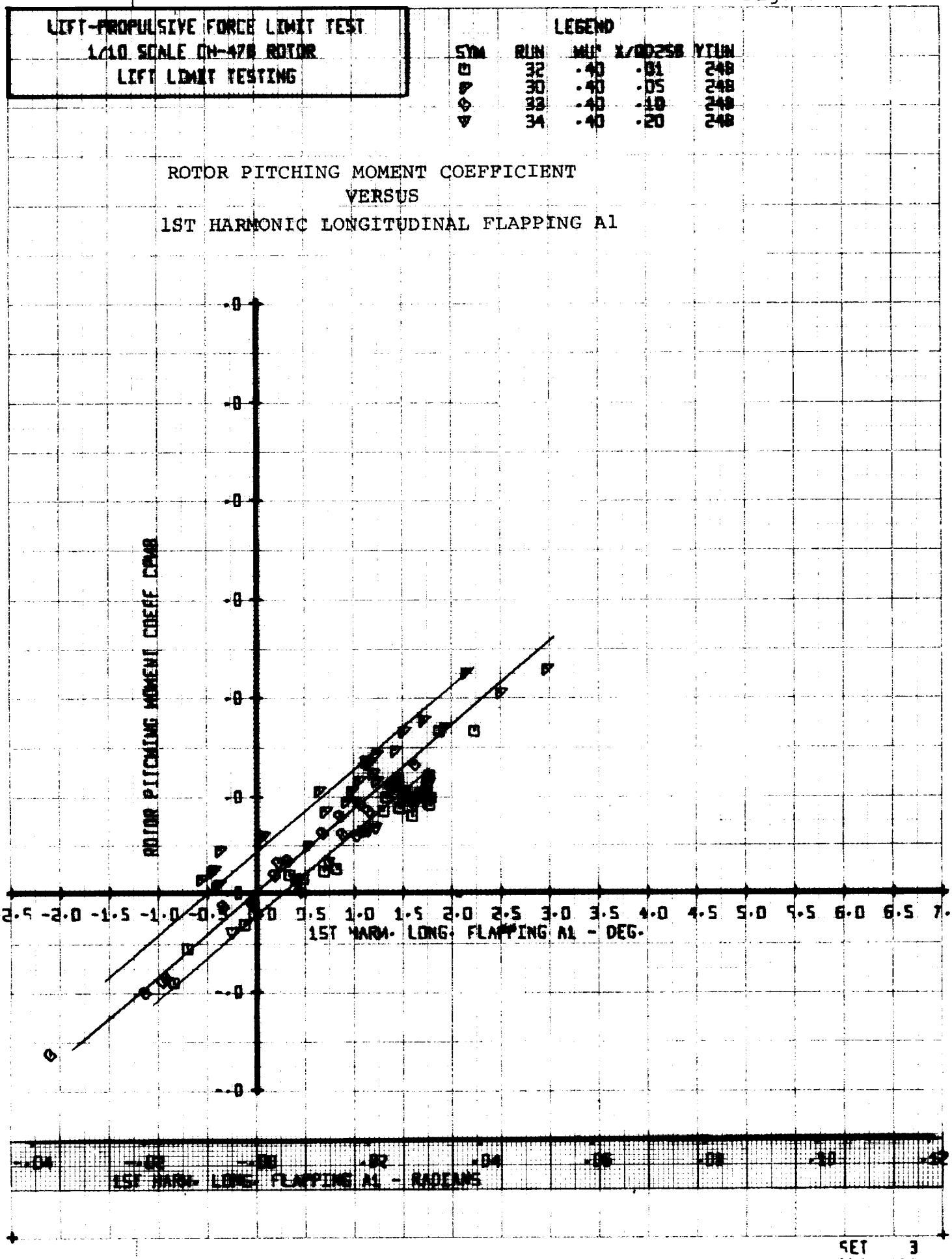

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU* X/QD25B YTUN
32 .40 .01 248
30 .40 .05 248
33 .40 .10 248
34 .40 .20 248
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
ALT. LEAD LAG ANGLE DEGREES
SET 3
BWWT 187

Figure A-78



SET 3
BWT 187

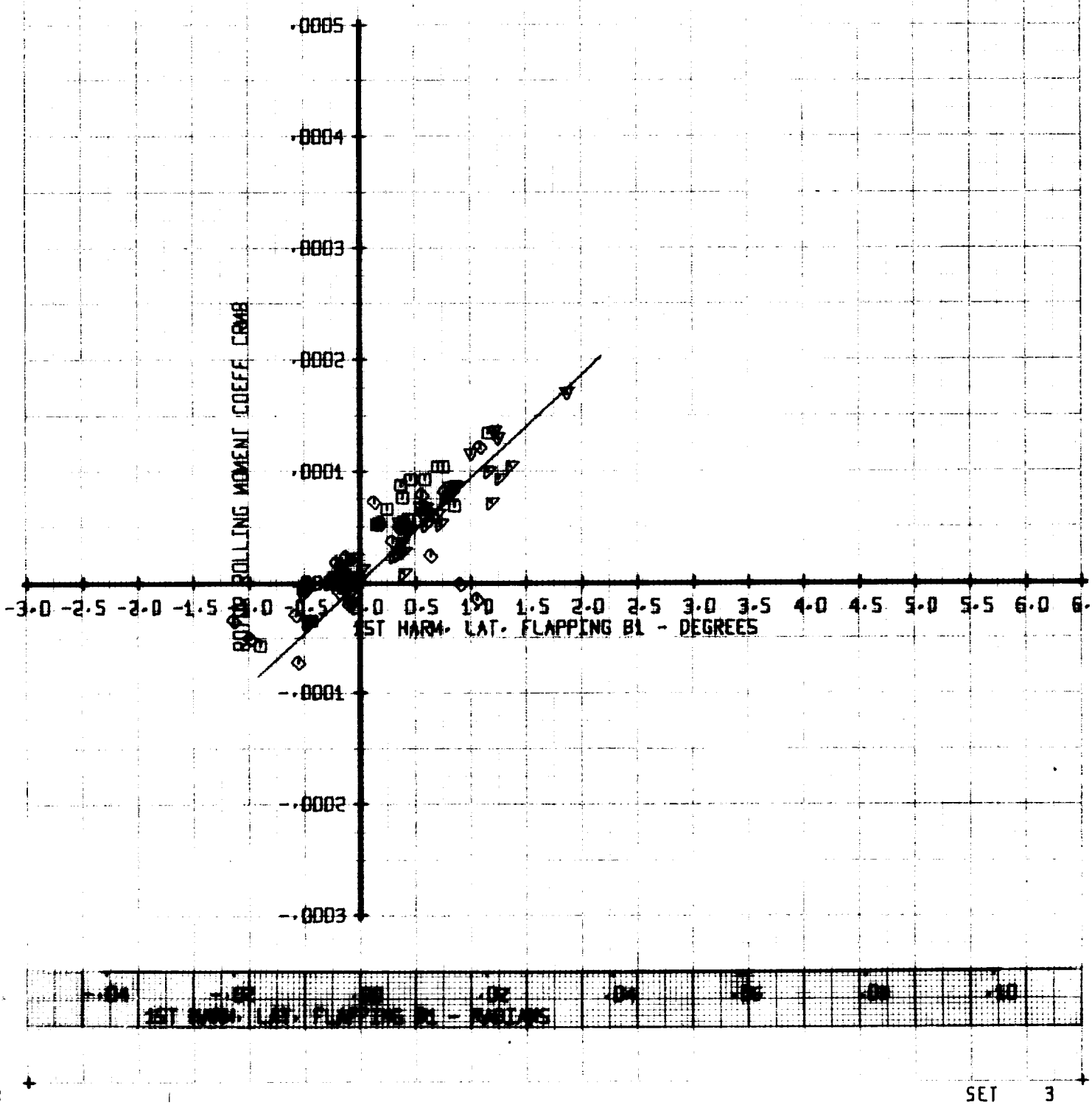
SET 3
BWT 197

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YIUN
□	32	.40	.01	248
▽	30	.40	.05	248
◇	33	.40	.10	248
▽	34	.40	.20	248

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



SET 3
BVWT 187

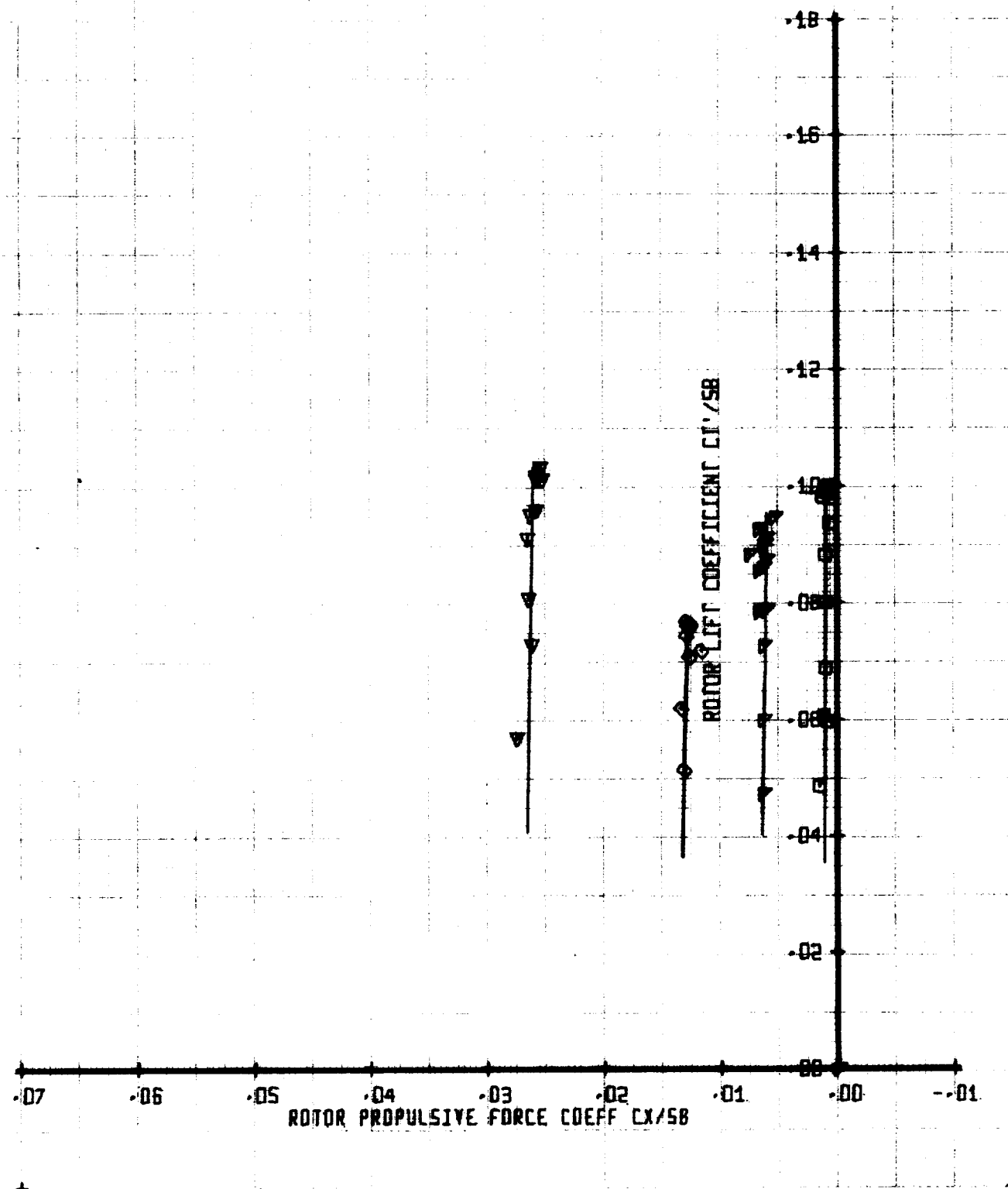
Figure A-80

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
▫	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 4
WT 187

SET 4
BVWT 187

Figure A-81

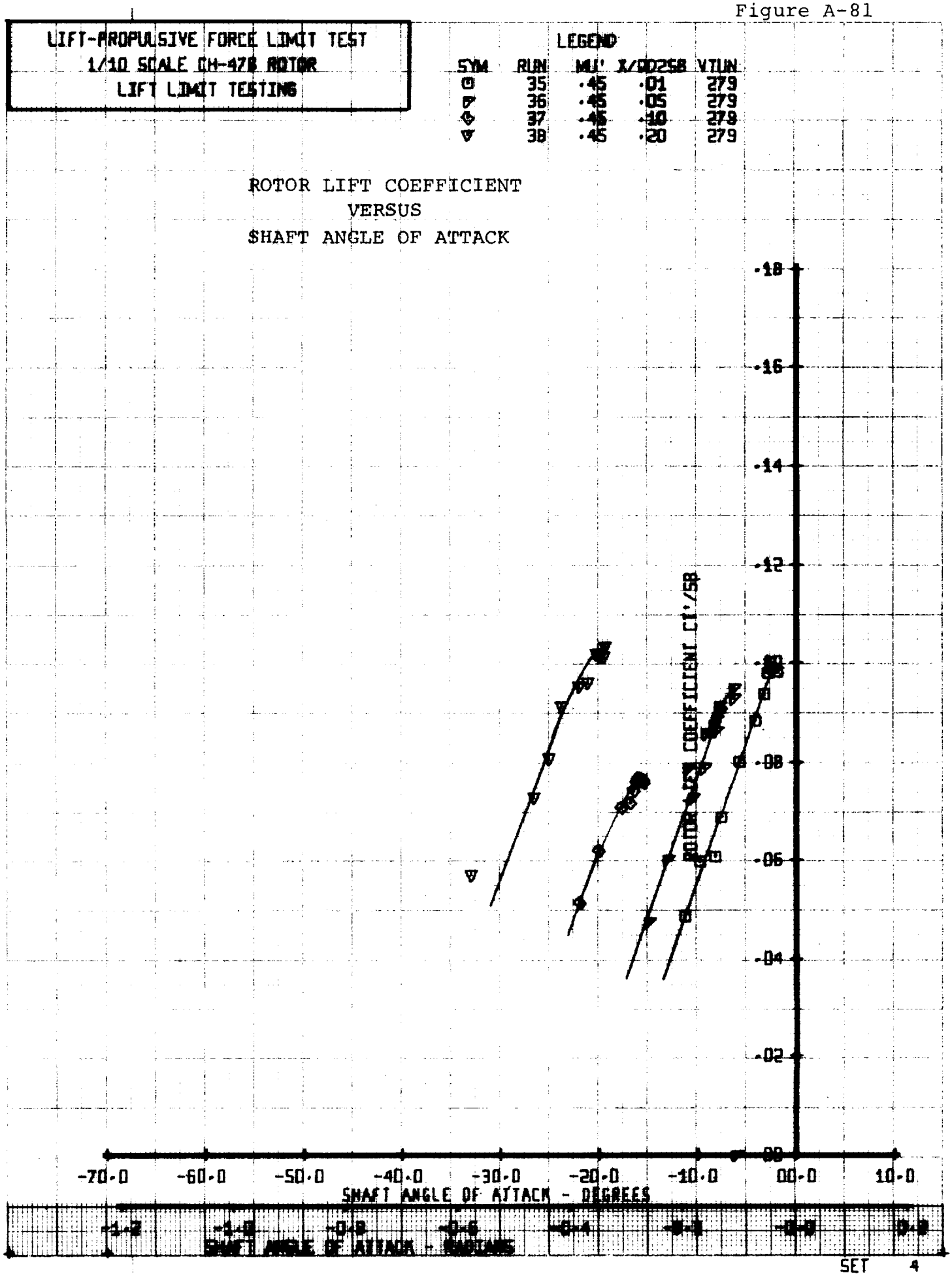

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB VTUN
35 .45 .01 279
36 .45 .05 279
37 .45 .10 278
38 .45 .20 279
ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.08
.06
.04
.02
.00
-70.0
-60.0
-50.0
-40.0
-30.0
-20.0
-10.0
00.0
10.0
SHAFT ANGLE OF ATTACK - DEGREES
SHAFT ANGLE OF ATTACK - RADIANS
SET 4
BVWT 187

Figure A-82

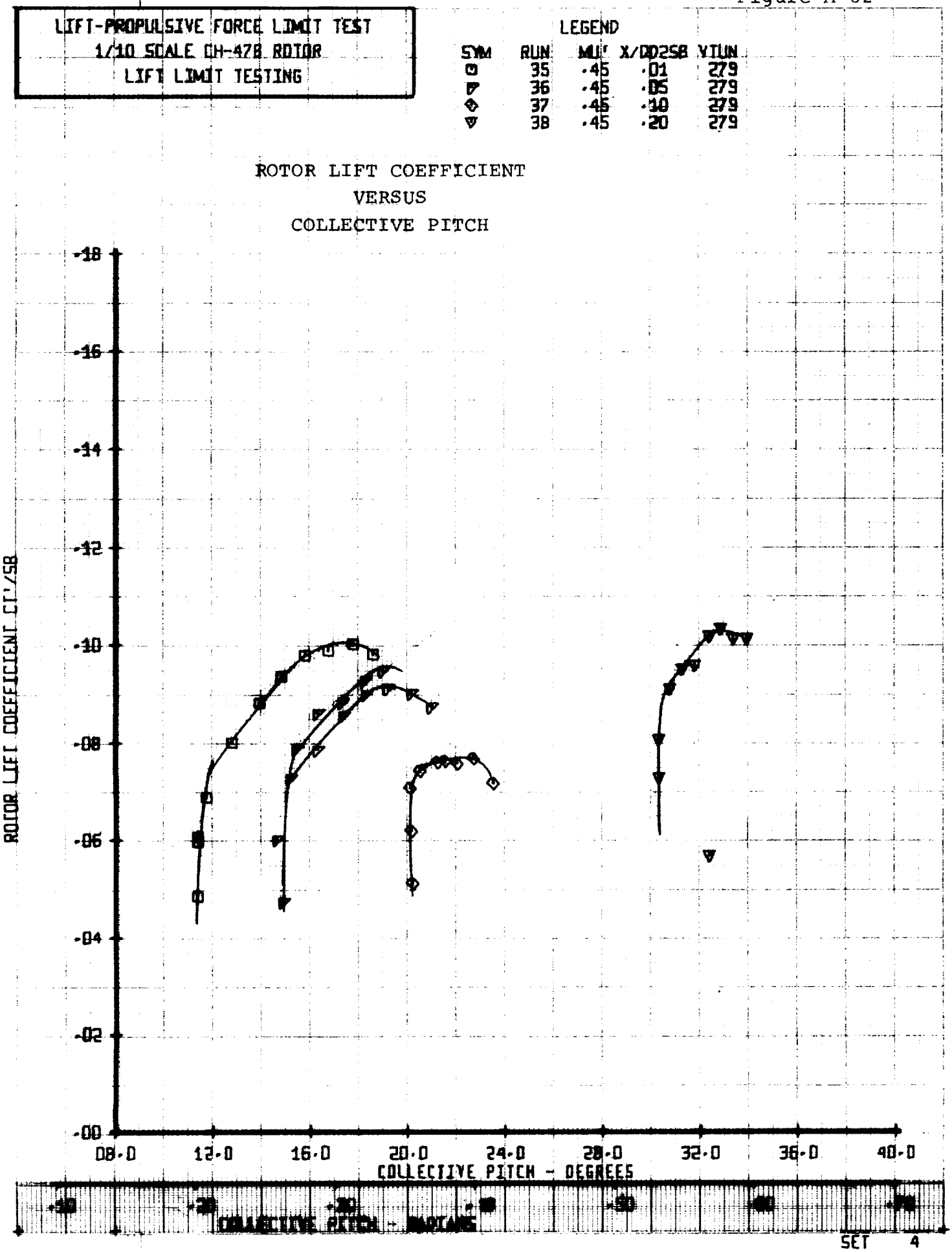

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/DD2SB YTUN
35 .45 .01 279
36 .45 .05 279
37 .45 .10 279
38 .45 .20 279
ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH
ROTOR LIFT COEFFICIENT CT/SB
-18
-16
-14
-12
-10
-08
-06
-04
-02
-00
08.0
12.0
16.0
20.0
24.0
28.0
32.0
36.0
40.0
COLLECTIVE PITCH - DEGREES
SET 4
BWT 187

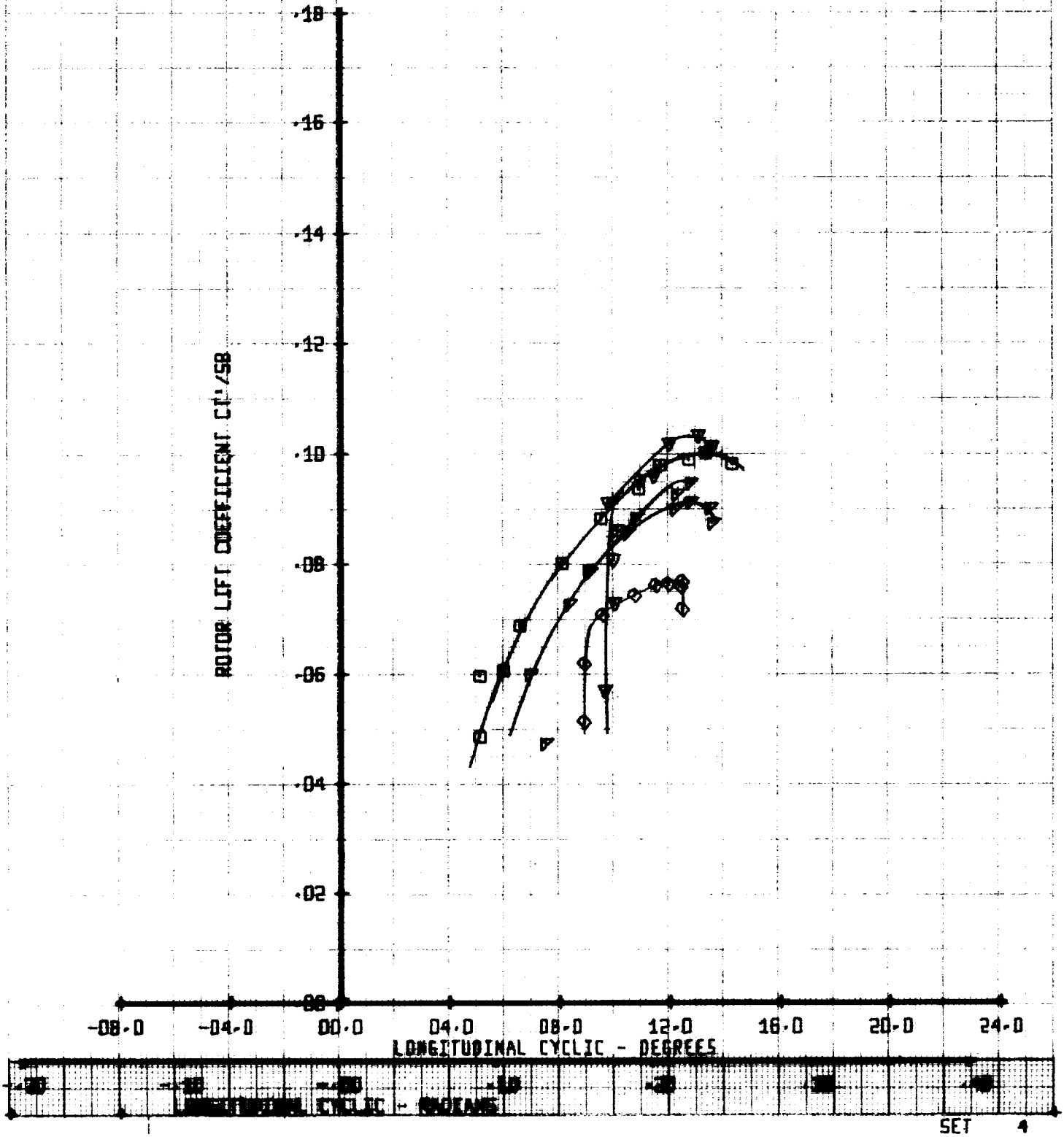
Figure A-83

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QC2SB	YTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



SET 4
BVWT 187

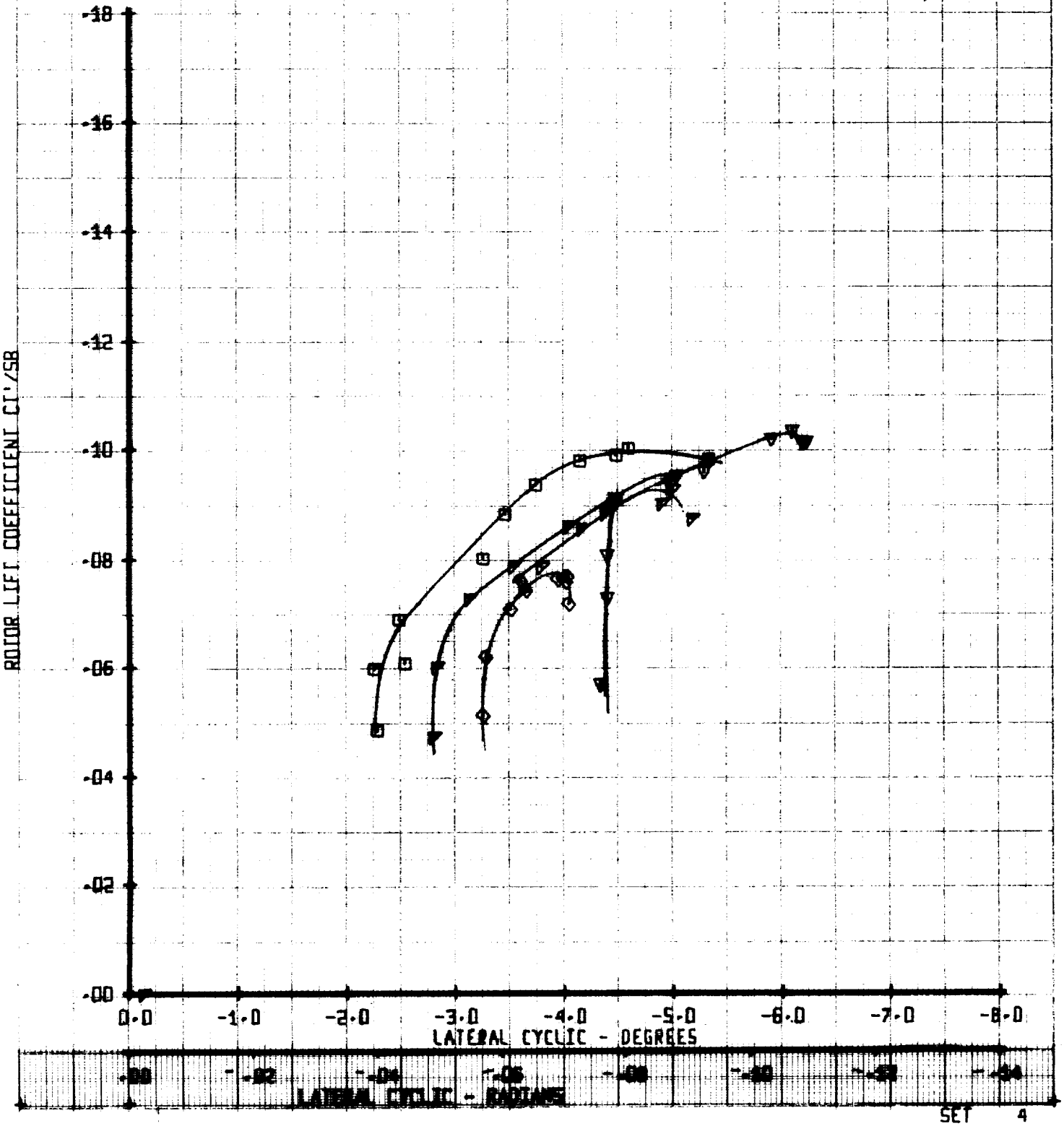
SET 4
BVWT 187

Figure A-84

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QDSB	YTUN
□	35	.45	.01	279
▷	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



SET 4
BVWT 187

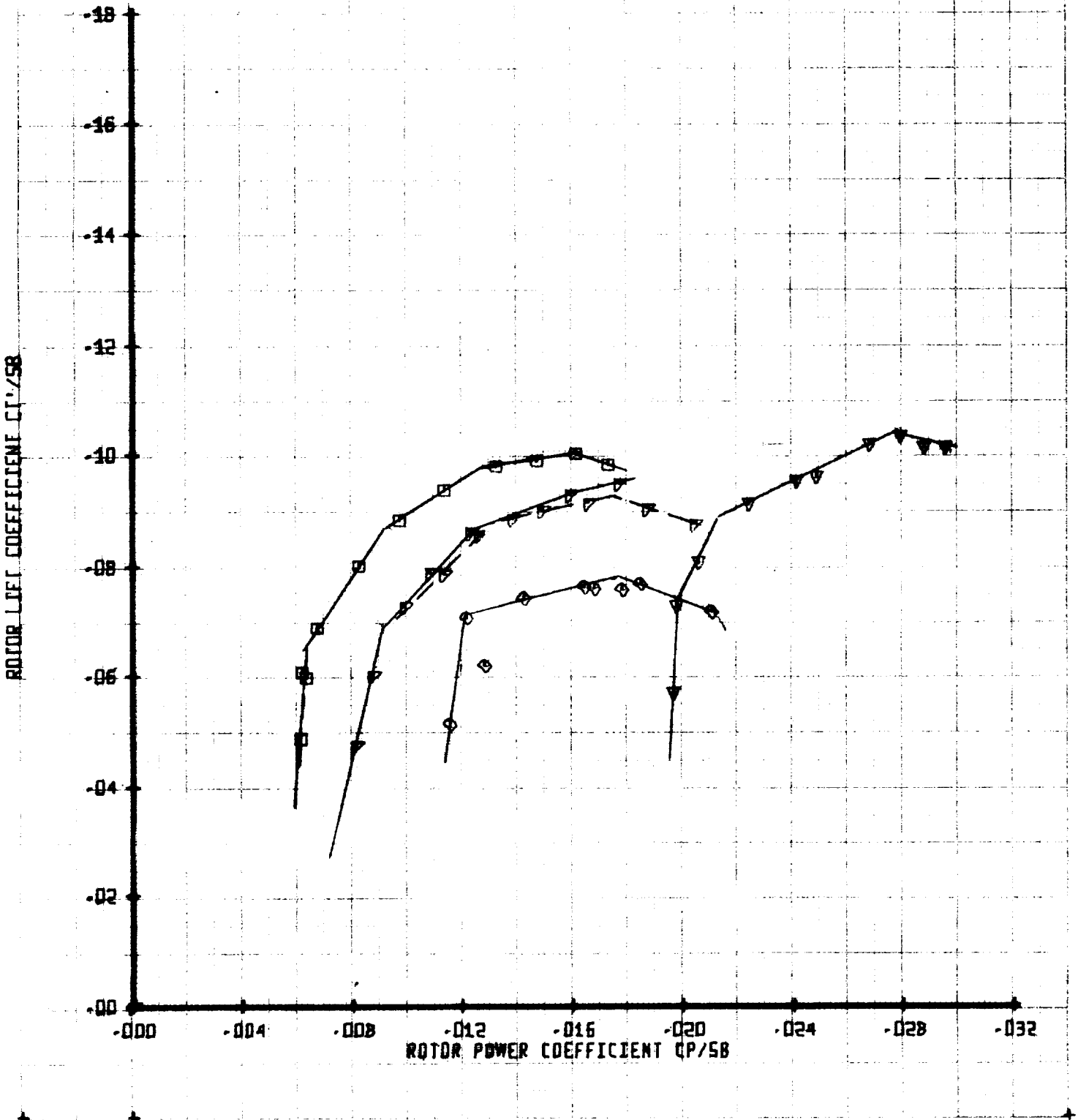
Figure A-85

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SB	VTUN
▫	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



SET 4
WT 187

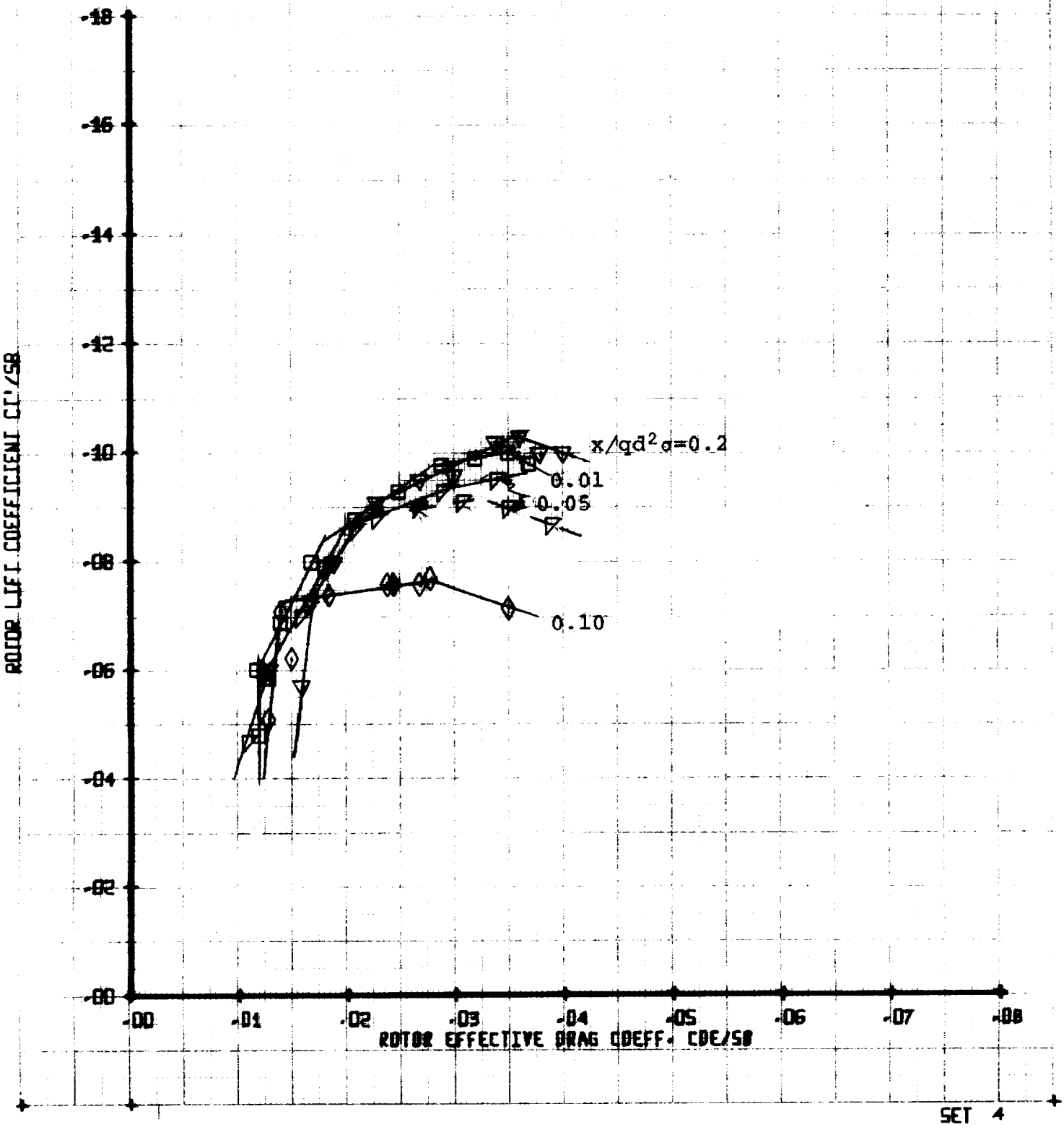
SET 4
BVWT 187

Figure A-86

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2S0	VTIP
▫	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT



ET
WT 193

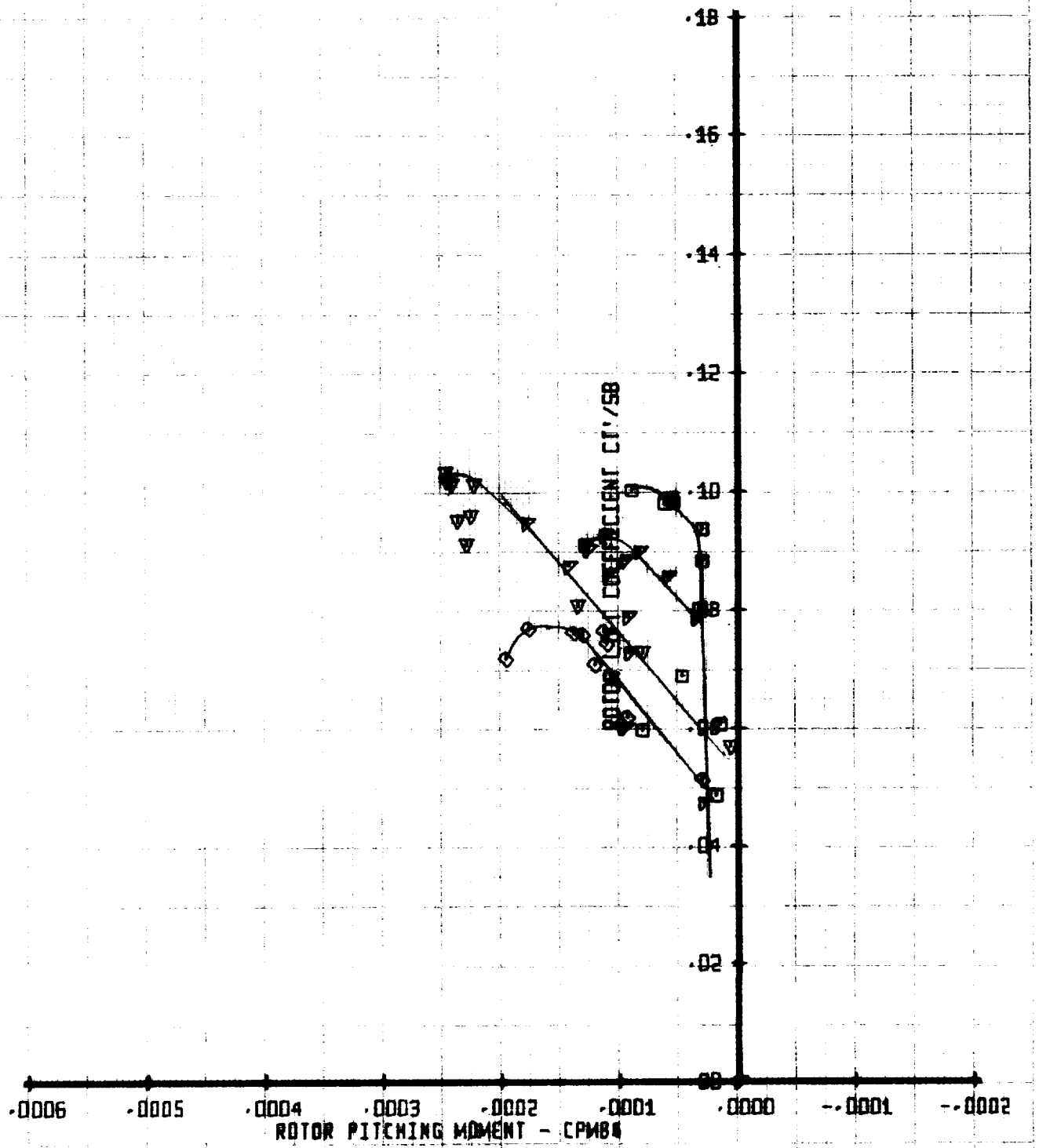
SET 4
BVWT 193

Figure A-87

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND SYM	RUN	MU'	X/D2SB	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 4
WT 187

SET 4
BVWT 187

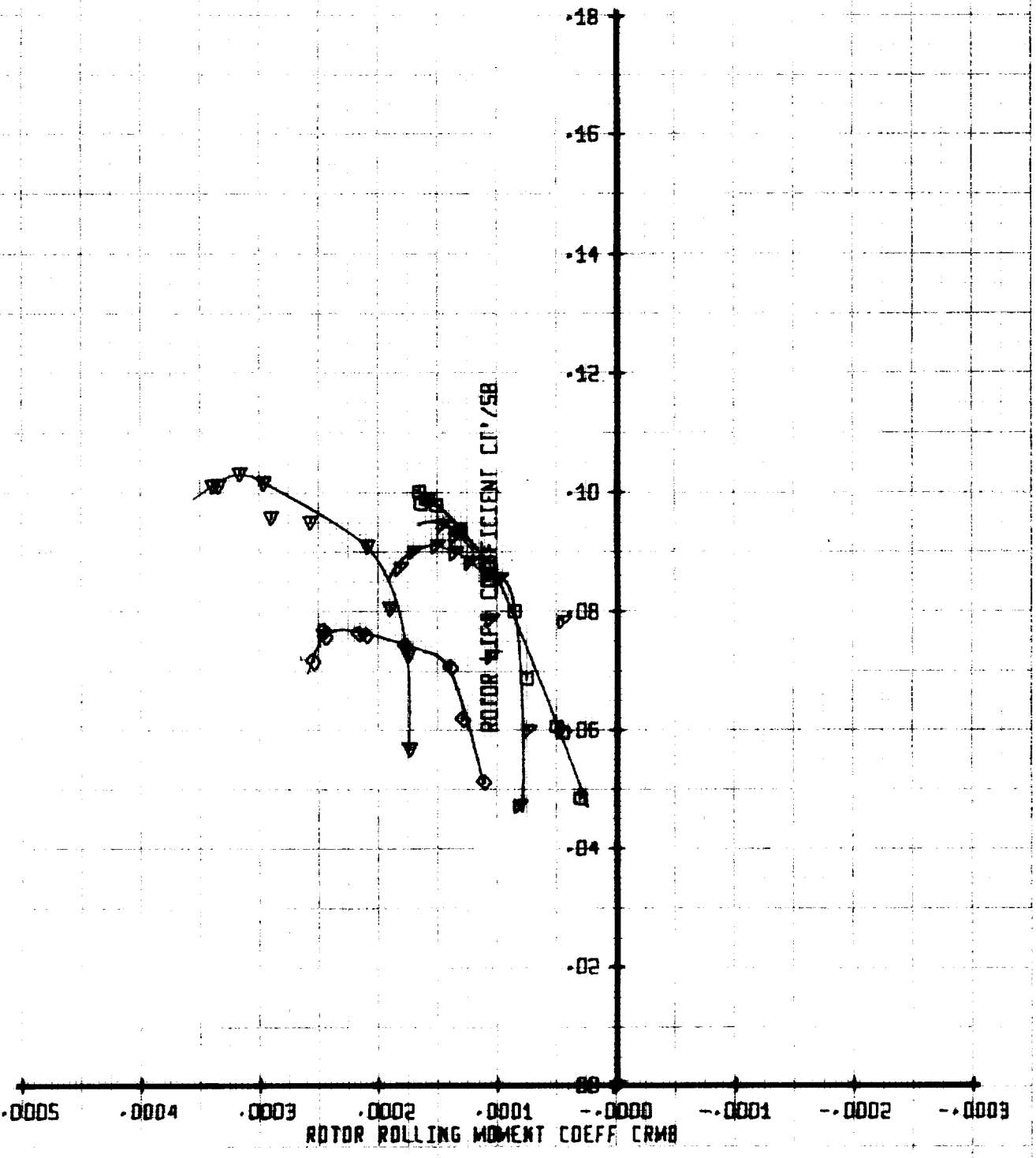
Figure A-88

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
▽	35	.45	.01	279
◇	36	.45	.05	279
▽	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



SET 4
BVWT 187

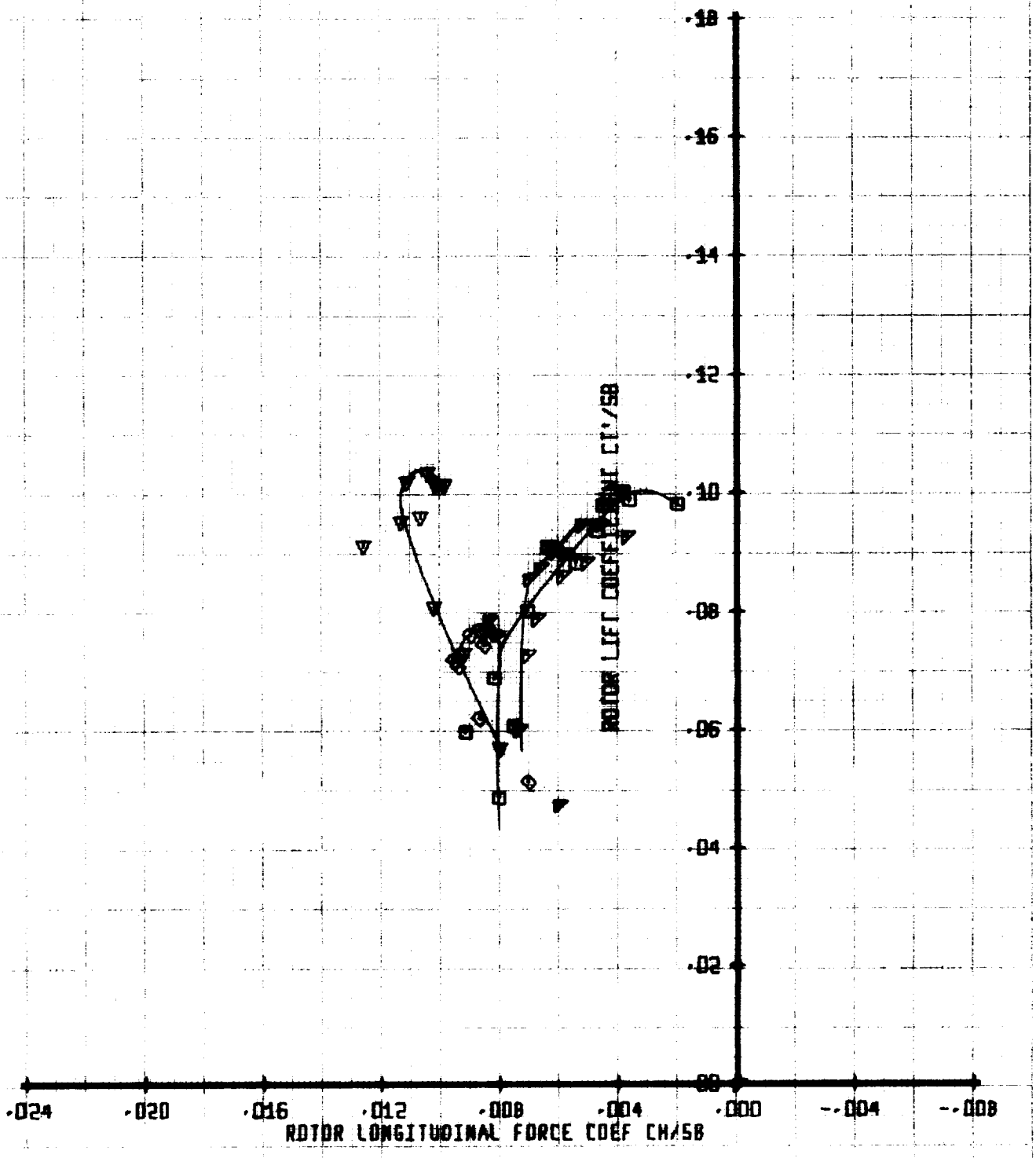
SET 4
BVWT 187

Figure A-89

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 4
WT 187

SET 4
BVWT 187

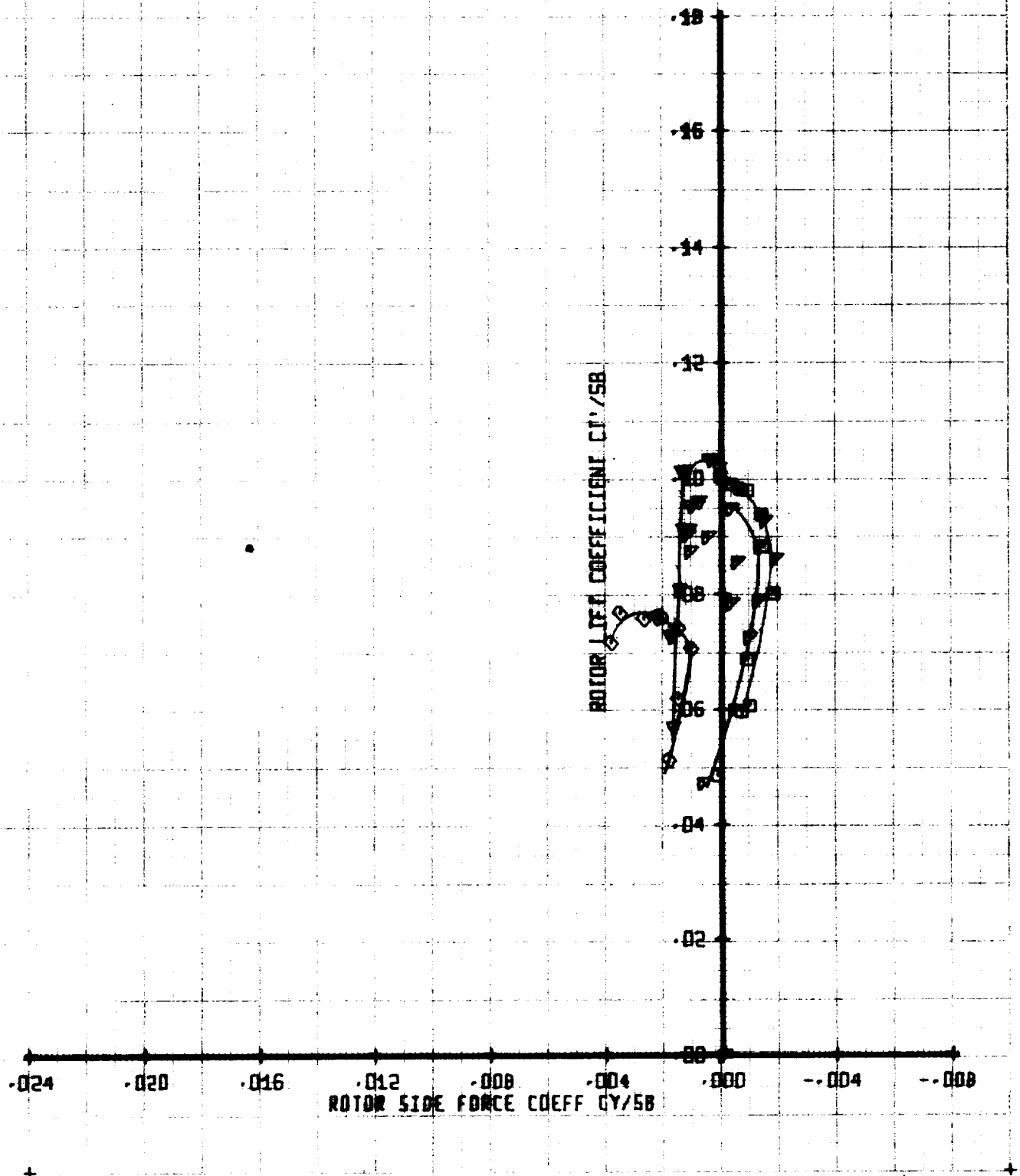
Figure A-90

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D25B	YTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



SET 4
BVWT 187

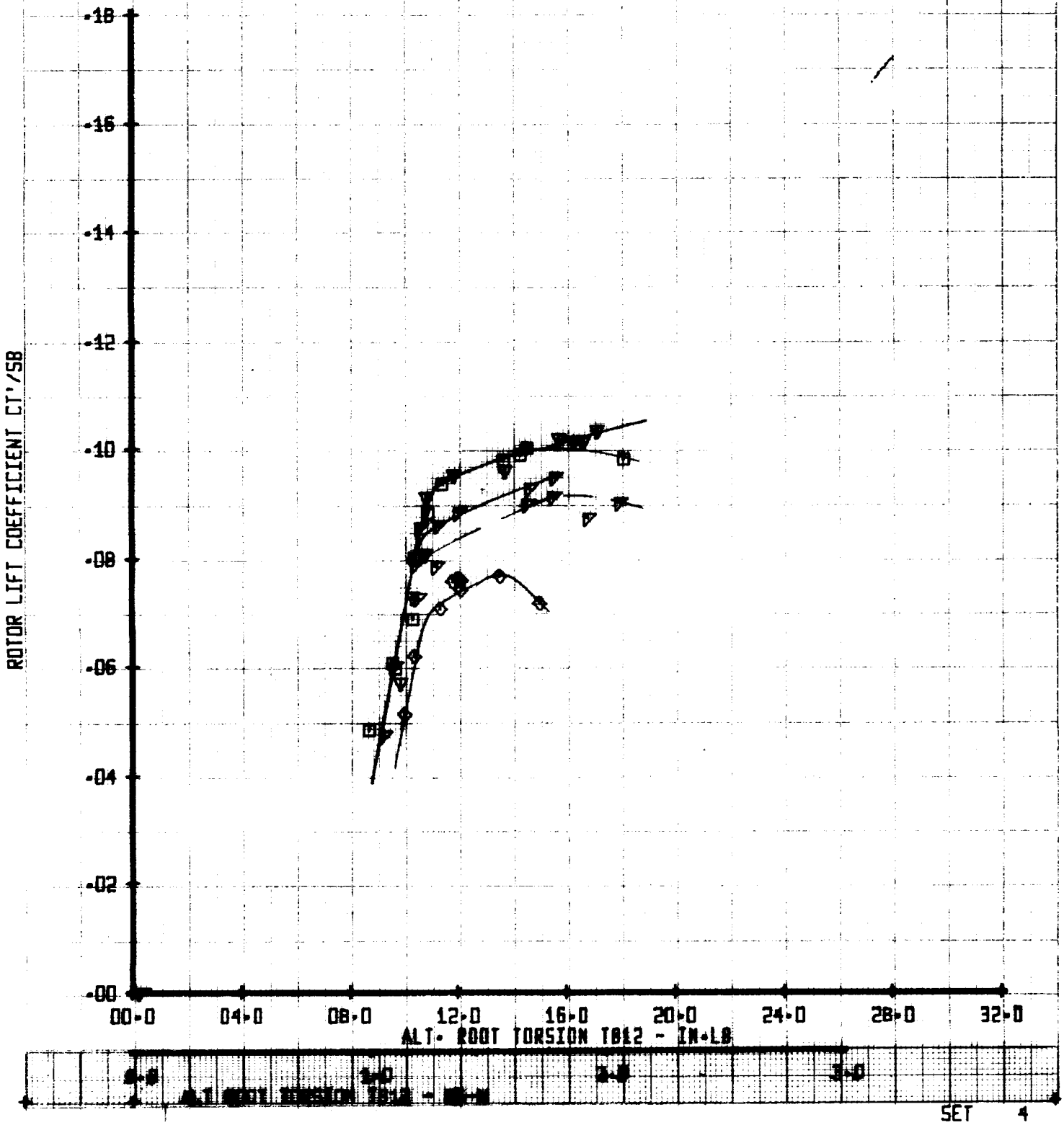
SET 4
BVWT 187

Figure A-91

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QDZSB	VTUN
⊡	35	.45	.01	279
◸	36	.45	.05	279
◈	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB 12



ET 4
WT 187

SET 4
BVWT 187

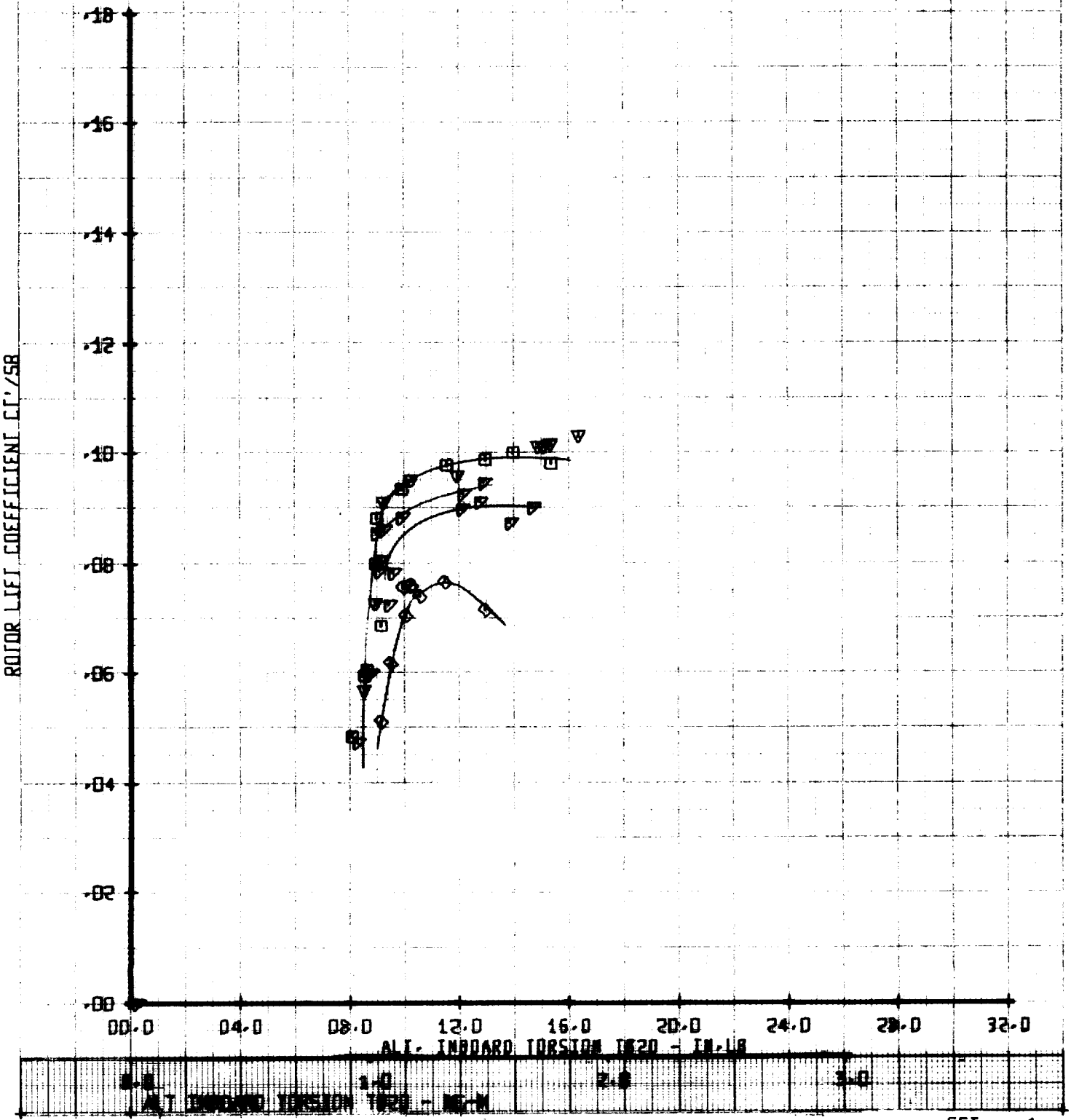
Figure A-92

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD2SB	NTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20



ET 4
WT 187

SET 4
BVWT 187

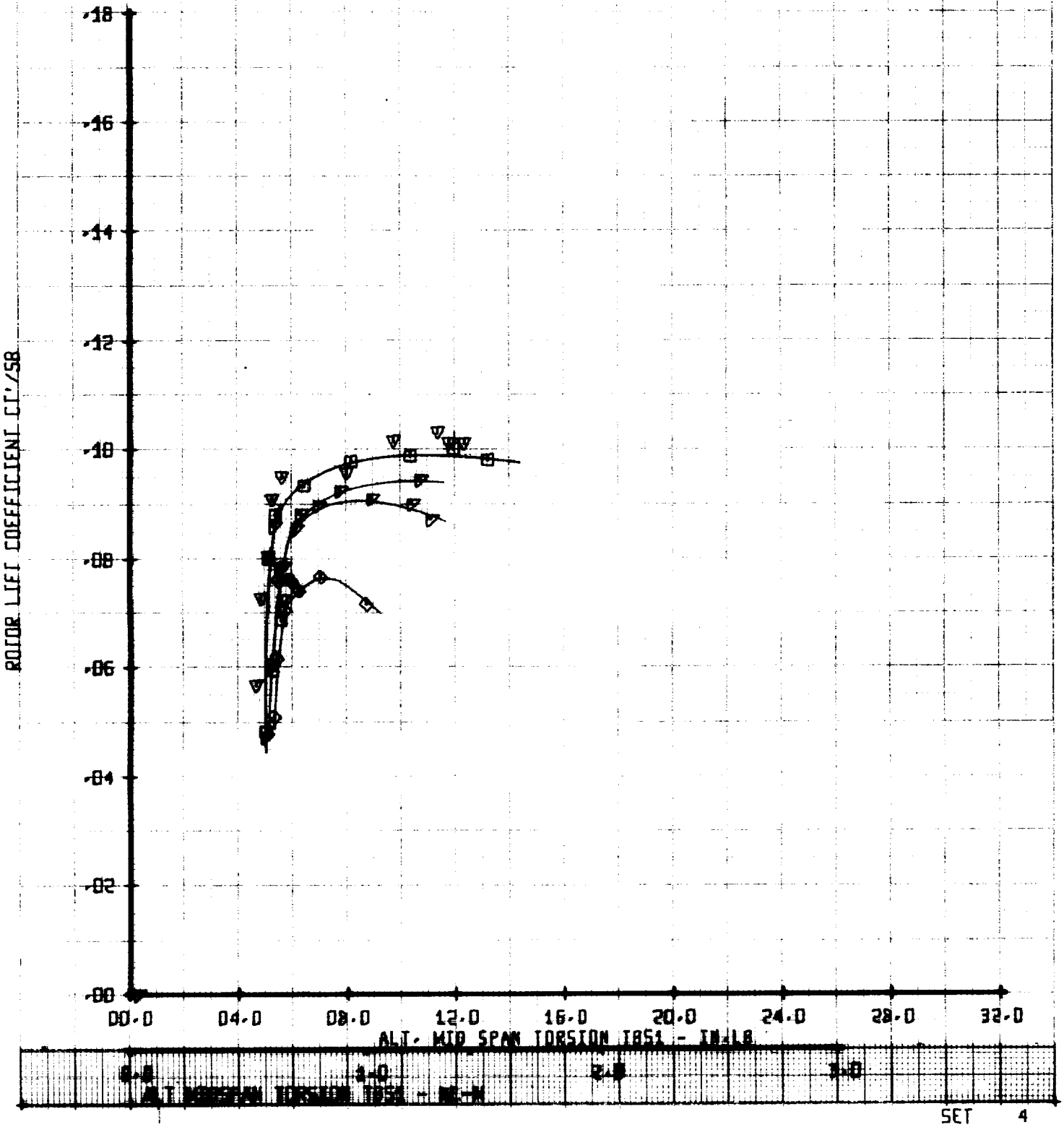
Figure A-93

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51



SET 4
BVWT 187

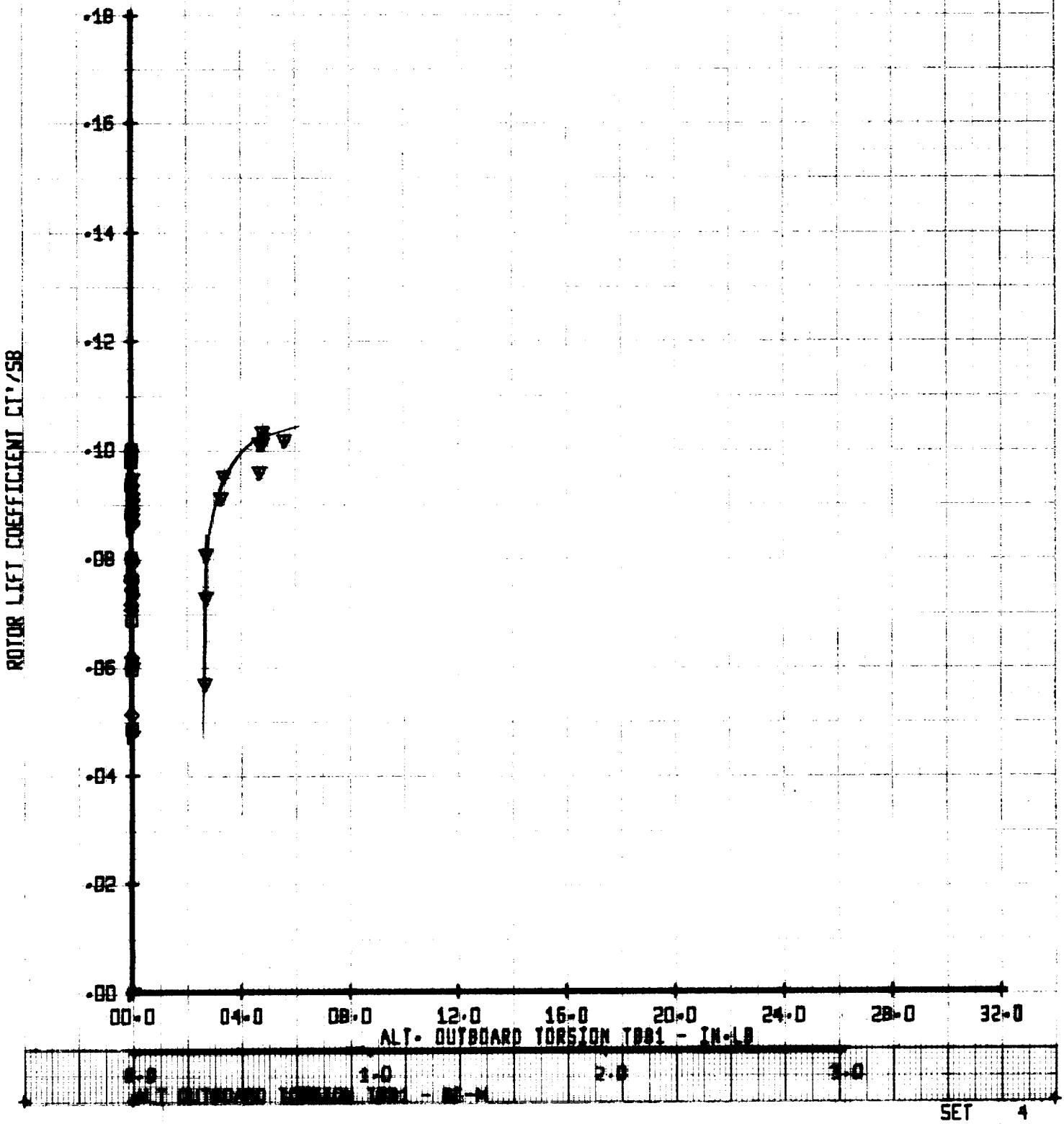
Figure A-94

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	278
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81



ET 4
WT 187

SET 4
BVWT 187

Figure A-95

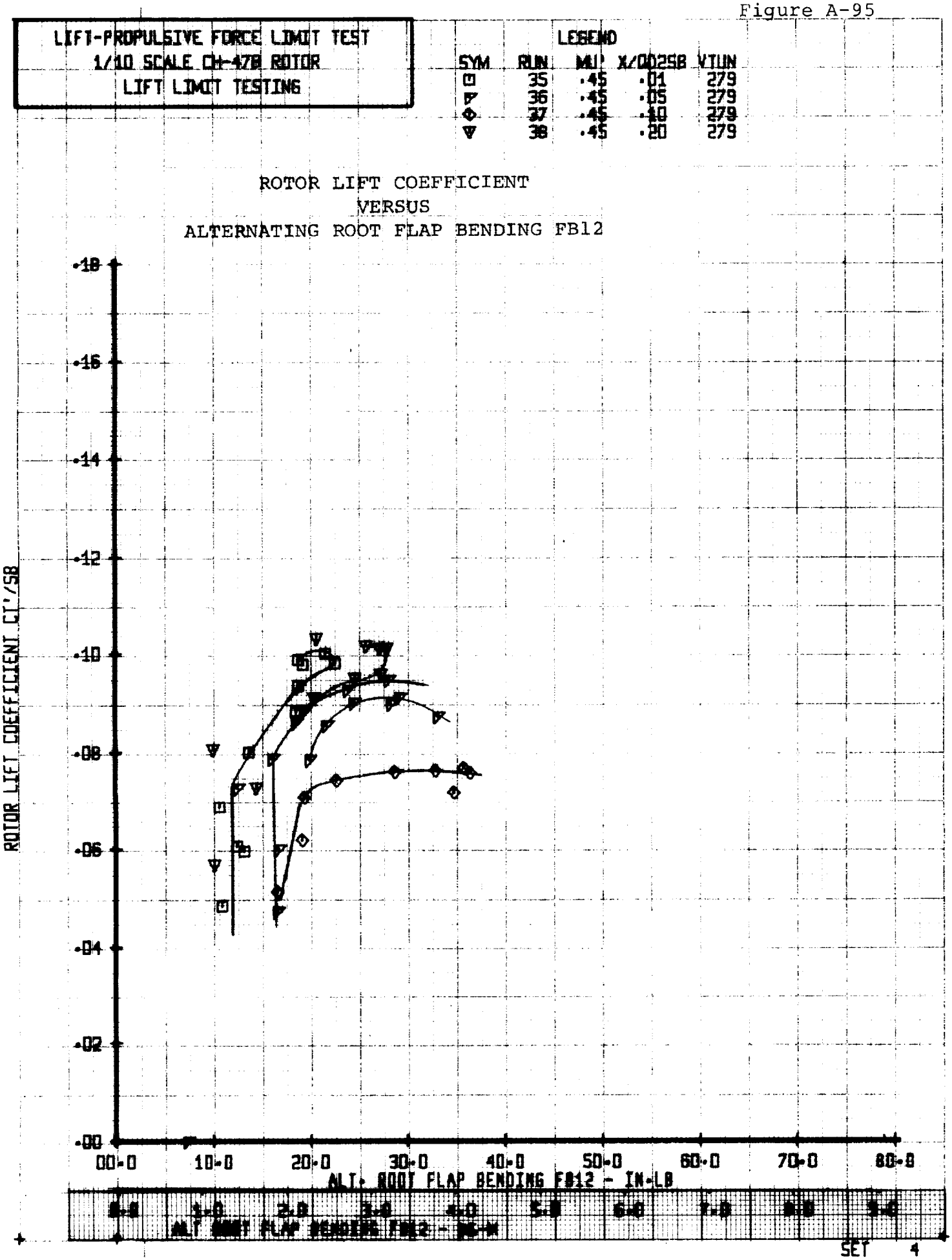
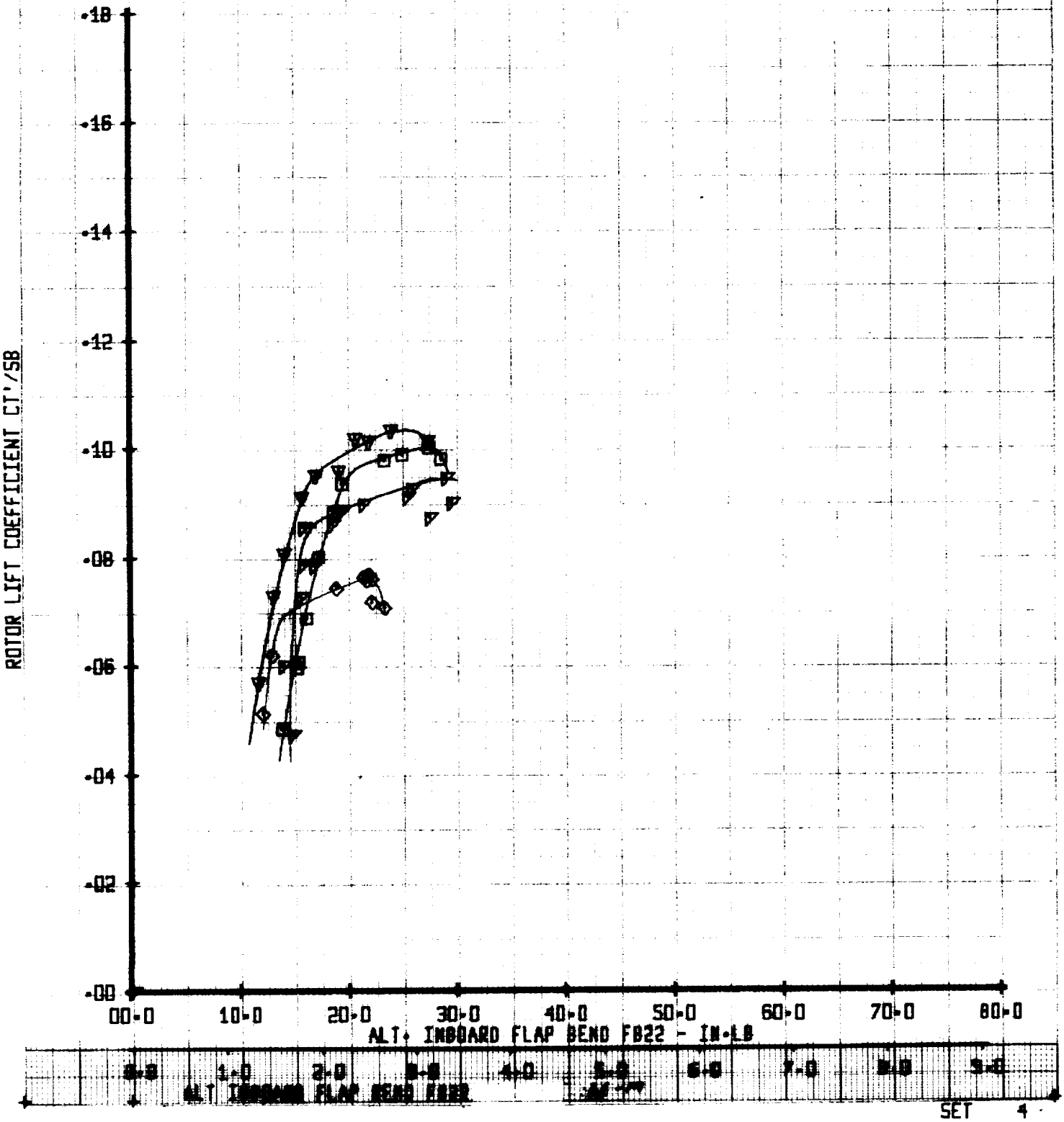

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D025B VTUN
35 .45 .01 279
36 .45 .05 279
37 .45 .10 279
38 .45 .20 279
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. ROOT FLAP BENDING FB12 - IN-LB
ET 4
WT 187
SET 4
BVWT 187

Figure A-96

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
⊡	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▼	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD FLAP BENDING FB22



ET 4
WT 187

SET 4
BVWT 187

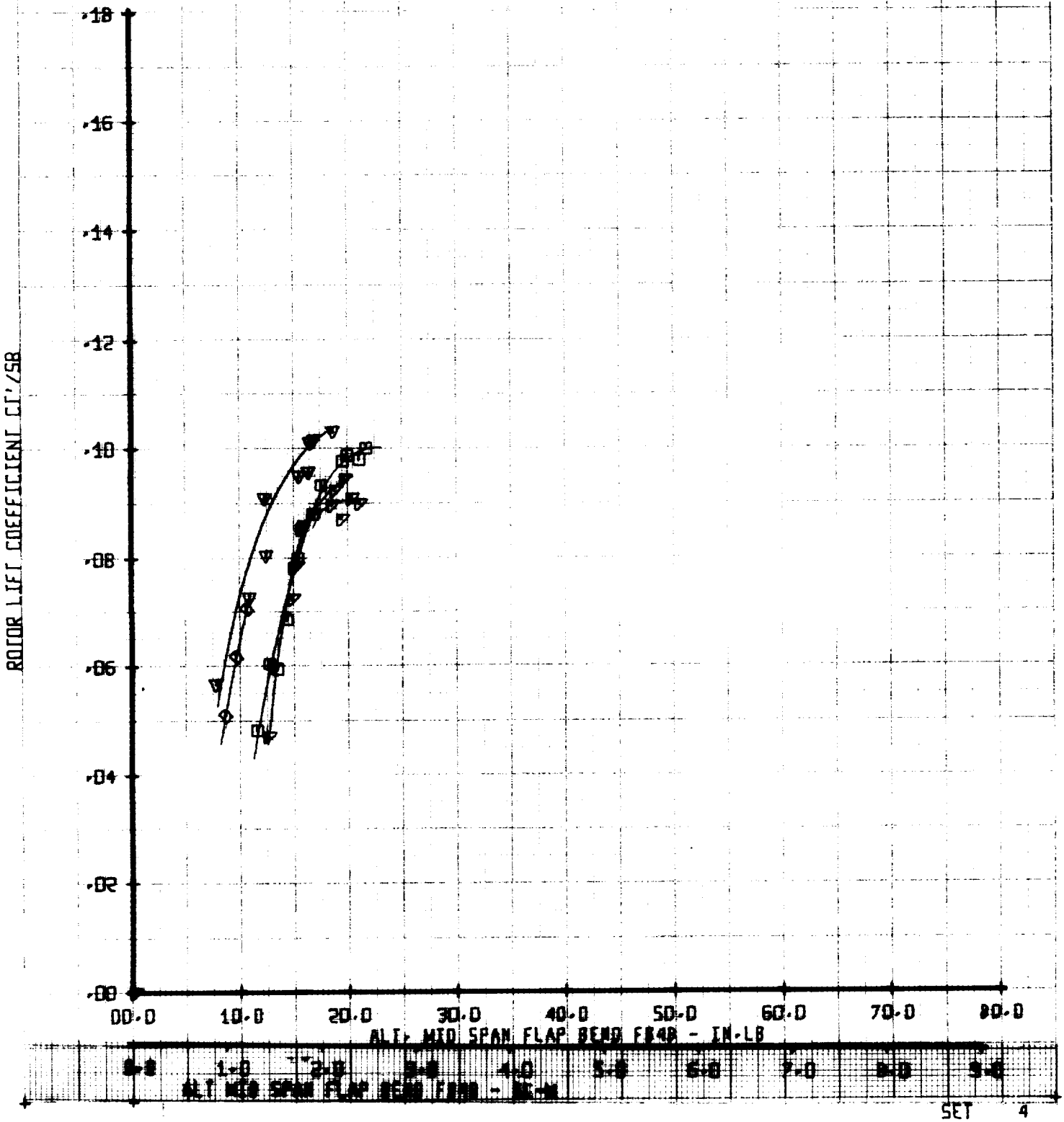
Figure A-97

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD25B	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB48



SET 4
BVWT 187

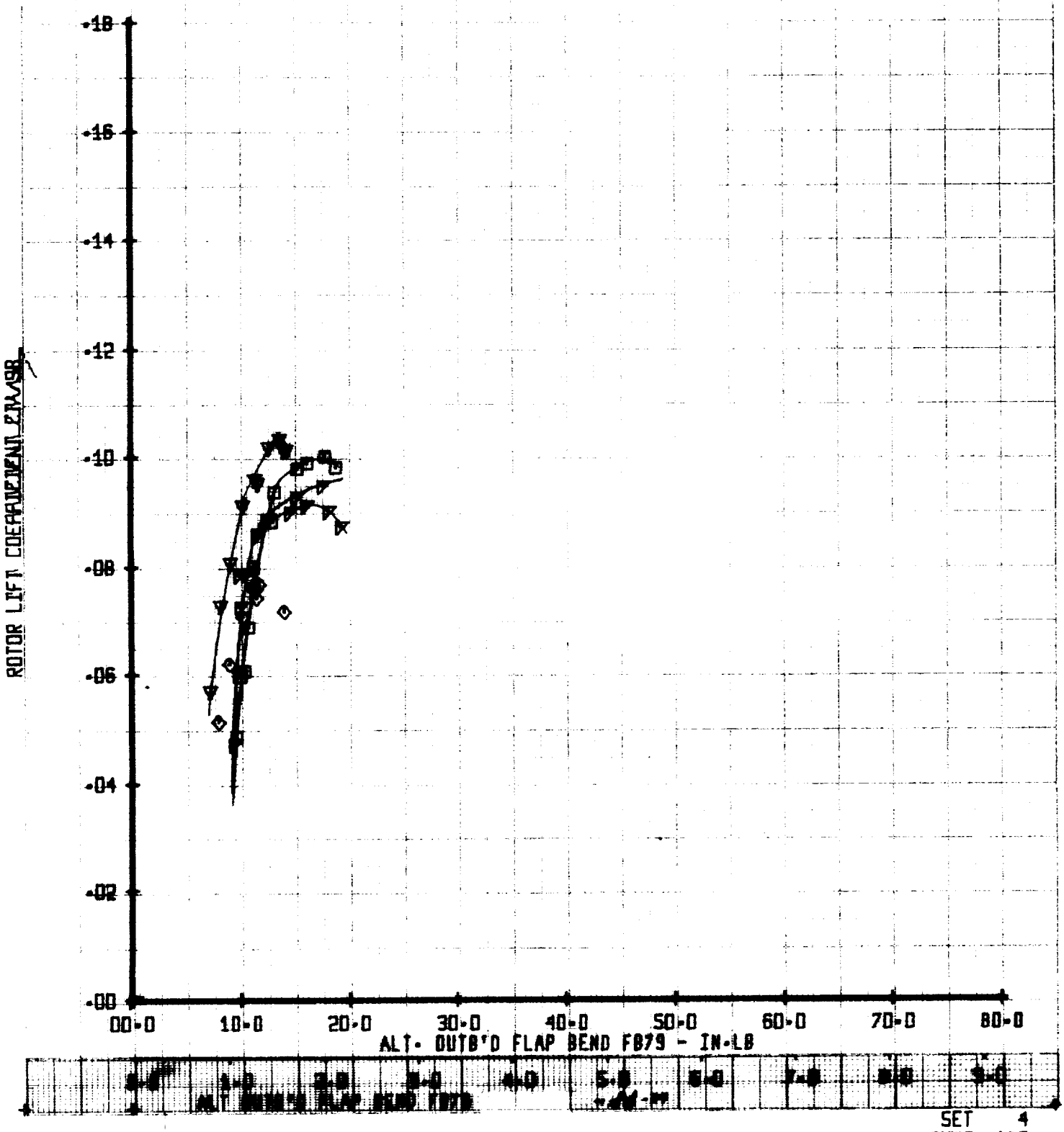
SET 4
WT 187

Figure A-98

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
⊡	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB79



ET 4
WT 187

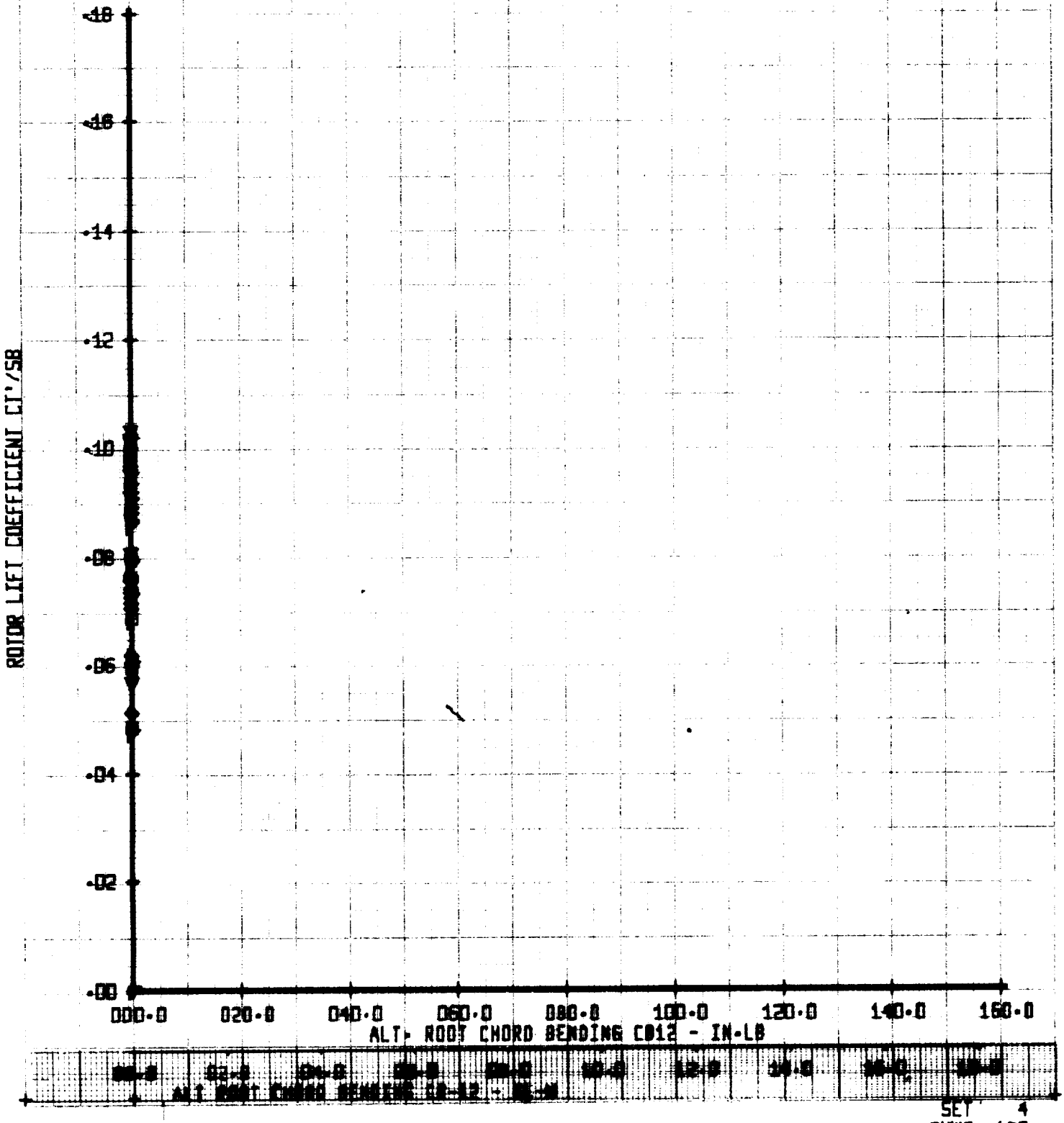
SET 4
BVWT 187

Figure A-99

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD25B	VTUN
⊡	35	.45	.01	279
▽	36	.45	.05	279
◈	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 4
WT 187

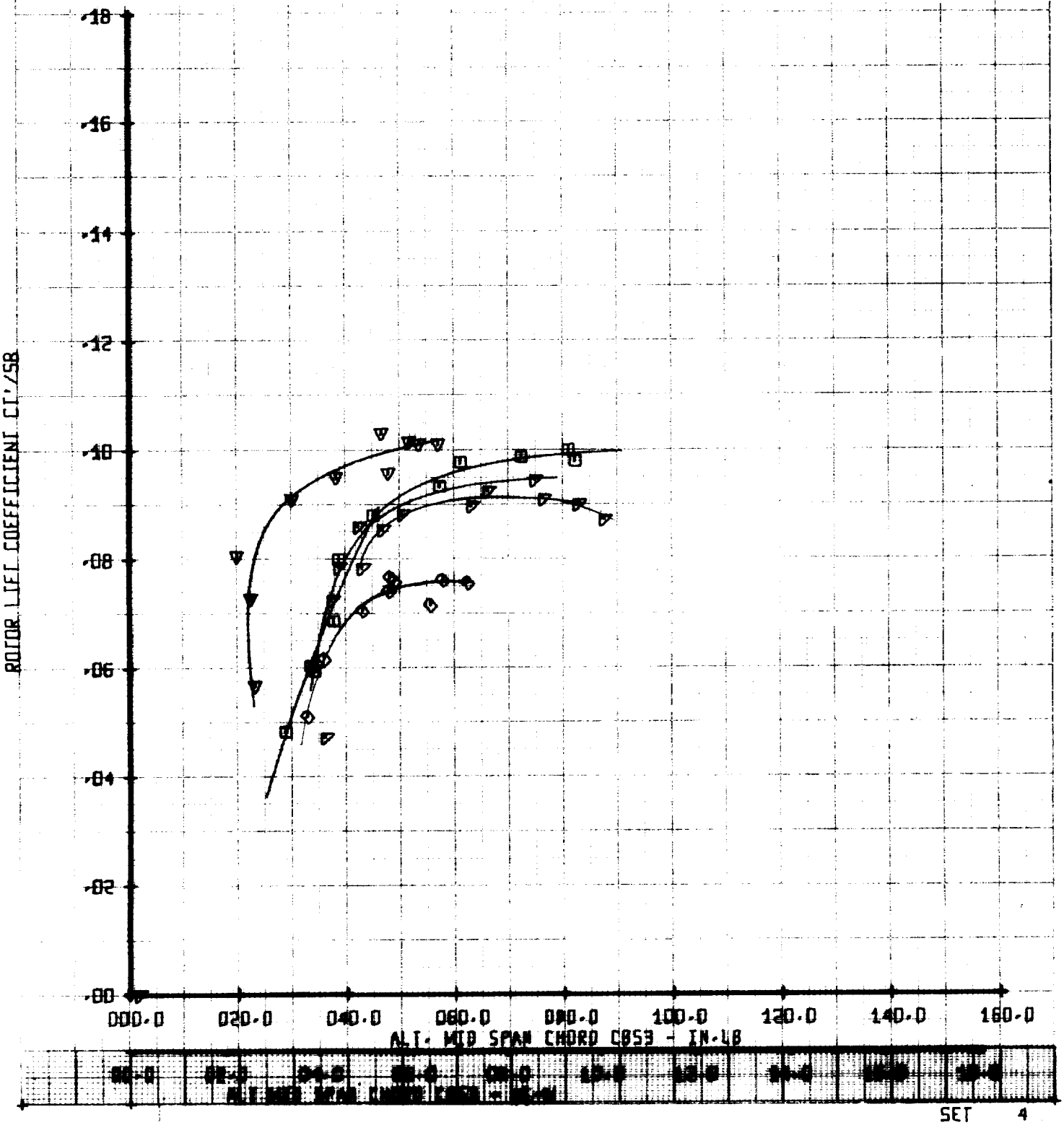
SET 4
BVWT 187

Figure A-100

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

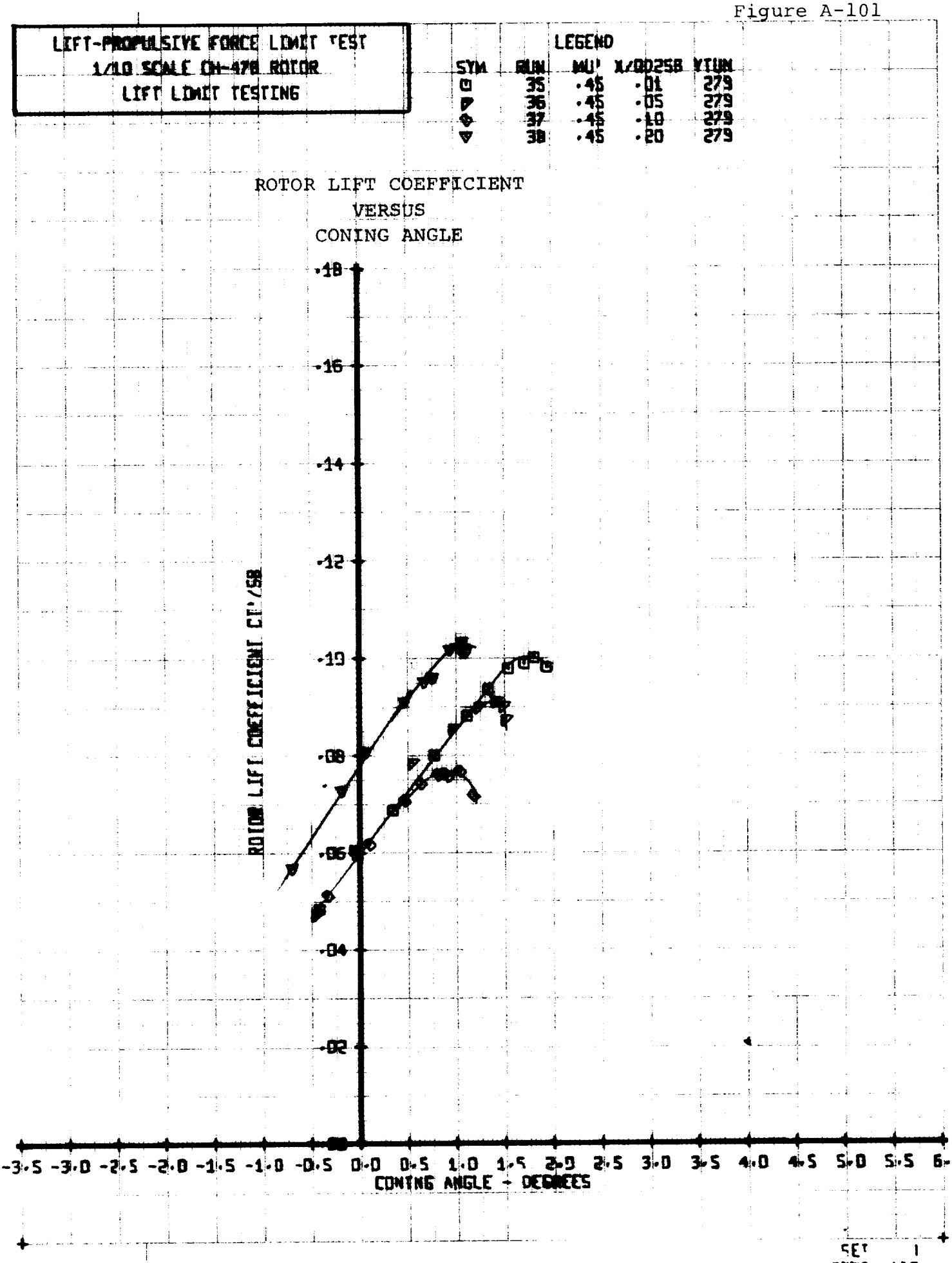
SYM	RUN	MU	X/DD2SB	VTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN CHORD CB53



SET 4
BVWT 187

Figure A-101



ET 4
WT 187

SET 1
RUN 197

Figure A-102

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	XTUN
□	35	.45	-.01	279
▶	36	.45	-.05	279
◆	37	.45	-.10	279
▼	38	.45	-.20	279

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

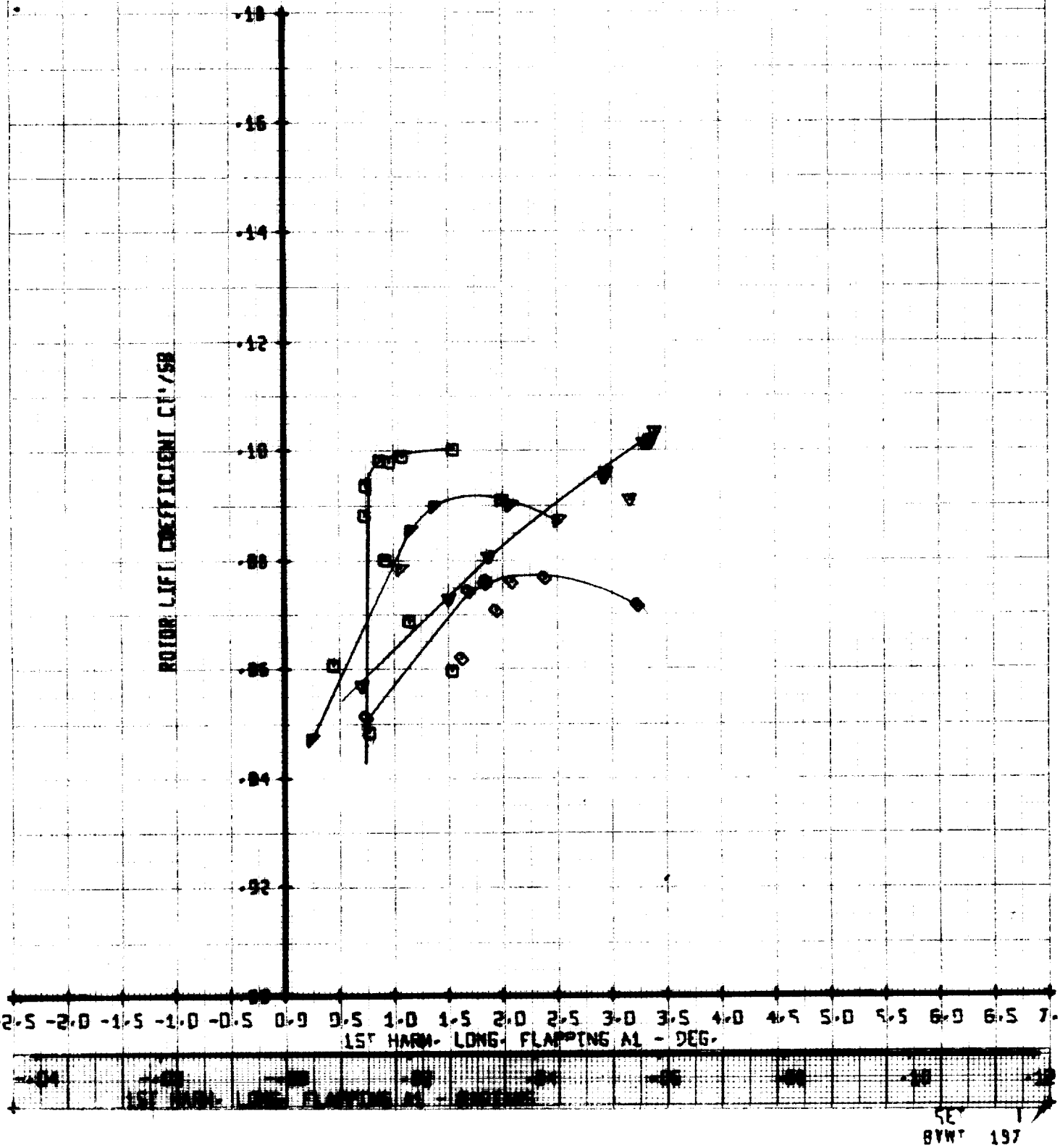
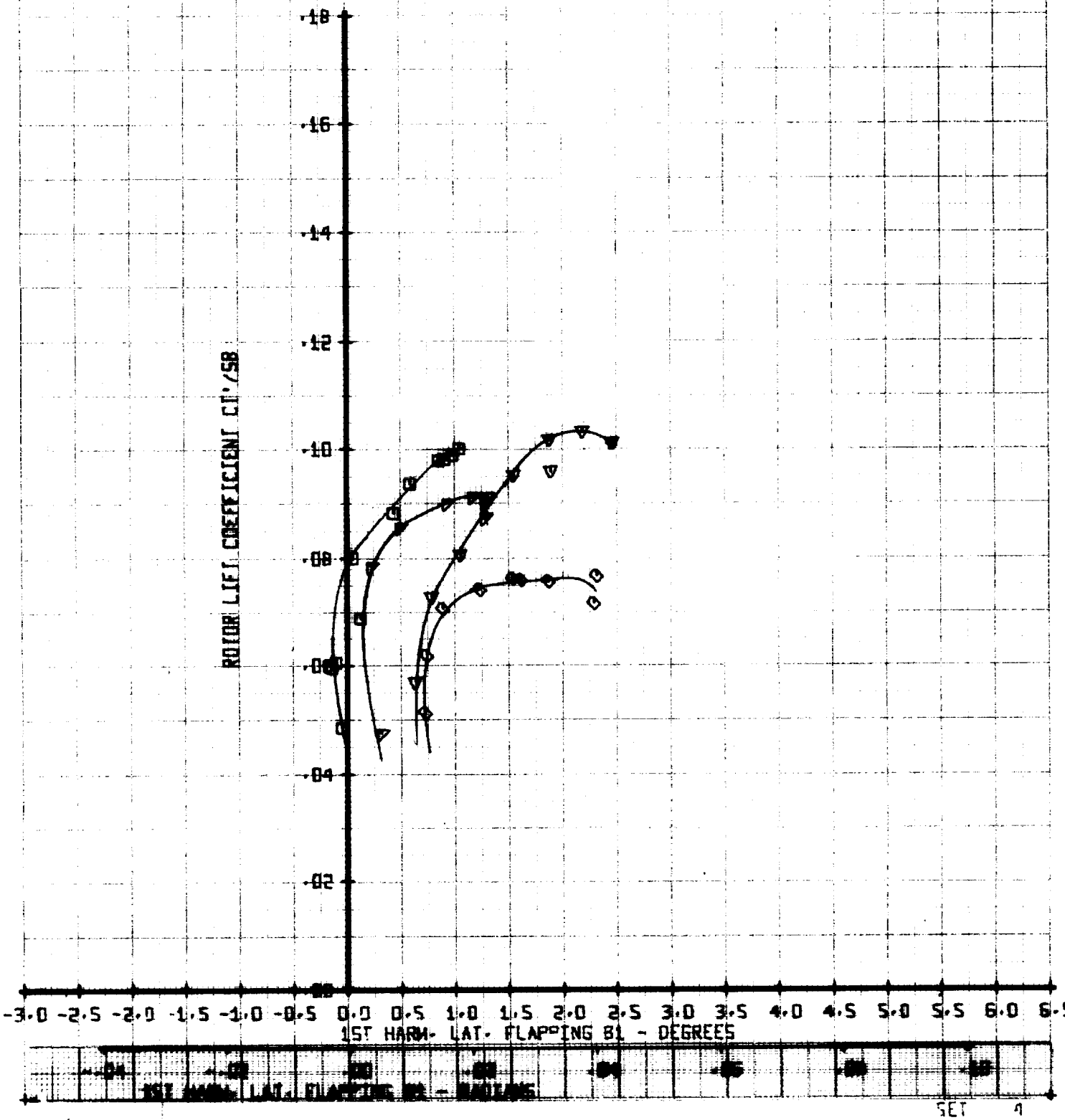


Figure A-103

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MUP	X/QD2SB	YIUN
□	35	.45	.01	279
◁	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



SET 4
WT 187

SET 4
B/WT 187

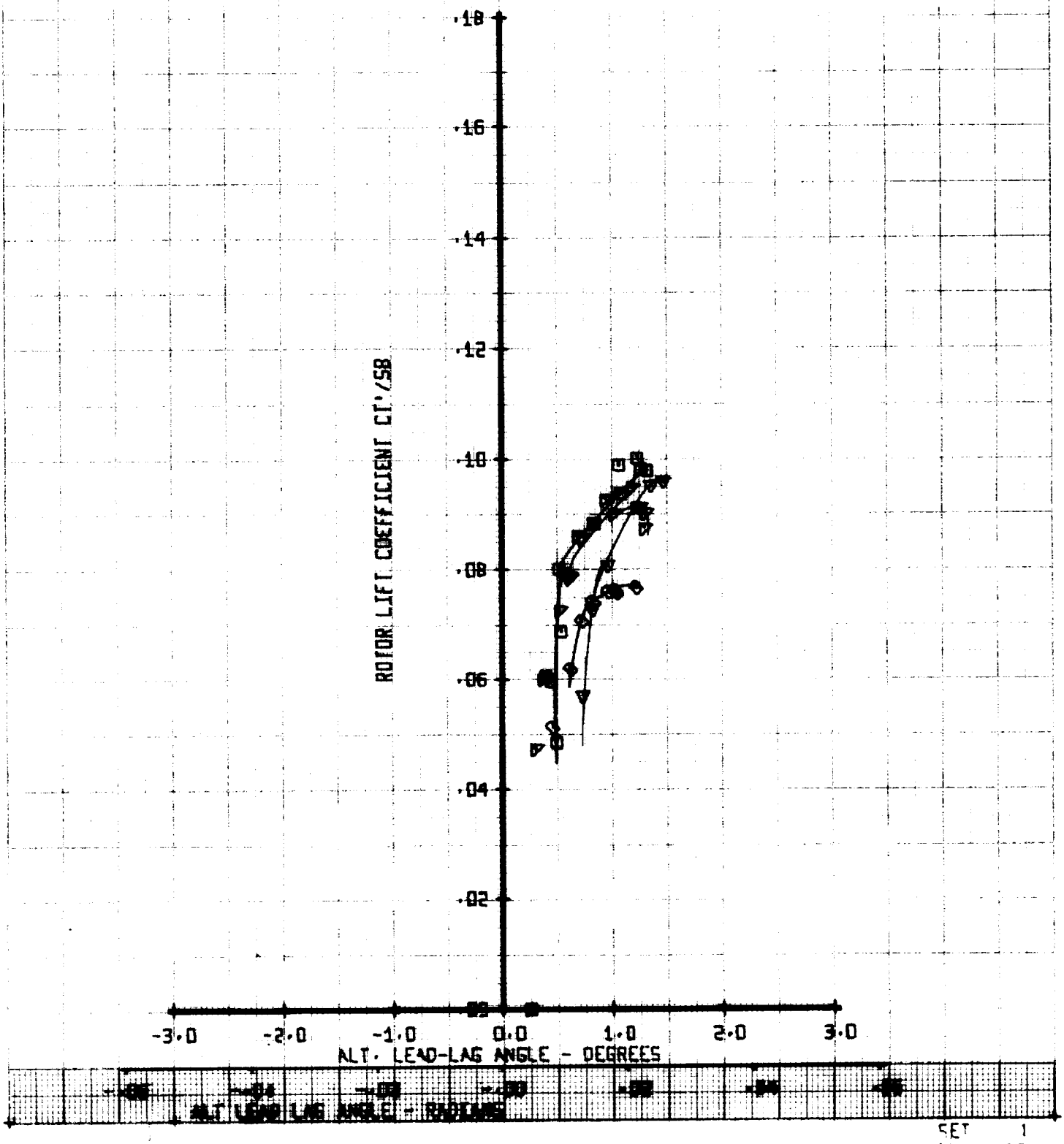
Figure A-104

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YTUN
□	35	.45	.01	279
▽	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



SET 4
RUN 187

SET 1
RUN 197

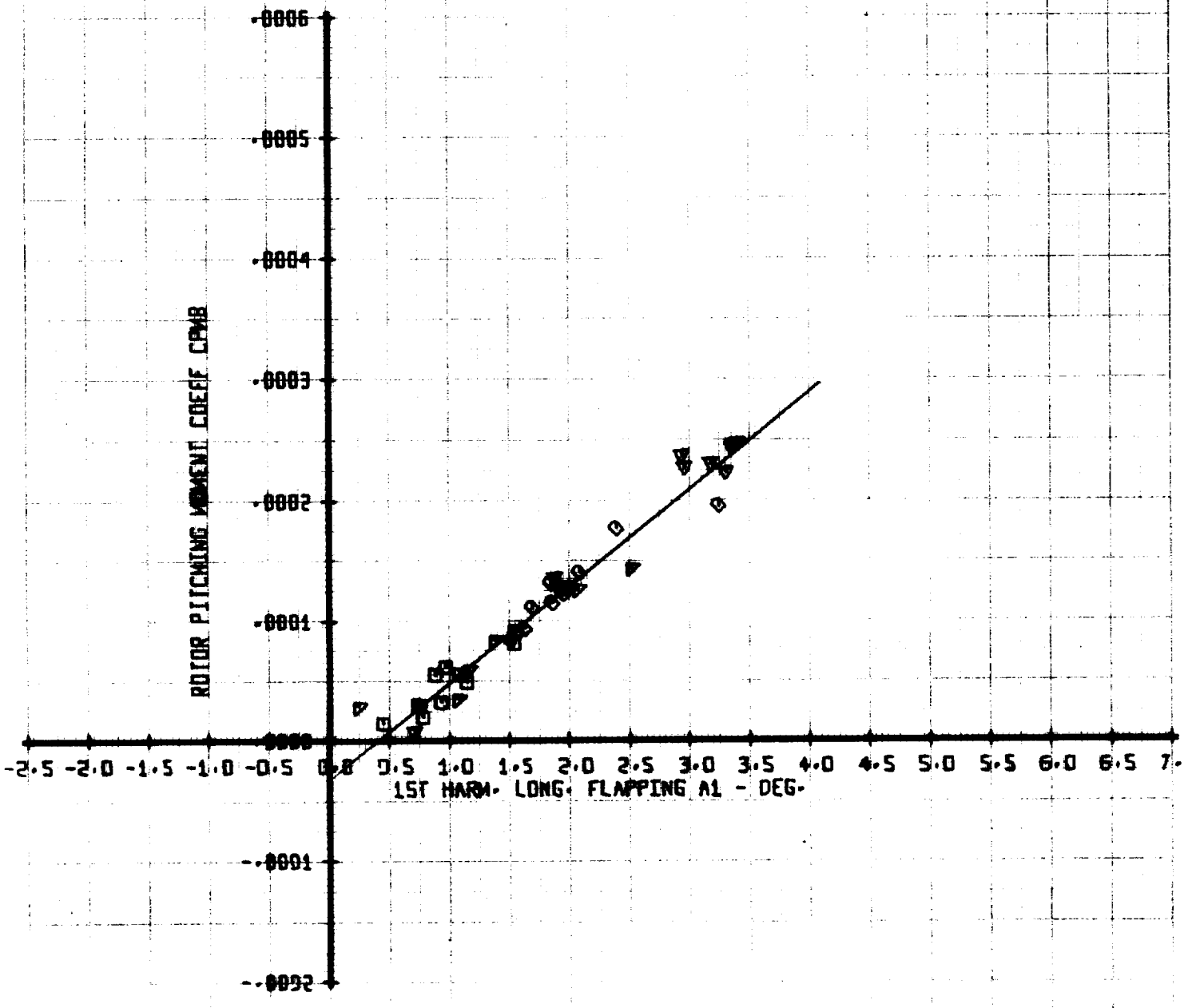
Figure A-105

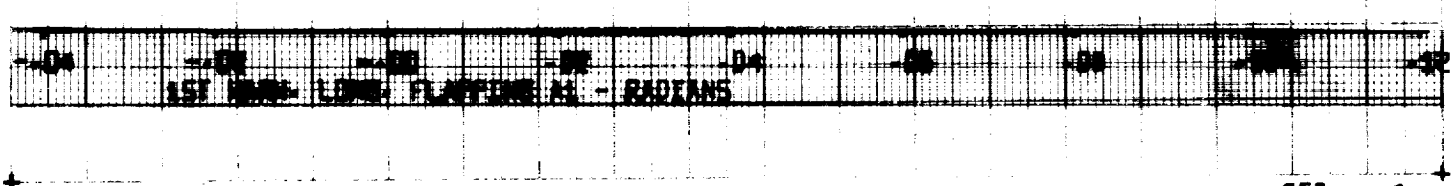
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YTUN
□	35	.45	.01	279
▷	36	.45	.05	279
◇	37	.45	.10	279
▽	38	.45	.20	279

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1





SET 4
RUN 187

SET 4
RUN 187

Figure A-106

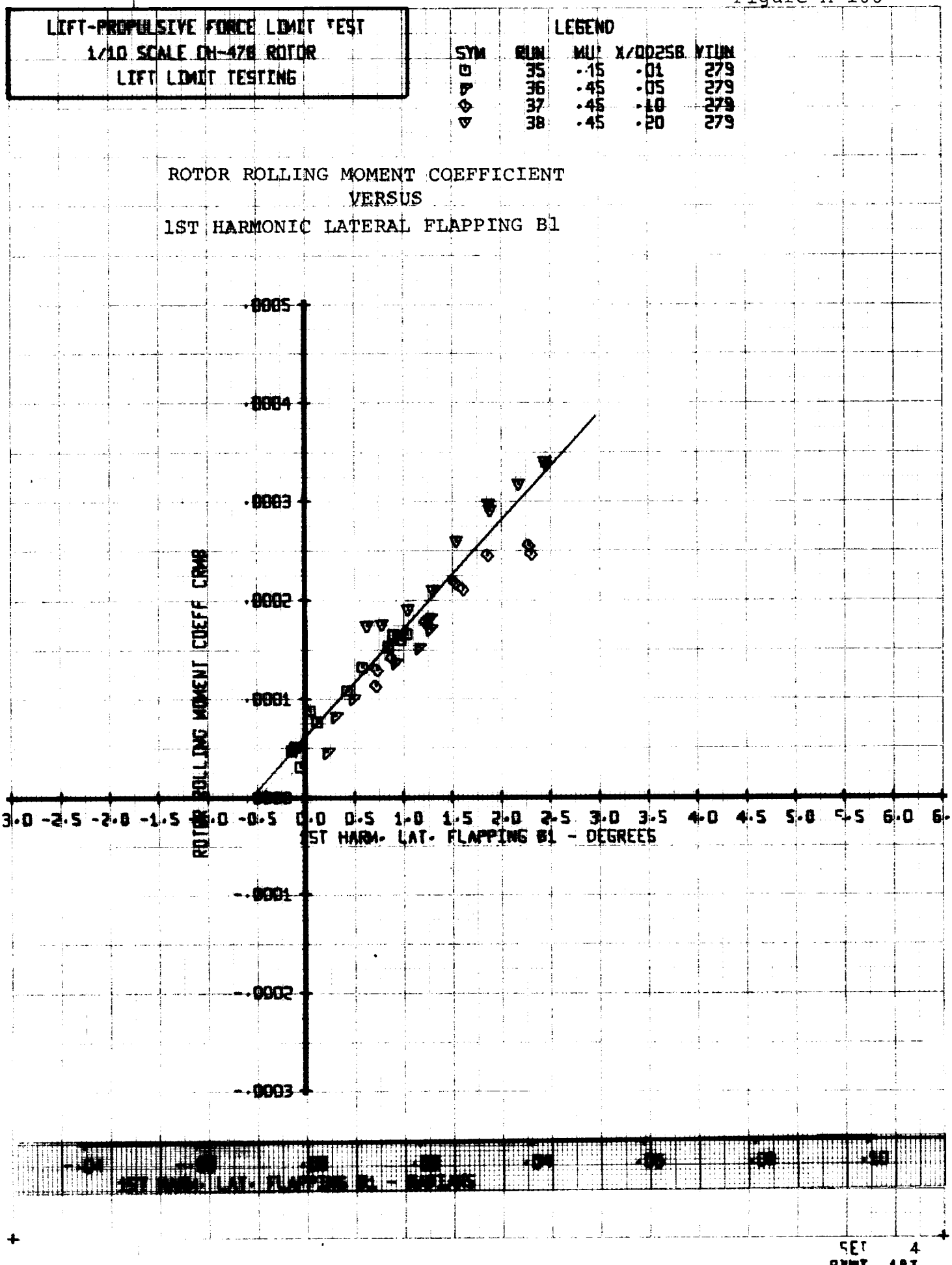

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/DD25B VTUN
35 .15 .01 279
36 .45 .05 279
37 .45 .10 279
38 .45 .20 279
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
.0005
.0004
.0003
.0002
.0001
-.0001
-.0002
-.0003
ROTOR ROLLING MOMENT COEFF CRMB
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LAT. FLAPPING B1 - DEGREES

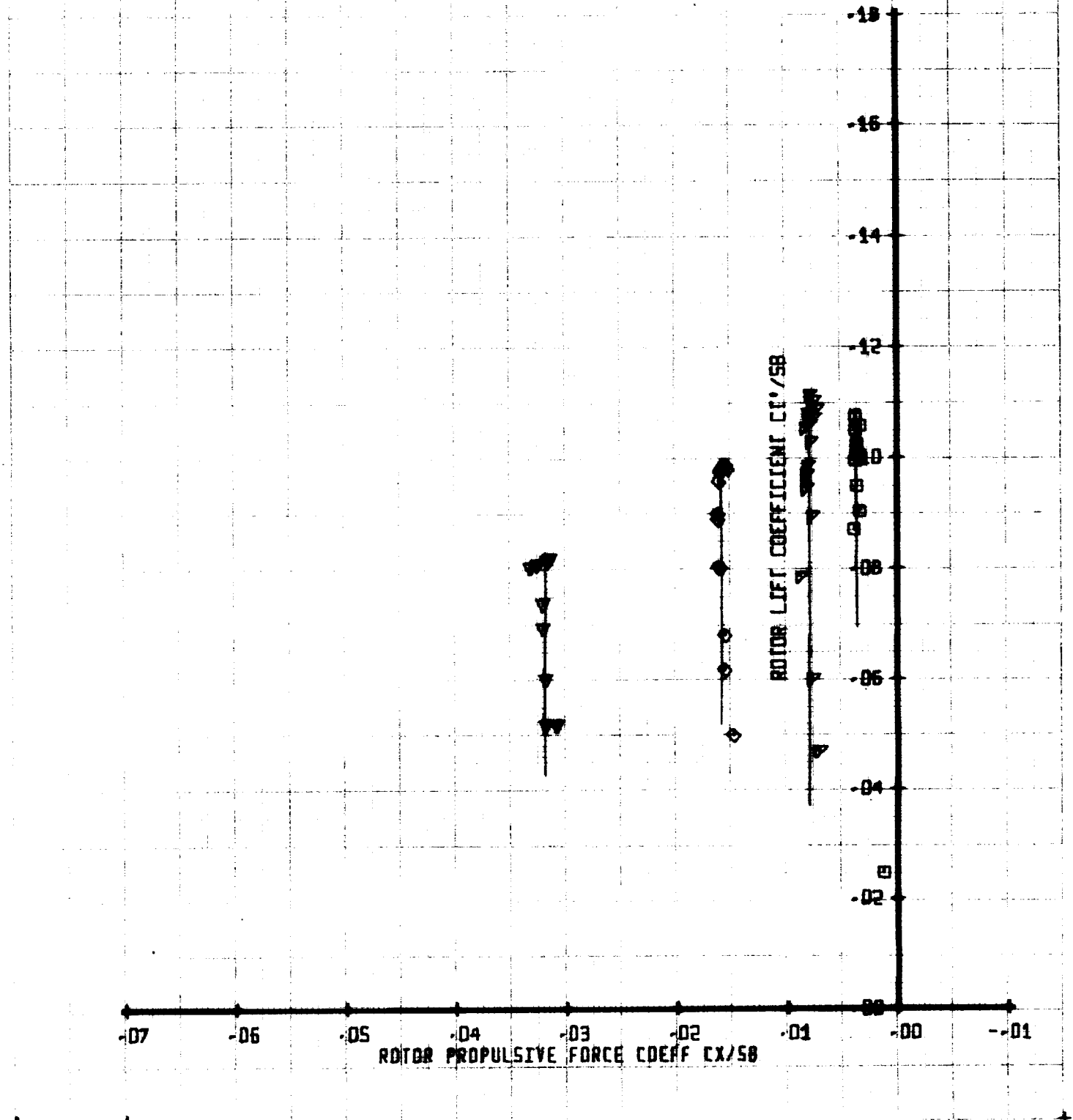
Figure A-107

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



SET 5
WT 187

SET 5
BVWT 187

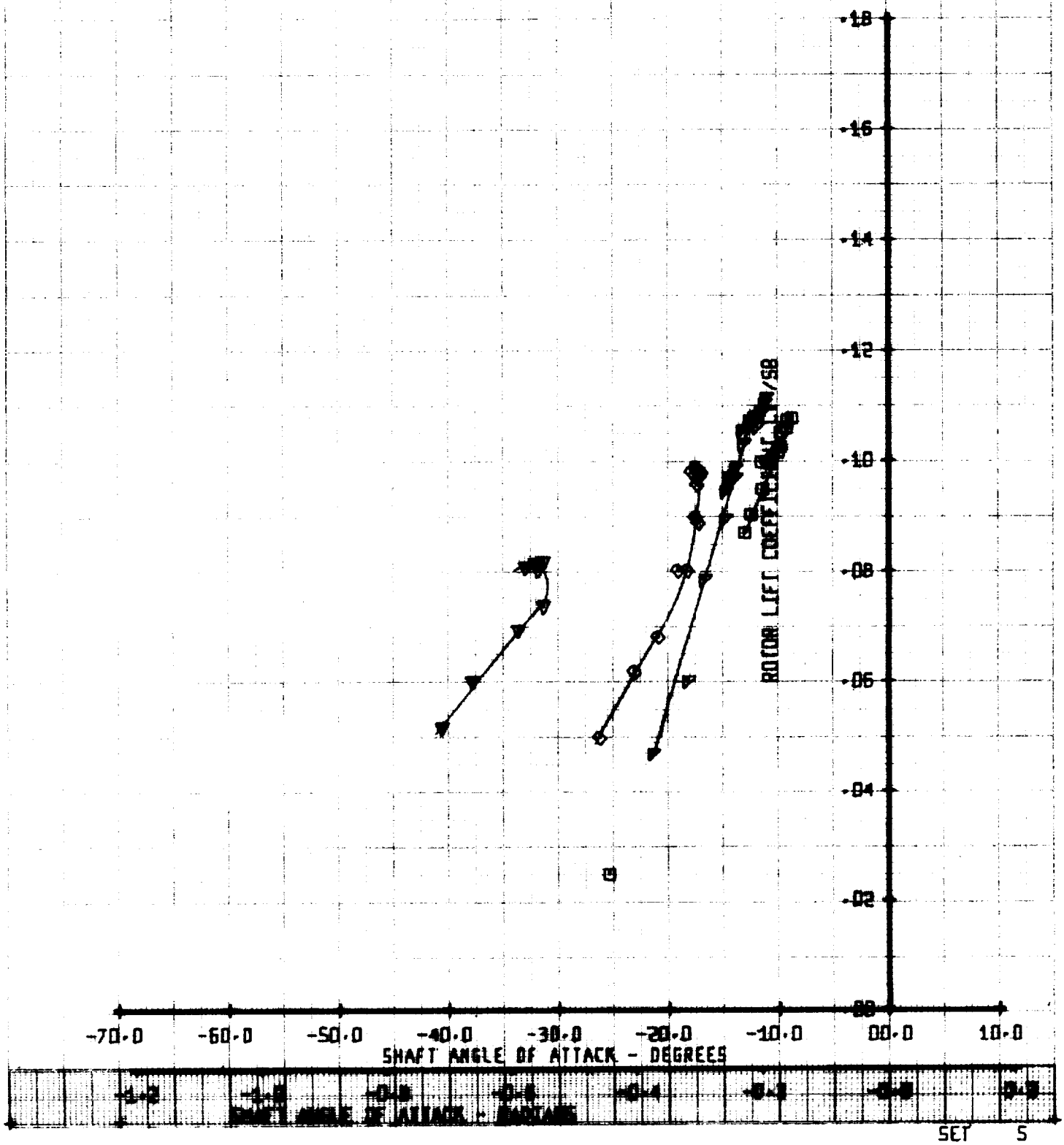
Figure A-108

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD258	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



SET 5
BVWT 187

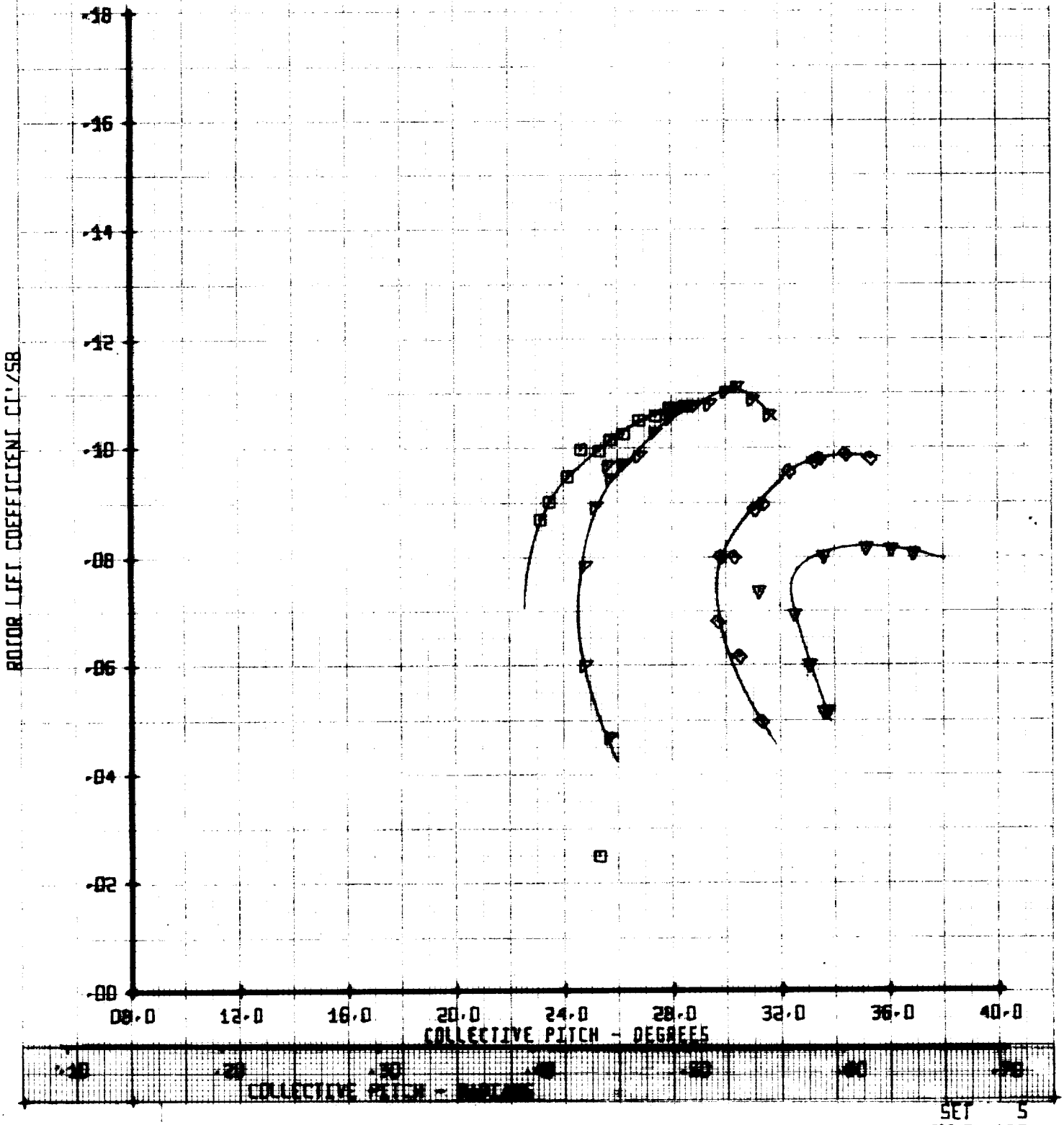
SET 5
BVWT 187

Figure A-109

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

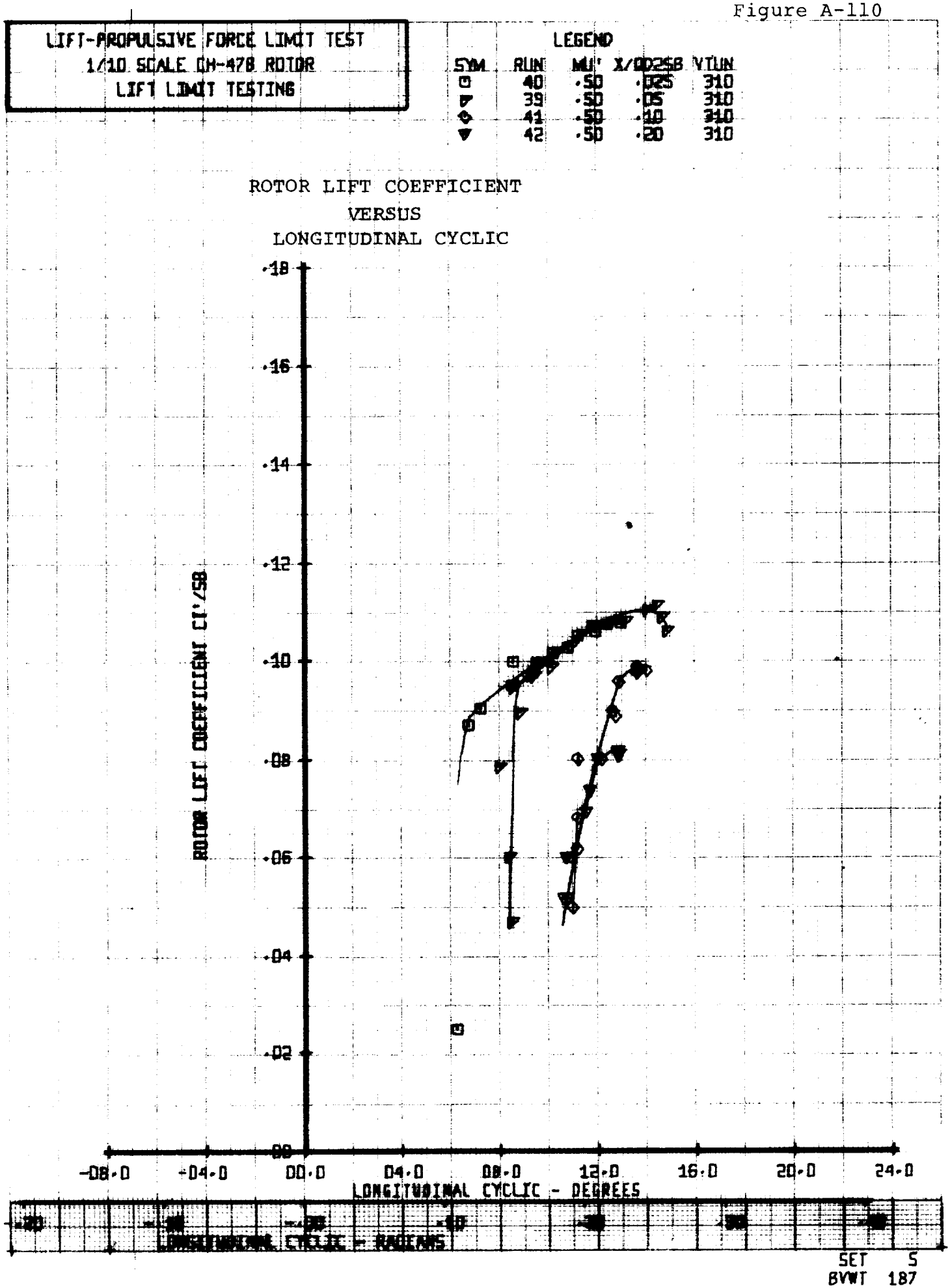
ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH

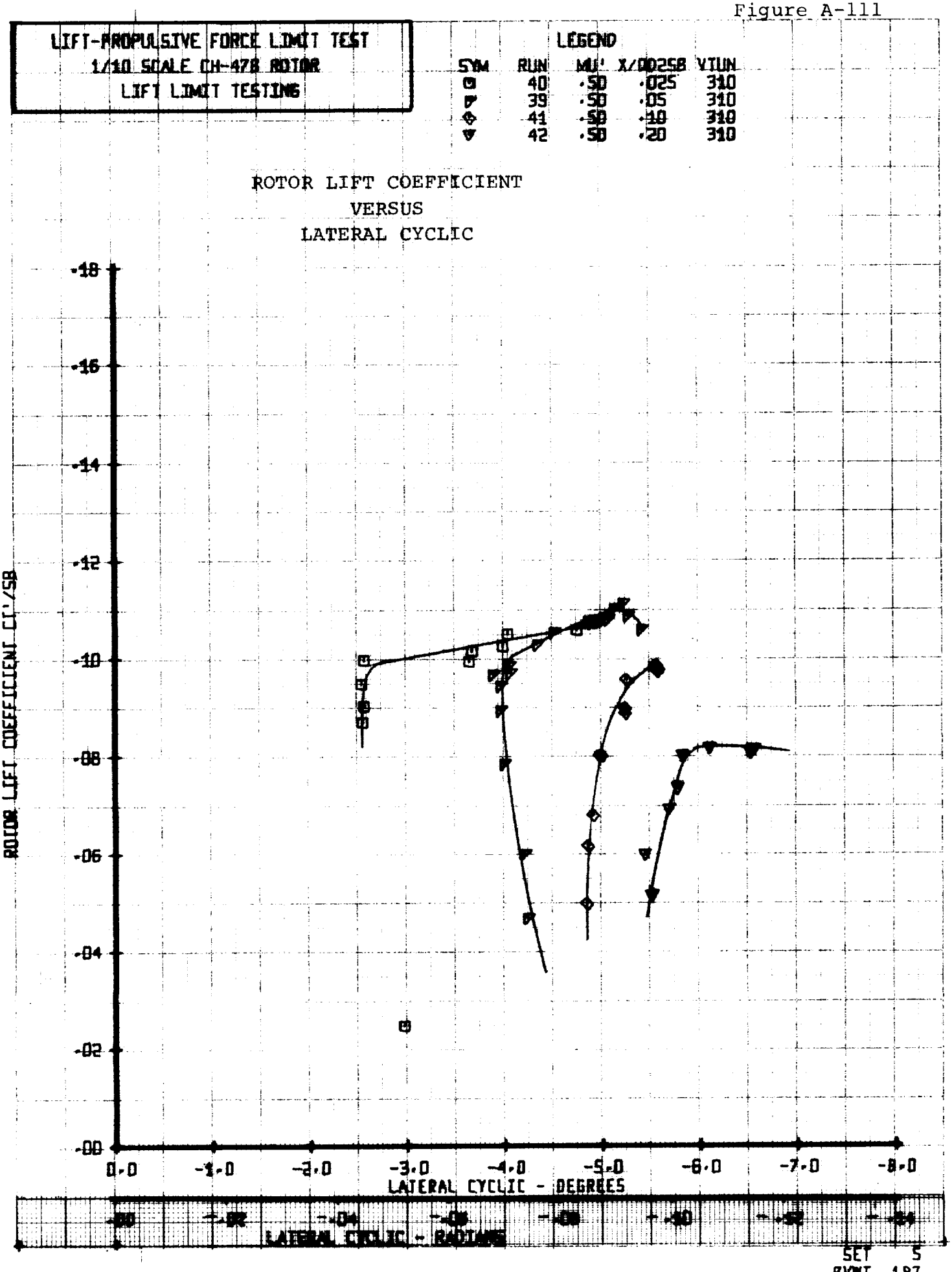


SET 5
WT 187

SET 5
BVWT 187

Figure A-110


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/D25B VTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-08.0
-04.0
00.0
04.0
08.0
12.0
16.0
20.0
24.0
LONGITUDINAL CYCLIC - DEGREES
LONGITUDINAL CYCLIC - RADIANS
SET S
BWT 187
SET S
BWT 187



SET 5
BVWT 187

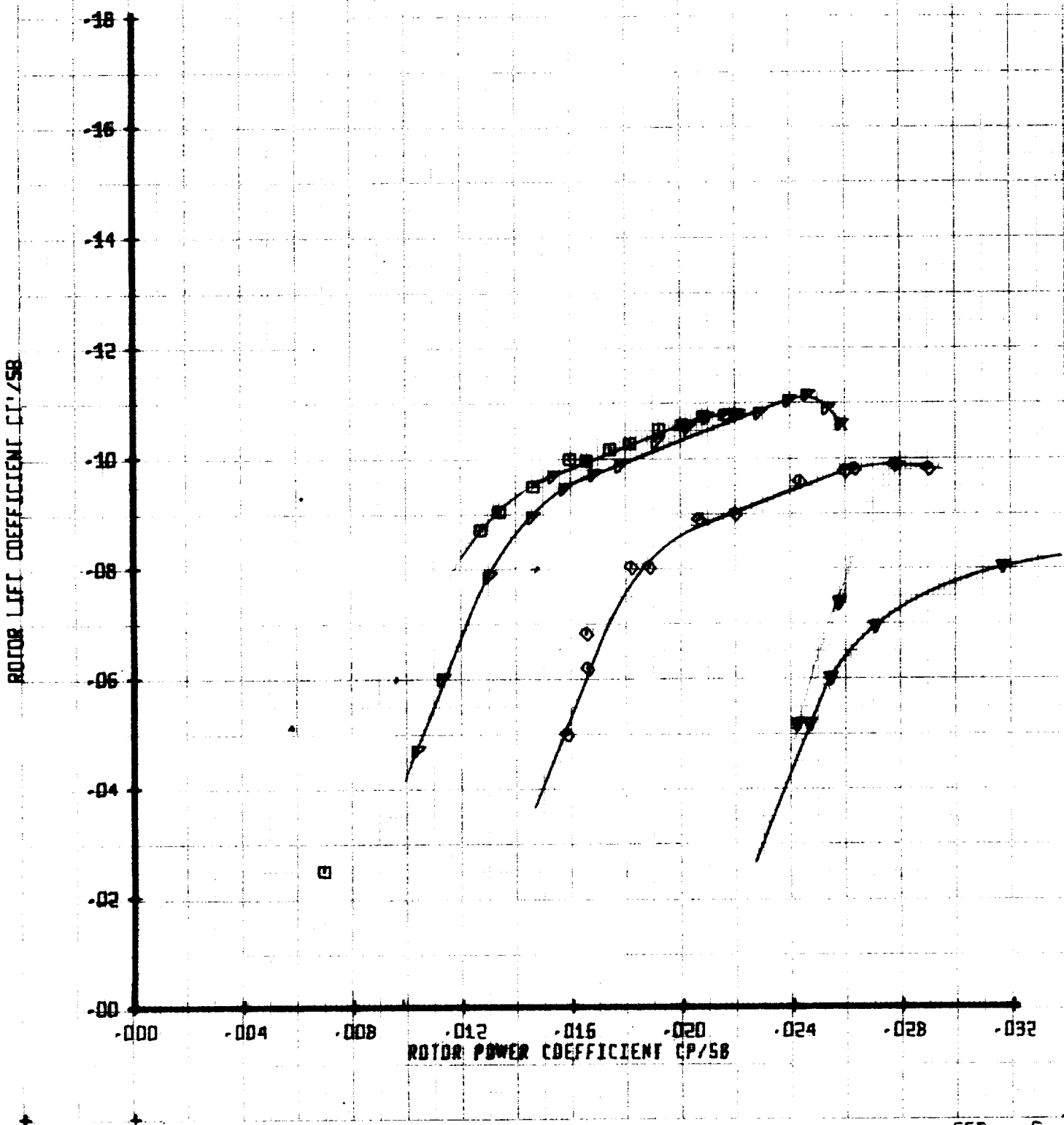
SET 5
BVWT 187

Figure A-112

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/D25B	VTUN
◻	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



SET 5
BWT 187

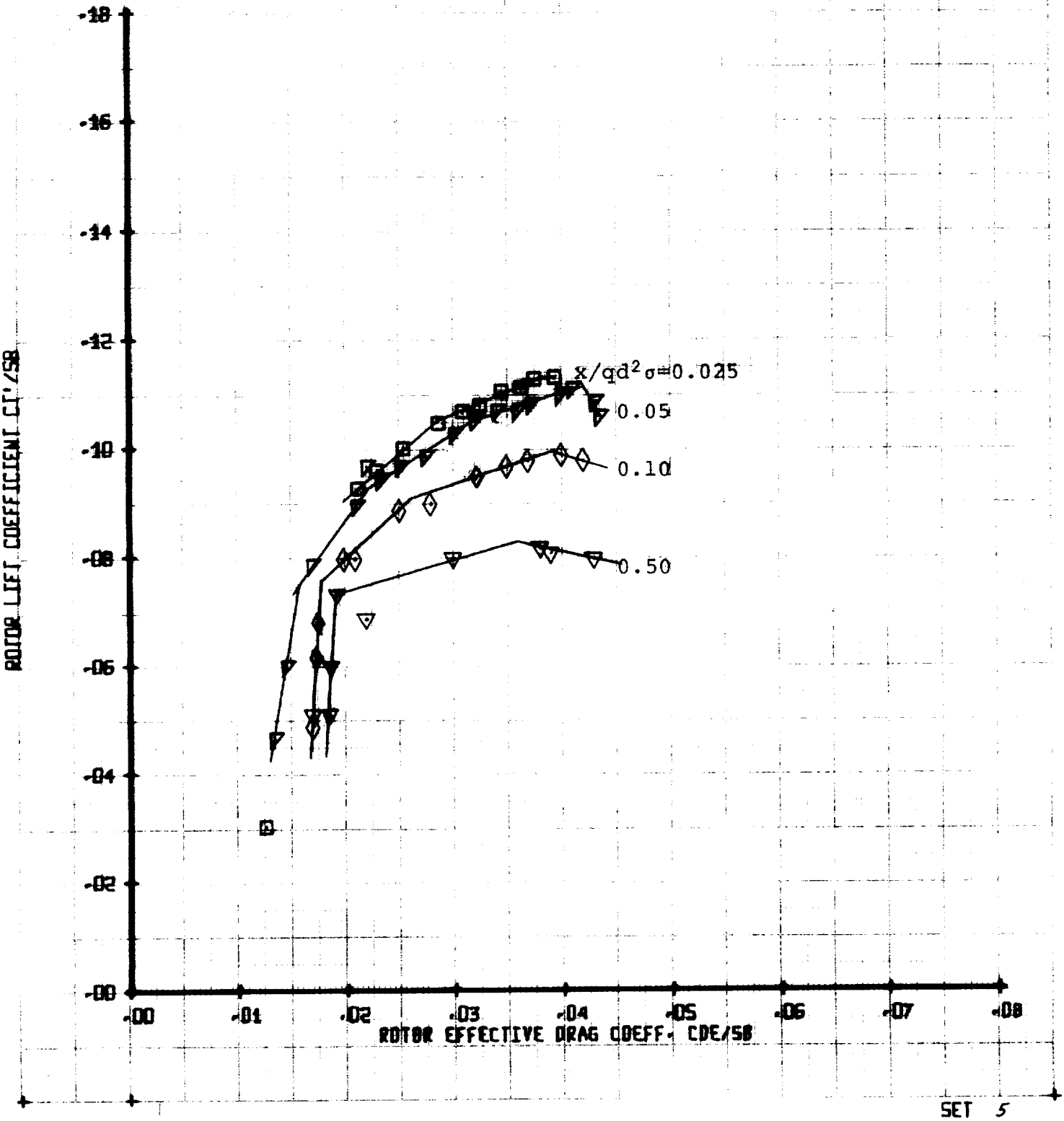
Figure A-113

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/qd²σ	YTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT



SET 5
BVWT 193

SET
WT 193

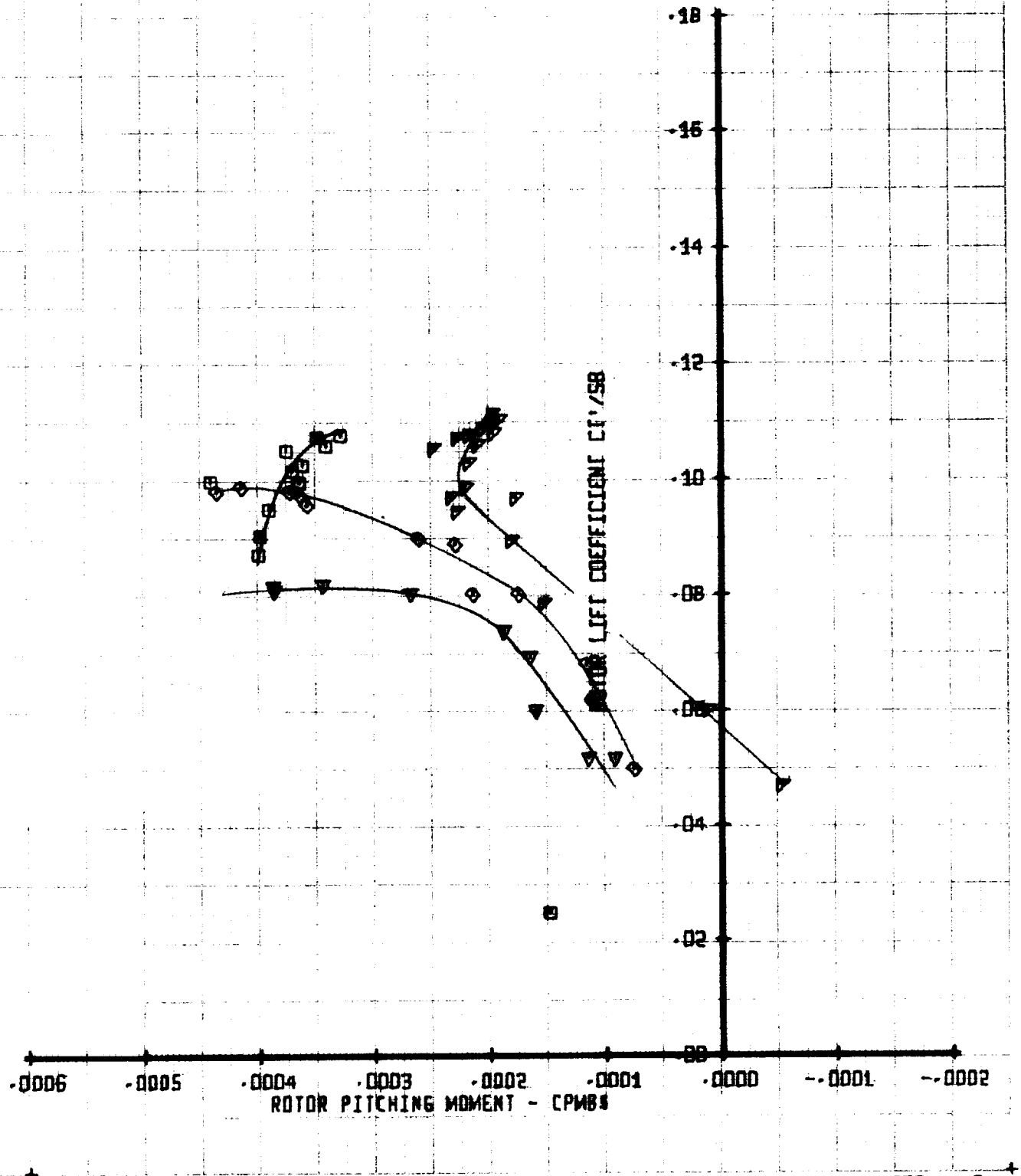
Figure A-114

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 5
WT 187

SET 5
BVWT 187

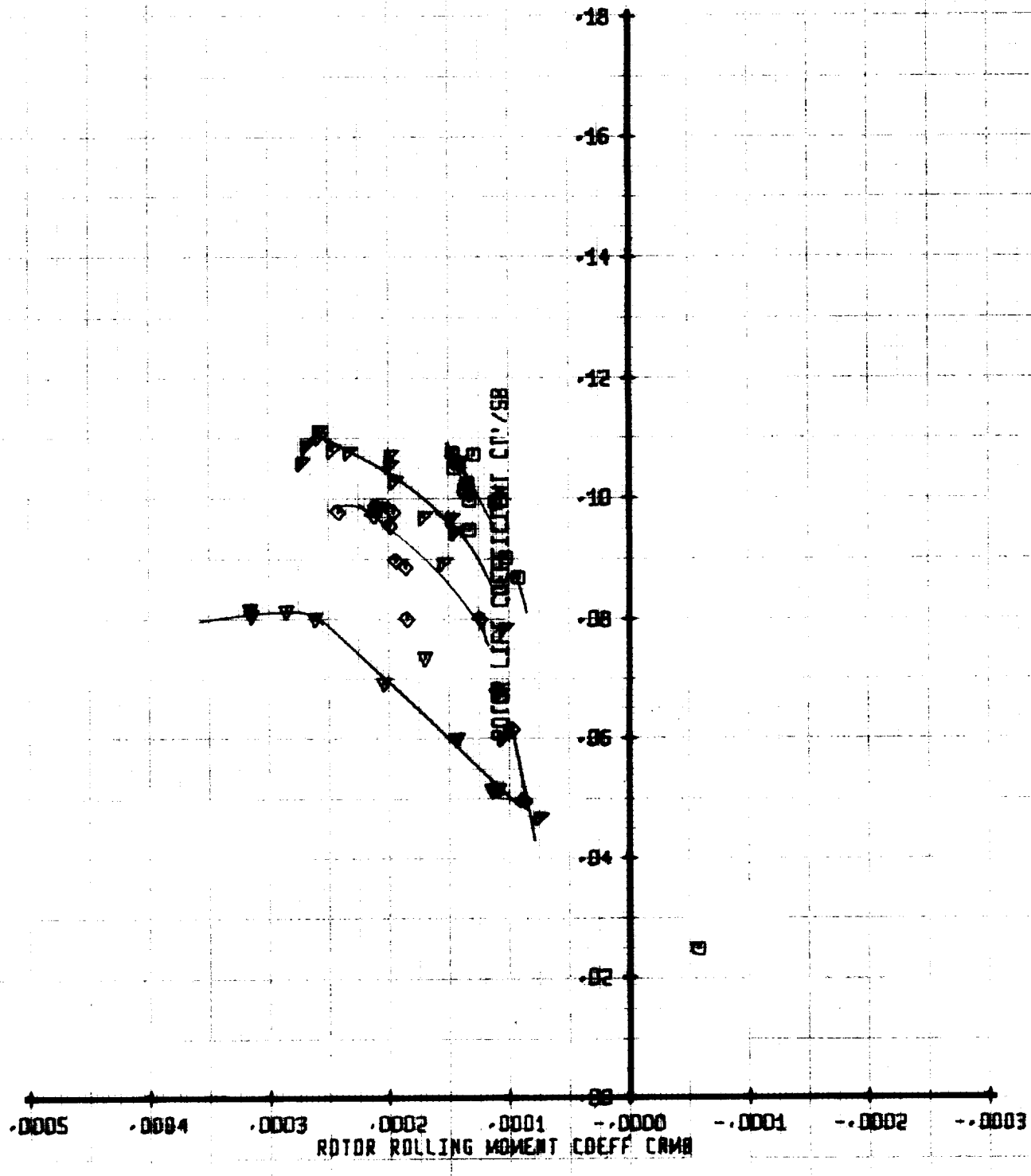
Figure A-115

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD2SB	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



SET 5
WT 187

SET 5
BVWT 187

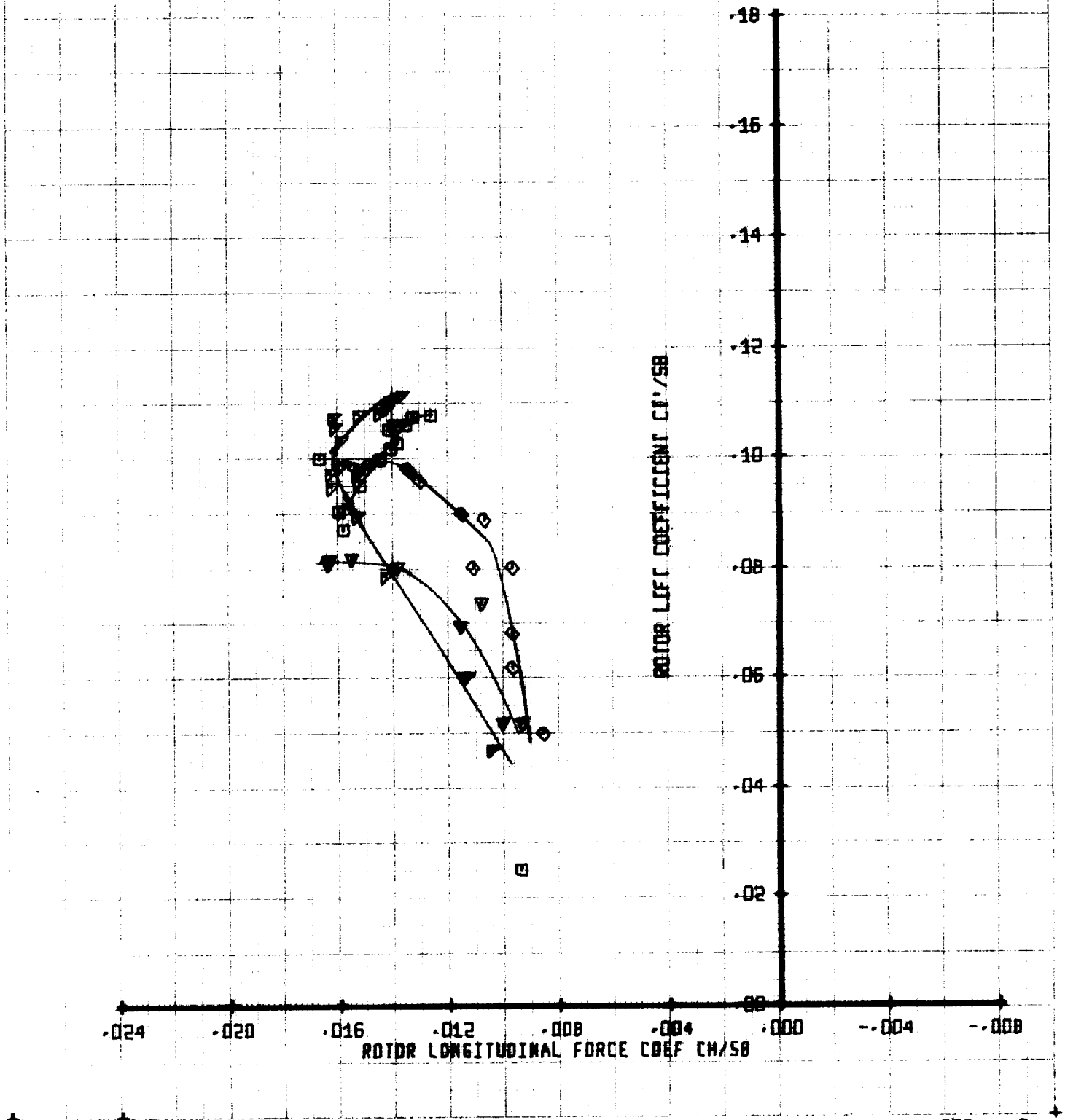
Figure A-116

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
▫	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



SET 5
WT 187

SET 5
BWT 187

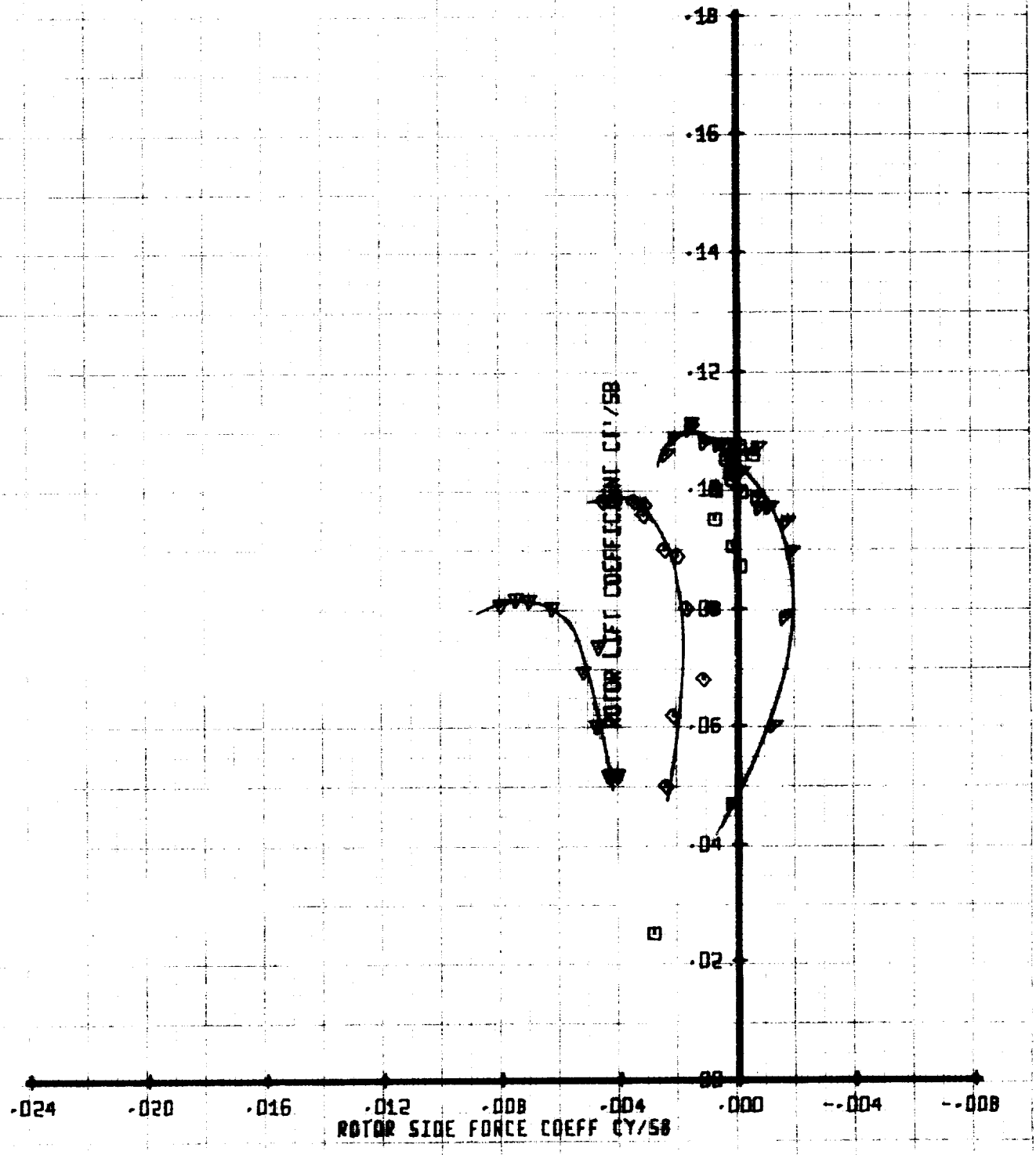
Figure A-117

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



SET 5
WT 187

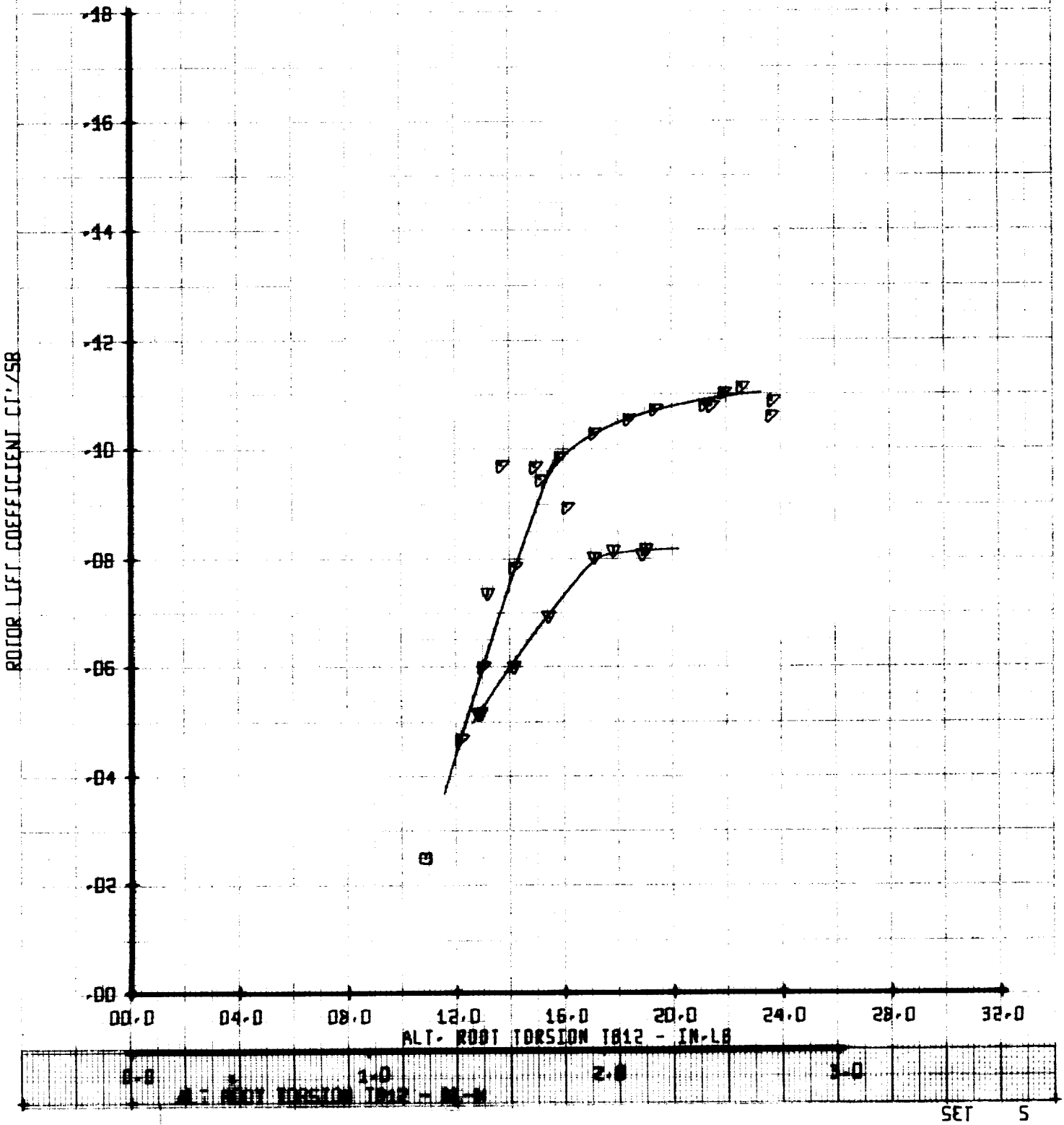
SET 5
BVWT 187

Figure A-118

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
▣	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



SET S
BVWT 187

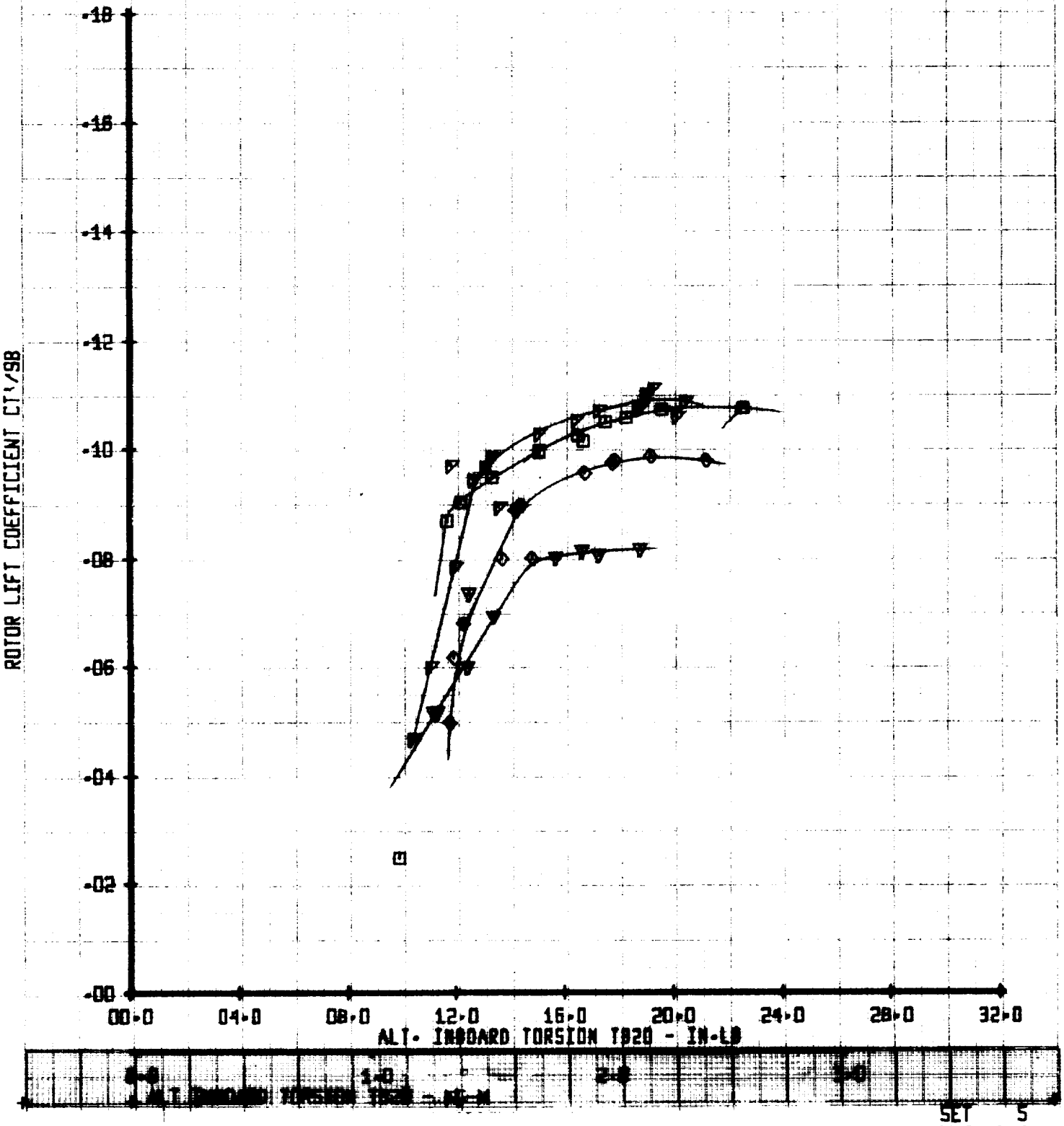
Figure A-119

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QBASE	YTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20



ET S
WT 187

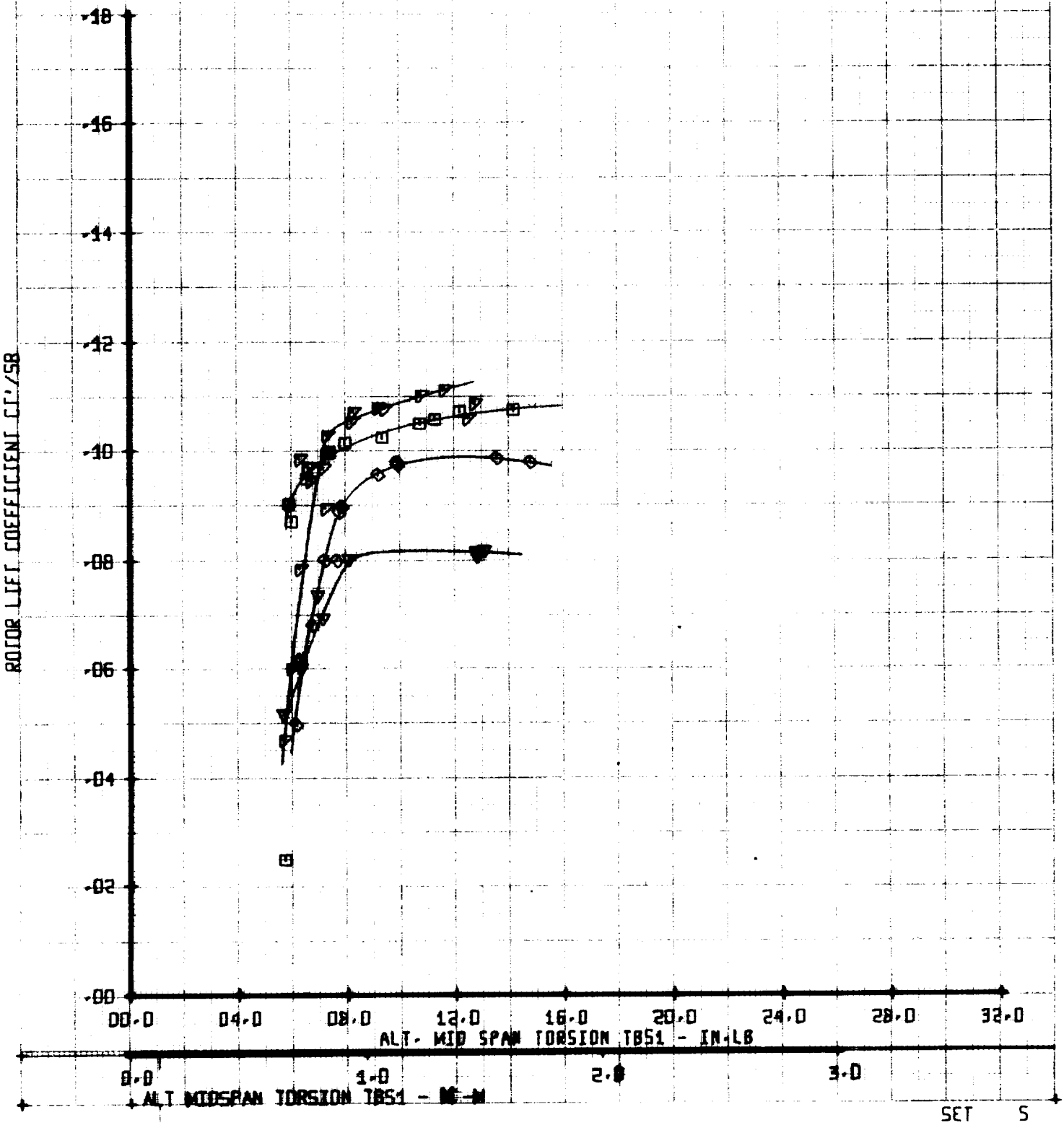
SET S
BYWT 187

Figure A-120

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51



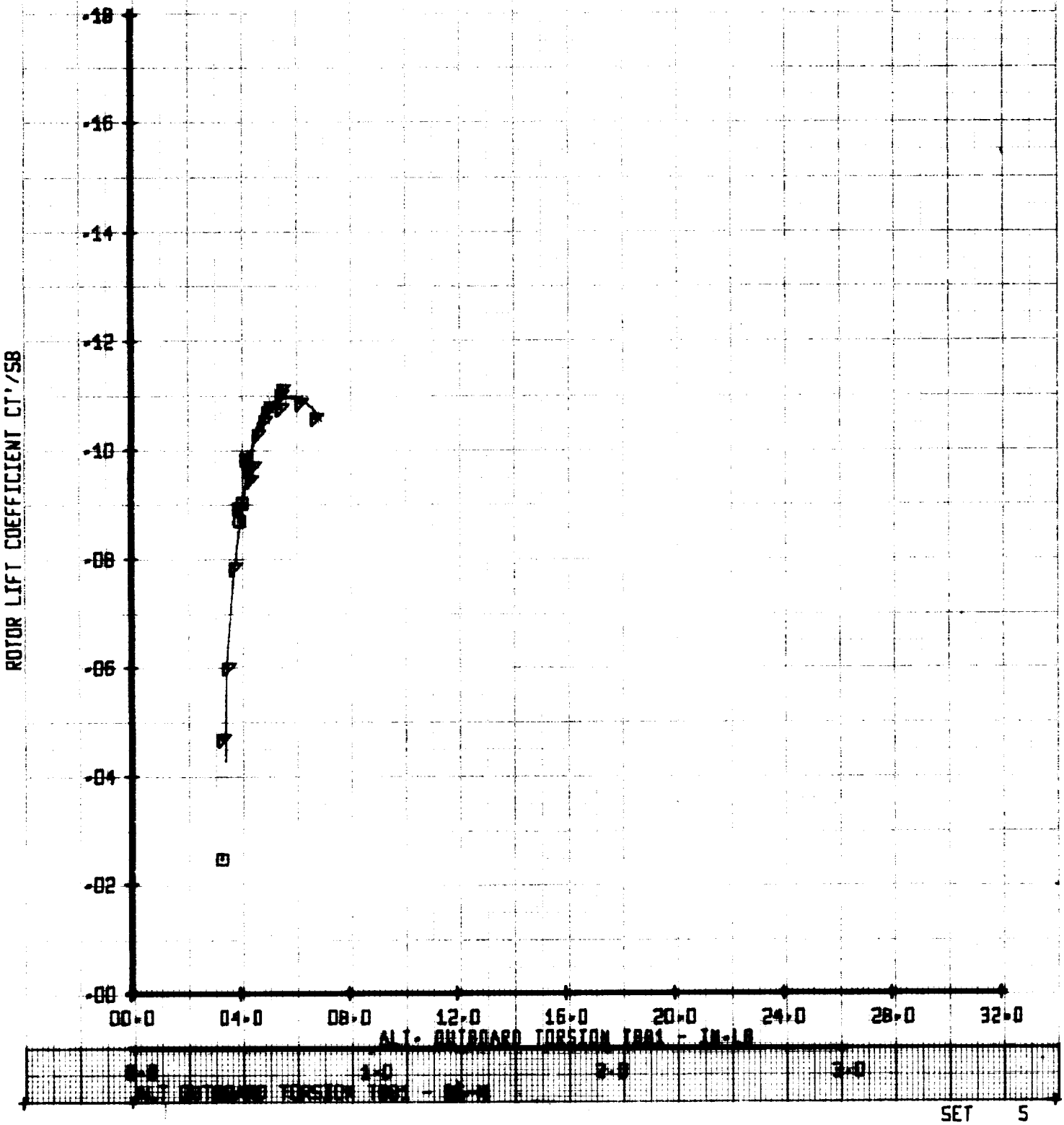
SET S
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DB2SB	VTUN
◻	40	.50	.025	310
◤	39	.50	.05	310
◆	41	.50	.10	310
▼	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81



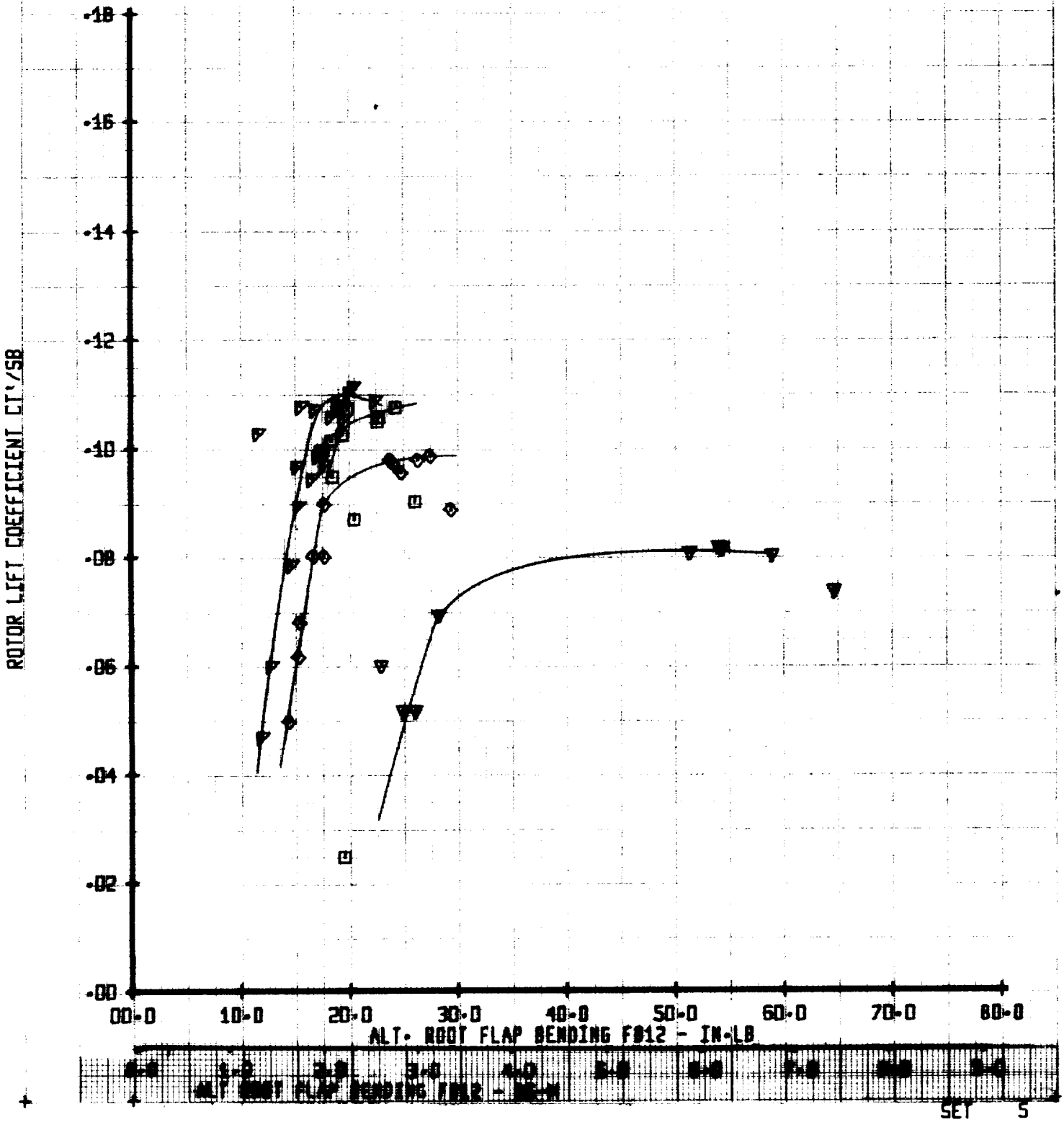
ET S
WT 187

SET S
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD2SB	VTUN
□	40	.50	.025	310
▷	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 5
WT 187

SET 5
BYWT 187

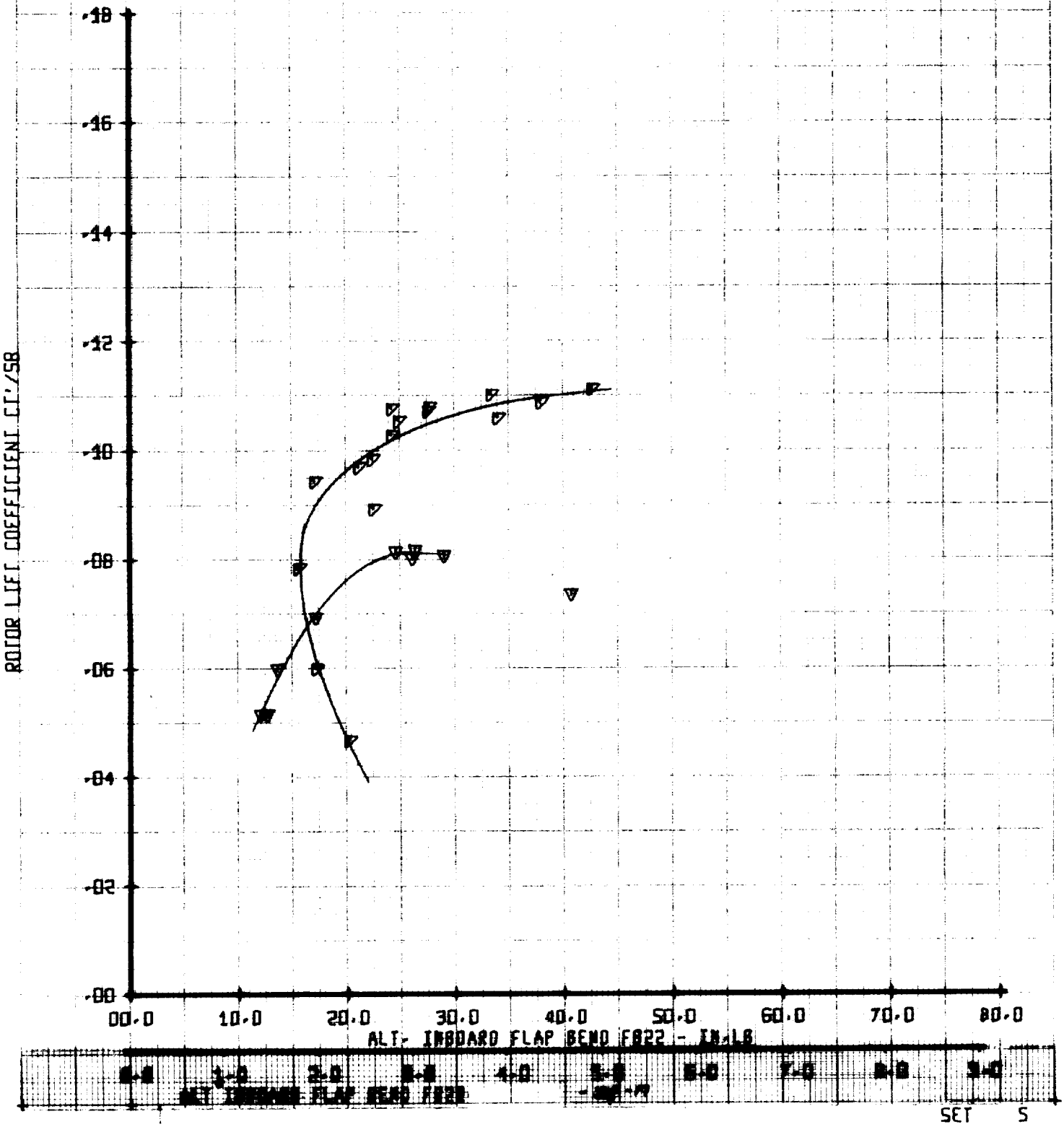
Figure A-123

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YIUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD FLAP BENDING FB22



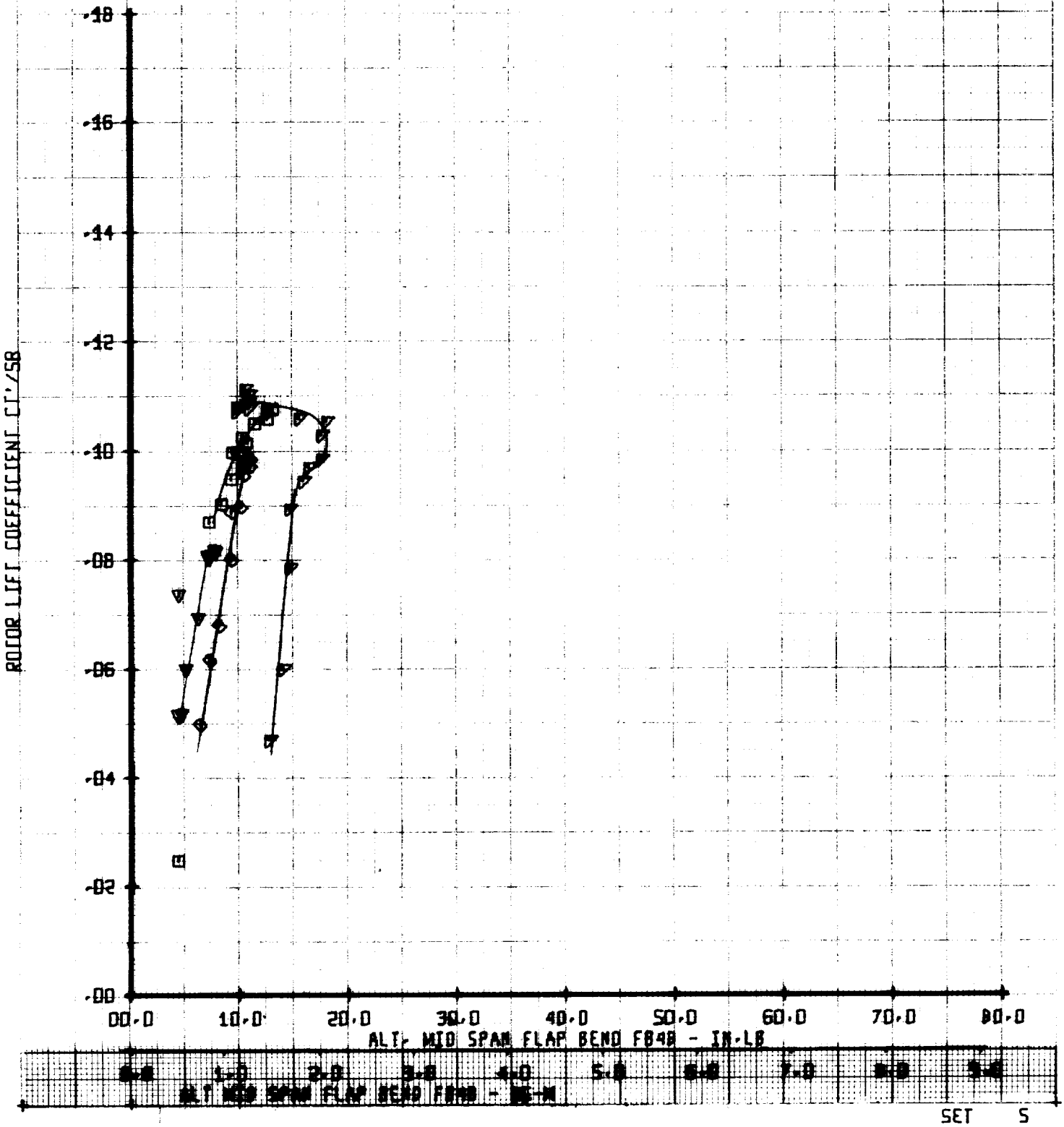
SET S
BWT 187

Figure A-124

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/D25B	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB48



SET 5
BWT 187

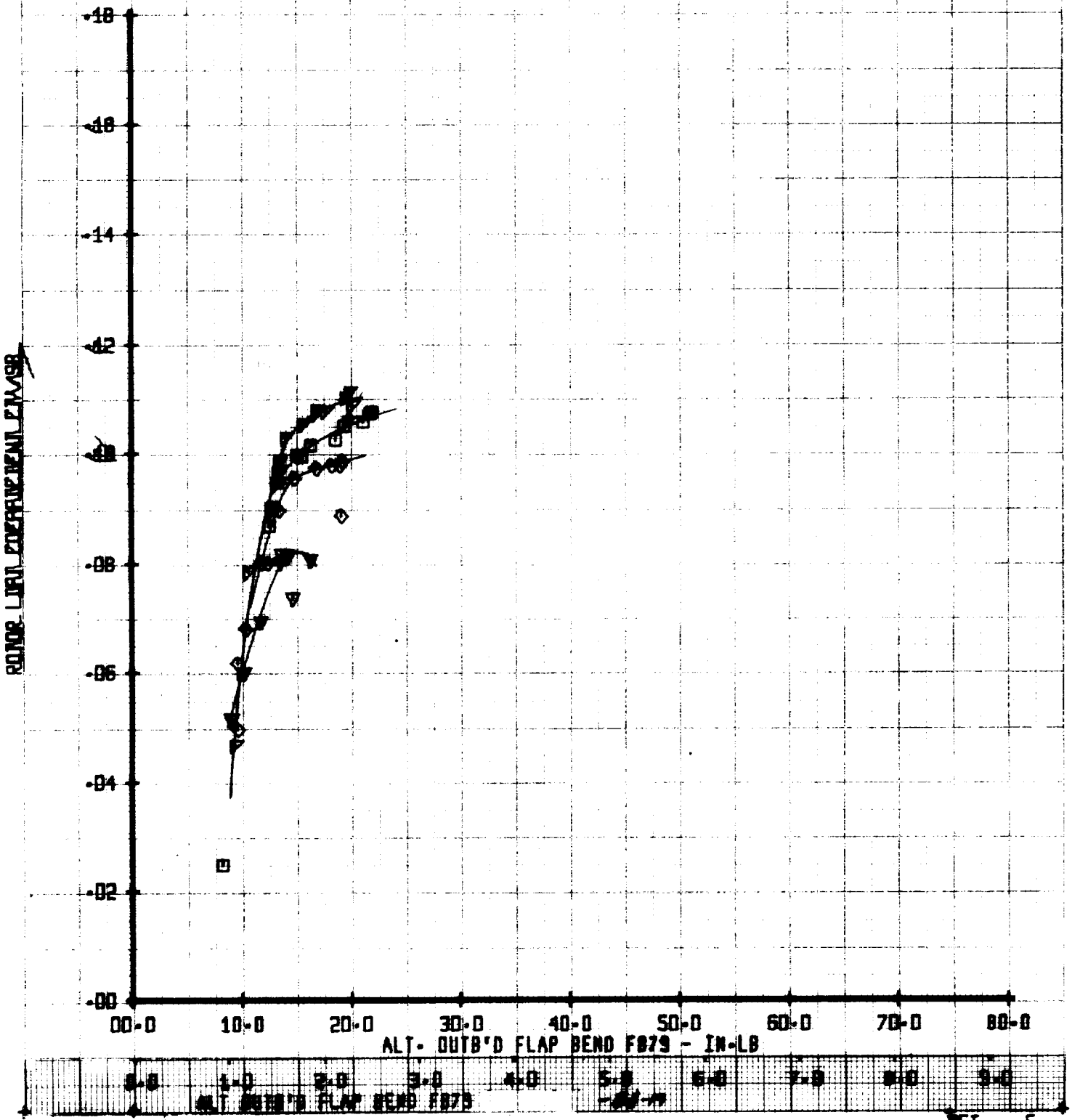
SET 5
BWT 187

Figure A-125

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/0025B	VTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB79



ET 5
WT 187

SET 5
BVWT 187

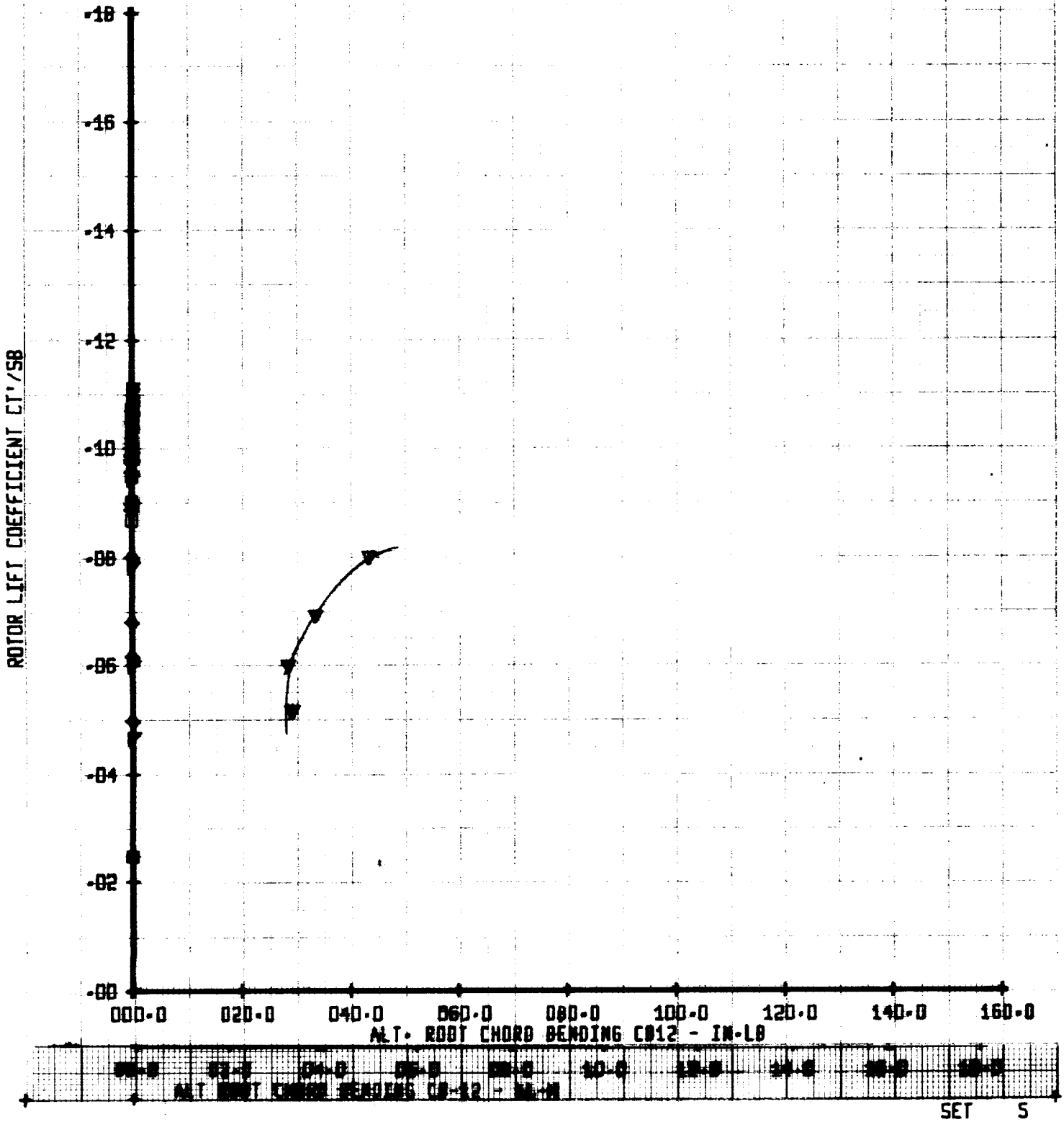
Figure A-126

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QDSB	VTUN
□	40	.50	.025	310
▷	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET S
WT 187

SET S
BVWT 187

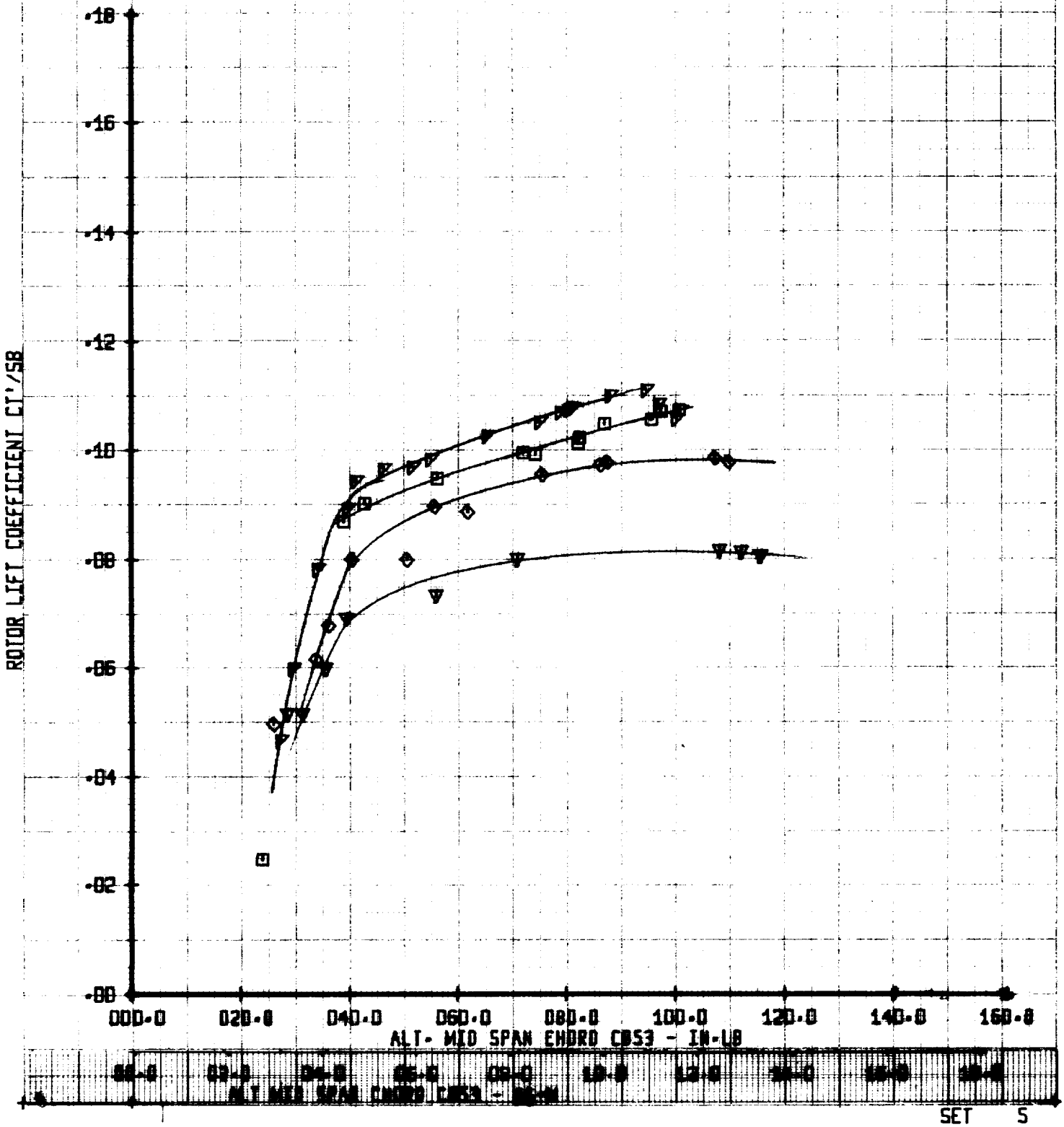
Figure A-127

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
▫	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN CHORD CB53



ET 5
WT 187

SET 5
BVWT 187

Figure A-128

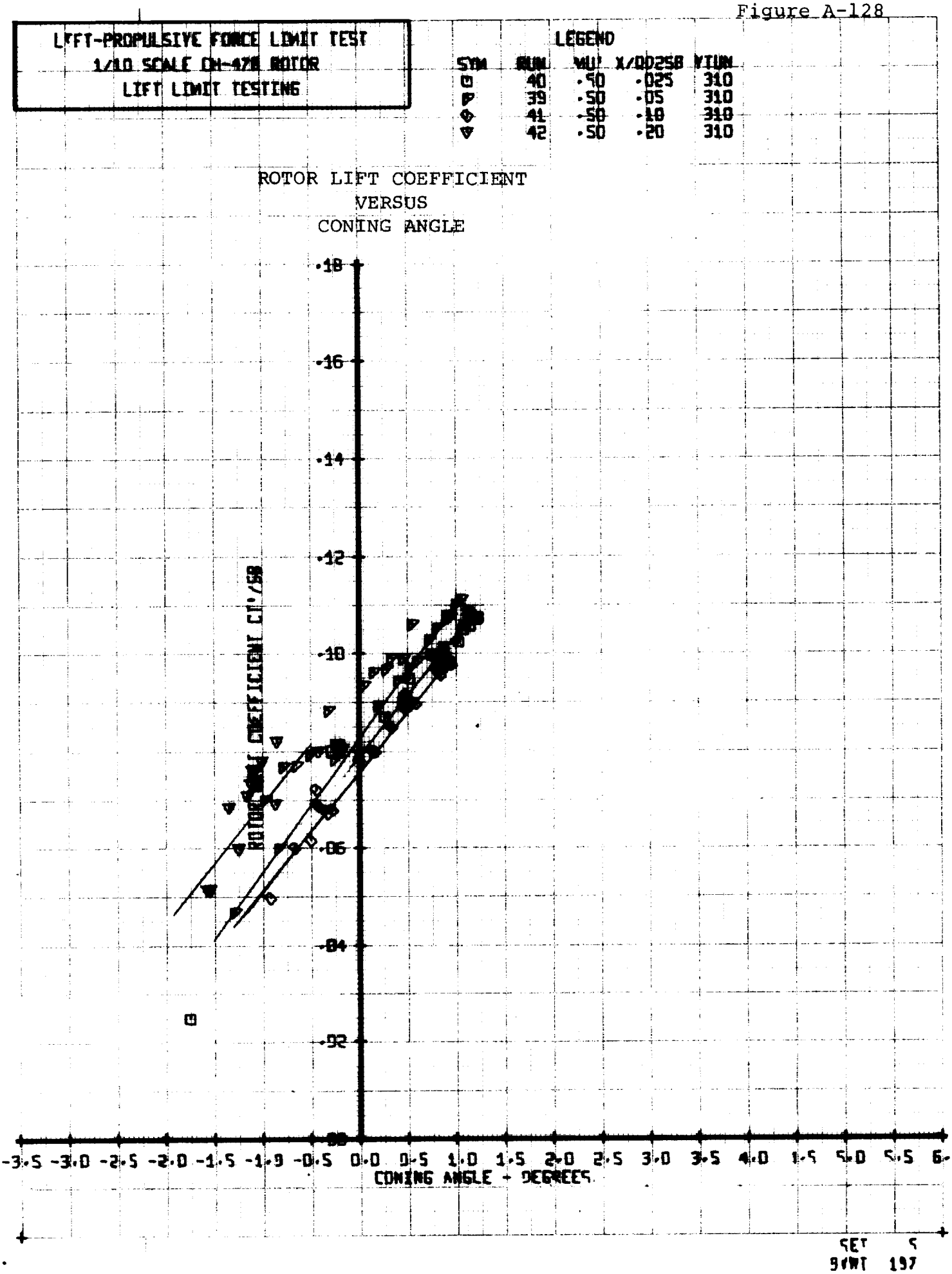

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QDOSB YTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE
.18
.16
.14
.12
.10
.08
.04
.02
-3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
CONING ANGLE - DEGREES

Figure A-129

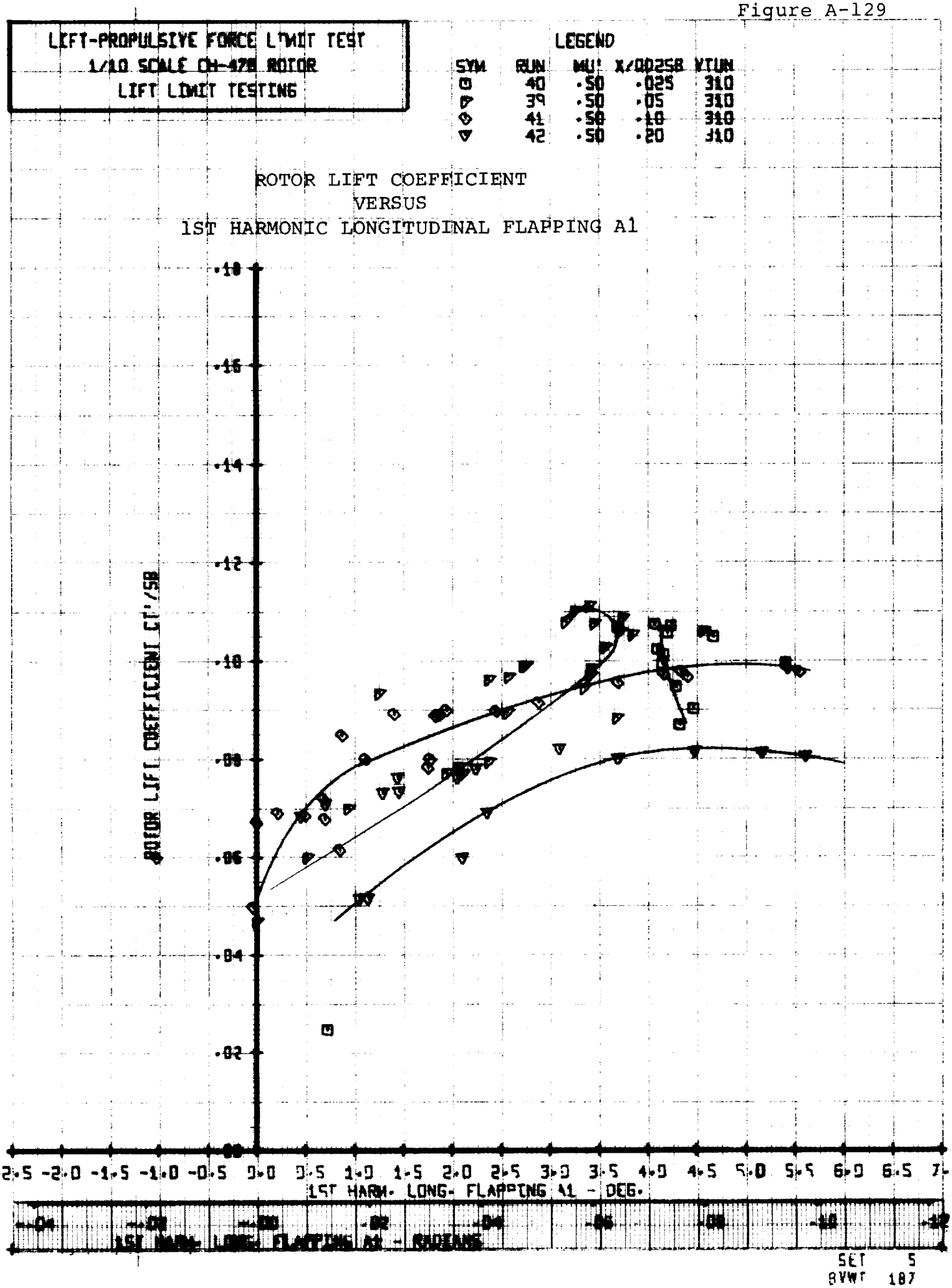

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1
ROTOR LIFT COEFFICIENT CT'/SB
.10
.08
.06
.04
.02
.00
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
1ST HARM. LONG. FLAPPING A1 - DEG.
1ST HARM. LONG. FLAPPING A1 - RADIANS

Figure A-130

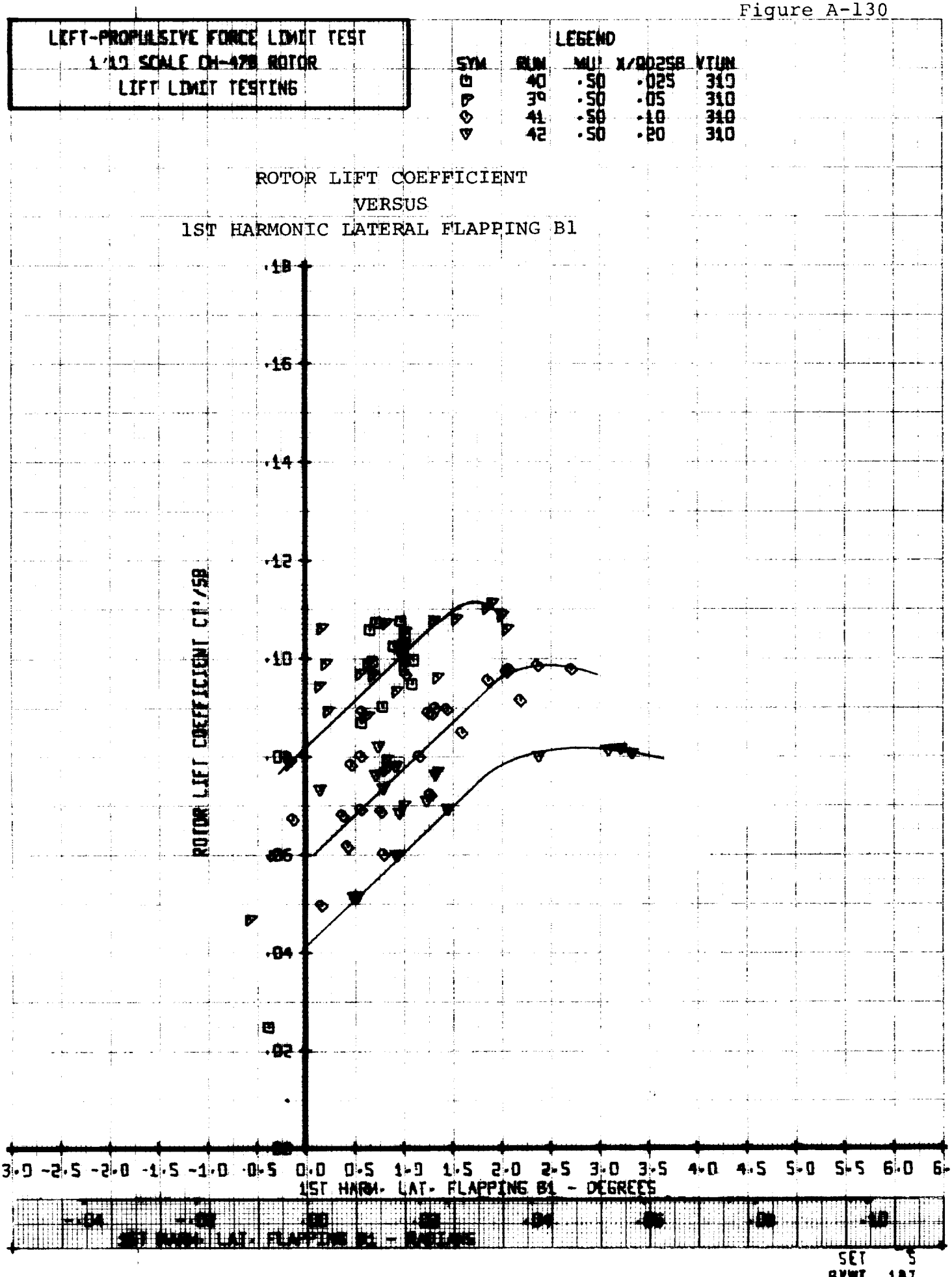

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/RO25R VTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LAT. FLAPPING B1 - DEGREES

Figure A-131

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

S/M	RUN	MU'	X/QD2SB	YTUN
□	40	.50	.025	310
▽	39	.50	.05	310
◇	41	.50	.10	310
▽	42	.50	.20	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

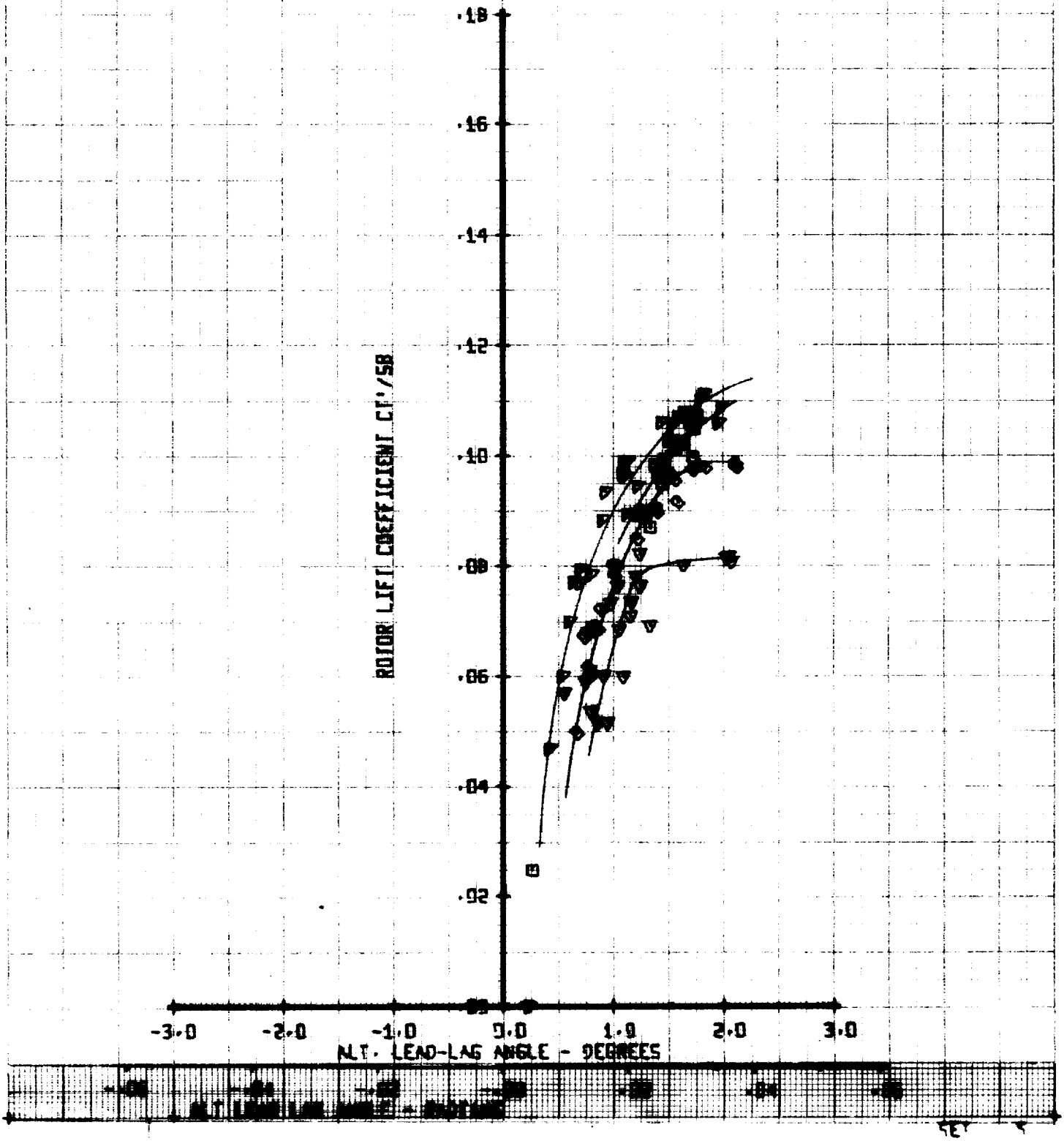


Figure A-132

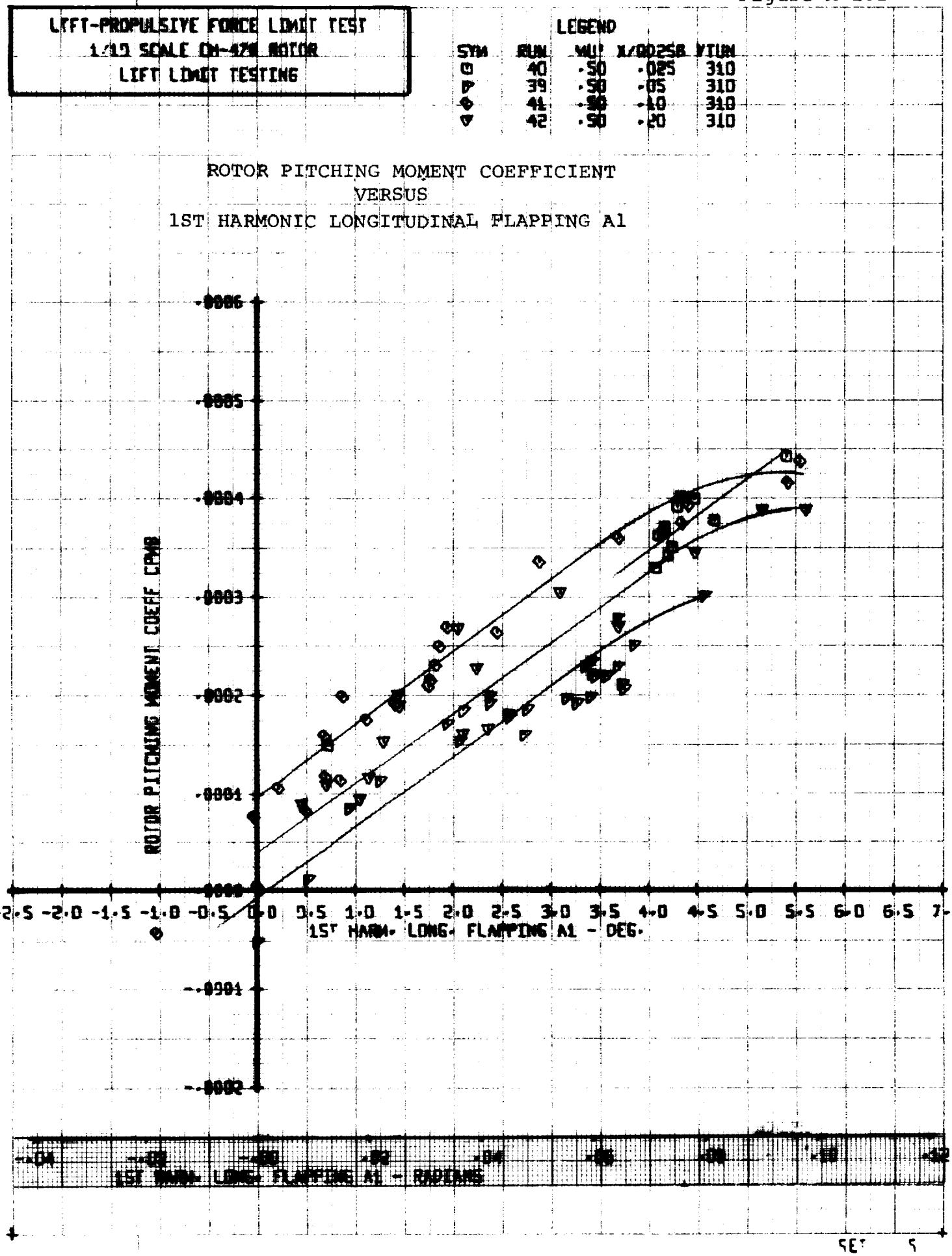

LIFT-PROPULSIVE FORCE LIMIT TEST
1/13 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/D025B YTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1
ROTOR PITCHING MOMENT COEFF CPMB
-.0006
-.0005
-.0004
-.0003
-.0002
-.0001
.0000
-.0001
-.0002
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
1ST HARM. LONG. FLAPPING A1 - DEG.
1ST HARM. LONG. FLAPPING A1 - RADIANS

Figure A-133

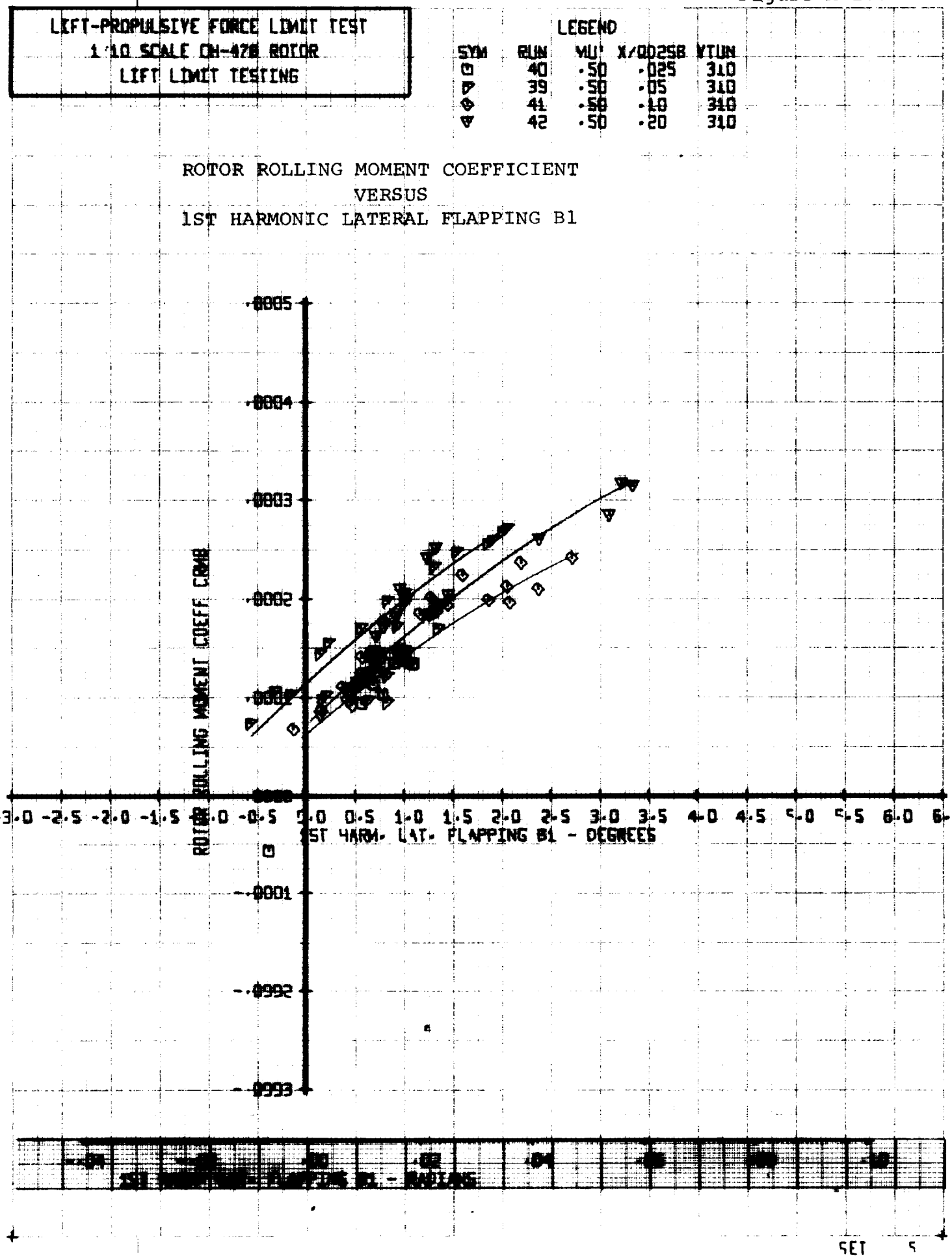

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
40 .50 .025 310
39 .50 .05 310
41 .50 .10 310
42 .50 .20 310
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR ROLLING MOMENT COEFF CRMB
.0005
.0004
.0003
.0002
.0001
-.0992
-.0993
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LAT. FLAPPING B1 - DEGREES

Figure A-134

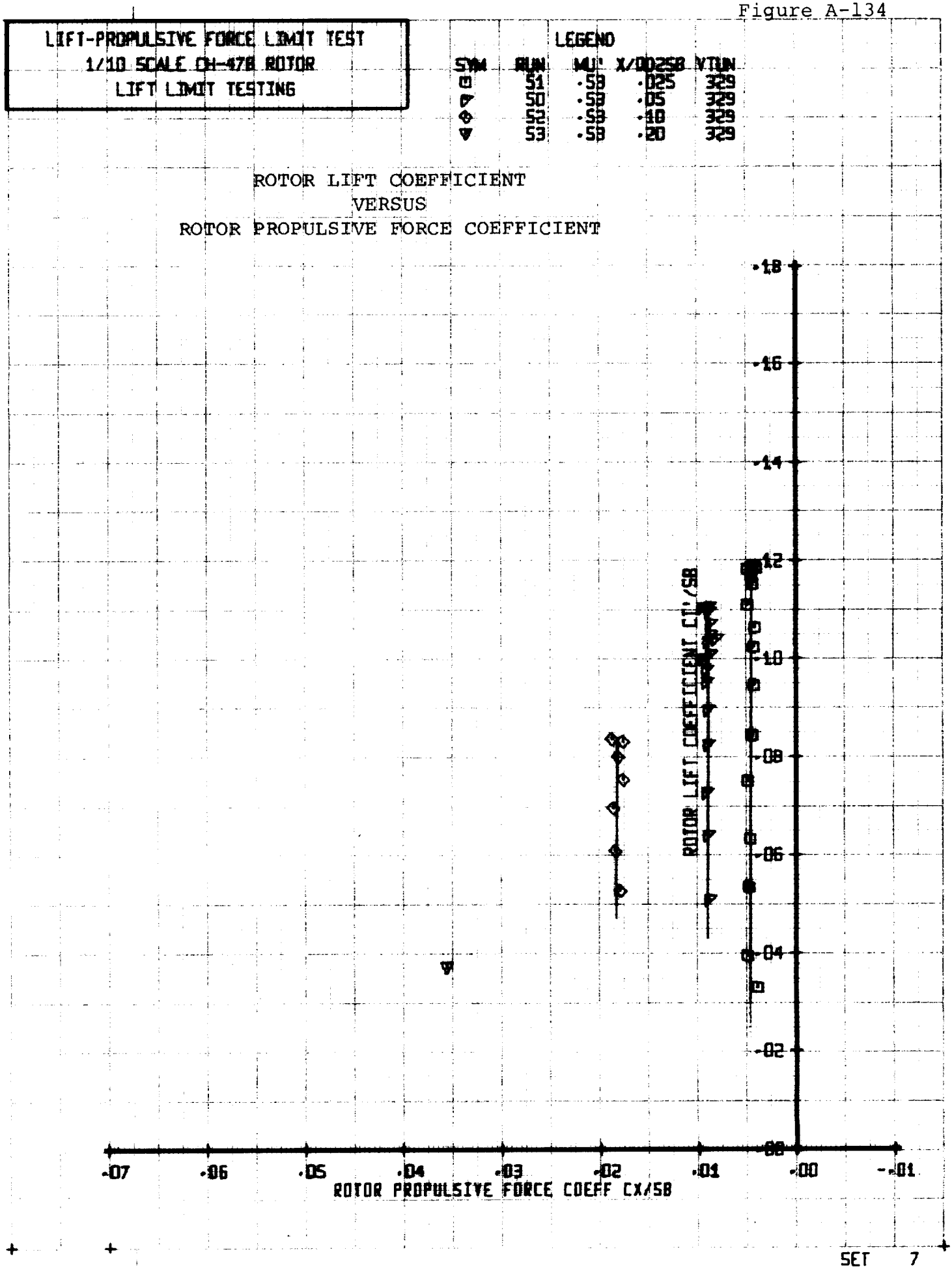

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD2SB VTIP
51 .58 .025 329
50 .58 .05 329
52 .58 .10 329
53 .58 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
ROTOR LIFT COEFFICIENT CL/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-.07
-.06
-.05
-.04
-.03
-.02
-.01
.00
.01
ROTOR PROPULSIVE FORCE COEFF CX/SB
SET 7
BVWT 187

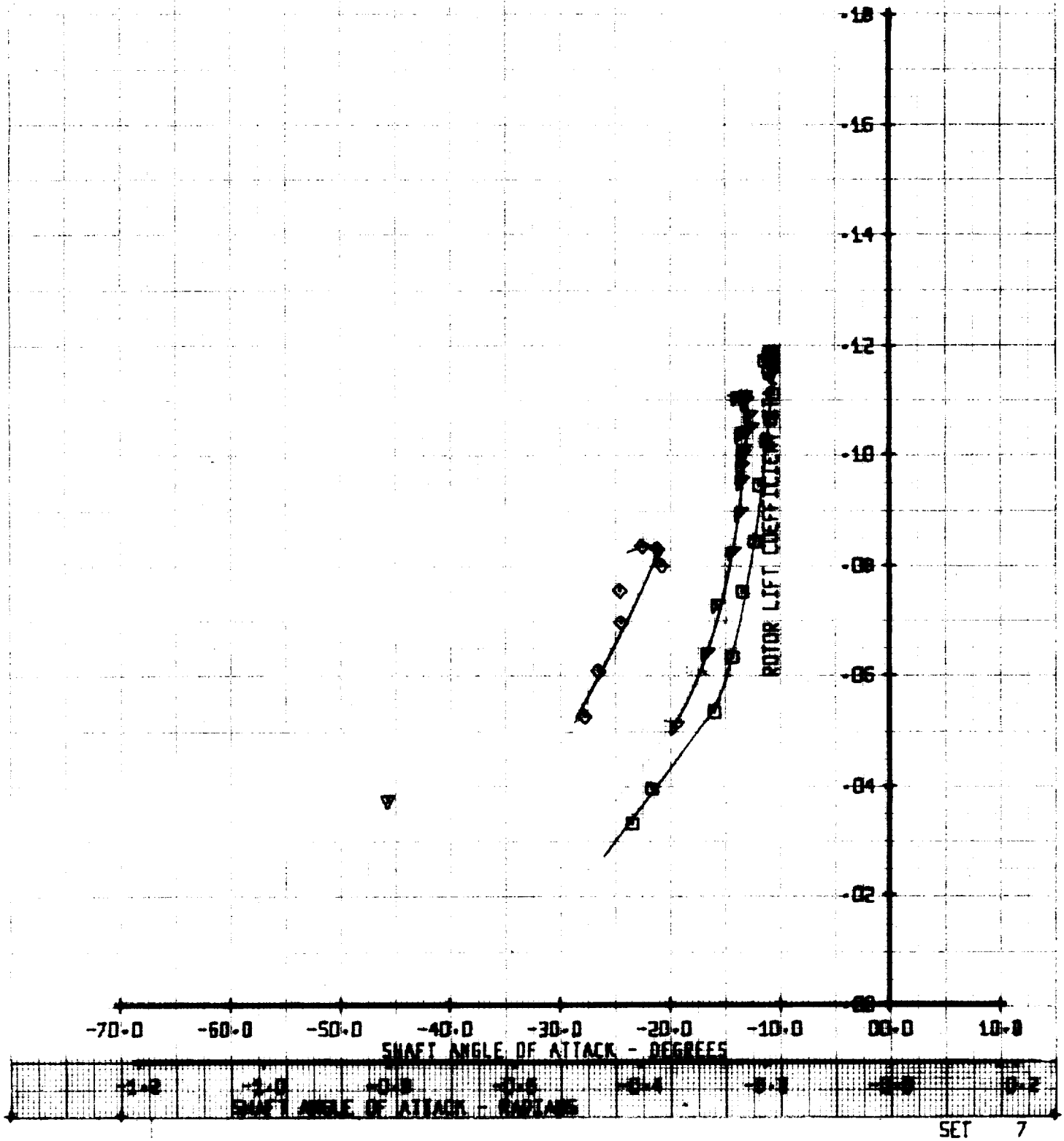
Figure A-135

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/D0258	VTUN
▣	51	.53	.025	329
▼	50	.53	.05	329
◆	52	.53	.10	329
▼	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



SET 7
RWT 187

SET 7
BVWT 187

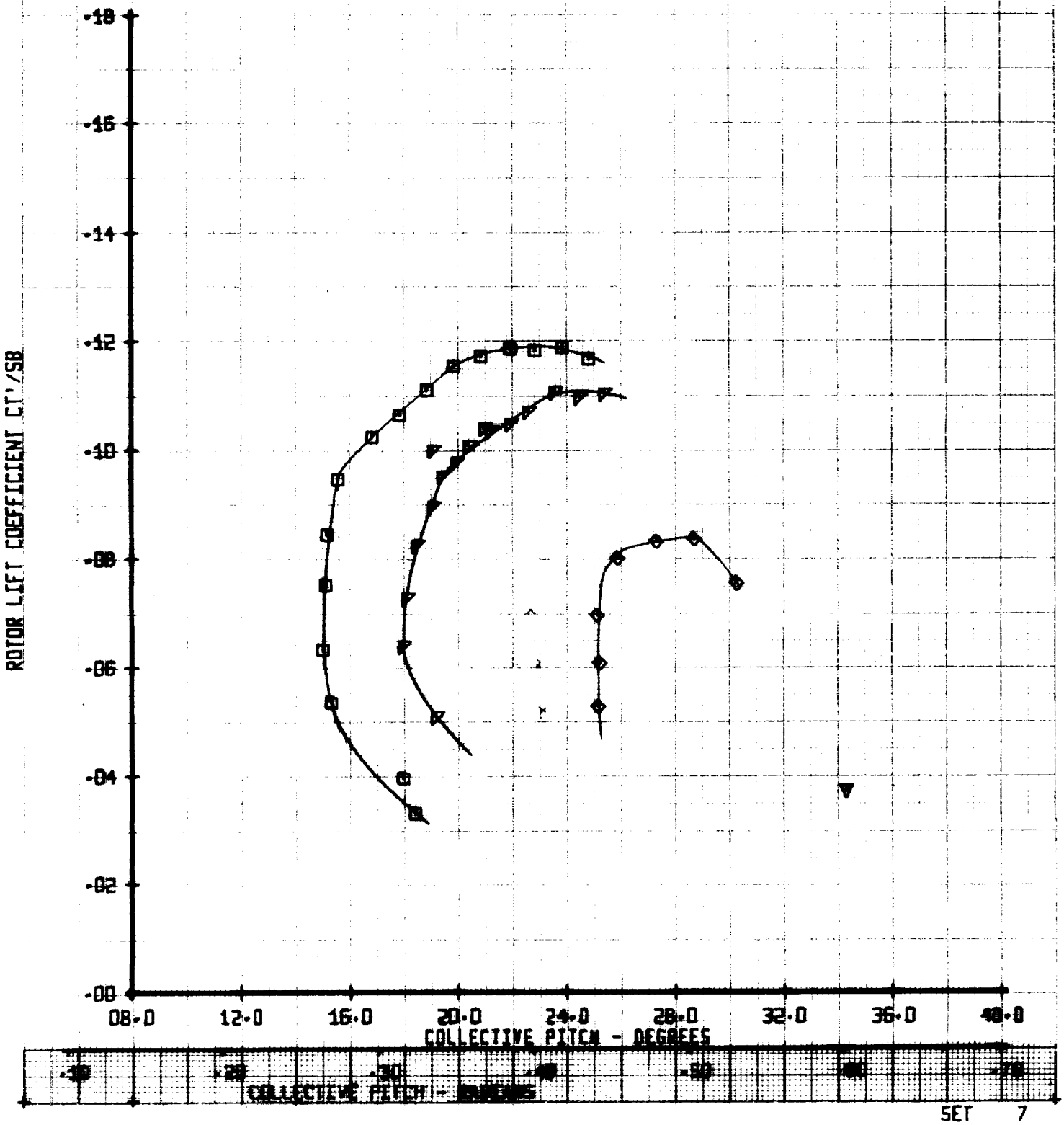
Figure A-136

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	VTIP
□	51	.53	.025	329
▽	50	.53	.05	329
◇	52	.53	.10	328
▽	53	.53	.20	329

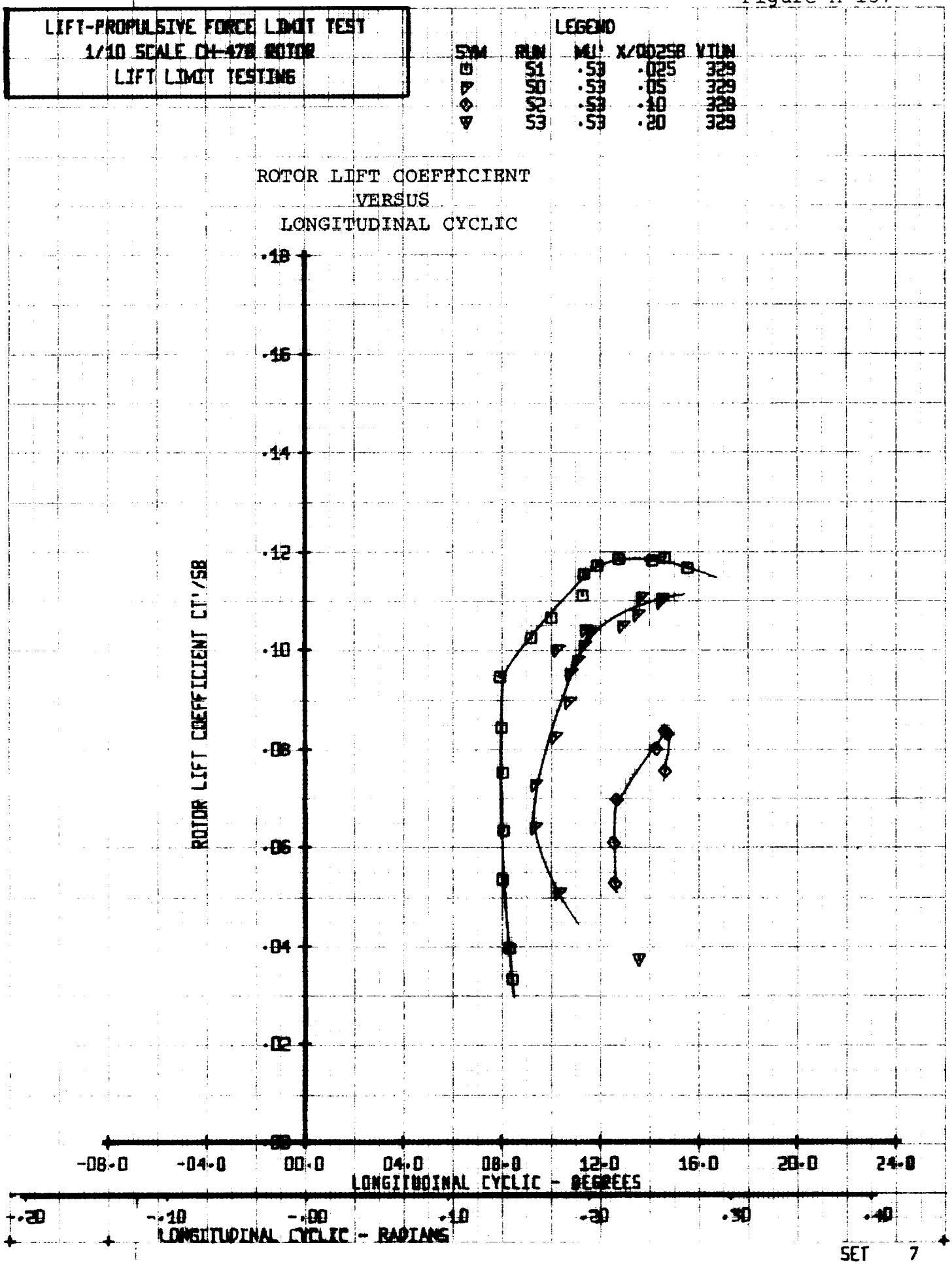
ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 7
WT 187

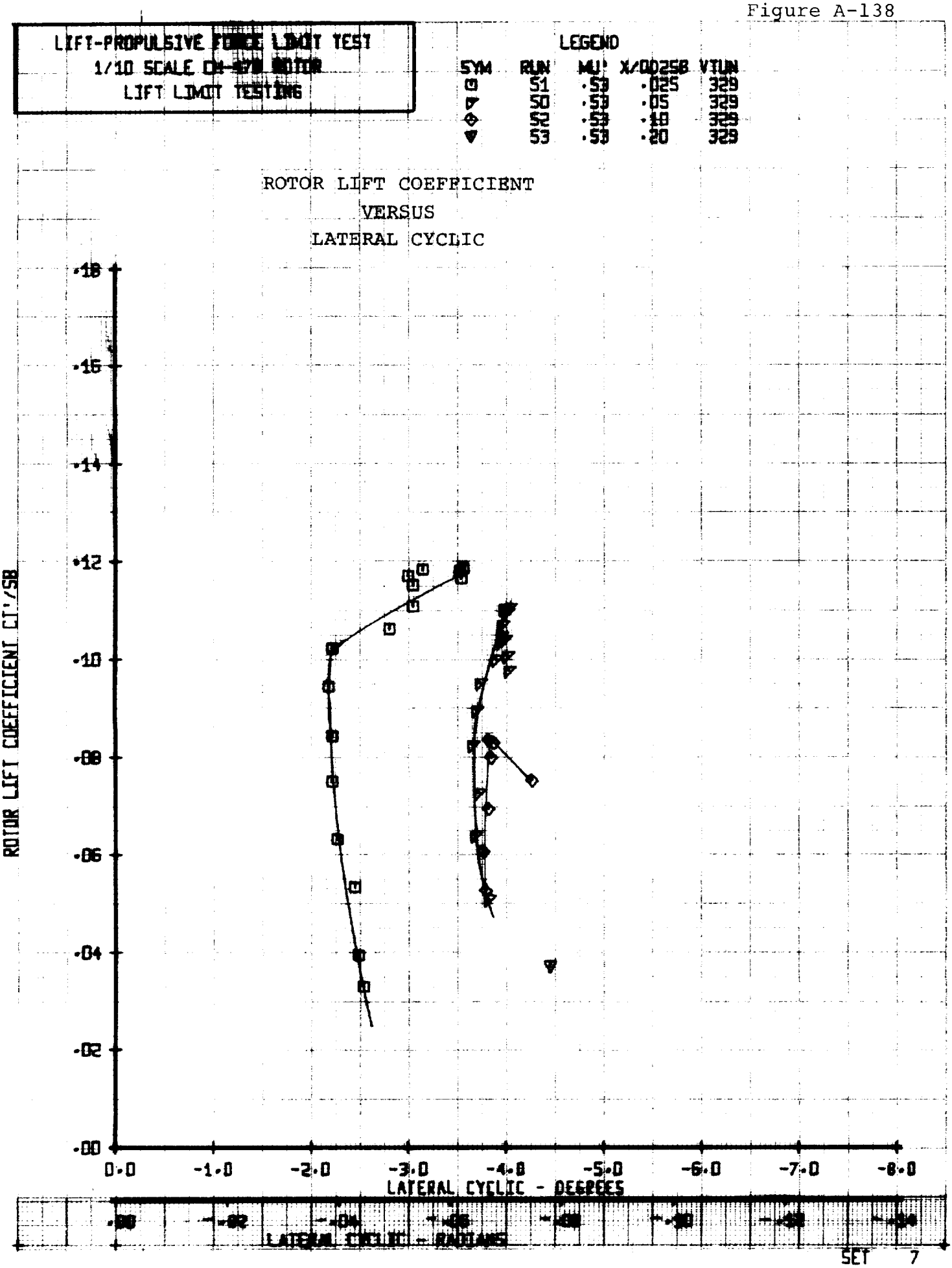
SET 7
BVWT 187

Figure A-137



ET 7
WT 187

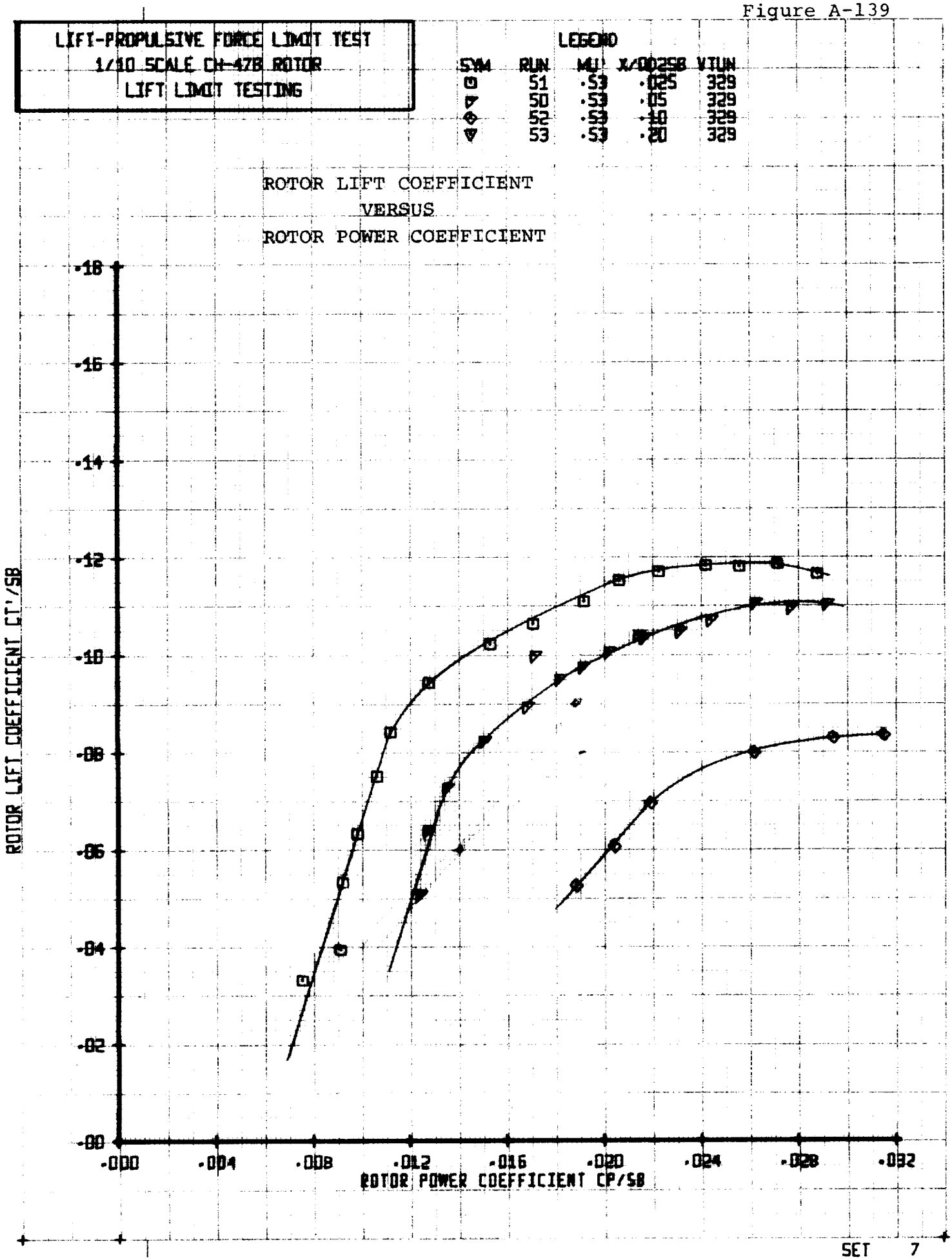
SET 7
BVWT 187



ET 7
WT 187

SET 7
BVWT 187

Figure A-139



ET 7
WT 187

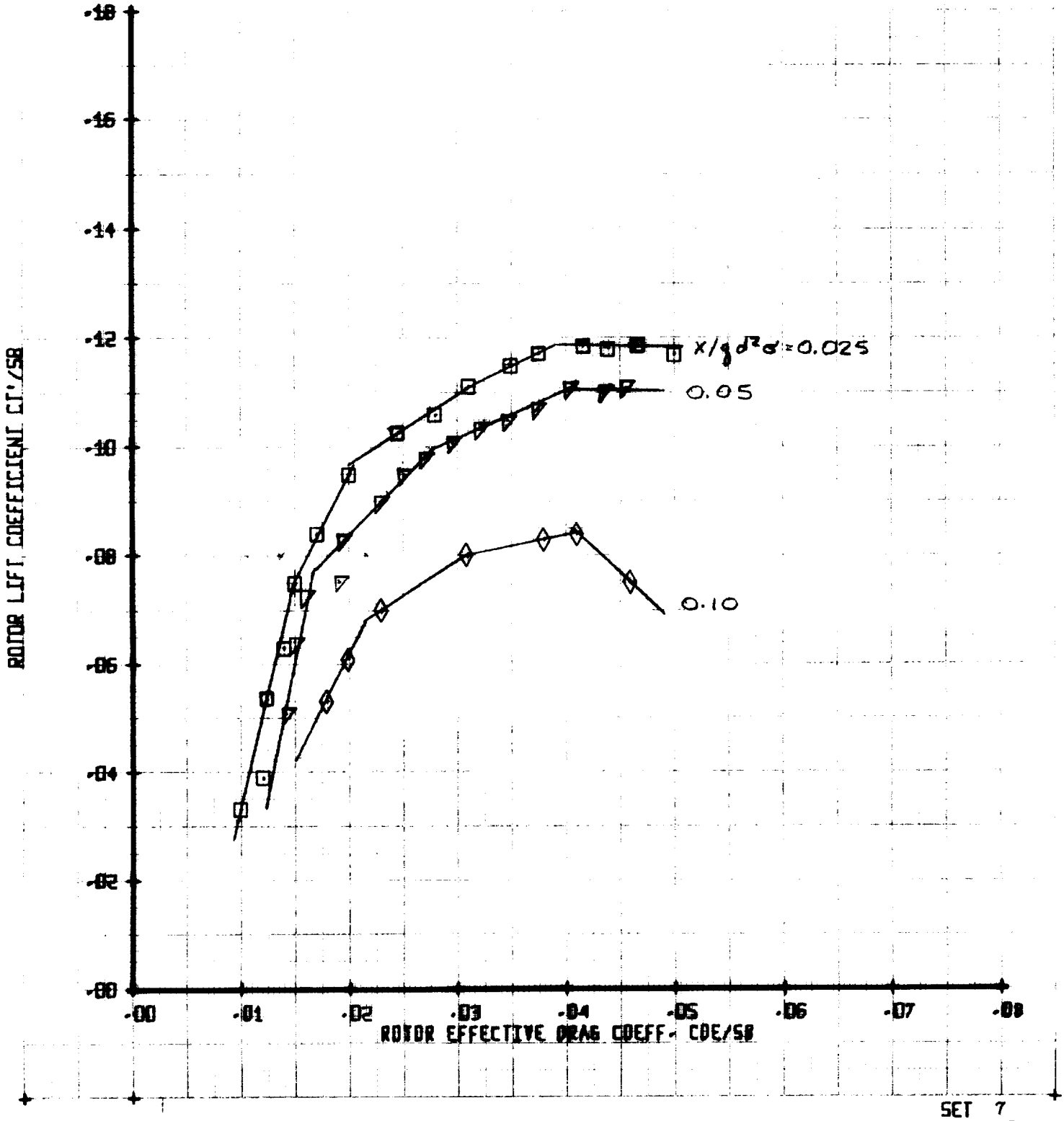
SET 7
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/R02SB	YTUM
□	51	.53	.025	329
▽	50	.53	.05	329
◇	52	.53	.10	329
▽	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT



ET
WT 193

SET 7
BVWT 193

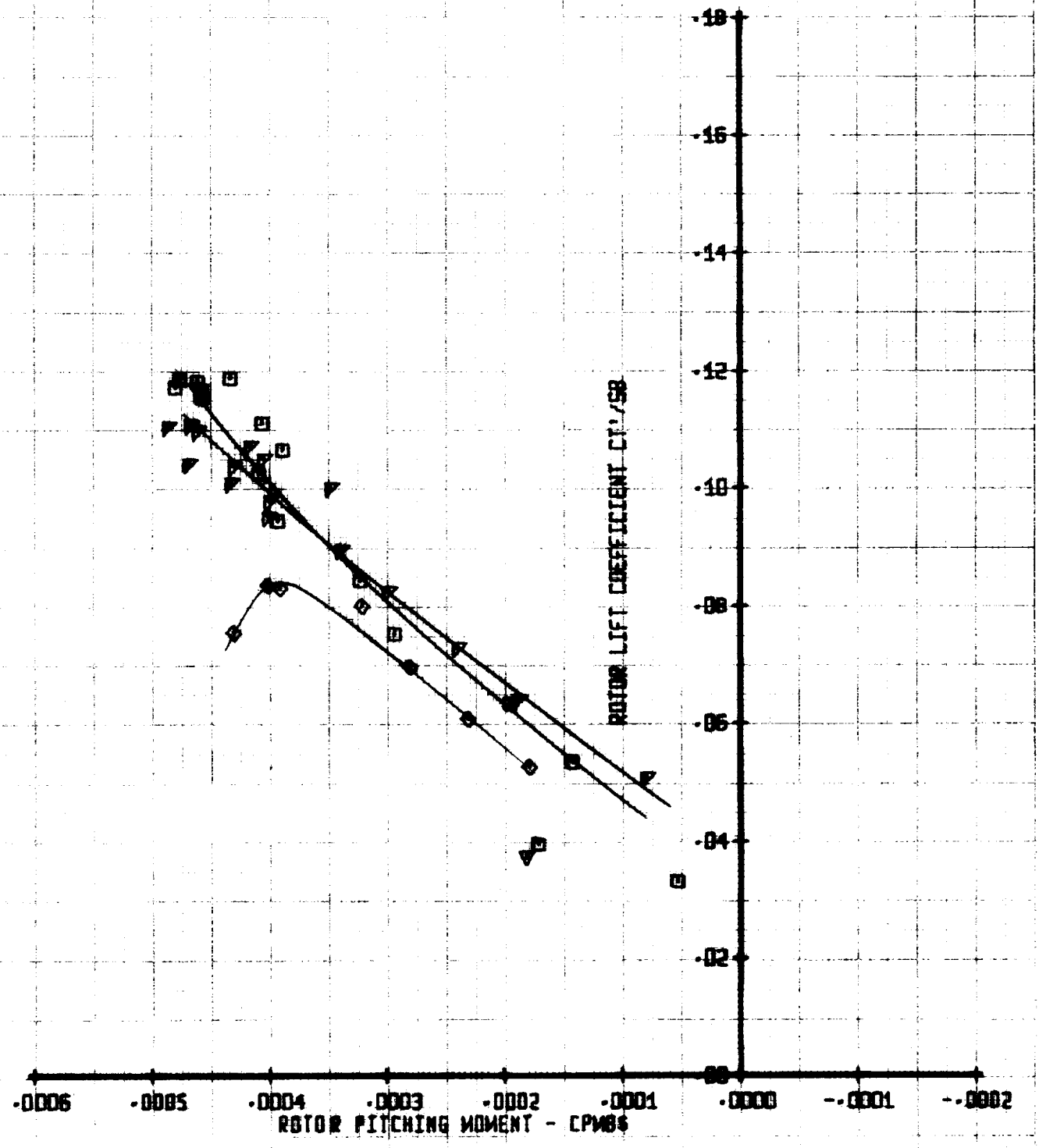
Figure A-141

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/D0258	VTUN
□	51	.53	.025	329
▽	50	.53	.05	329
◇	52	.53	.10	328
▽	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 7
WT 187

SET 7
BVWT 187

Figure A-142

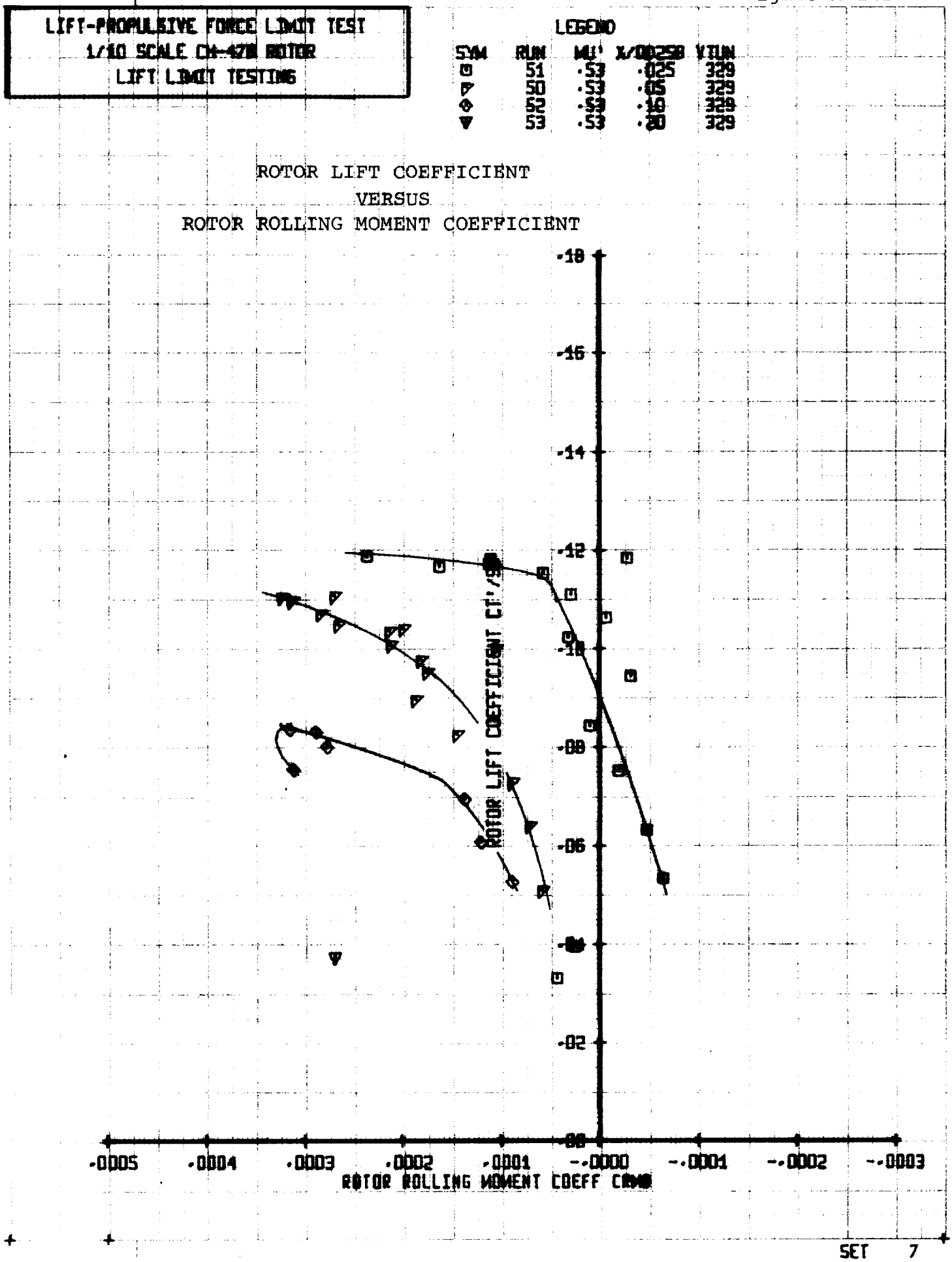

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/D25R YTUN
51 .53 .025 329
50 .53 .05 329
52 .53 .10 329
53 .53 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT
ROTOR LIFT COEFFICIENT CT/σ
ROTOR ROLLING MOMENT COEFF CRMR
-.18
-.16
-.14
-.12
-.10
-.08
-.06
-.04
-.02
-.00
-.0005
-.0004
-.0003
-.0002
-.0001
-.0000
-.0001
-.0002
-.0003
ET 7
WT 187
SET 7
BVWT 187

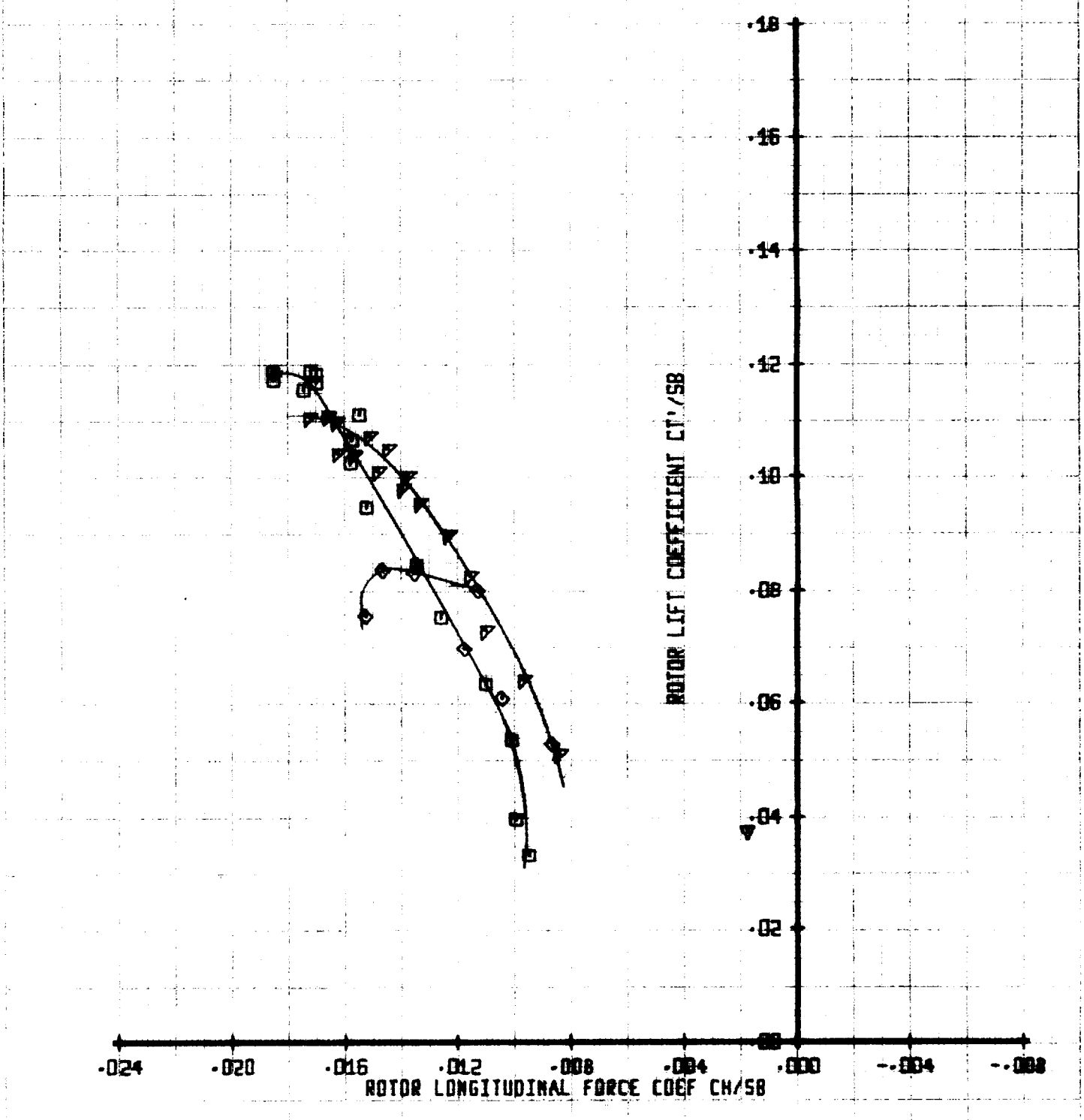
Figure A-143

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QDSB	VTUN
□	51	.58	.025	329
▽	50	.58	.05	329
◇	52	.58	.10	329
▽	53	.58	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 7
WT 187

SET 7
BVWT 187

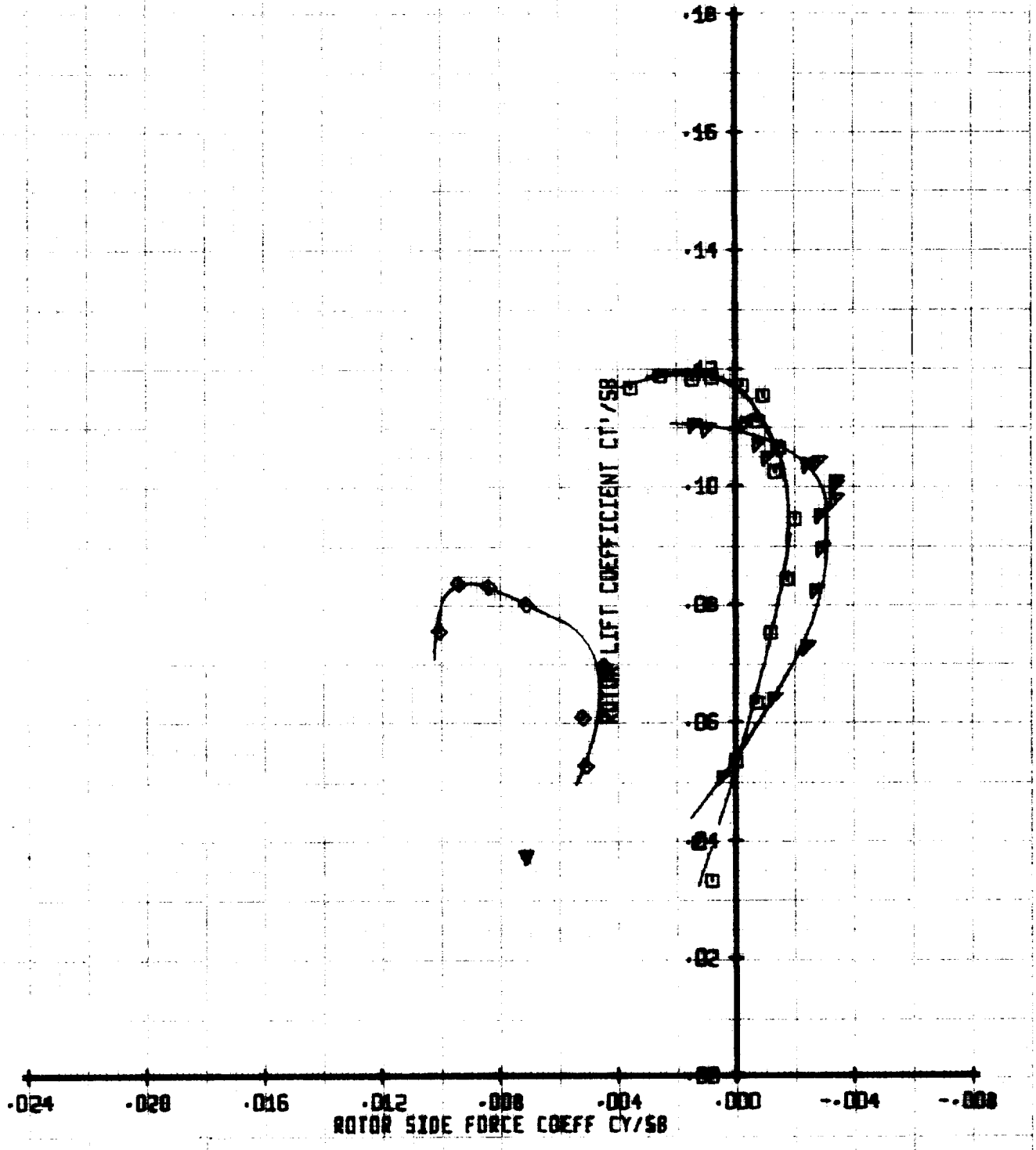
Figure A-144

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/D2SB	VTUN
▣	51	.53	.025	329
▼	50	.53	.05	329
◆	52	.53	.10	328
▼	53	.53	.20	329

ROTOR LIFT COEFFICENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 7
WT 187

SET 7
BVWT 187

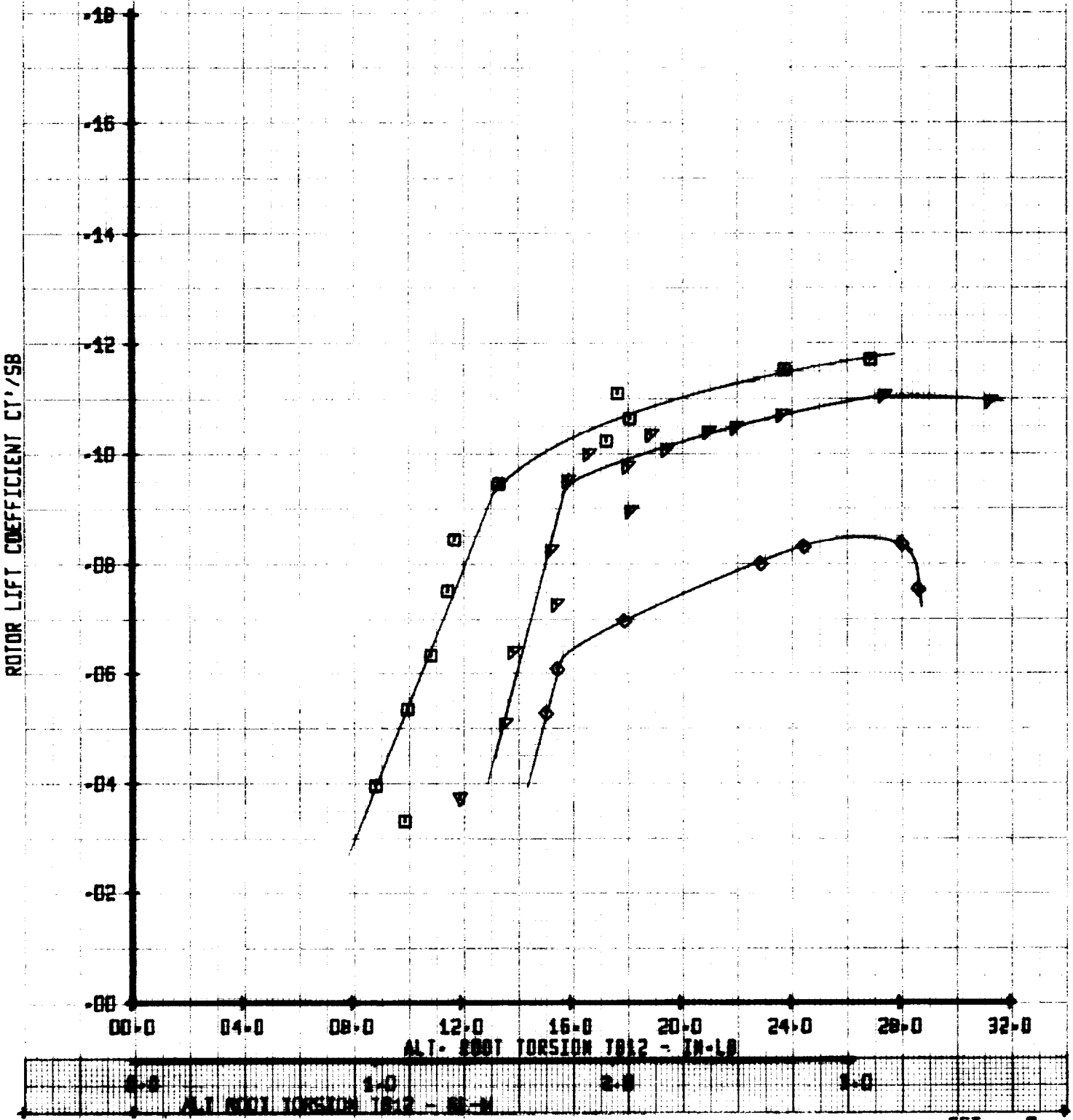
Figure A-145

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QBSB	VTUN
▫	51	.53	.025	329
▽	50	.53	.05	329
◆	52	.53	.10	329
▼	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



SET 7
WT 187

SET 7
BVWT 187

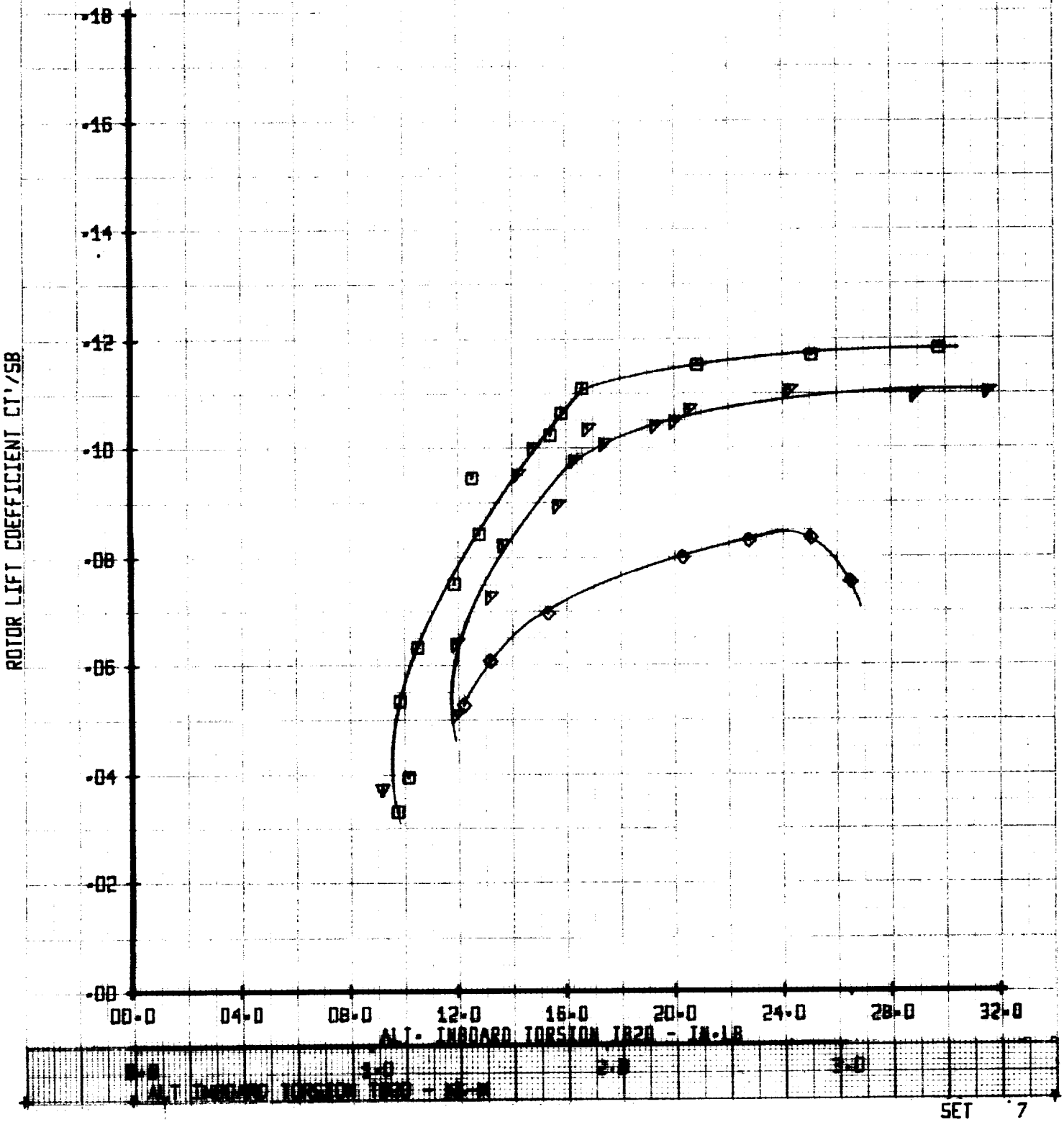
Figure A-146

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/DD2SB	VTUN
□	51	.53	.025	329
▽	50	.53	.05	329
◇	52	.53	.10	329
▼	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING INBOARD TORSION TB20



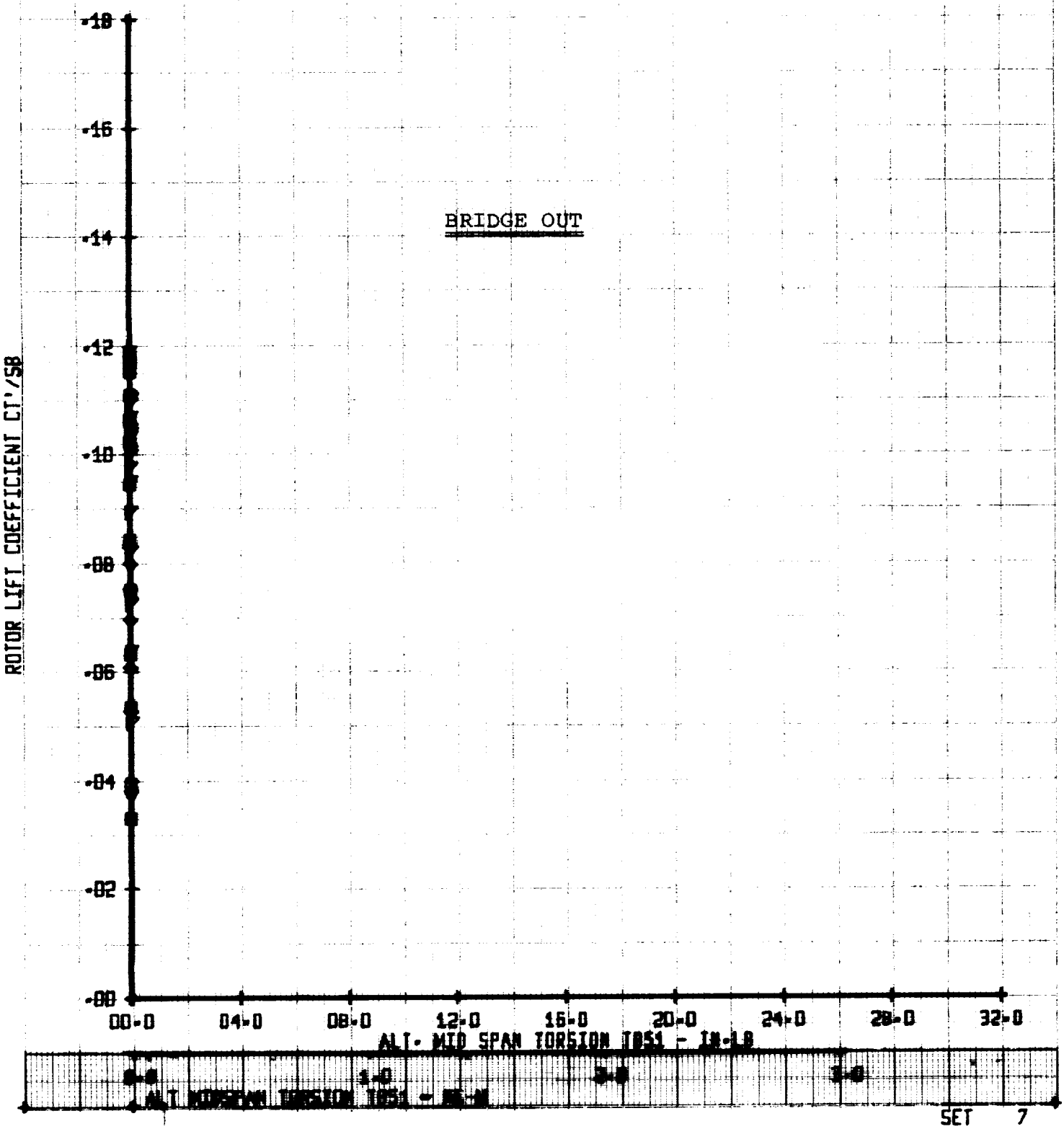
ET 7
WT 187

SET 7
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	51	.53	.025	329
▷	50	.53	.05	329
◇	52	.53	.10	329
▽	53	.53	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB51



SET 7
BVWT 187

SET 7
WT 187

Figure A-148

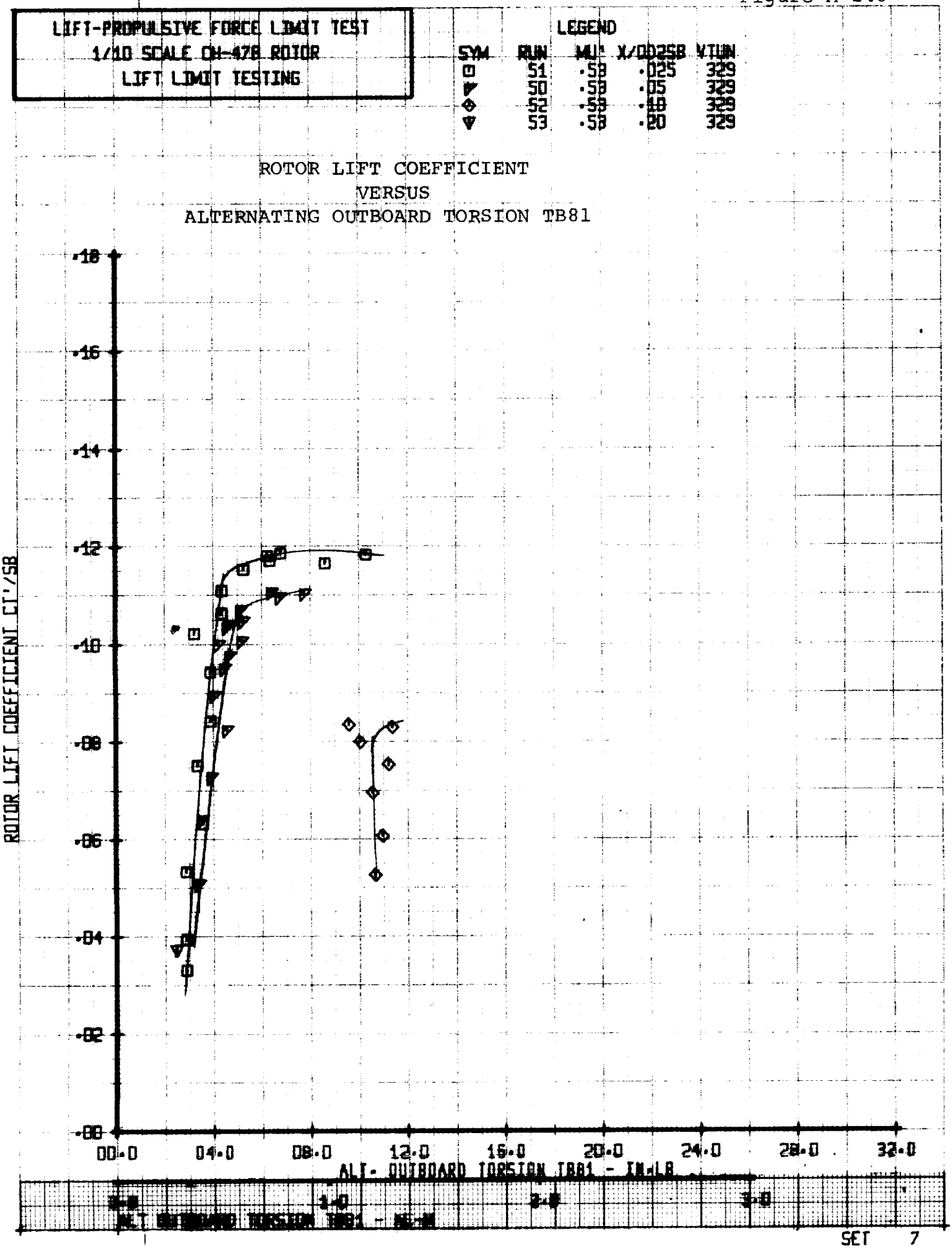

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/DD2SB VTUN
51 .58 .025 329
50 .58 .05 329
52 .58 .10 329
53 .58 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB81
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
00.0
04.0
08.0
12.0
16.0
20.0
24.0
28.0
32.0
ALT. OUTBOARD TORSION TB81 - IN-LB
SET 7
BVWT 187

Figure A-149

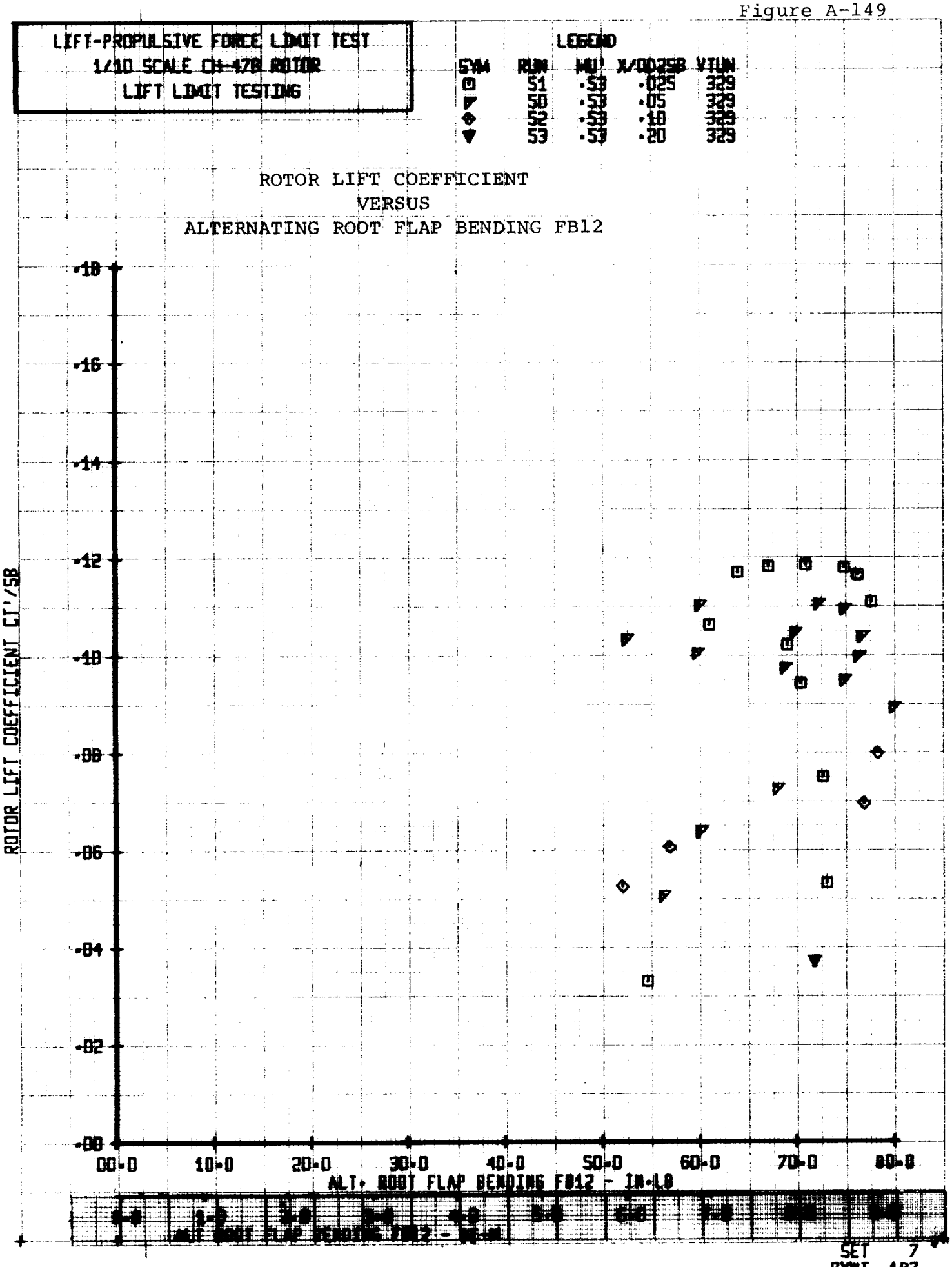
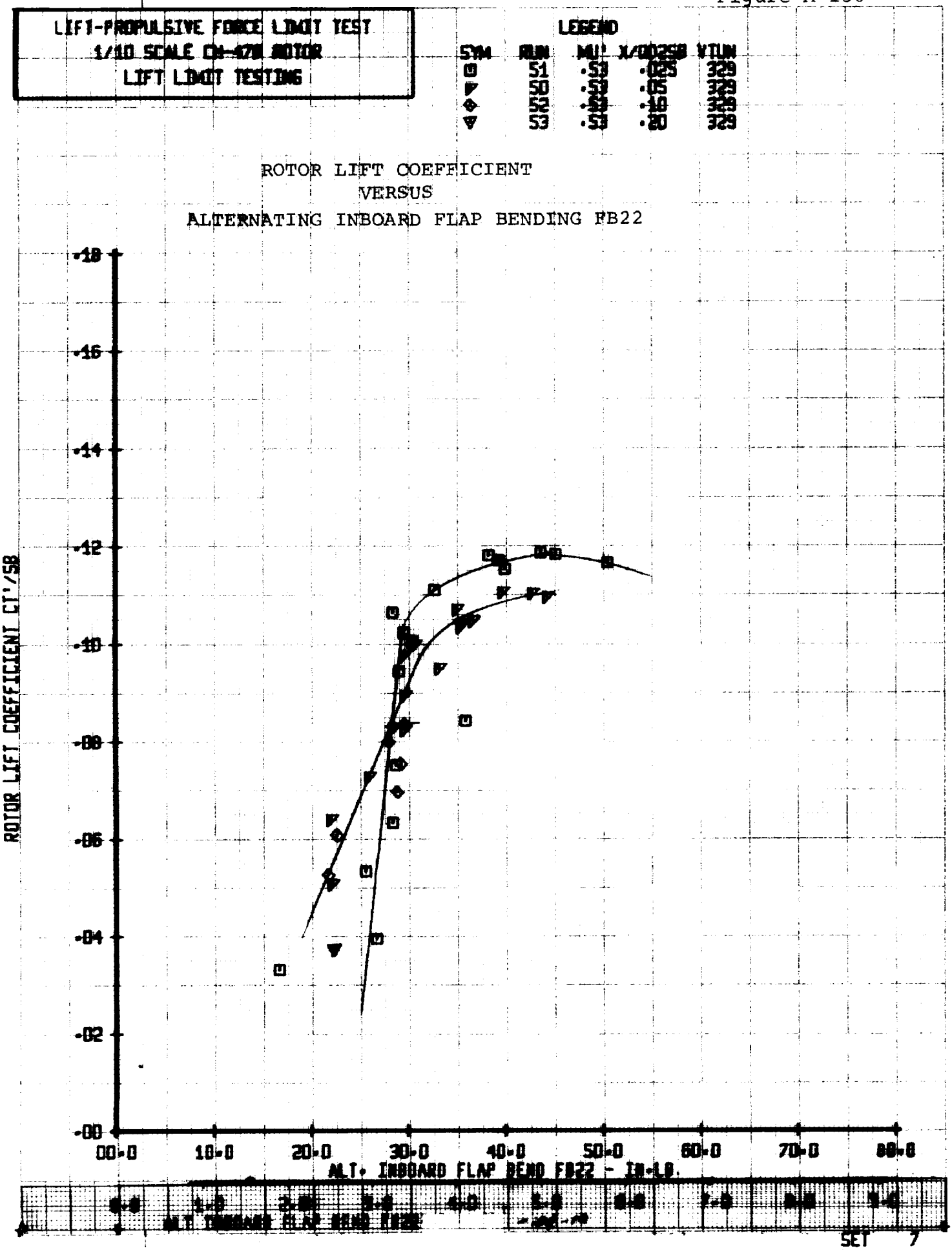

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QQ2SB VTUN
51 .53 .025 329
50 .53 .05 329
52 .53 .10 329
53 .53 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. ROOT FLAP BENDING FB12 - IN-LB
SET 7
BVWT 187
ET 7
WT 187

Figure A-150



ET 7
WT 187

SET 7
BWT 187

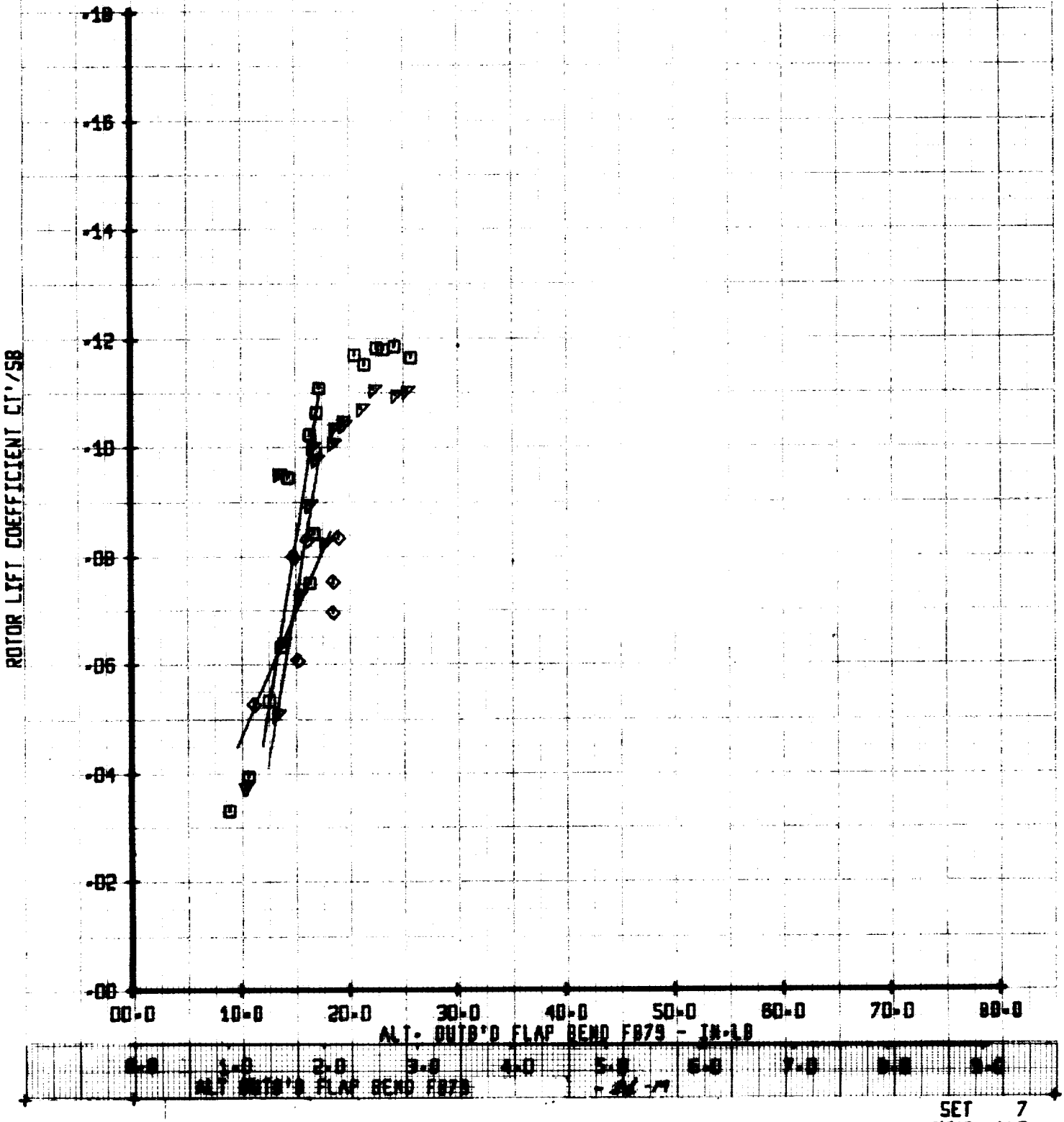
Figure A-151

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
▫	51	.53	.025	329
▽	50	.53	.05	329
◇	52	.53	.10	329
▽	53	.53	.20	329

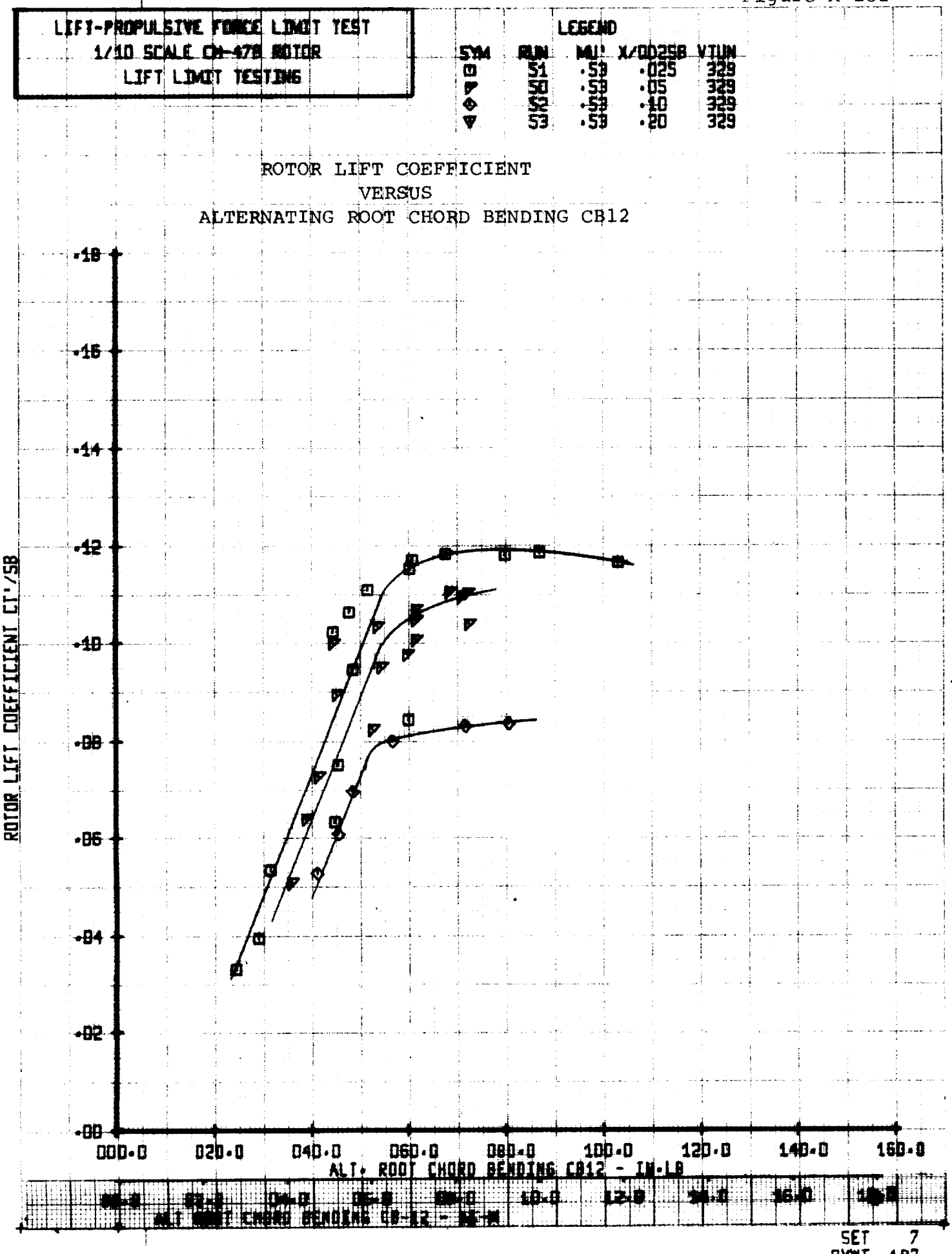
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB79



ET 7
WT 187

SET 7
BVWT 187

Figure A-152



187

Figure A-153

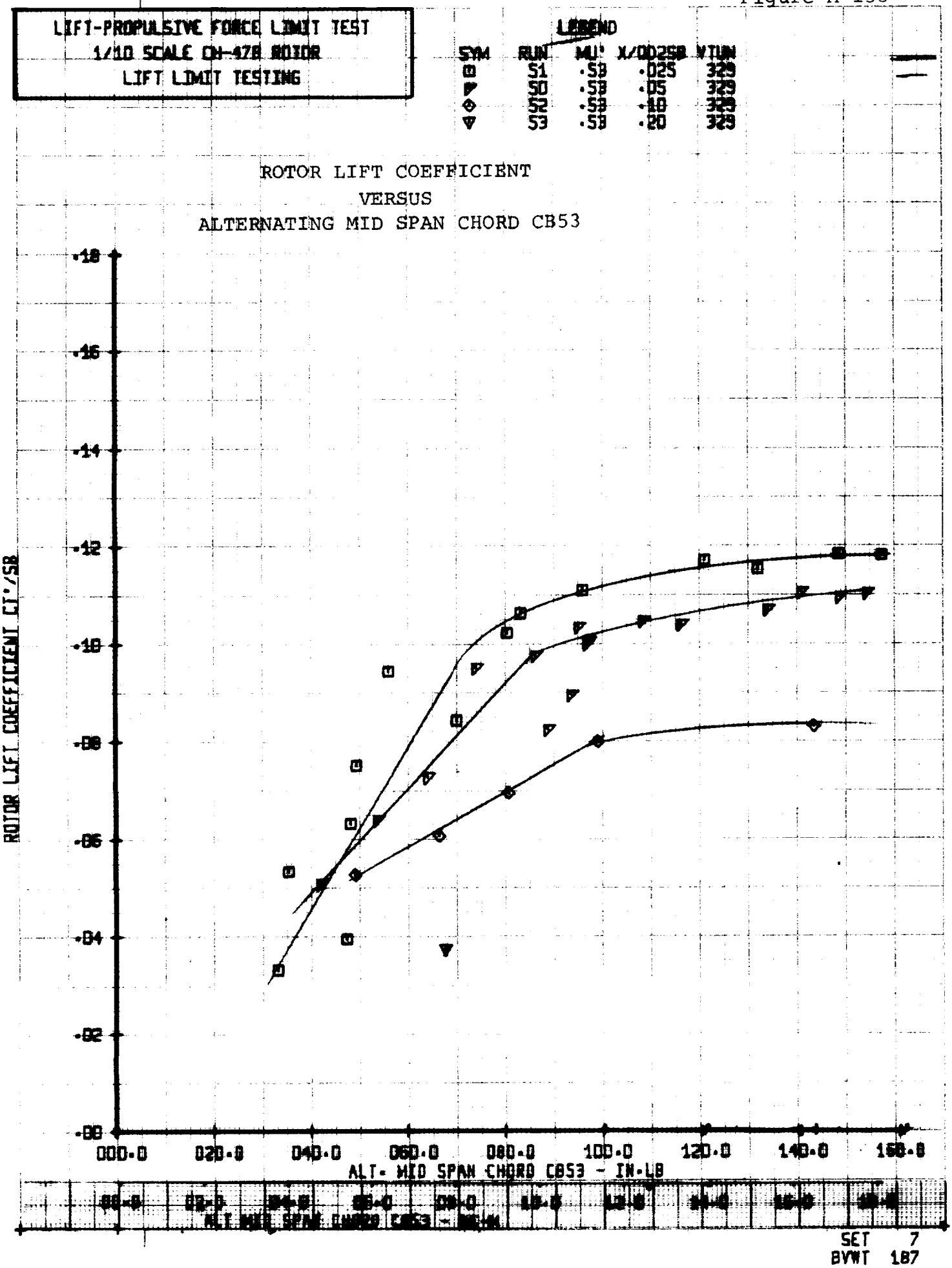

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/DD25B VTUN
51 .53 .025 329
50 .53 .05 329
52 .53 .10 329
53 .53 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN CHORD CB53
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
000.0
020.0
040.0
060.0
080.0
100.0
120.0
140.0
160.0
ALT. MID SPAN CHORD CB53 - IN-LB
SET 7
BVWT 187
SET 7
WT 187

Figure A-154

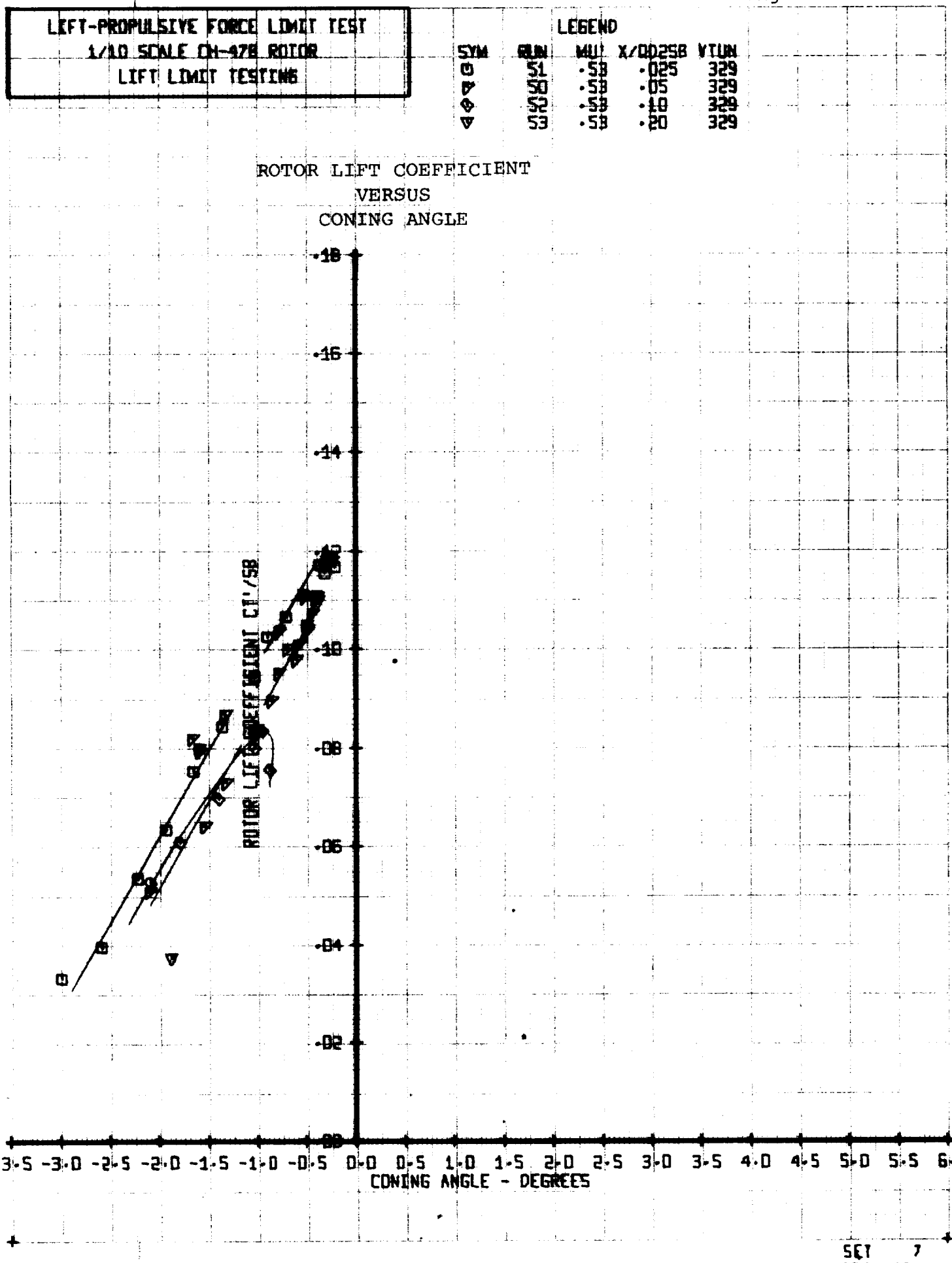

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU1 X/QD2SB VTUN
51 .53 .025 329
50 .53 .05 329
52 .53 .10 329
53 .53 .20 329
ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
CONING ANGLE - DEGREES
ET 7
WT 187
SET 7
BVWT 187

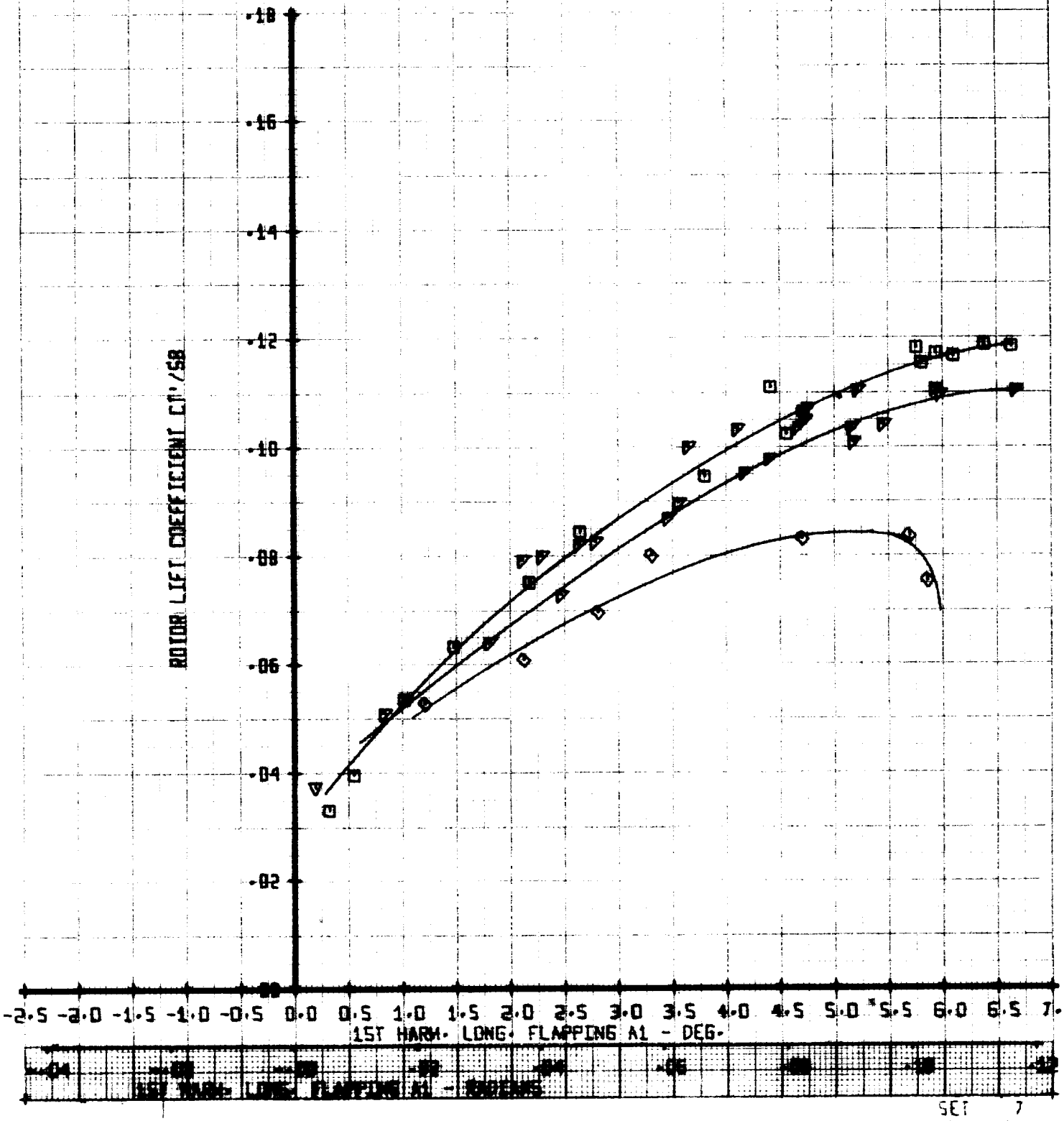
Figure A-155

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	WTUN
□	51	.58	.025	329
▽	50	.58	.05	329
◇	52	.58	.10	329
▽	53	.58	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

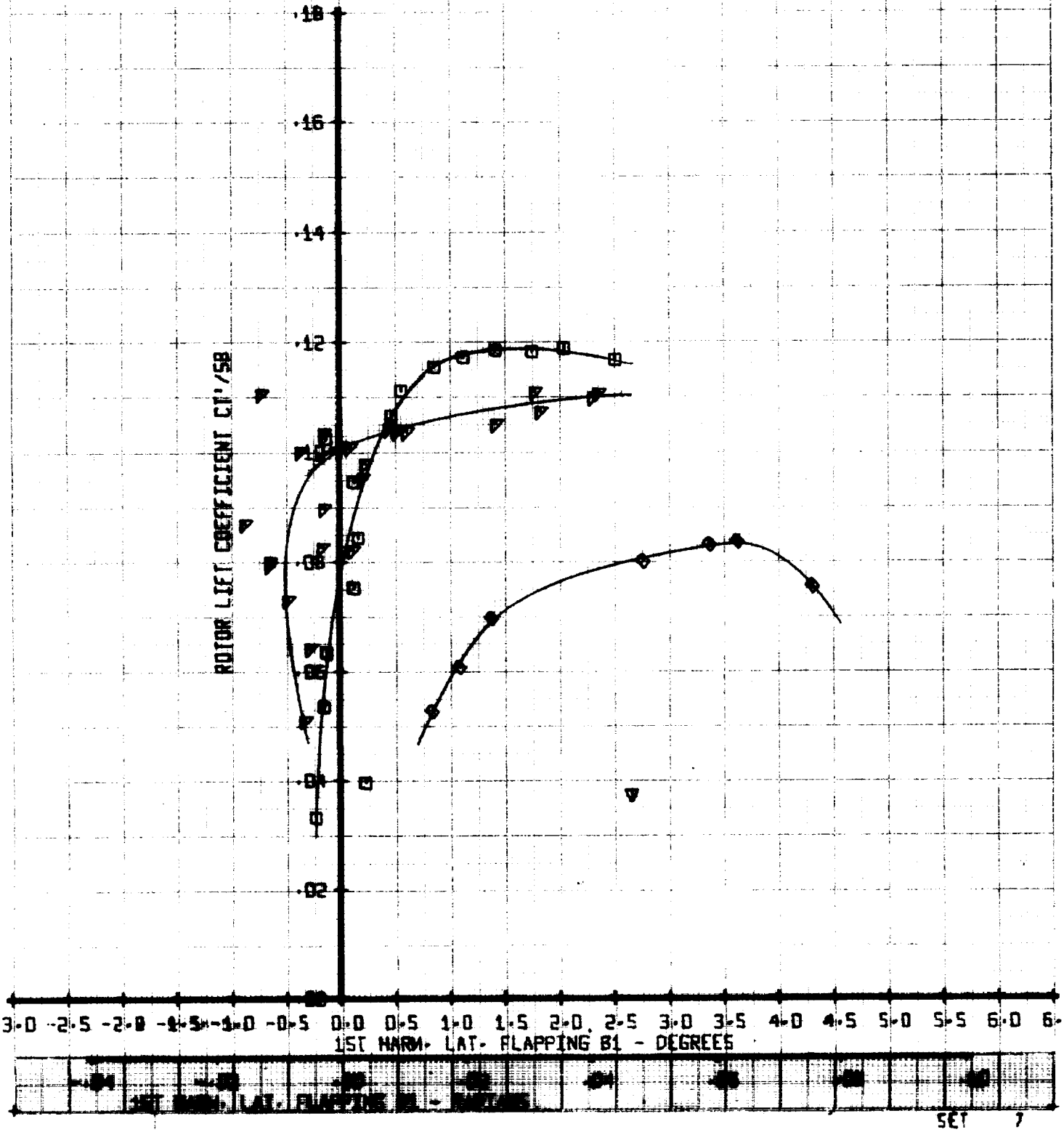


SET 7
BVWT 187

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU	X/QD2SB	XIUN
□	51	.58	.025	329
▽	50	.58	.05	329
◇	52	.58	.10	329
▽	53	.58	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 7
WT 187

SET 7
BYWT 187

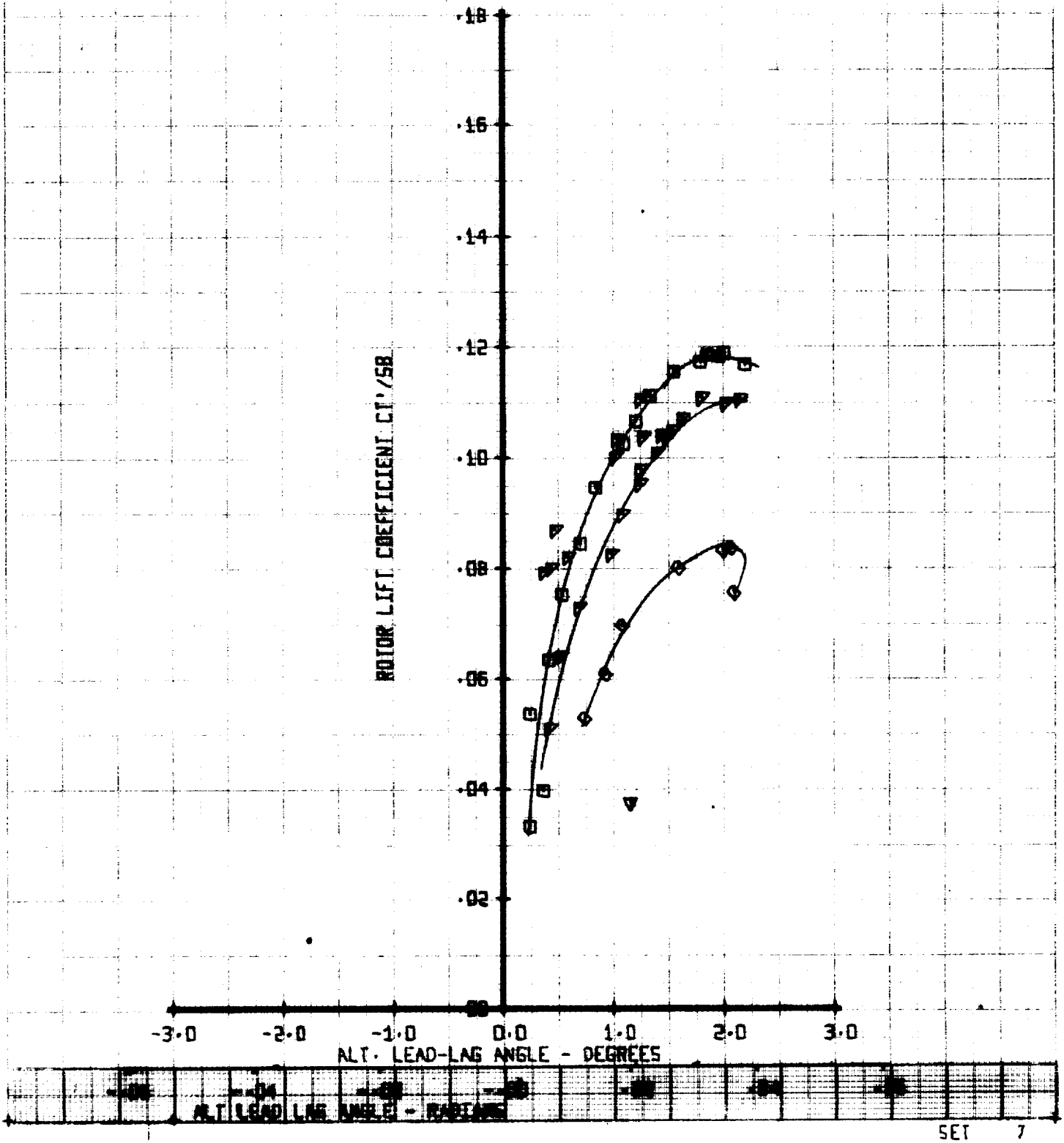
Figure A-157

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YIUN
□	51	.58	.025	329
▽	50	.58	.05	329
◇	52	.58	.10	328
▽	53	.58	.20	329

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



SET 7
BYWT 187

SET 7
BYWT 187

Figure A-158

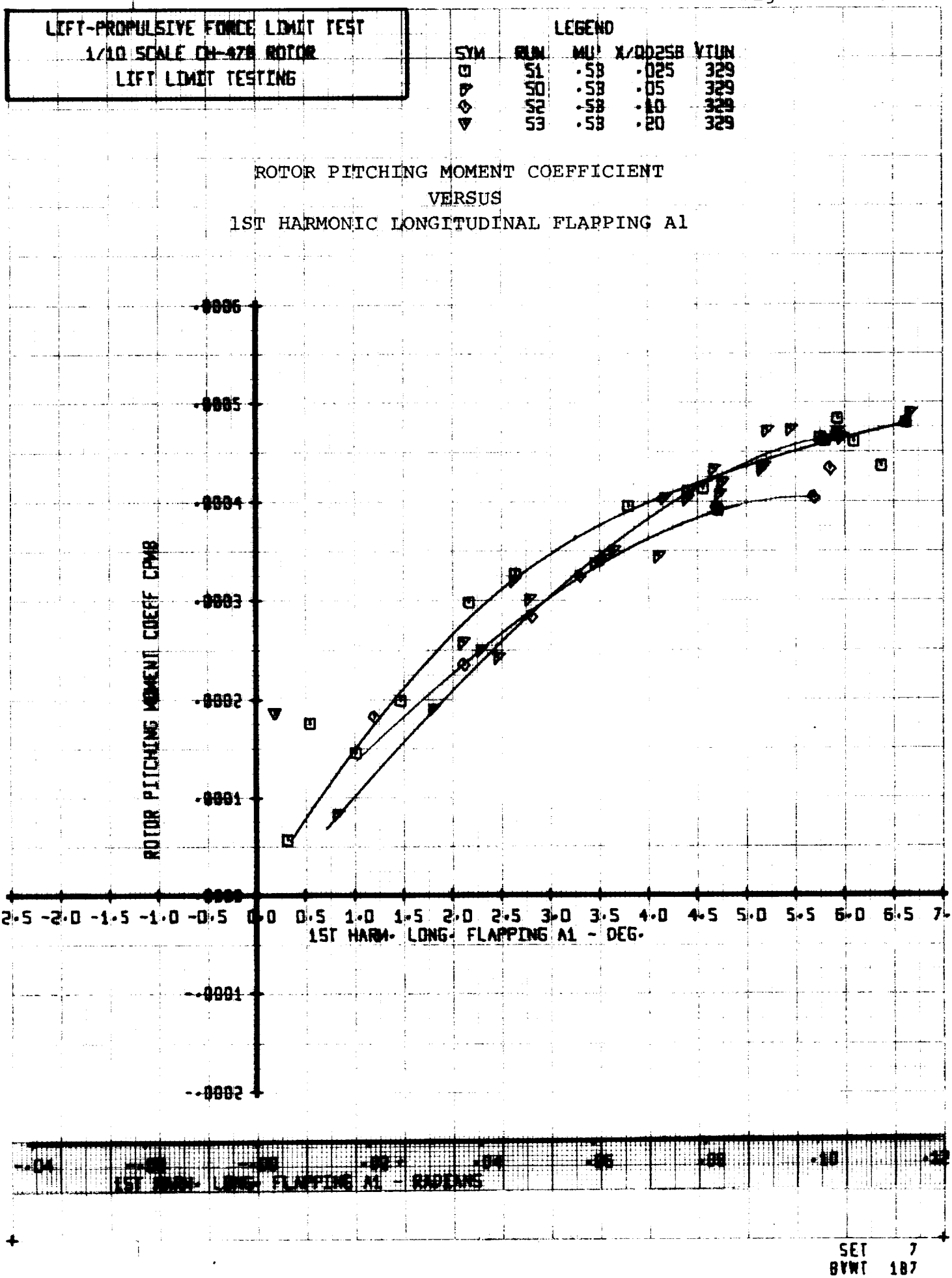

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU X/QD25B VTUN
51 .58 .025 329
50 .58 .05 329
52 .58 .10 329
53 .58 .20 329
ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1
ROTOR PITCHING MOMENT COEFF CPMB
-.0006
-.0005
-.0004
-.0003
-.0002
-.0001
.0000
-.0001
-.0002
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
1ST HARM. LONG. FLAPPING A1 - DEG.
-.04
1ST HARM. LONG. FLAPPING A1 - RADIANS
.10
.12
ET 7
WT 187
SET 7
BWT 187

Figure A-159

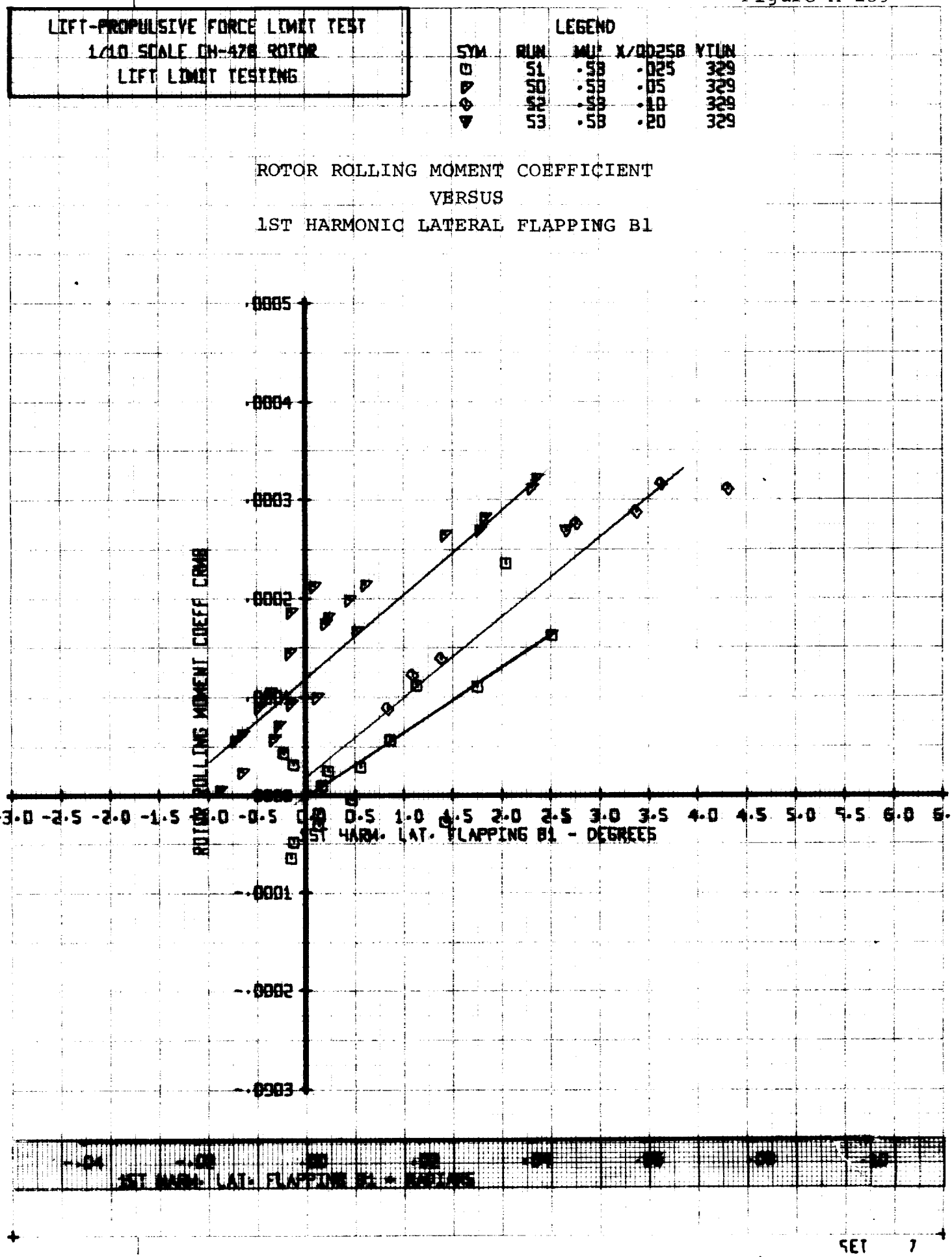
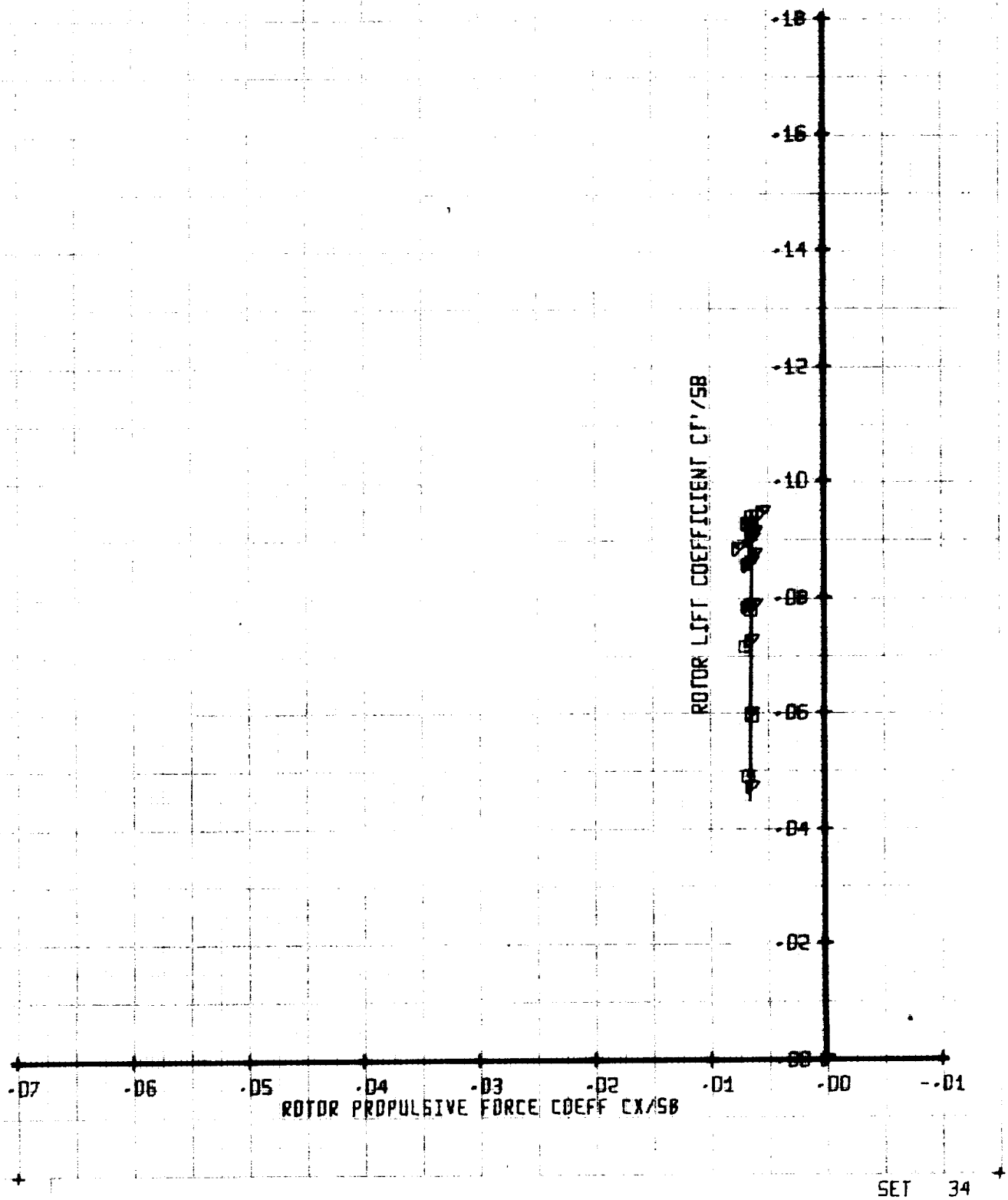

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU² X/QD25B YTUN
51 .58 .025 329
50 .58 .05 329
52 .58 .10 329
53 .58 .20 329
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR ROLLING MOMENT COEFF CRMB
.0005
.0004
.0003
.0002
.0001
-.0002
-.0003
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LAT. FLAPPING B1 - DEGREES

Figure A-160

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD2SB	VTUN
⊡	227	.45	.05	279
⊡	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 34
WT 193

SET 34
BVWT 193

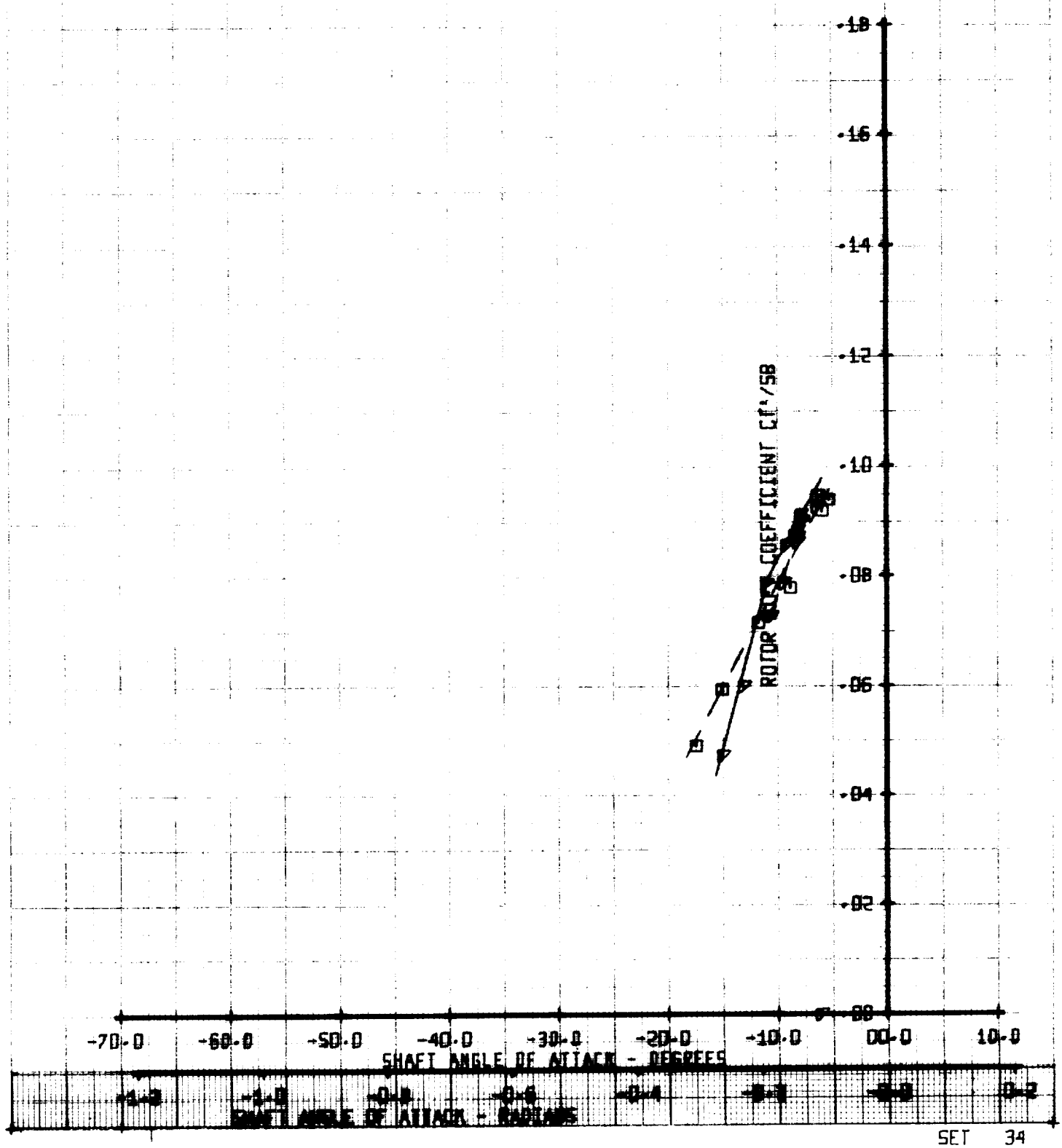
Figure A-161

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 34
WT 193

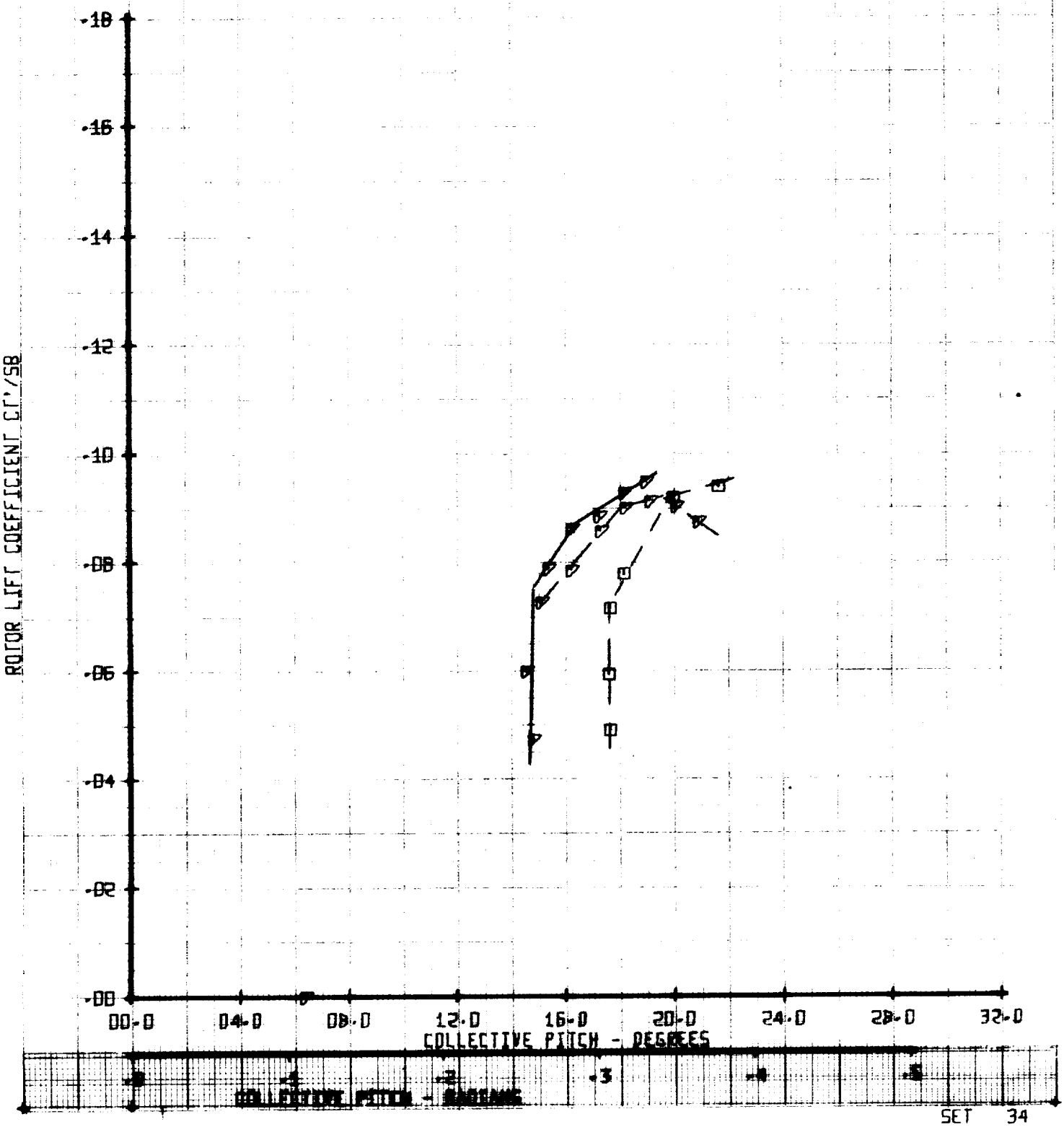
SET 34
BVWT 193

Figure A-162

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD25B	VTUN
⊡	227	.45	.05	279
⊡	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



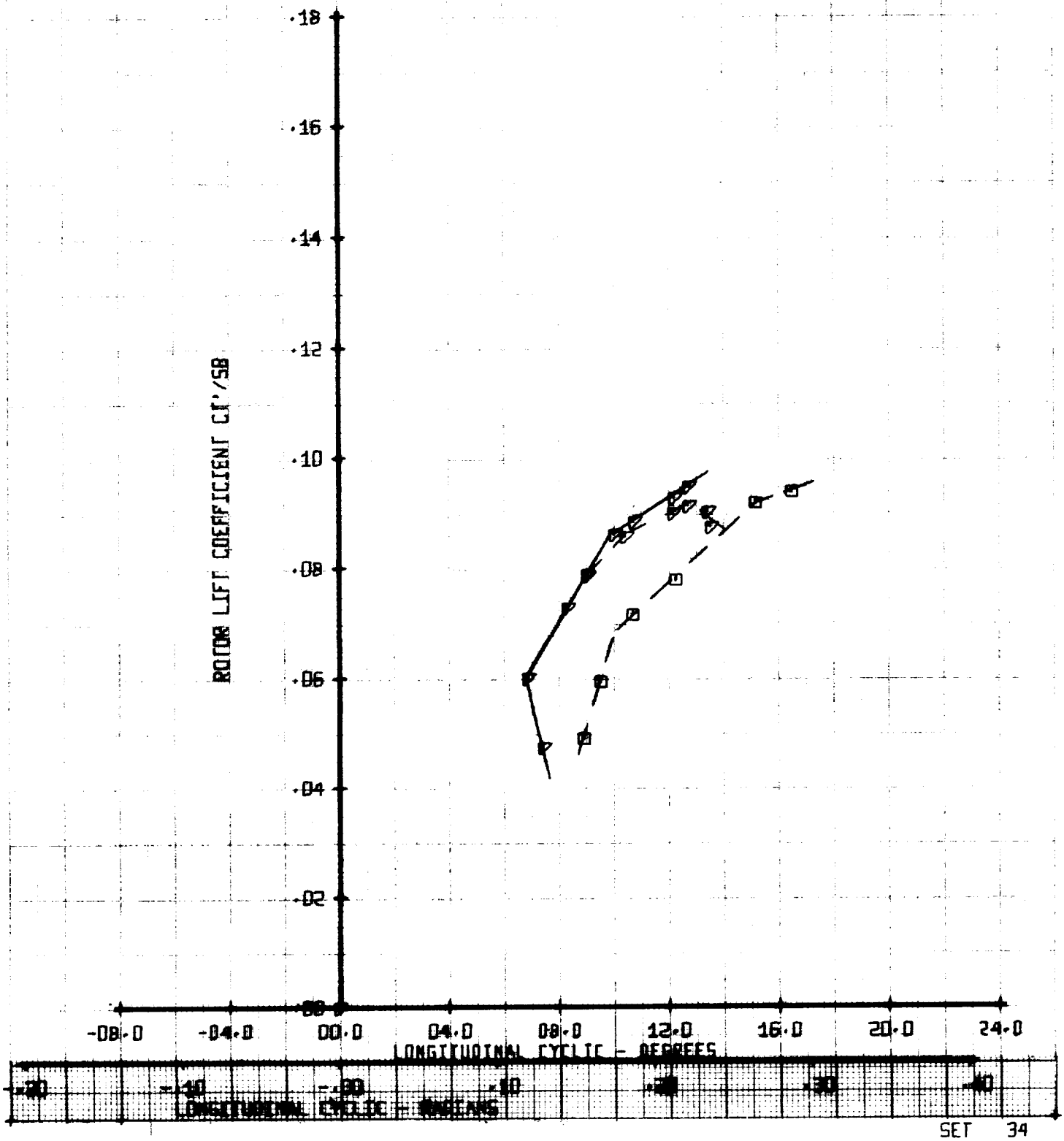
ET 34
WT · 193

SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 34
WT 193

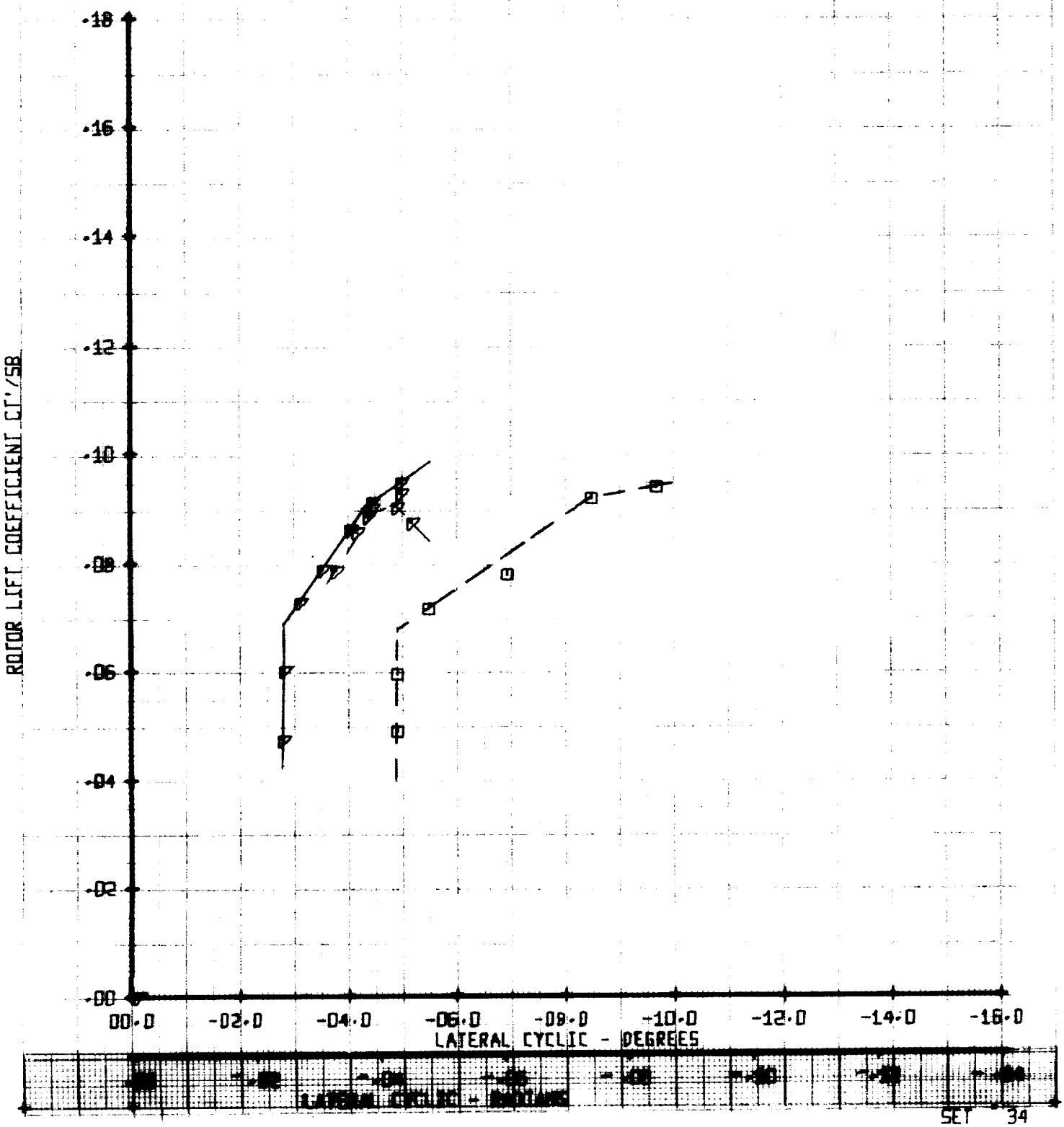
SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	227	.45	.05	279
◸	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 34
WT 193

SET 34
BVWT 193

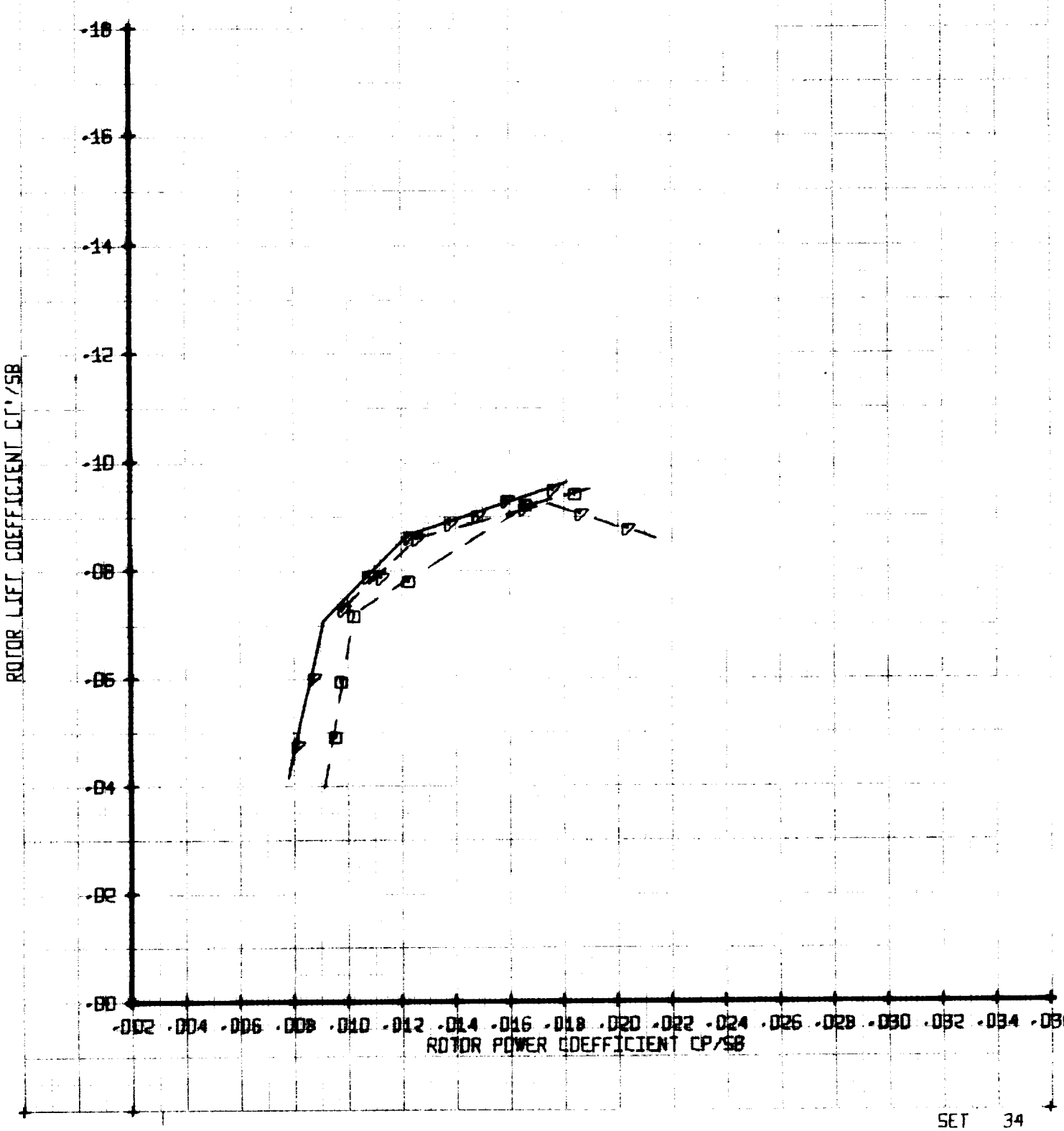
Figure A-165

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 34
WT 193

SET 34
BVWT 193

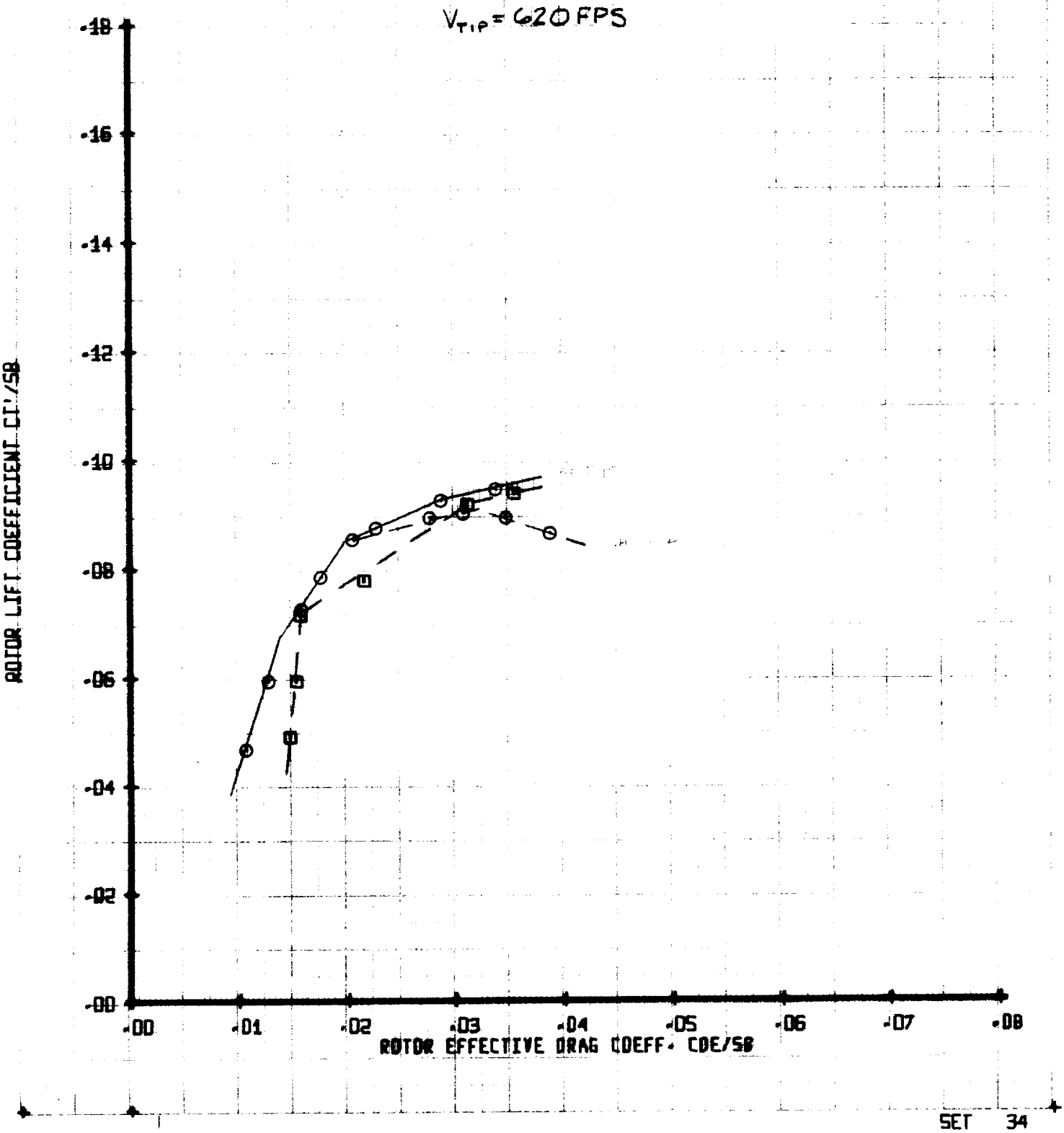
Figure A-165A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QDESB	VTUN
⊡	227	.45	.05	279
⊙	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

V_{TIP} = 620 FPS



SET 34
WT 193

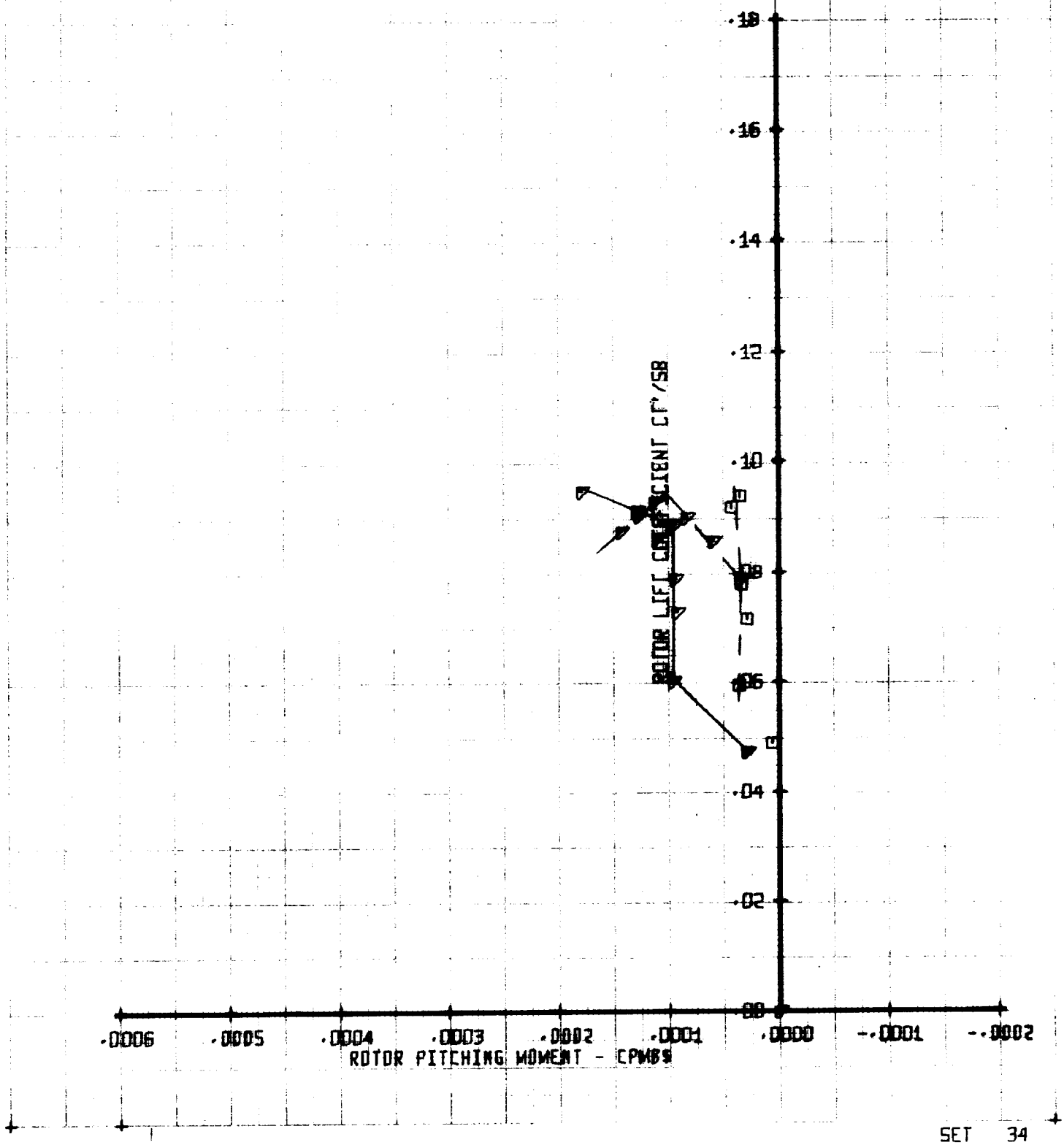
SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SB	YTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 34
WT 193

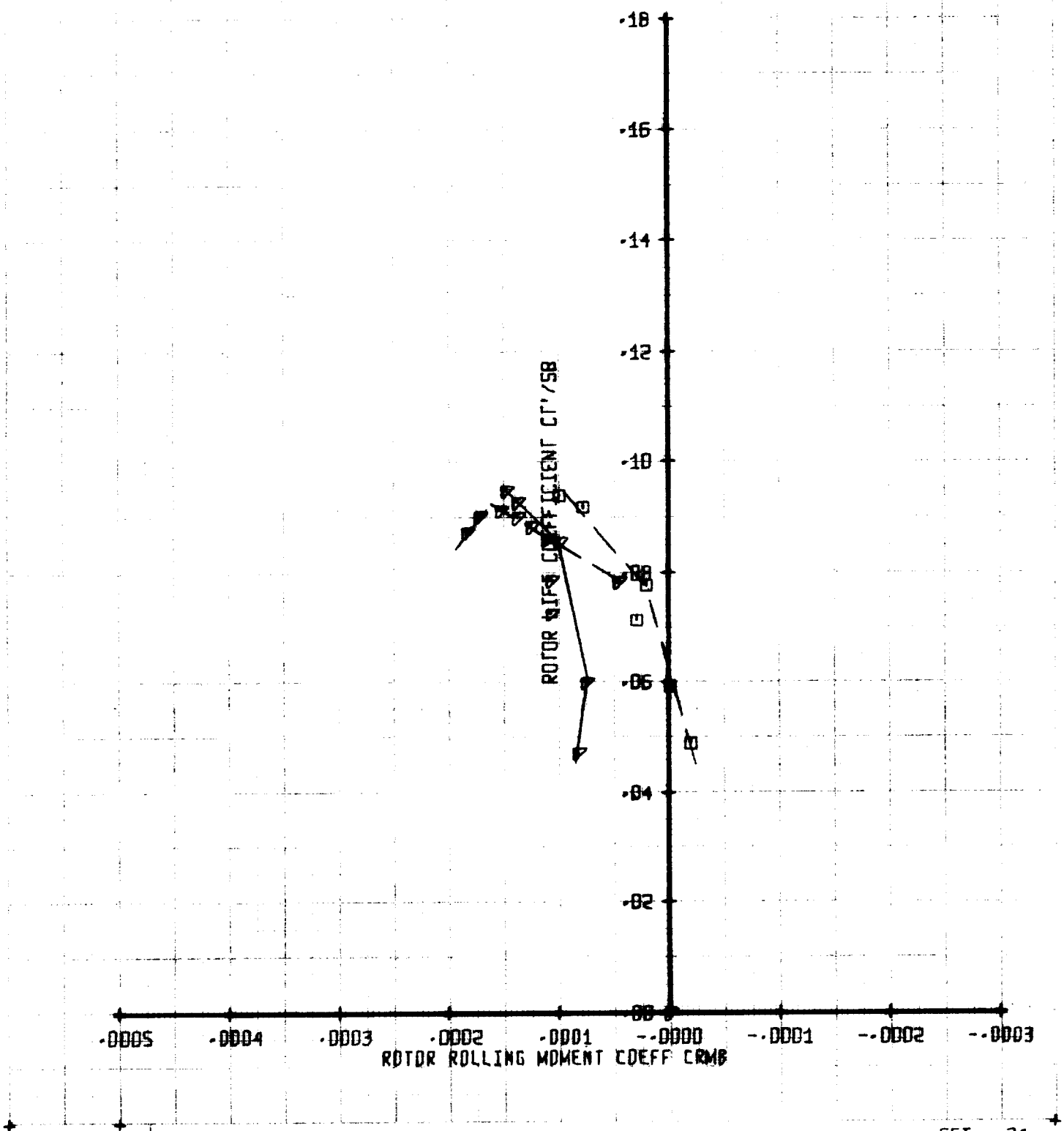
SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 34
WT 193

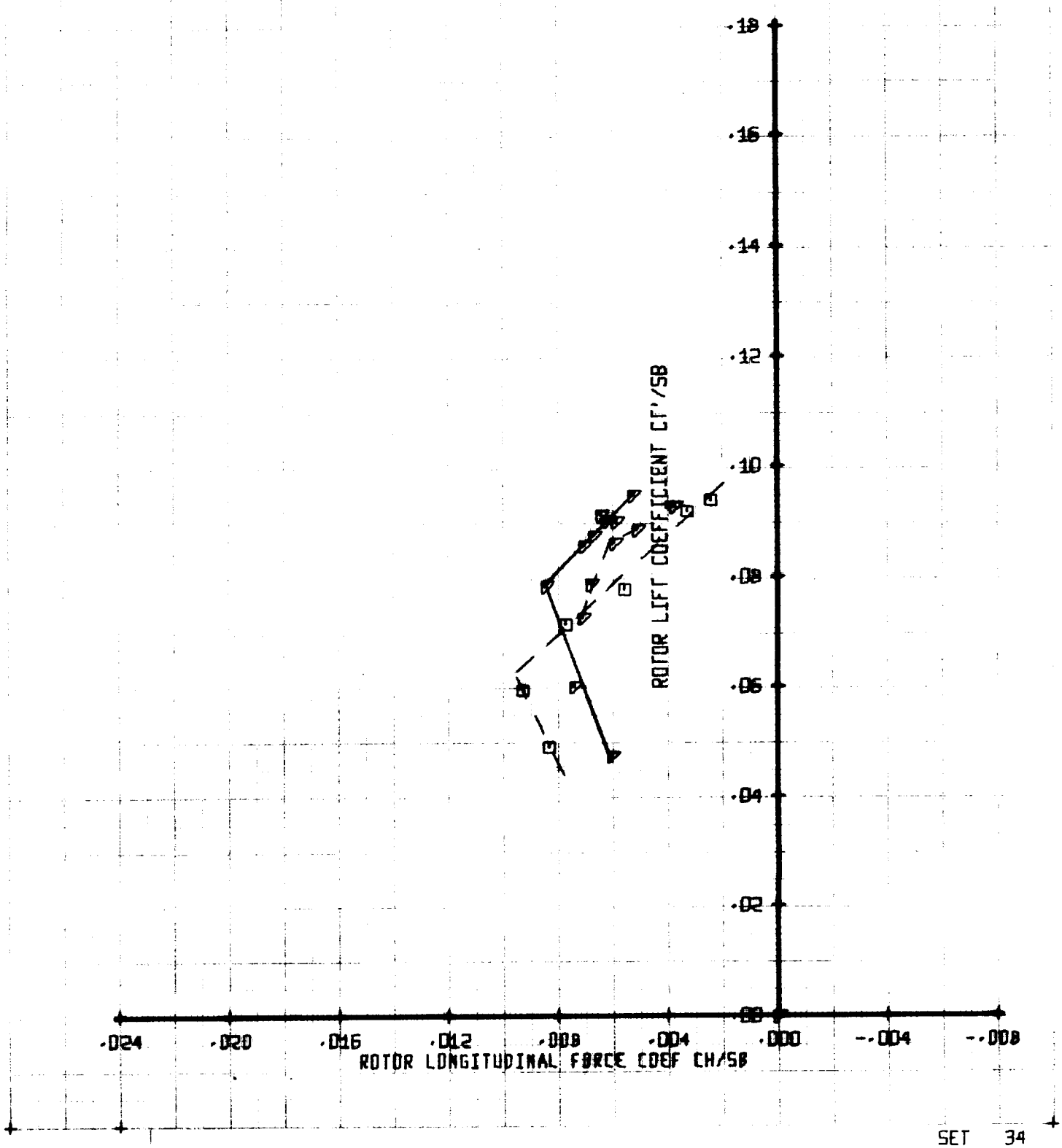
SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



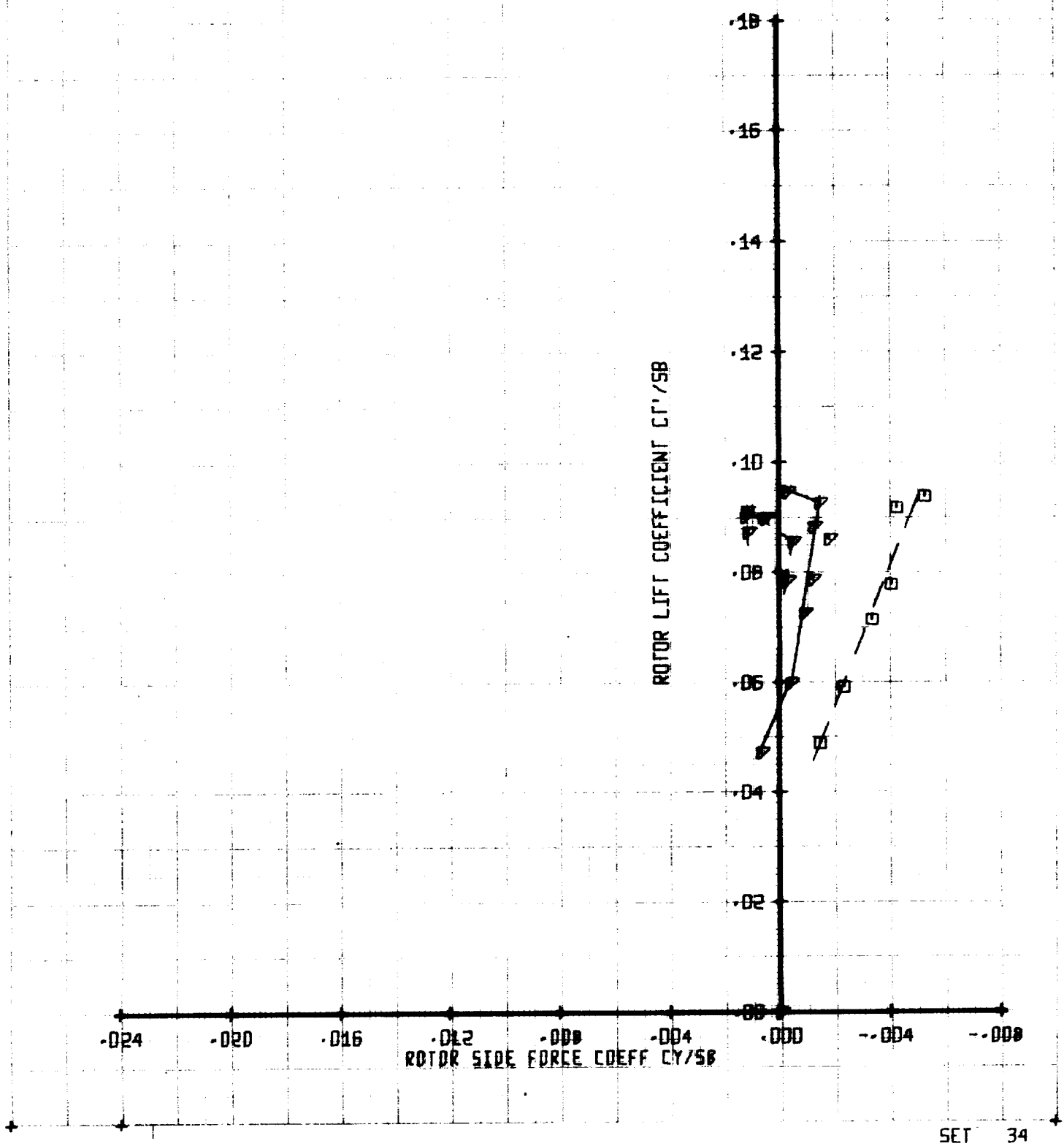
SET 34
RUN 193

SET 34
RUN 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QQ2SB	VTUN
☐	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 34
WT 193

SET 34
BVWT 193

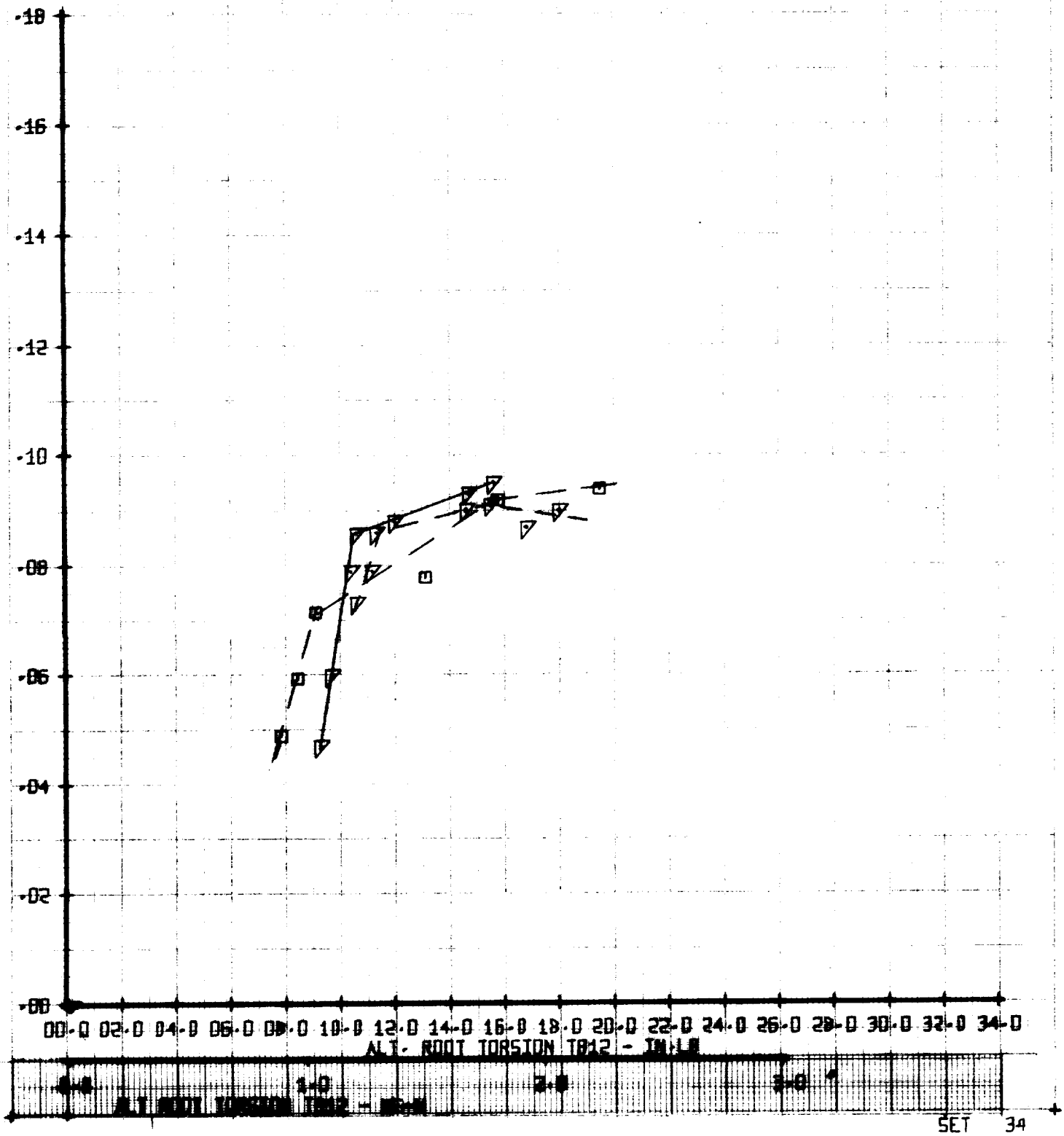
Figure A-169A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 34
WT 193

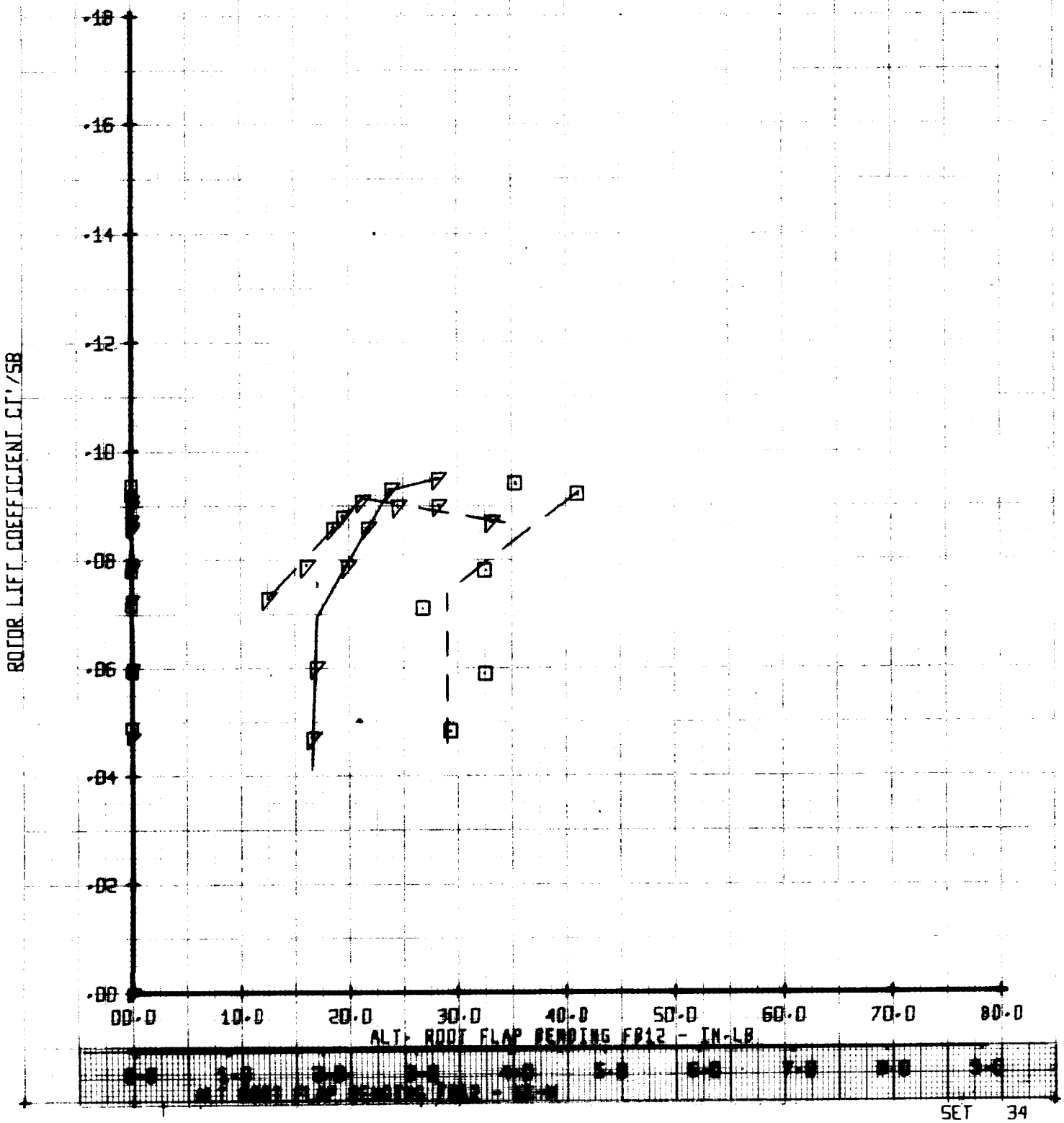
SET 34
BVWT 193

Figure A-170

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
⊡	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 34
WT 193

SET 34
BVWT 193

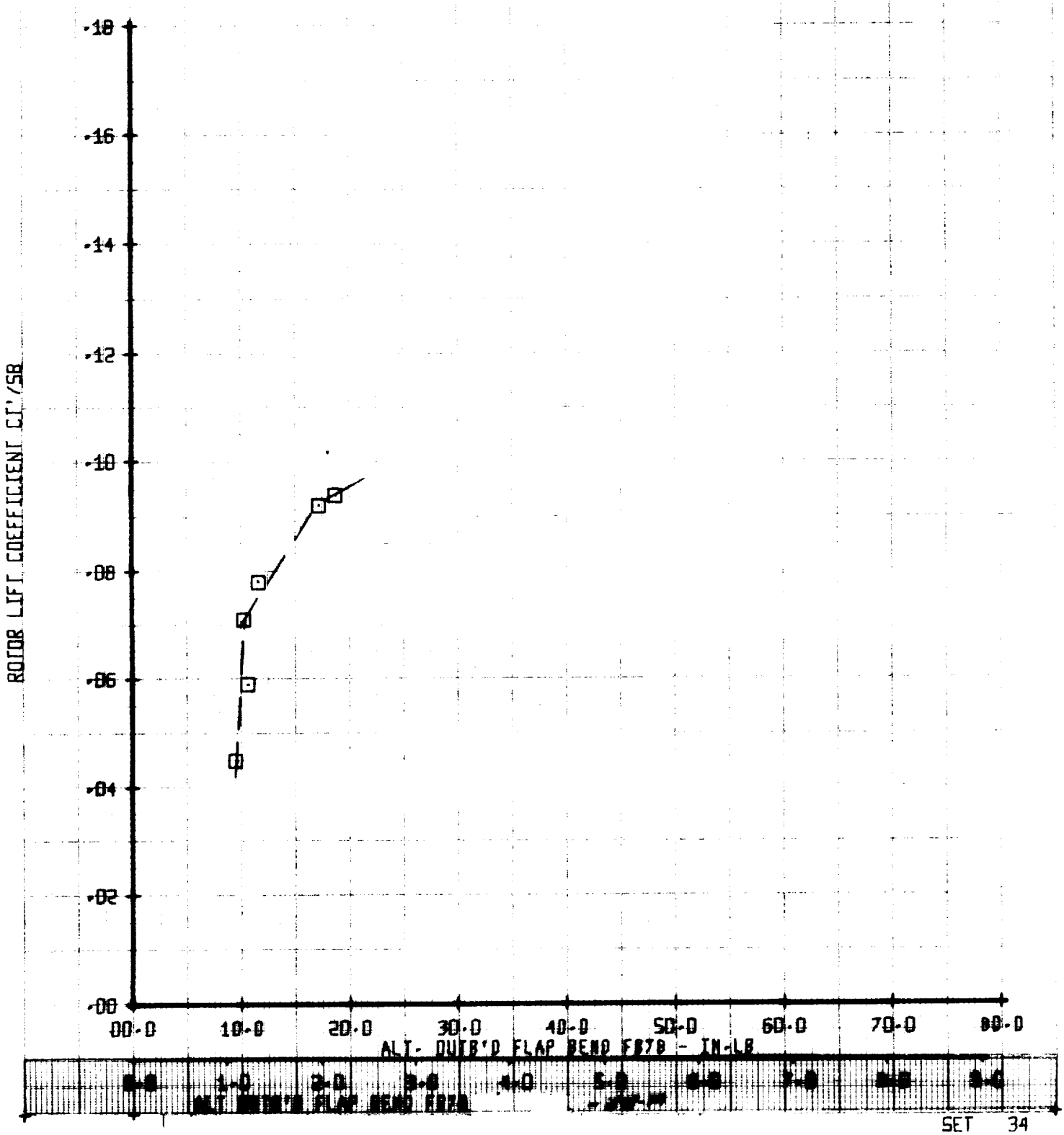
Figure A-171

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



ET 34
WT 193

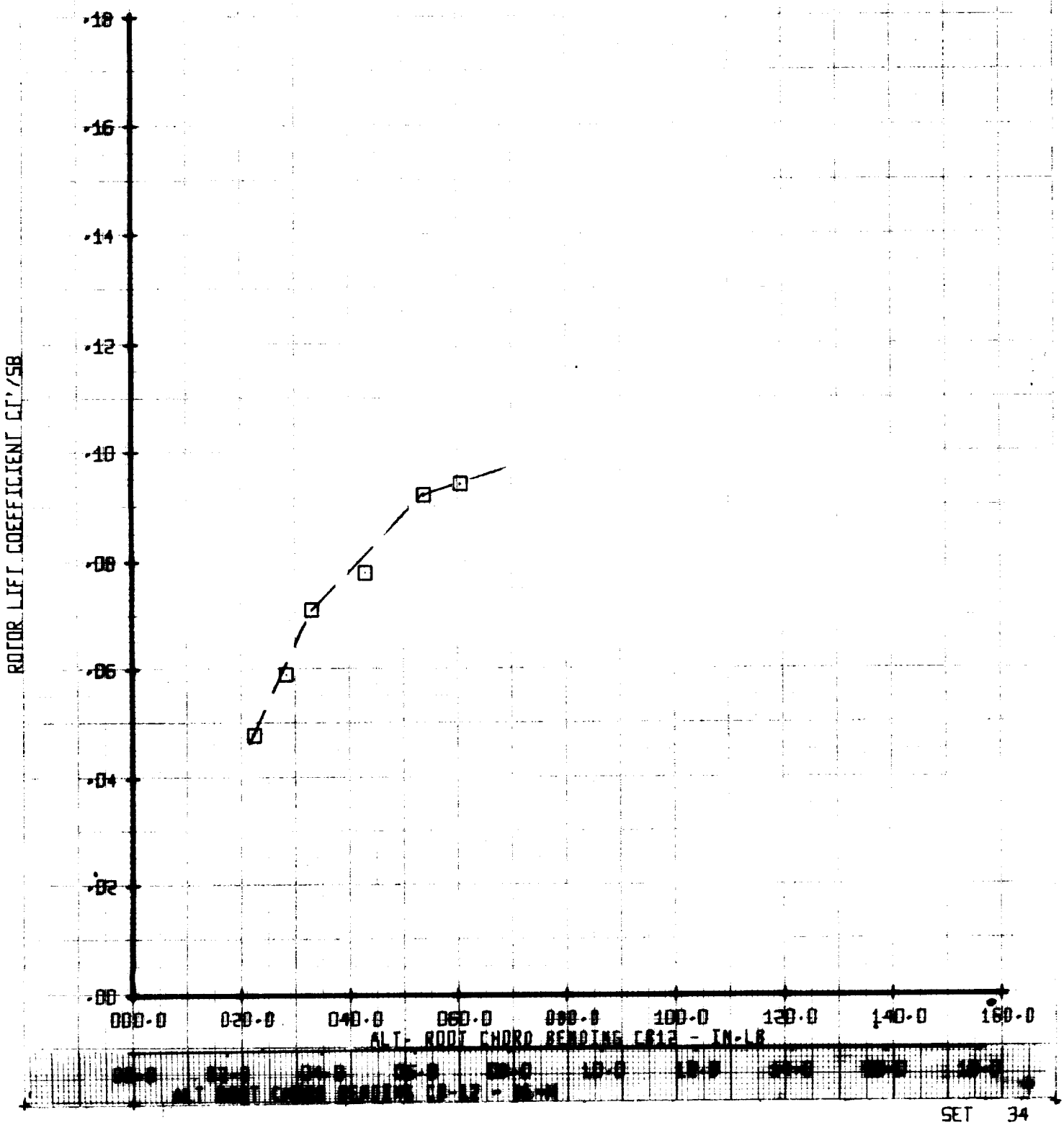
SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
☐	227	.45	.05	279
▽	36	.45	.05	279

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12

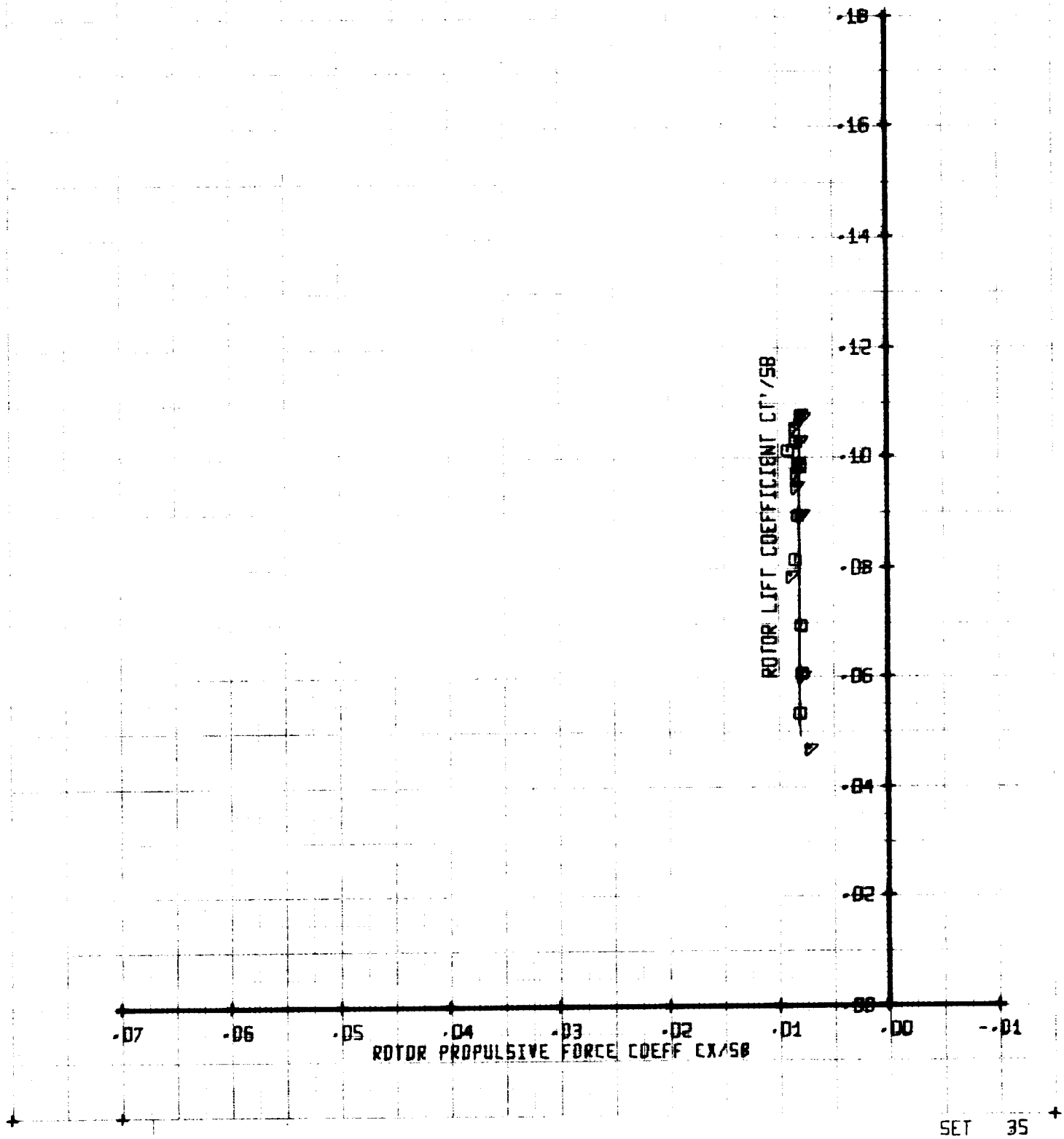


SET 34
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
⊡	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 35
WT 193

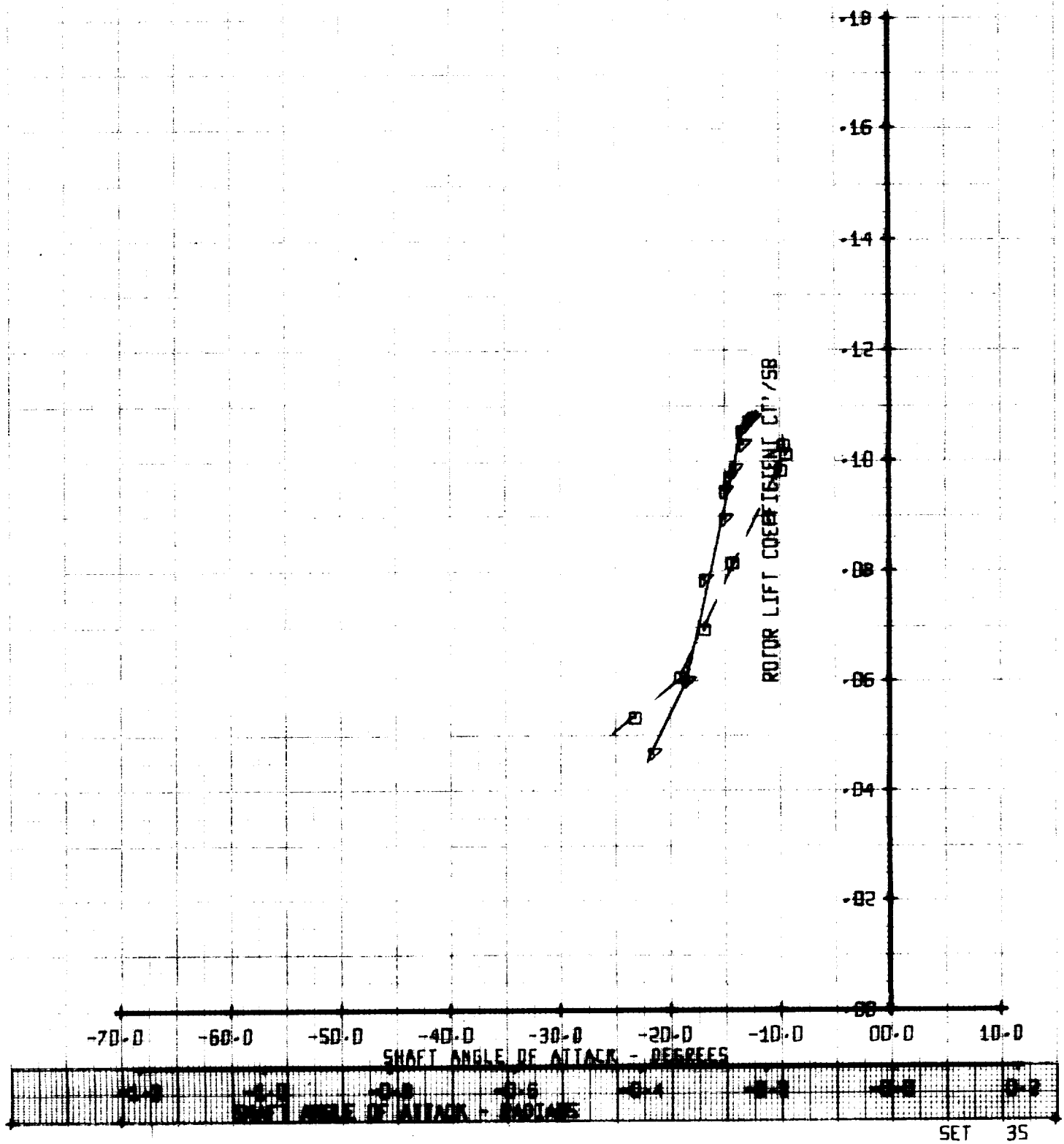
SET 35
BVWT 193

Figure A-174

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD25B	VTUN
⊡	225	.50	.05	310
⊡	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 35
WT 193

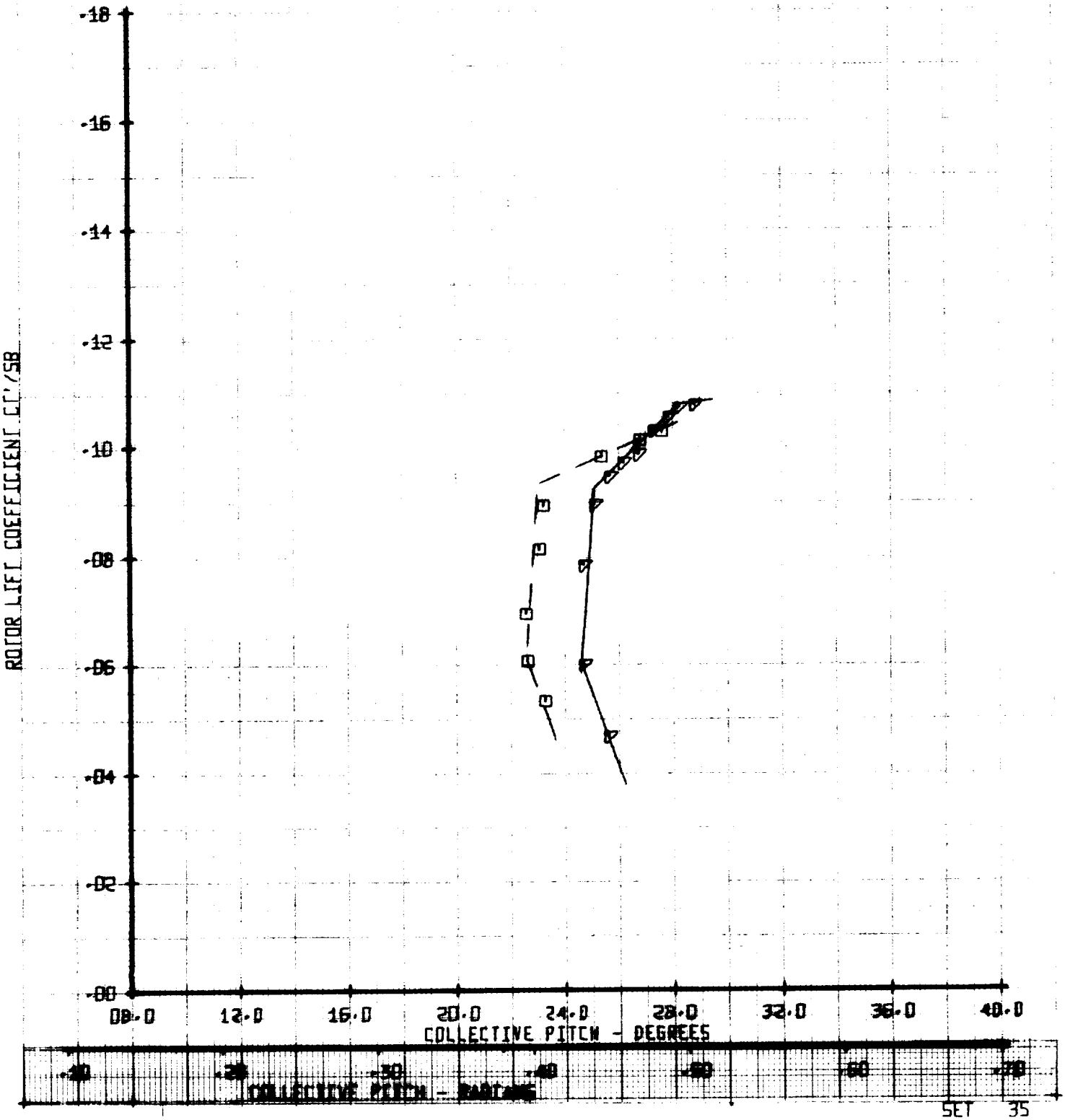
SET 35
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



SET 35
BVWT 193

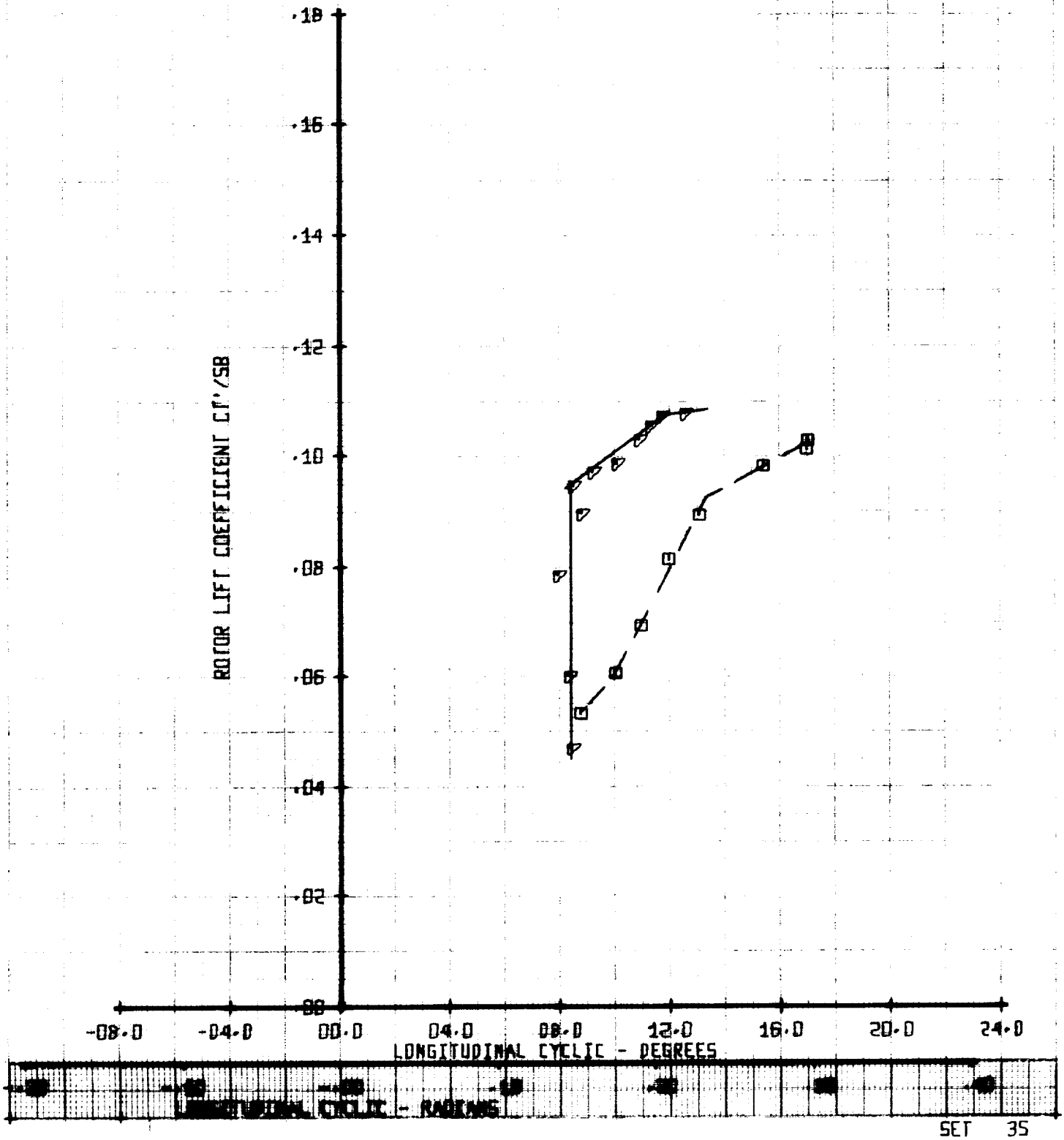
Figure A-176

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



SET 35
BVWT 193

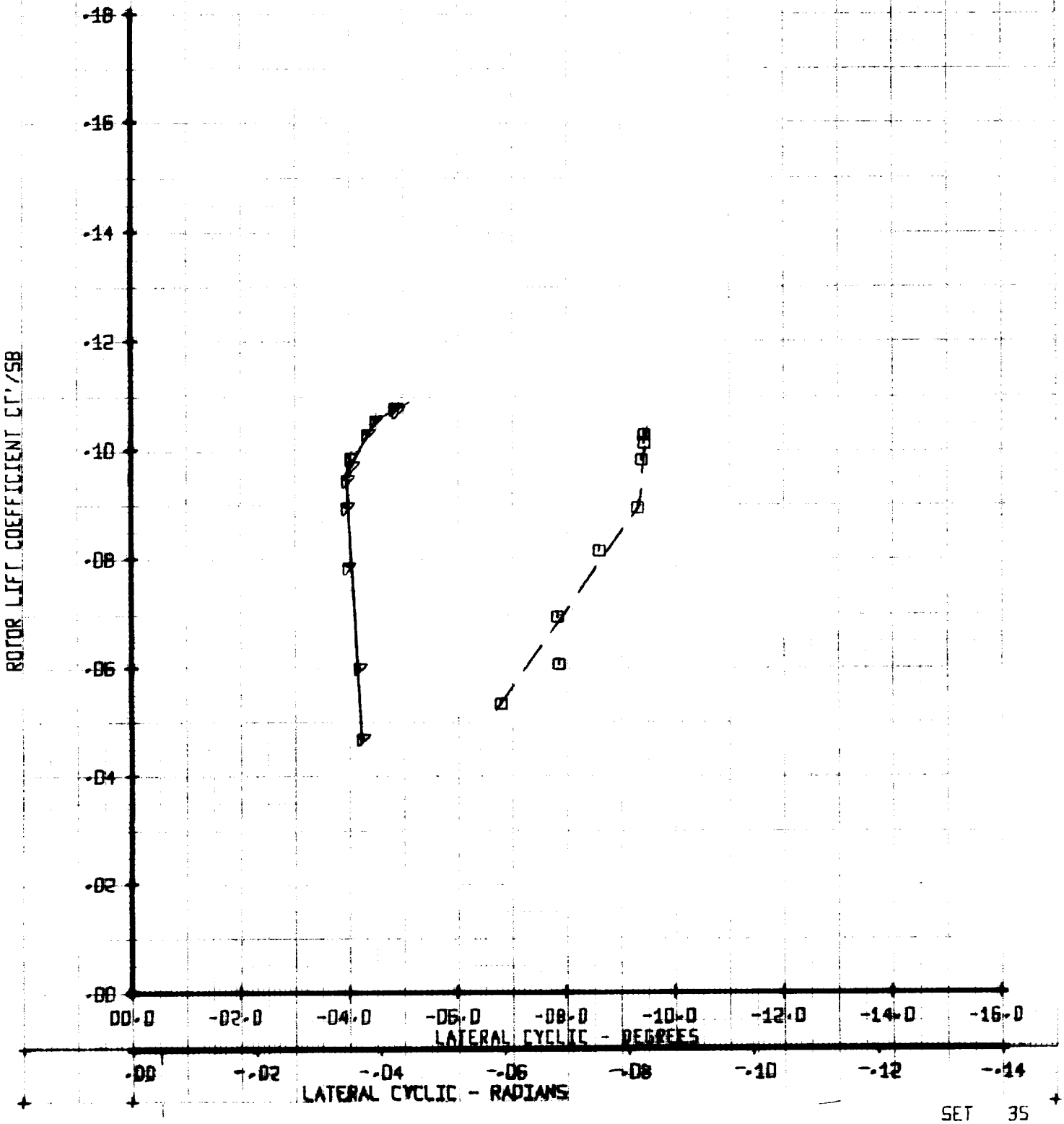
Figure A-177

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 35
WT 193

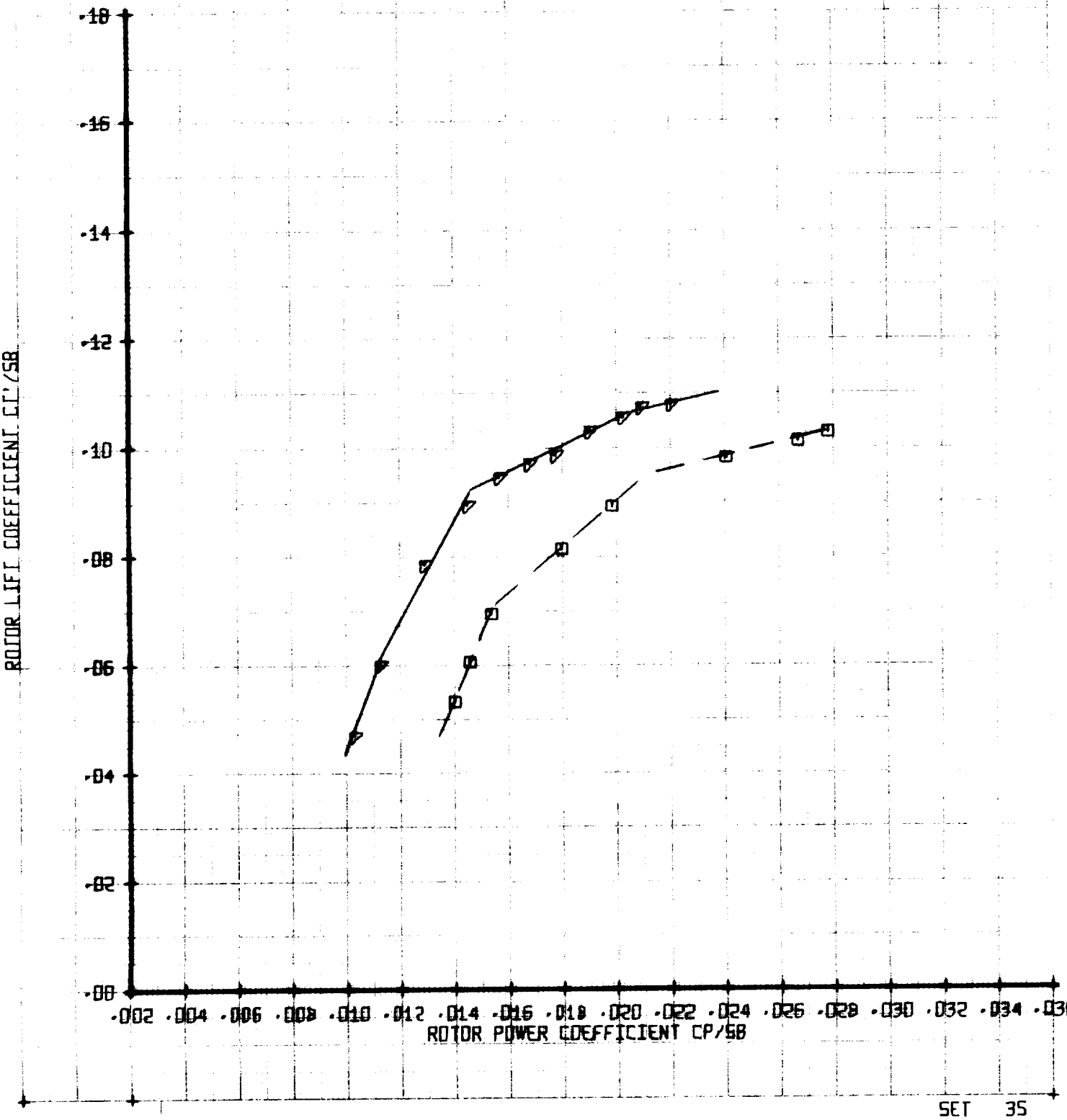
SET 35
BVWT 193

Figure A-178

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	225	.50	.05	310
⊡	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 35
WT 193

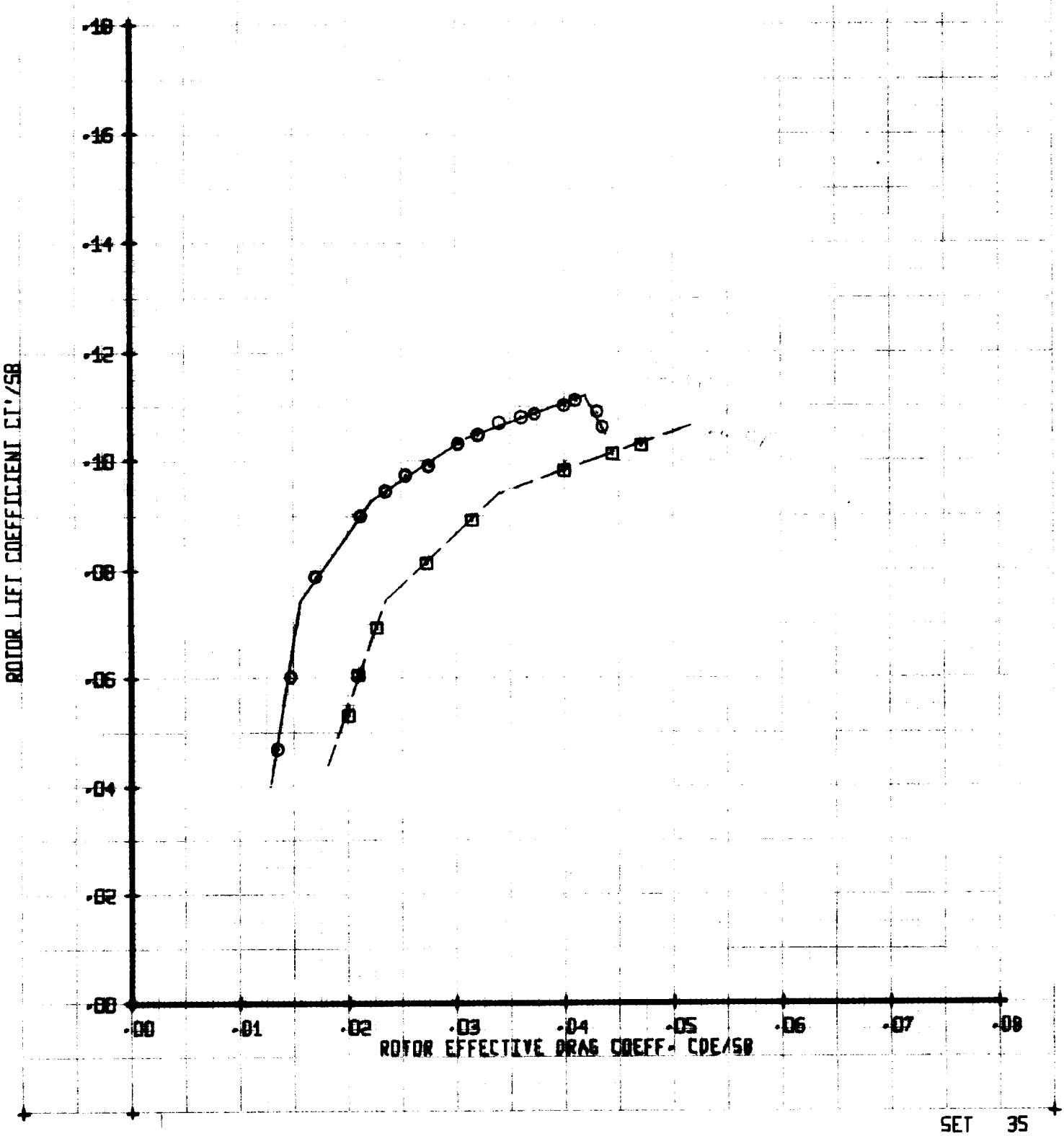
SET 35
BVWT 193

Figure A-178A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/D025B	YTUN
⊡	225	.50	.05	310
⊙	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT



ET 35
WT 193

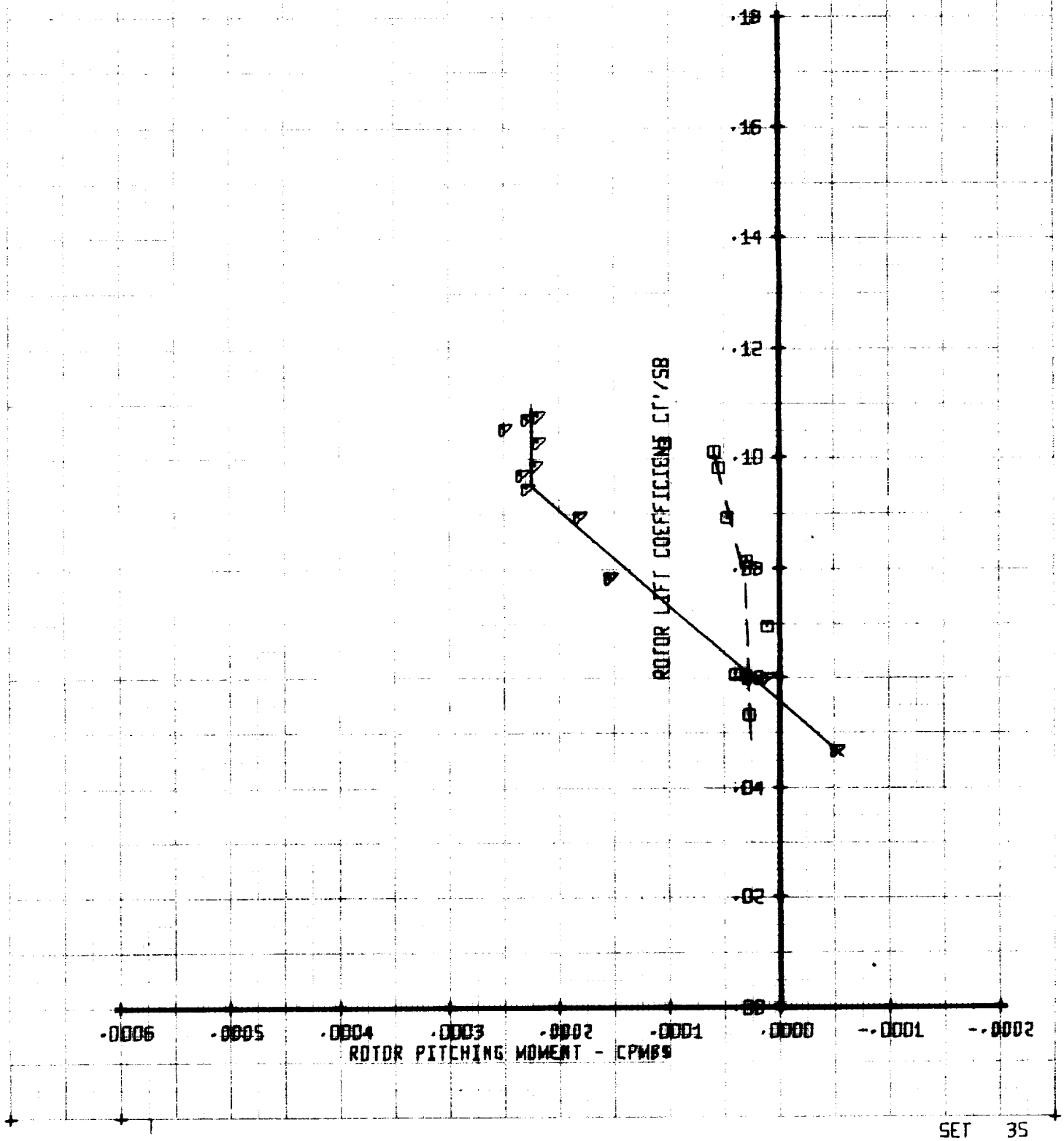
SET 35
BVWT 193

Figure A-179

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
⊡	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 35
WT 193

SET 35
BVWT 193

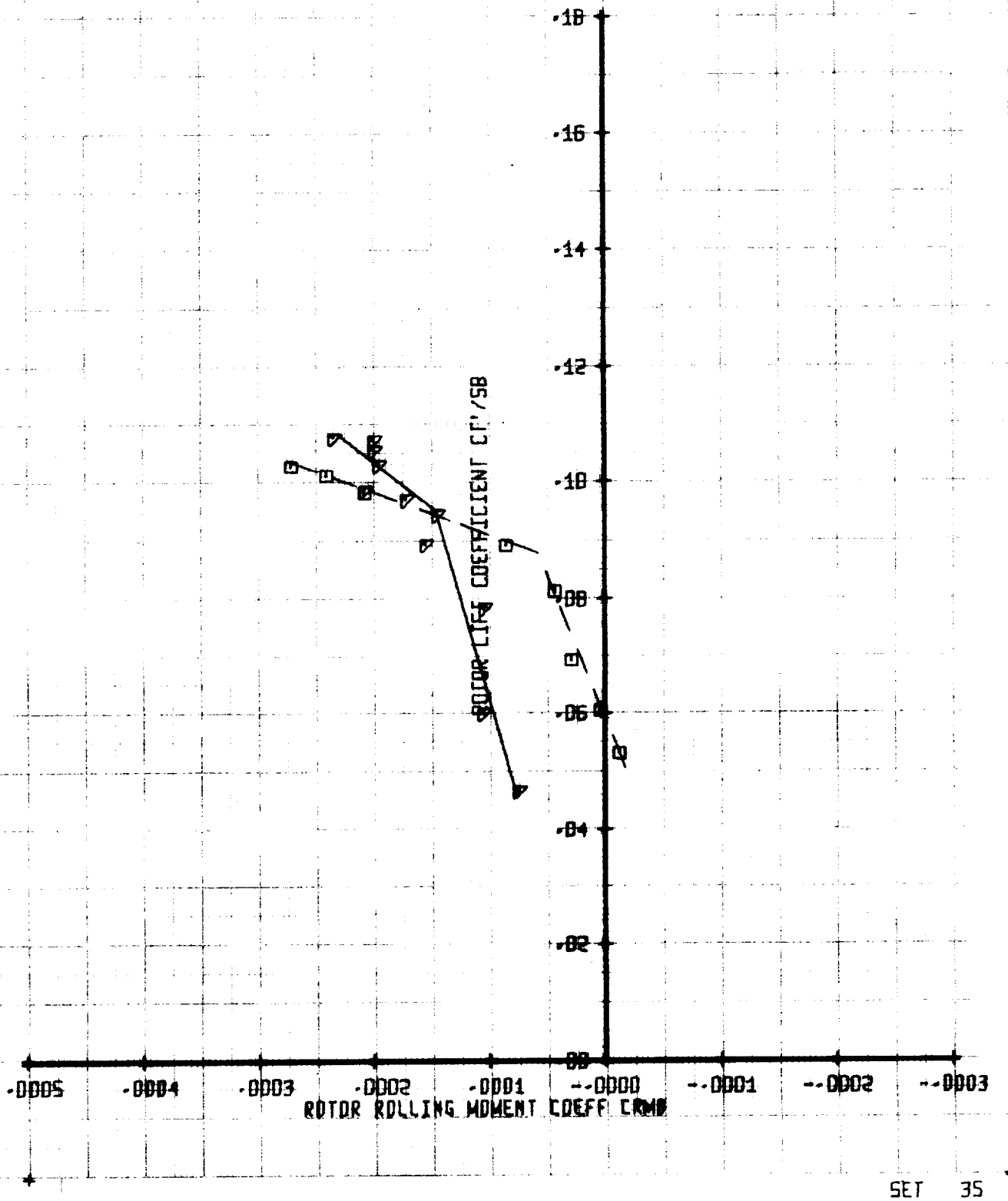
Figure A-180

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	225	.50	.05	310
▷	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 35
WT 193

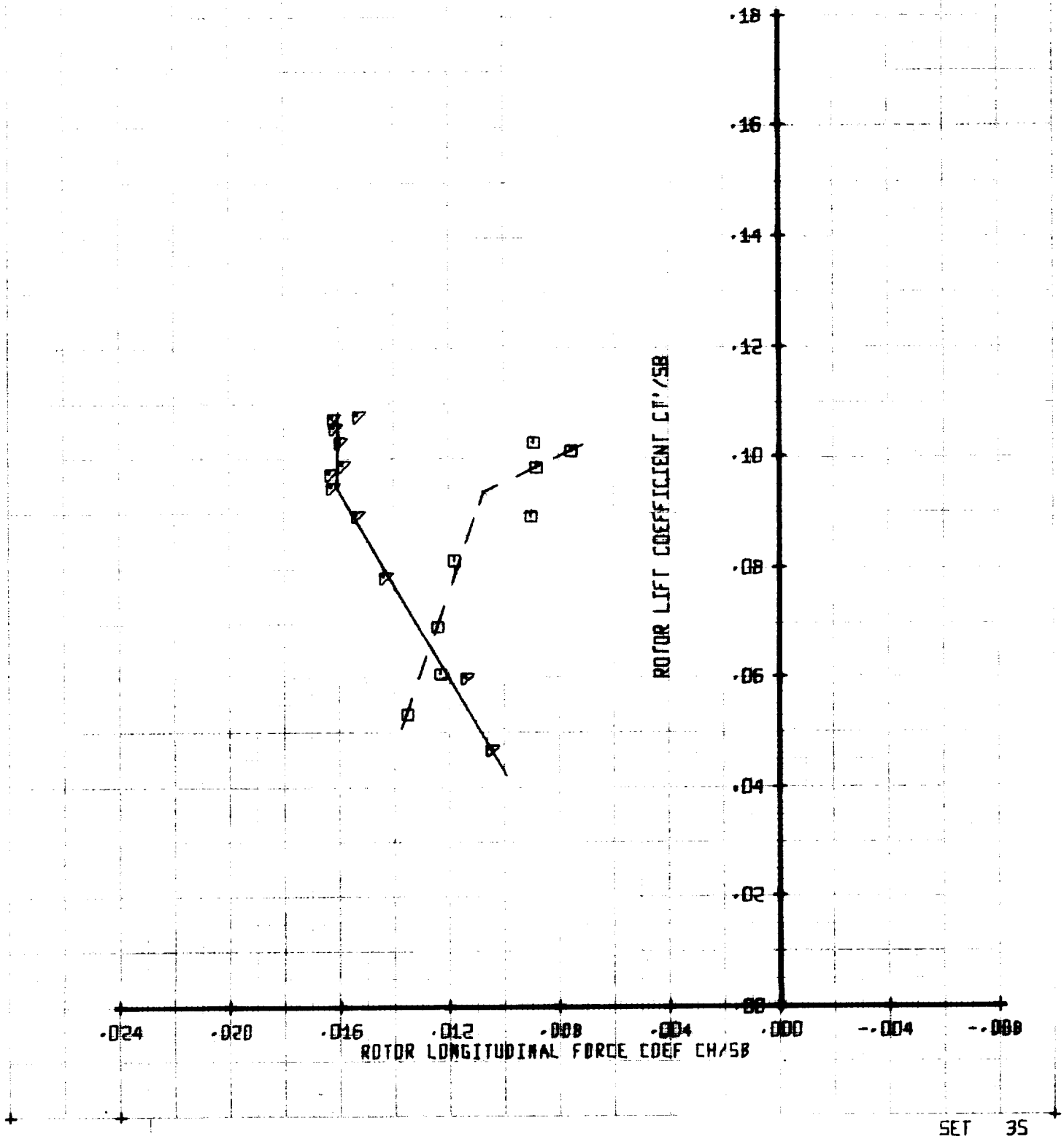
SET 35
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 35
WT 193

SET 35
BVWT 193

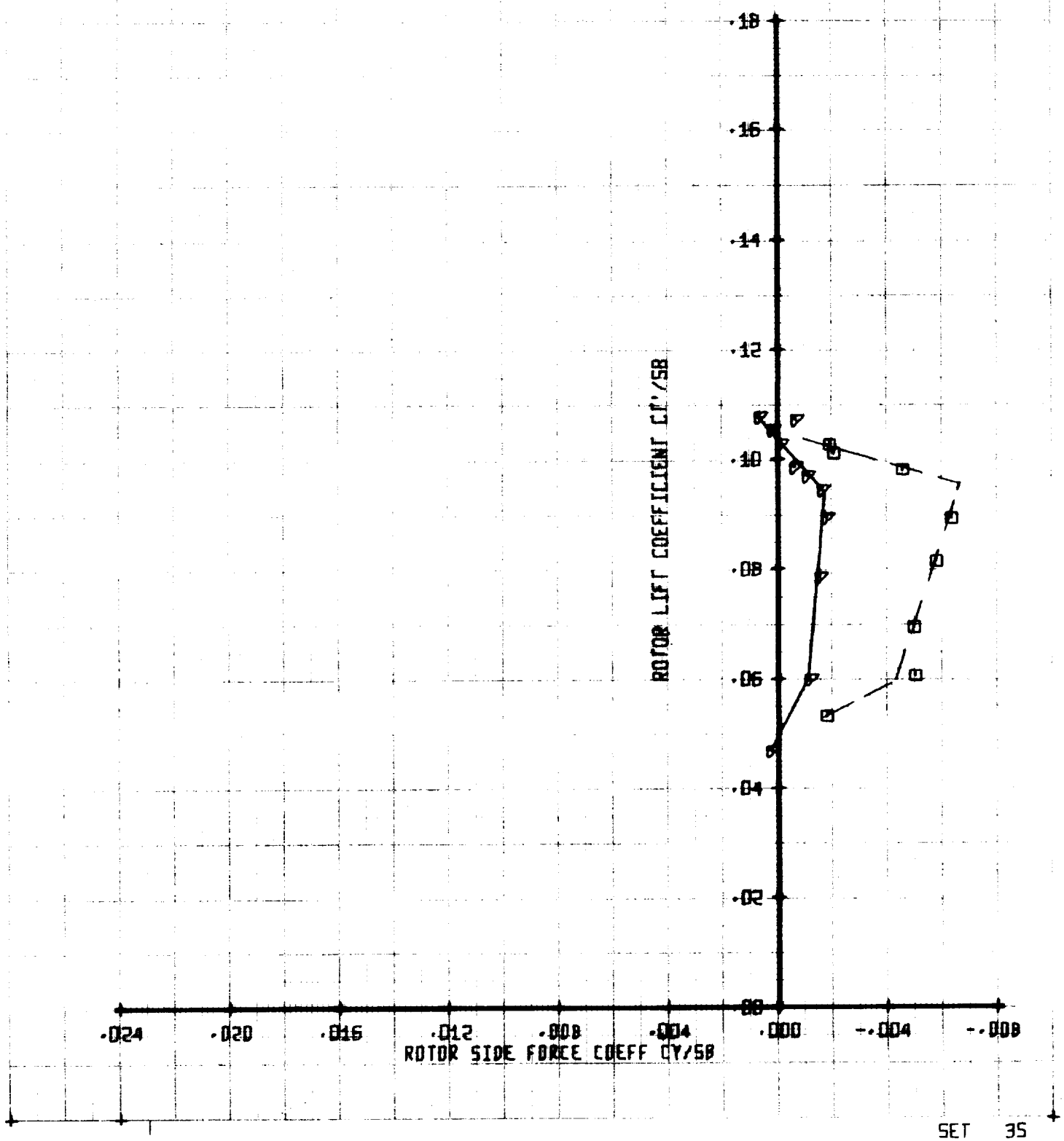
Figure A-182

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



SET 35
WT 193

SET 35
BVWT 193

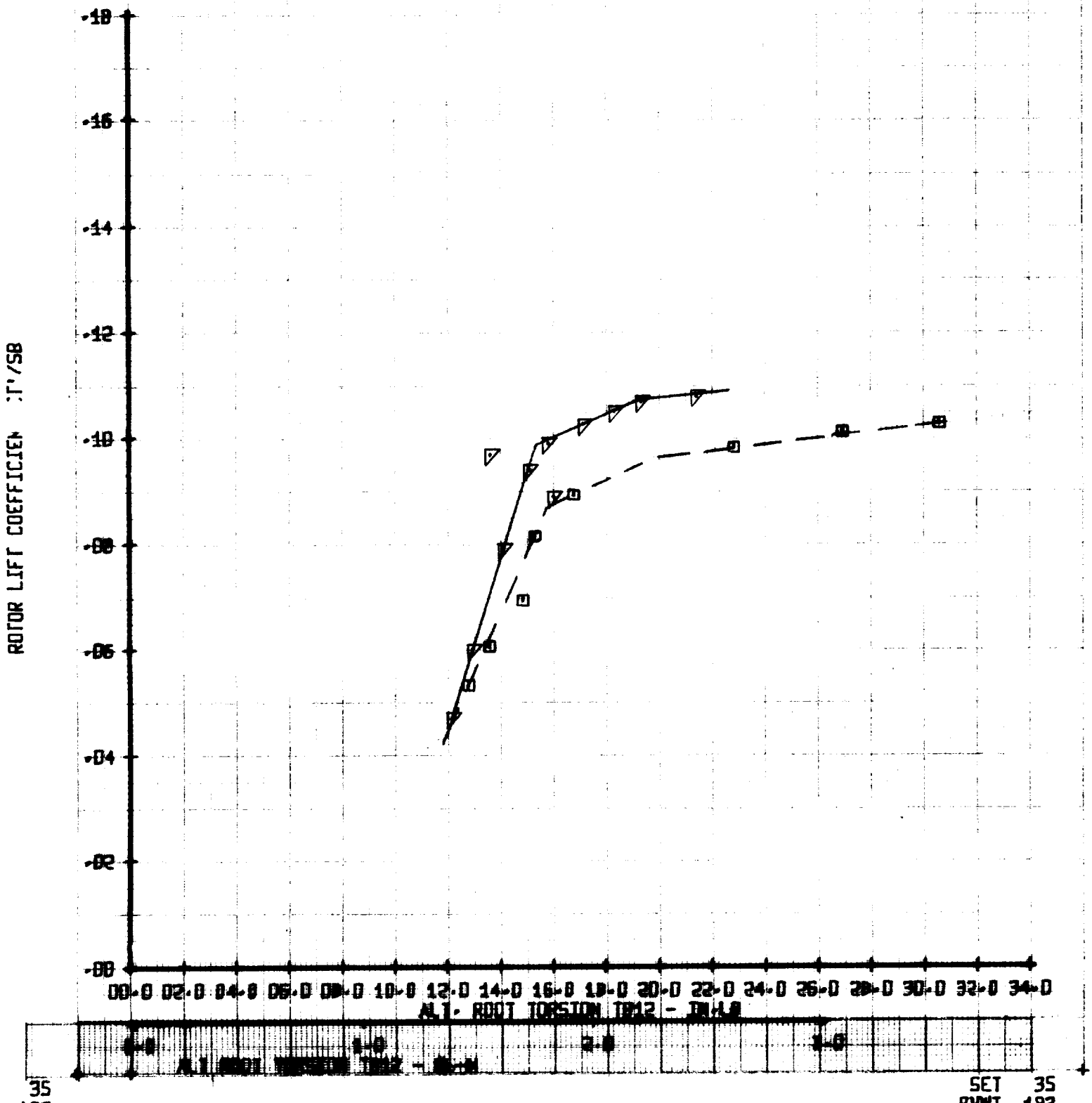
Figure A-183

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
◻	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 35
WT 193

SET 35
BVWT 193

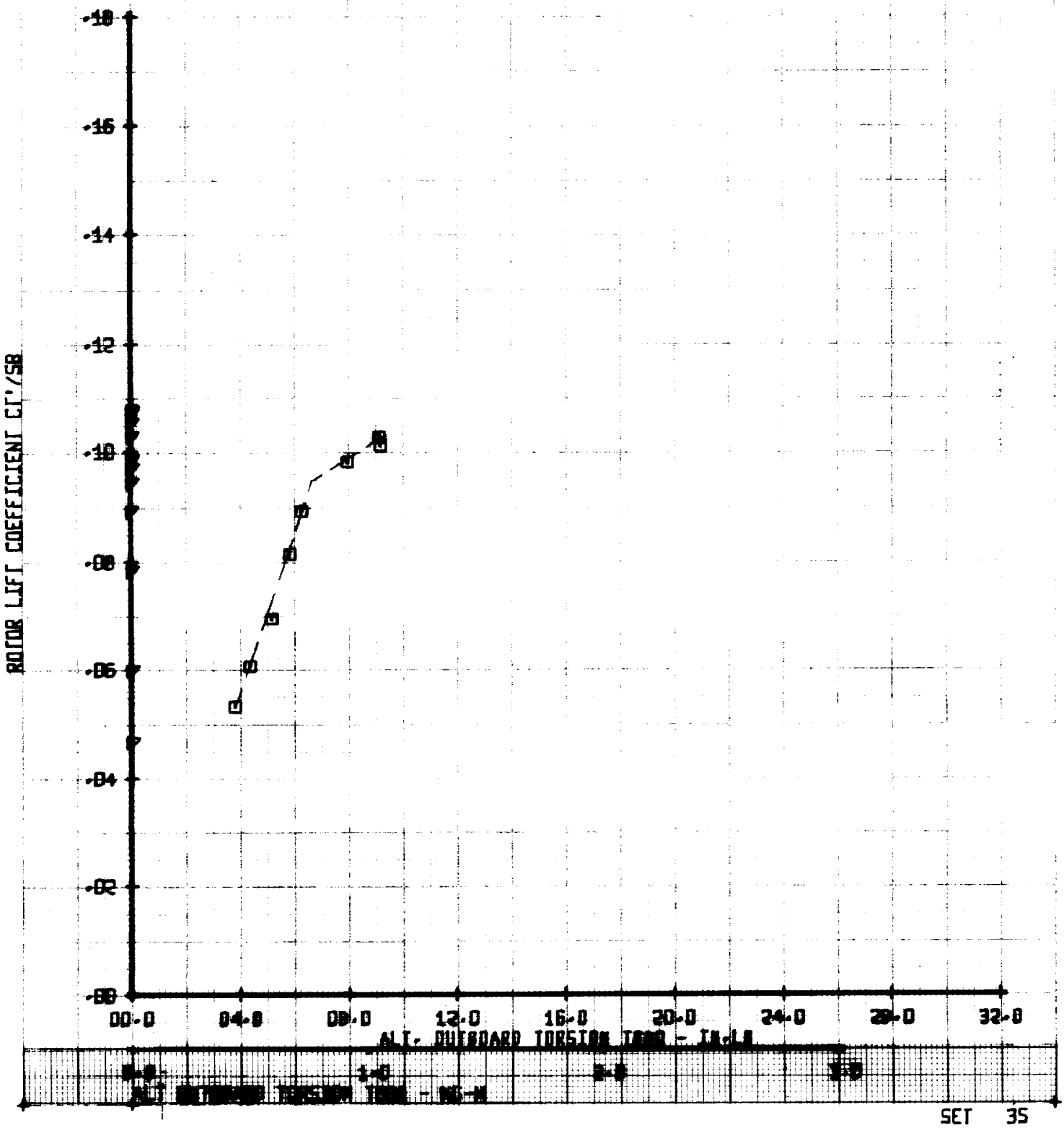
Figure A-184

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/RD25B	YTUN
⊡	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 35
WT 193

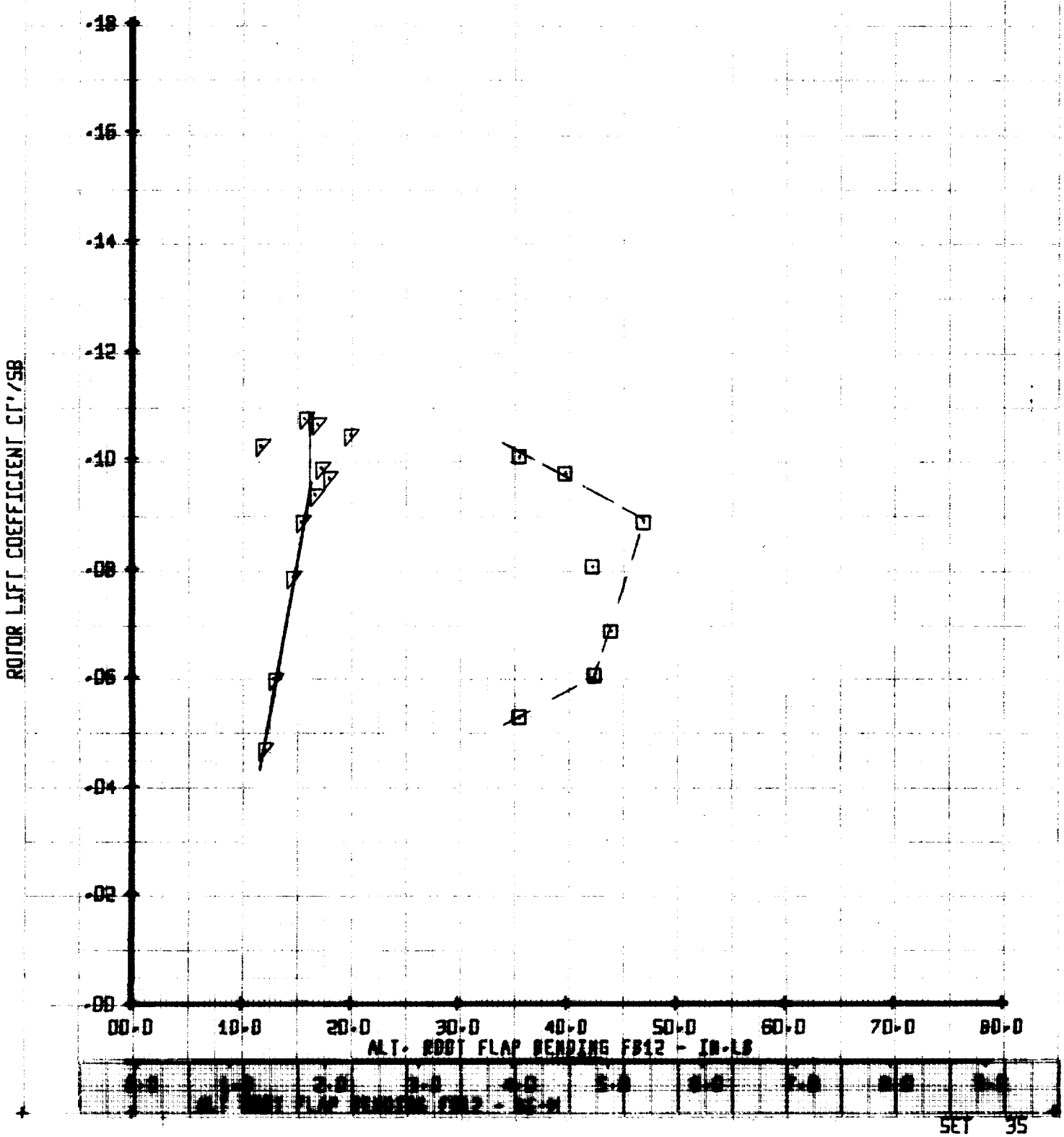
SET 35
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QR2SB	VTUN
⊡	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 35
WT 193

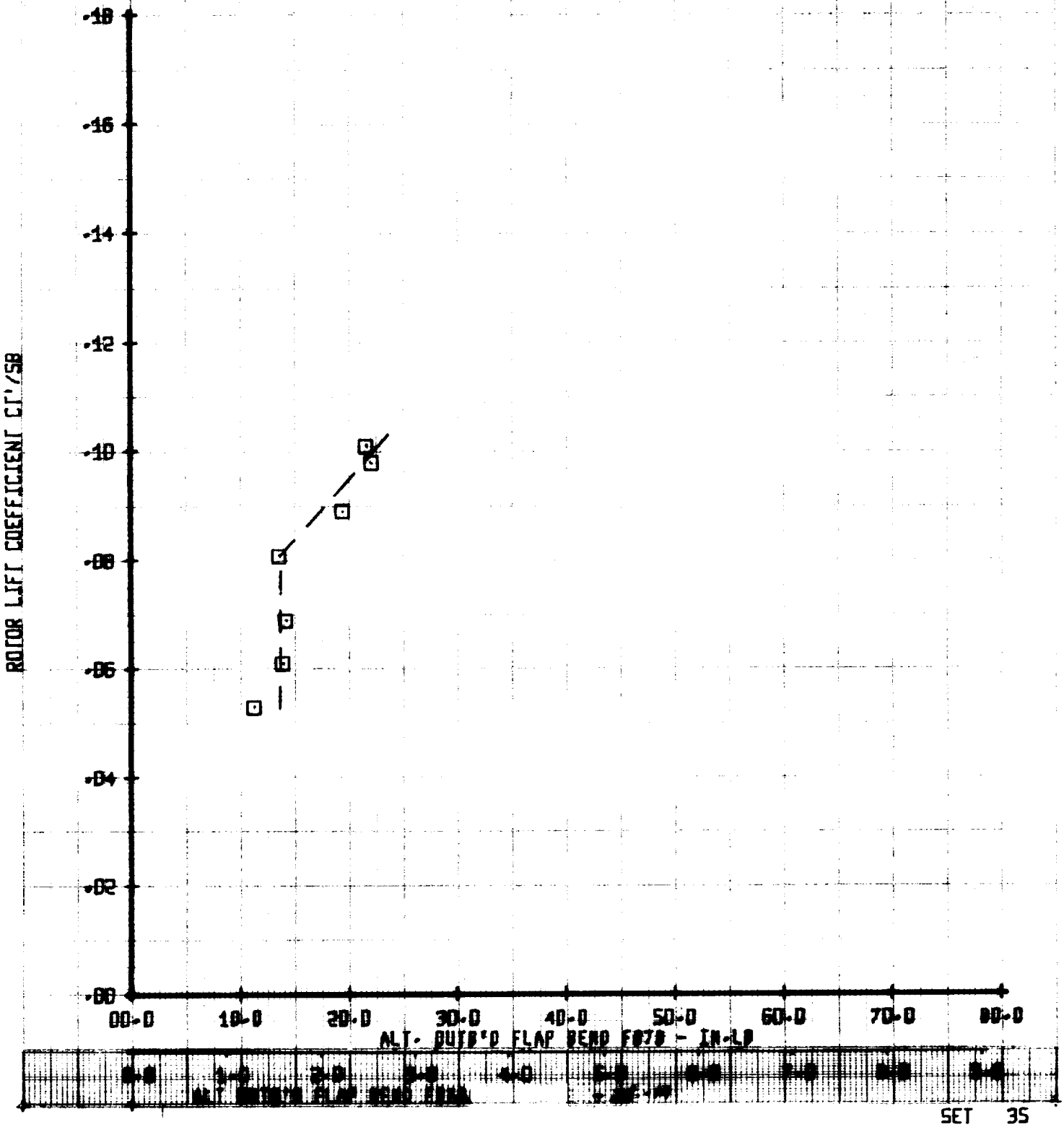
SET 35
BVWT 193

Figure A-186

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
⊡	225	.50	.05	310
▽	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



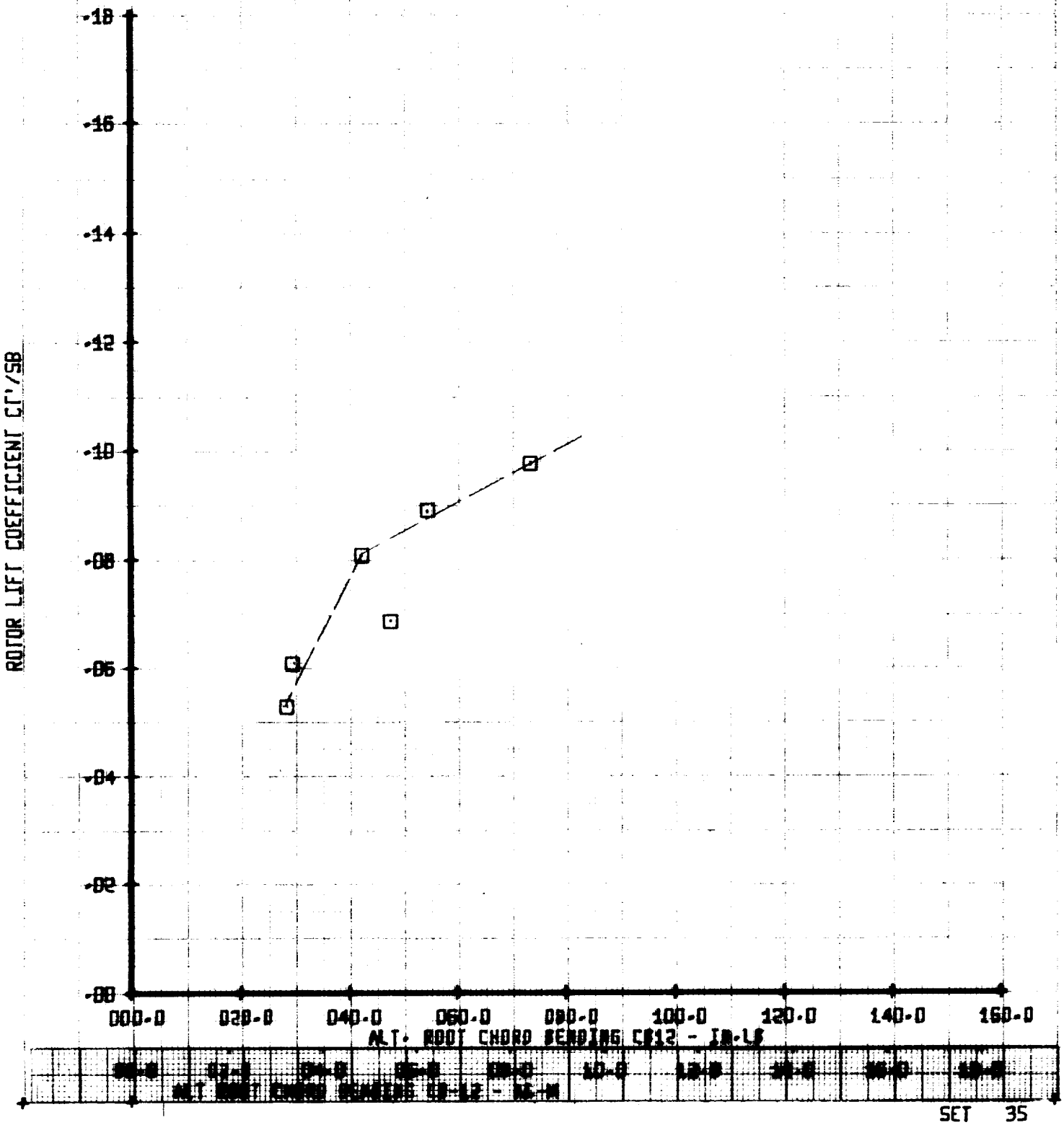
ET 35
WT 193

SET 35
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD2SB	YTUN
⊡	225	.50	.05	310
⊡	39	.50	.05	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



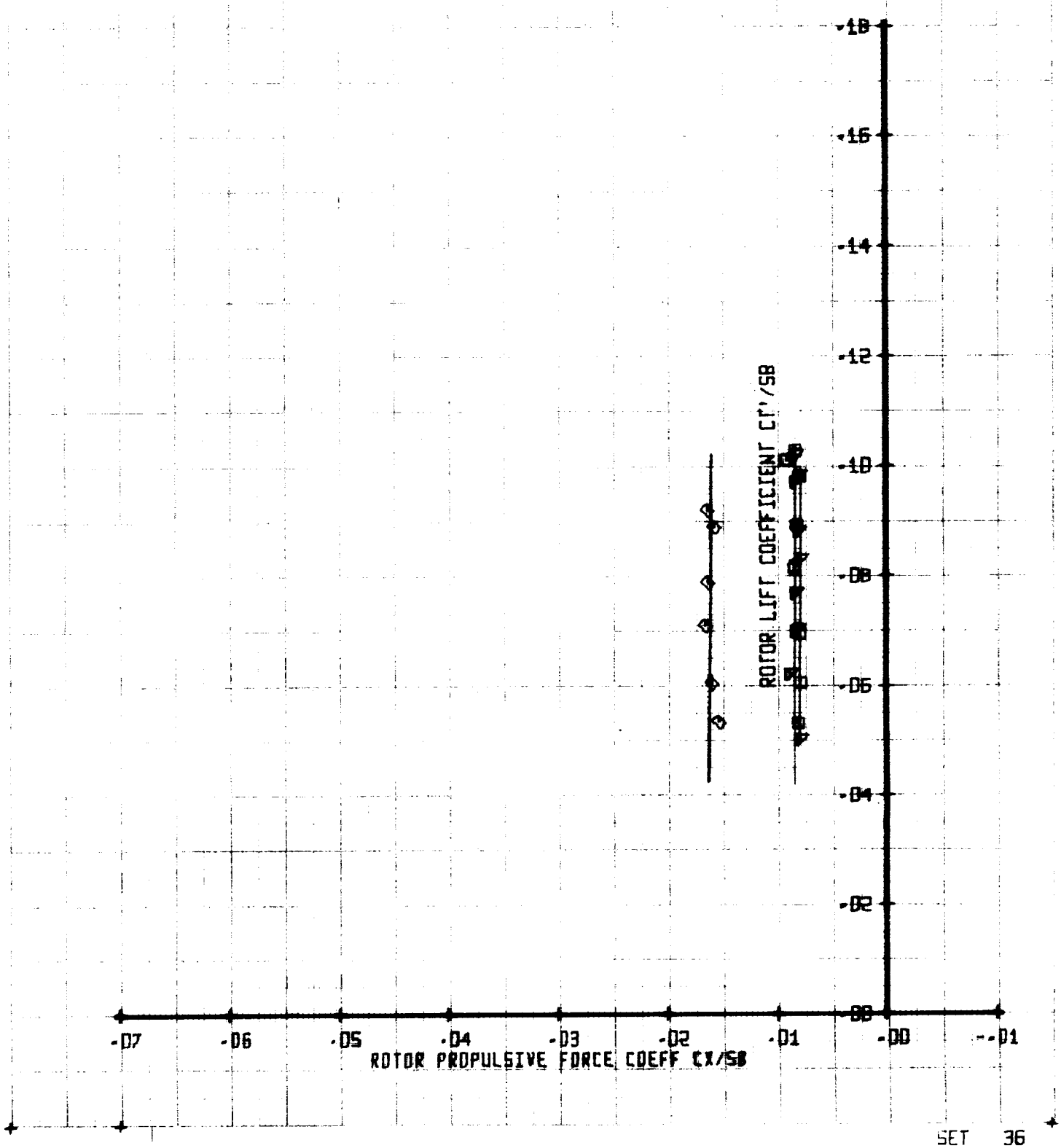
ET 35
WT 193

SET 35
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QQ2SB	VTUN
⊡	225	.50	.05	310
⊡	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 36
WT 193

SET 36
BVWT 193

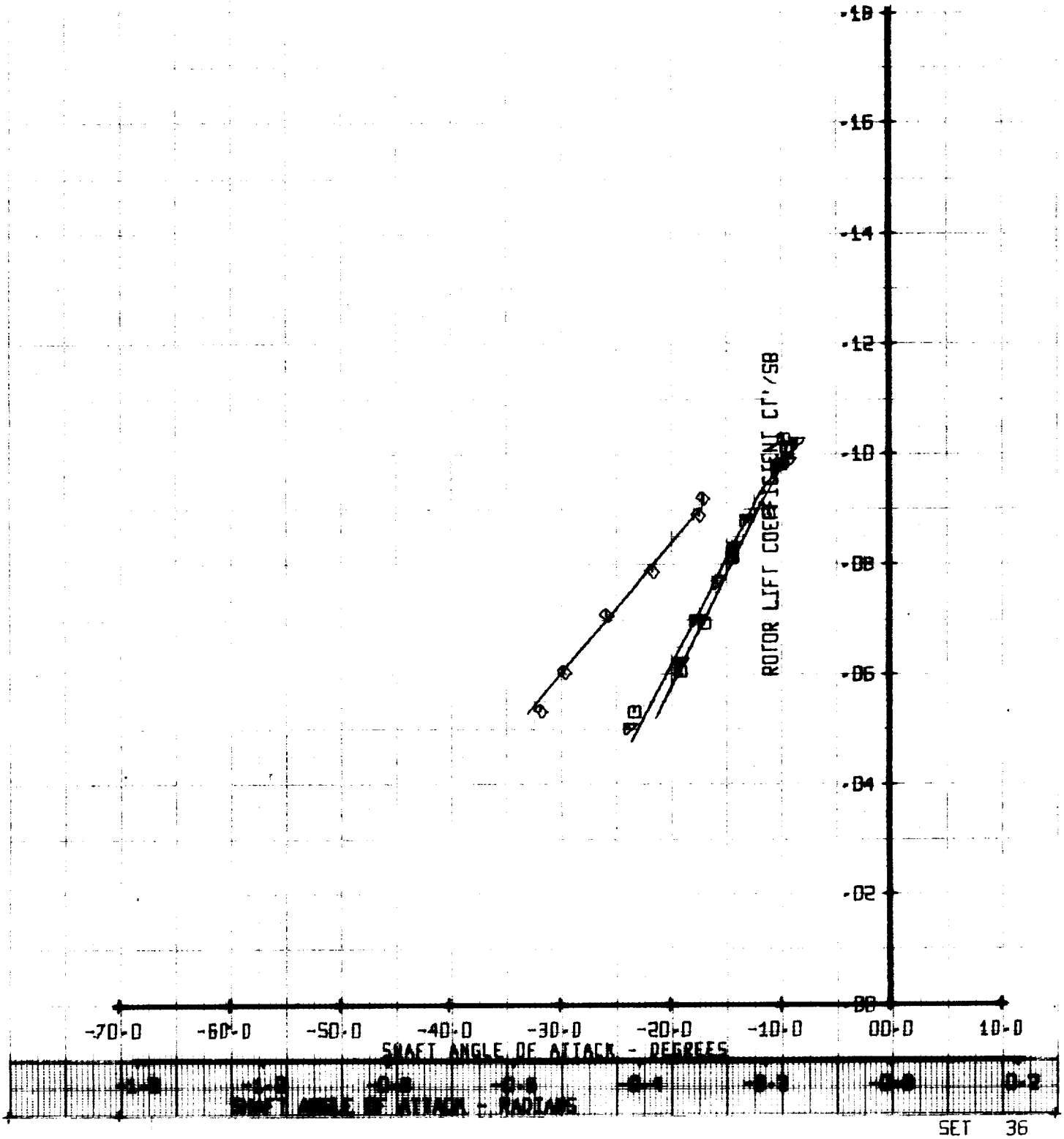
Figure A-189

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QR2SB	VTUN
◻	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 36
WT 193

SET 36
BVWT 193

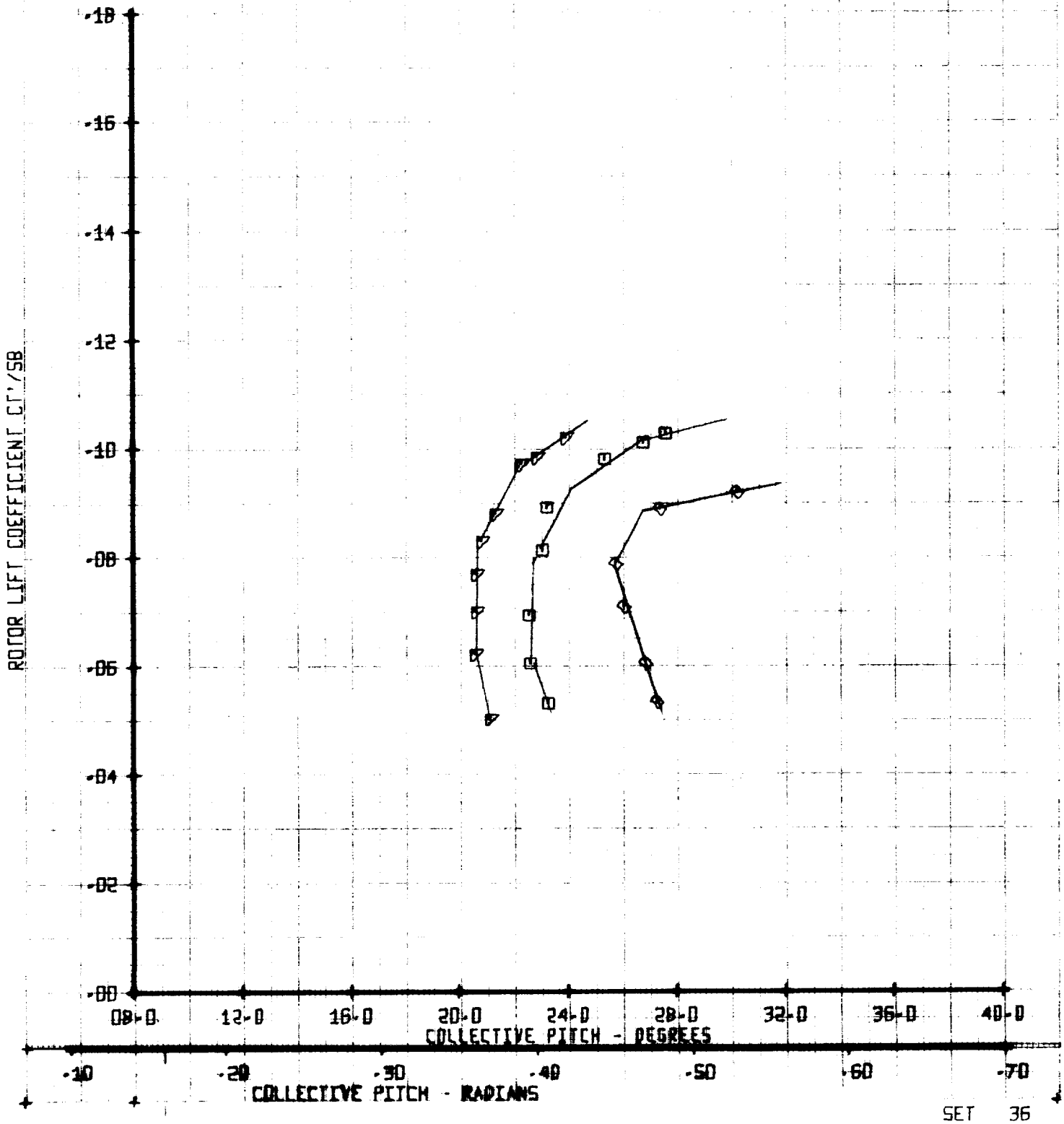
Figure A-190

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 36
WT 193

SET 36
BVWT 193

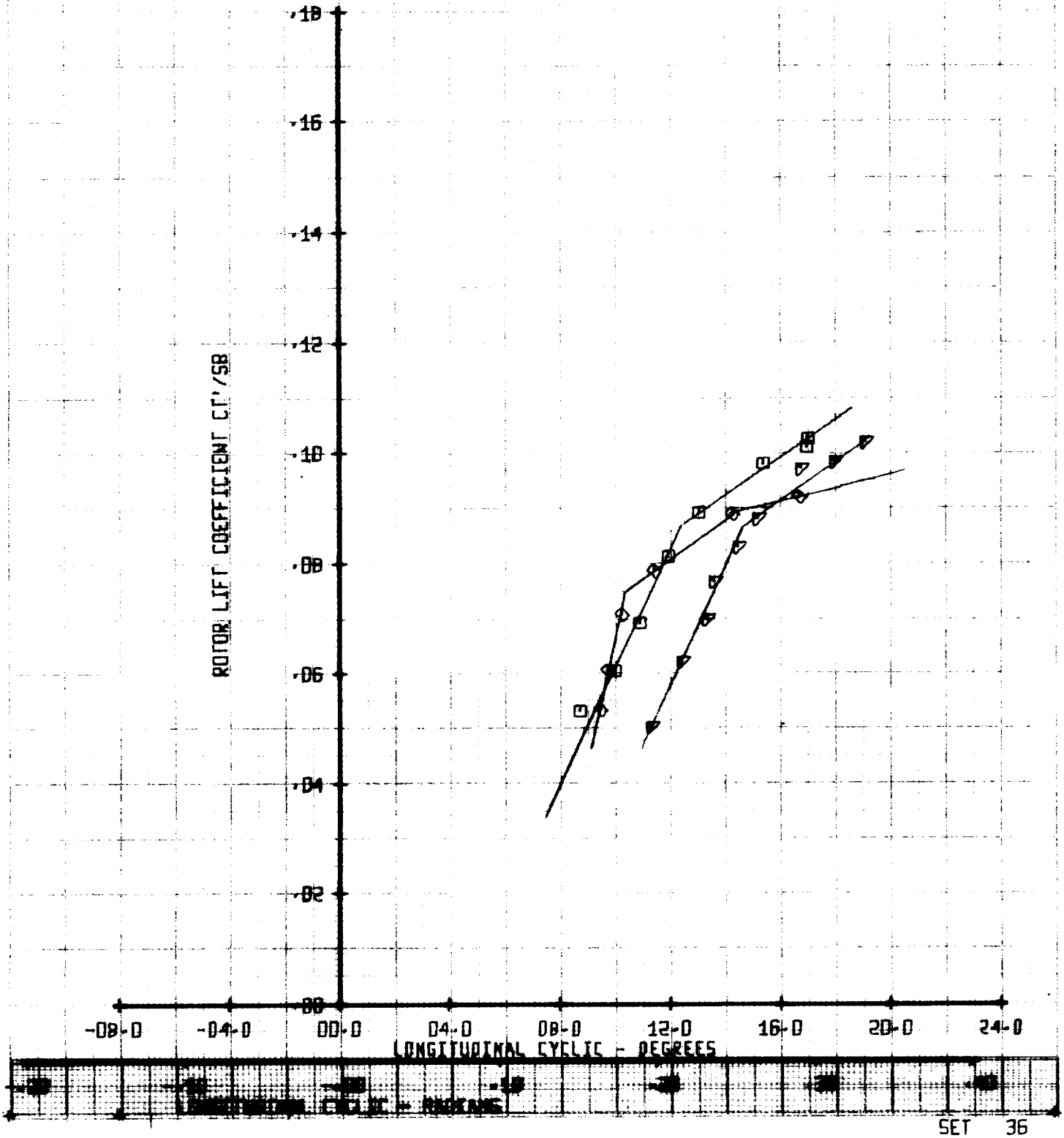
Figure A-191

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 36
WT 193

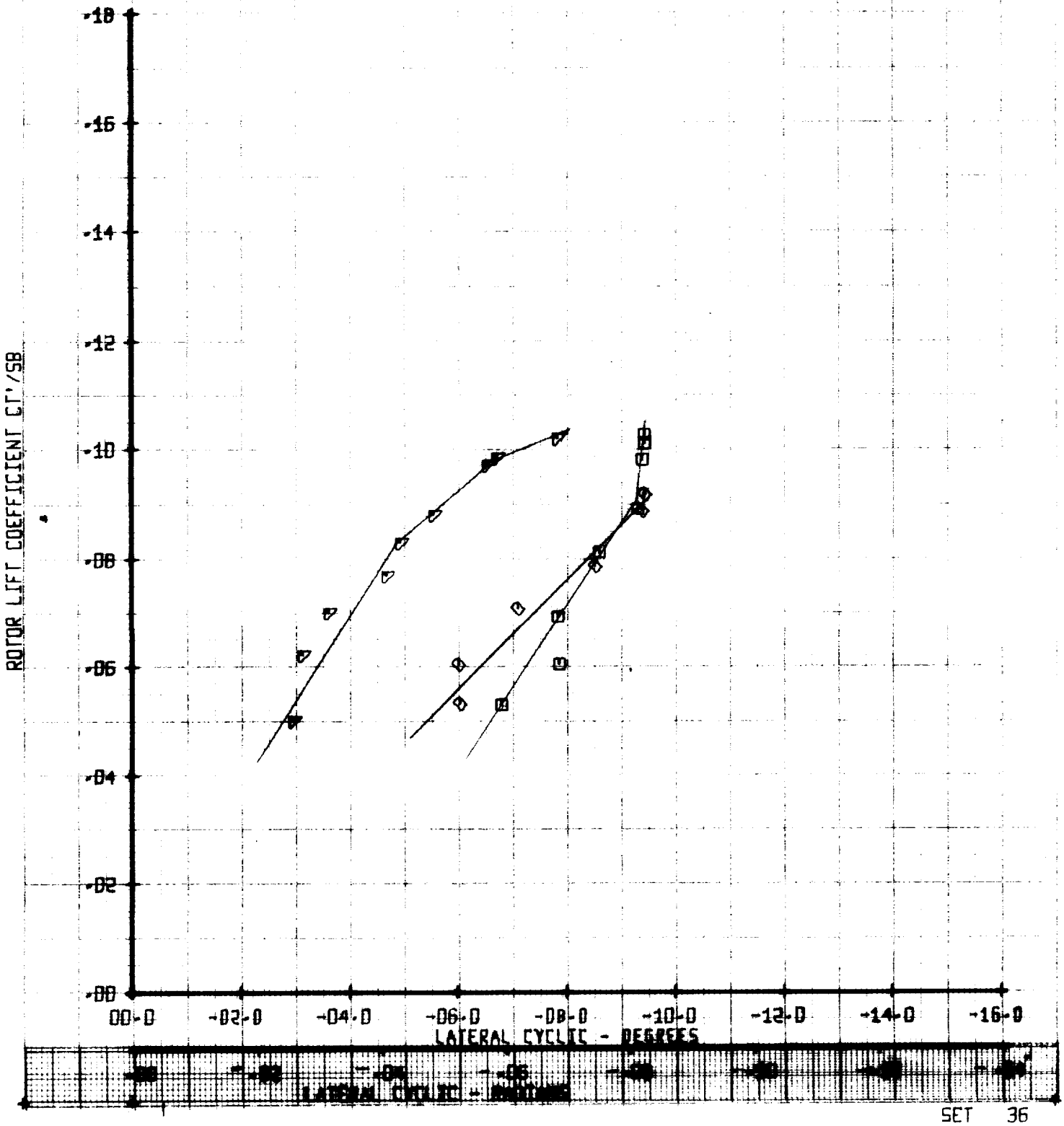
SET 36
BVWT 193

Figure A-192

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD2SB	VTUN
▢	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 36
WT 193

SET 36
BVWT 193

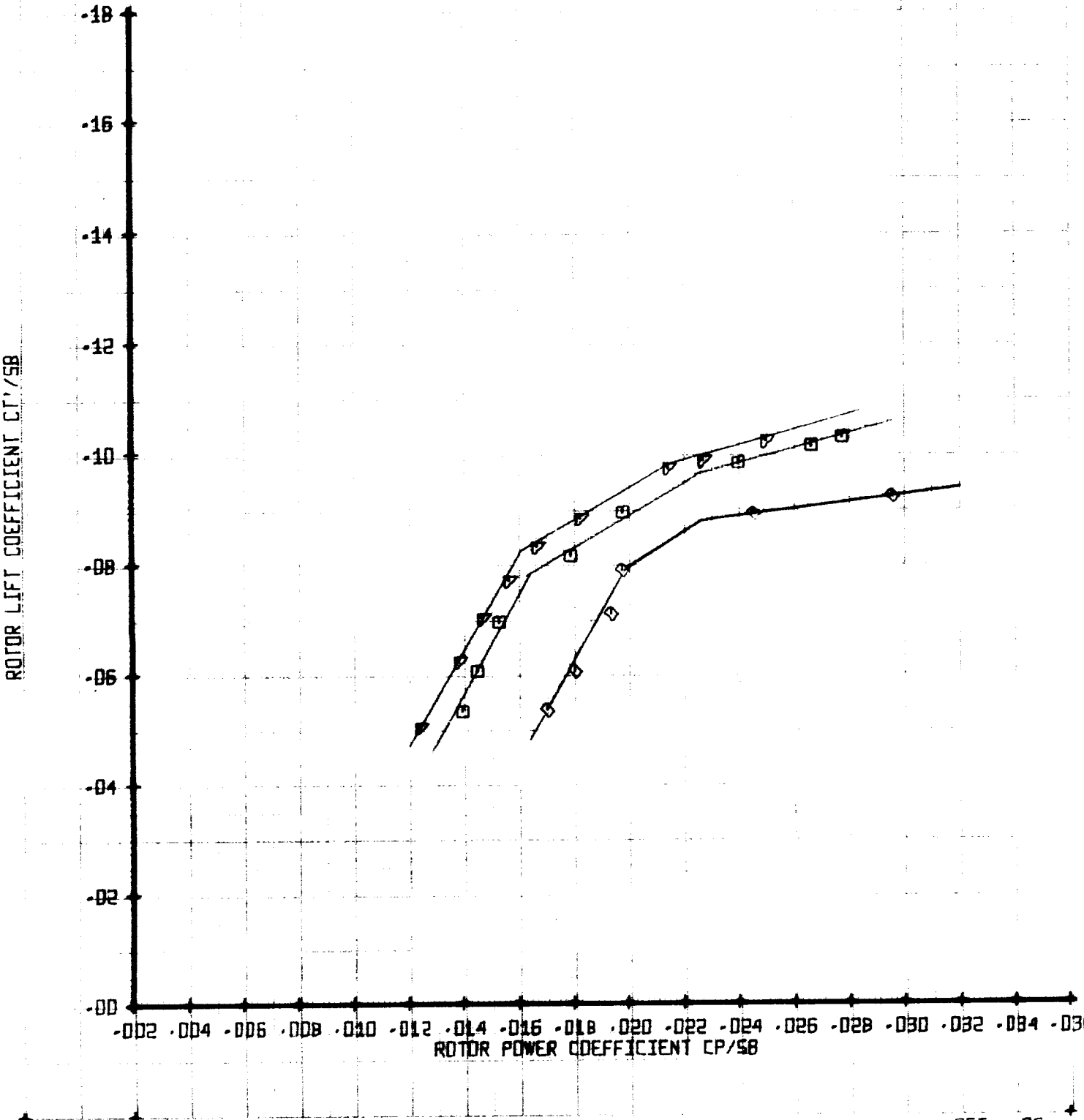
Figure A-193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
◻	225	.50	.05	310
◸	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 36
WT 193

SET 36
BVWT 193

Figure A-194

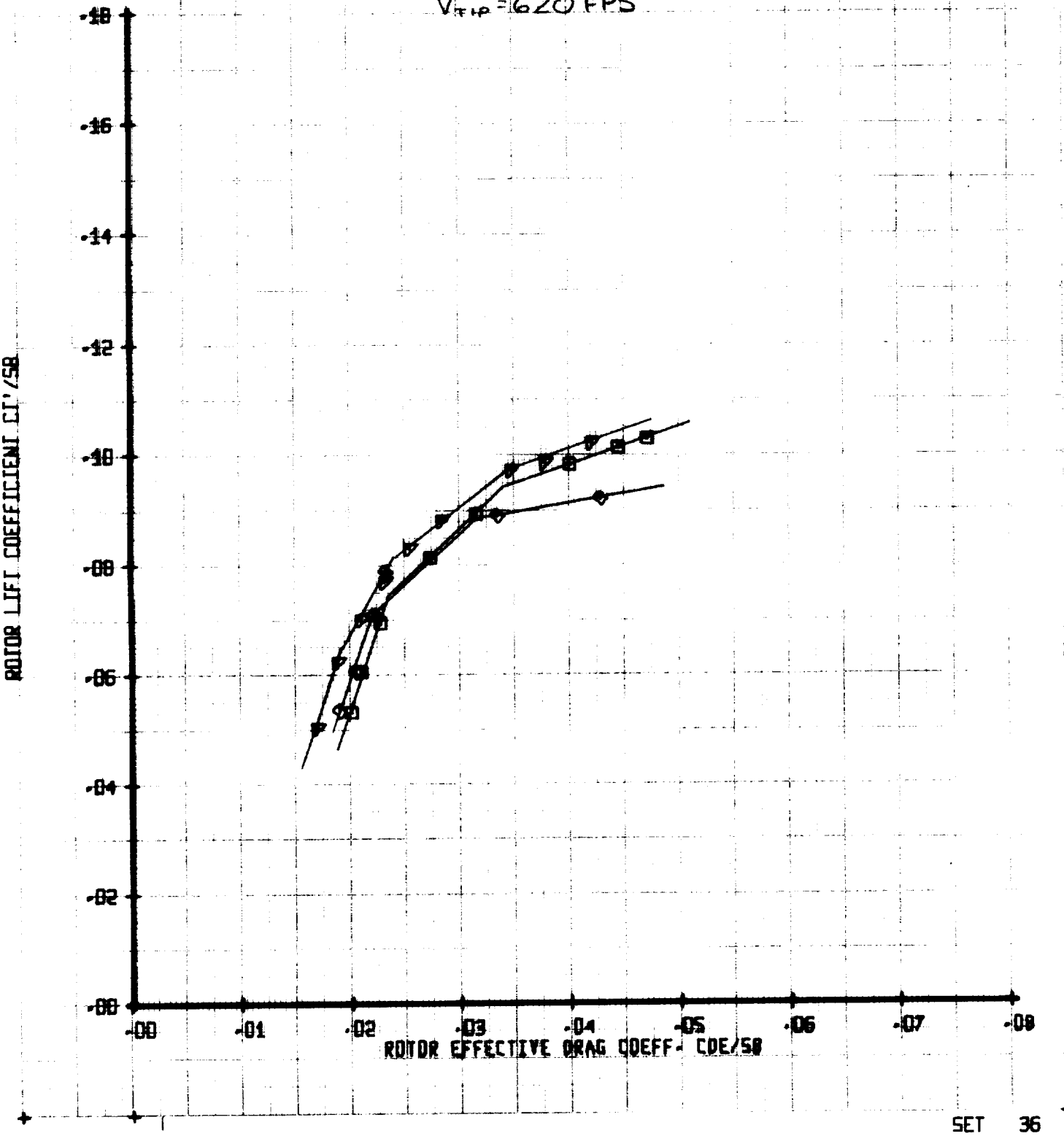
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SR	YTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

V_{TIP} = 620 FPS



ET 36
WT 193

SET 36
BVWT 193

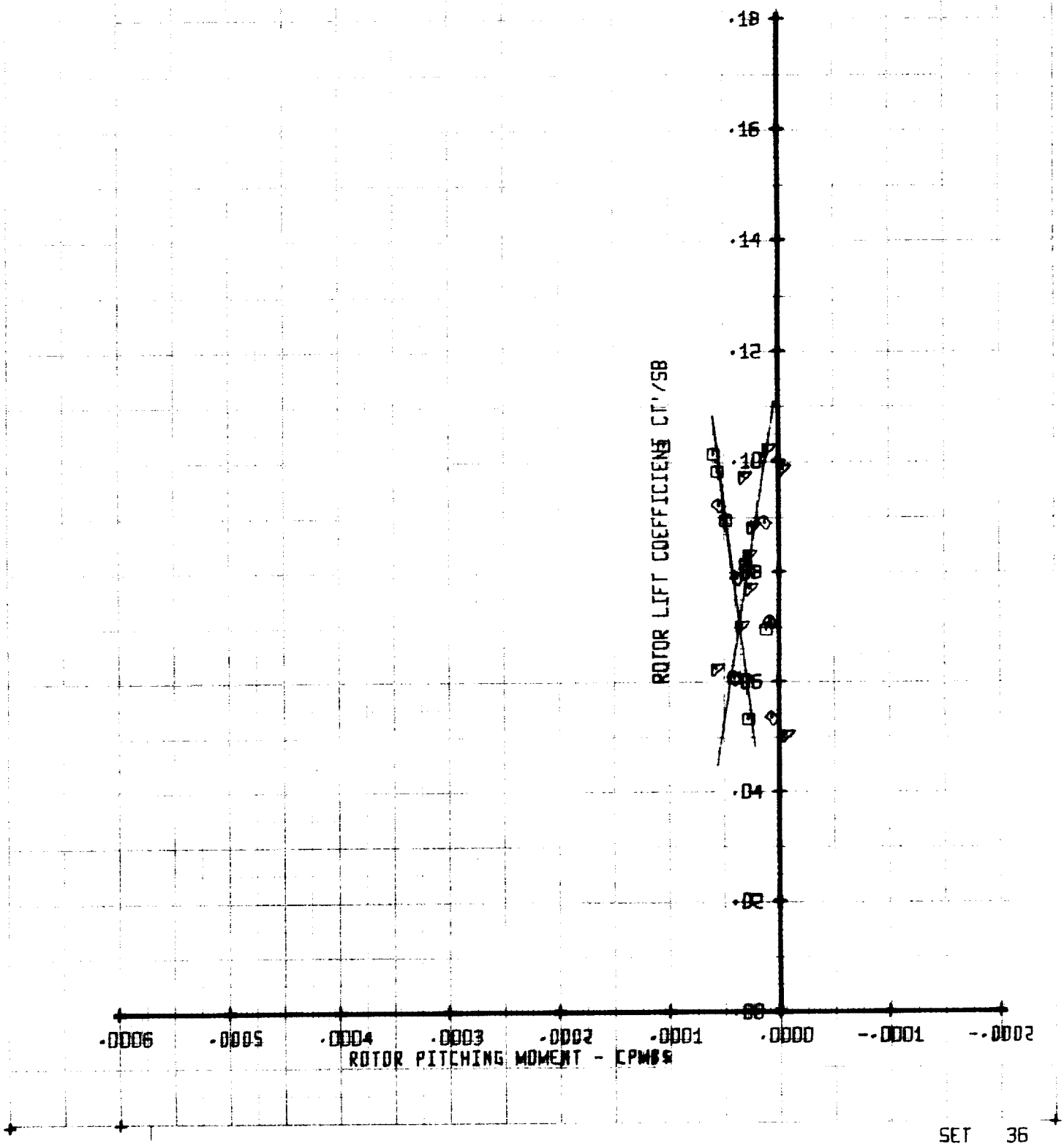
Figure A-195

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
◻	225	.50	.05	310
◸	261	.50	.05	310
◈	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 36
WT 193

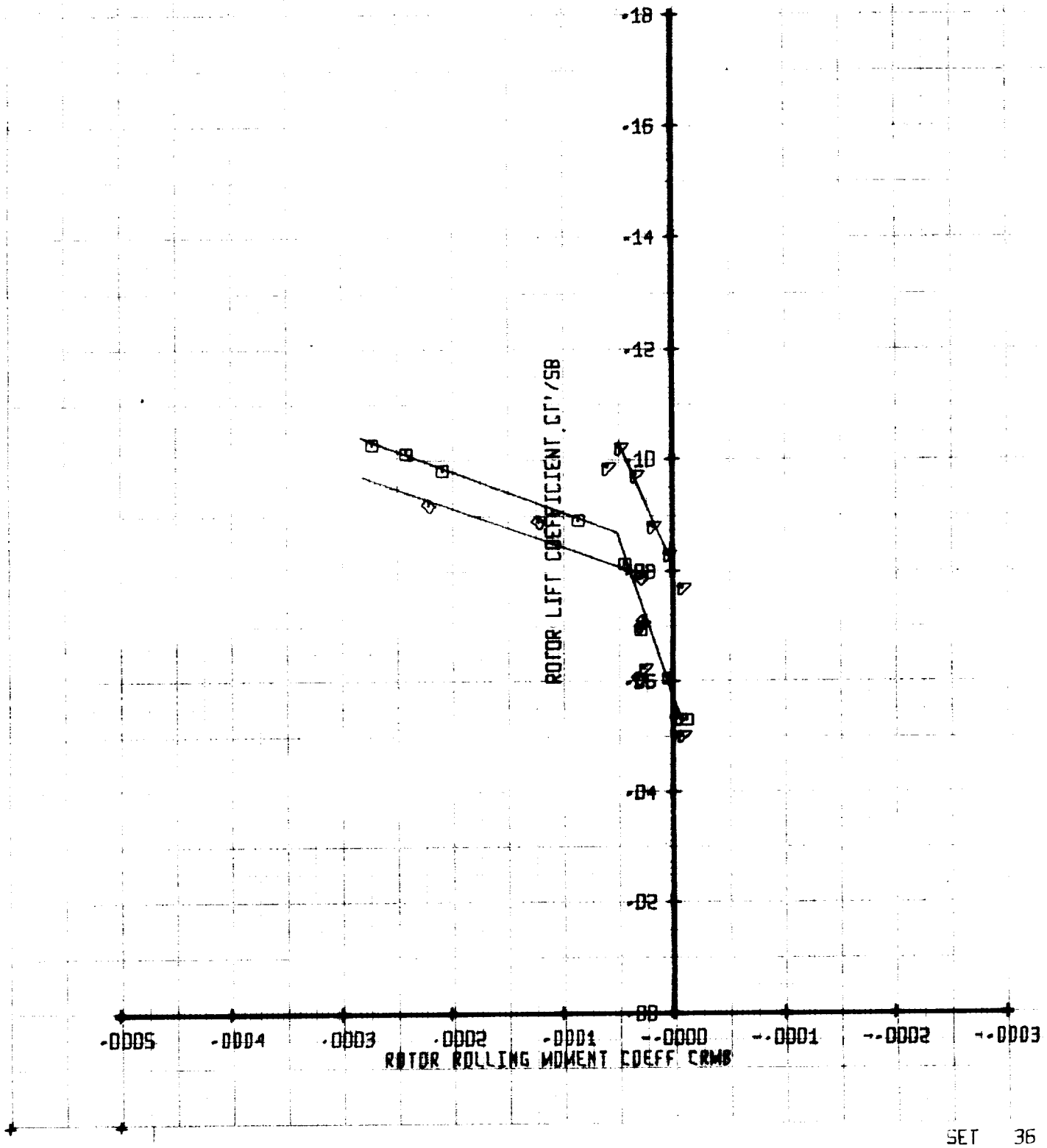
SET 36
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 36
WT 193

SET 36
BVWT 193

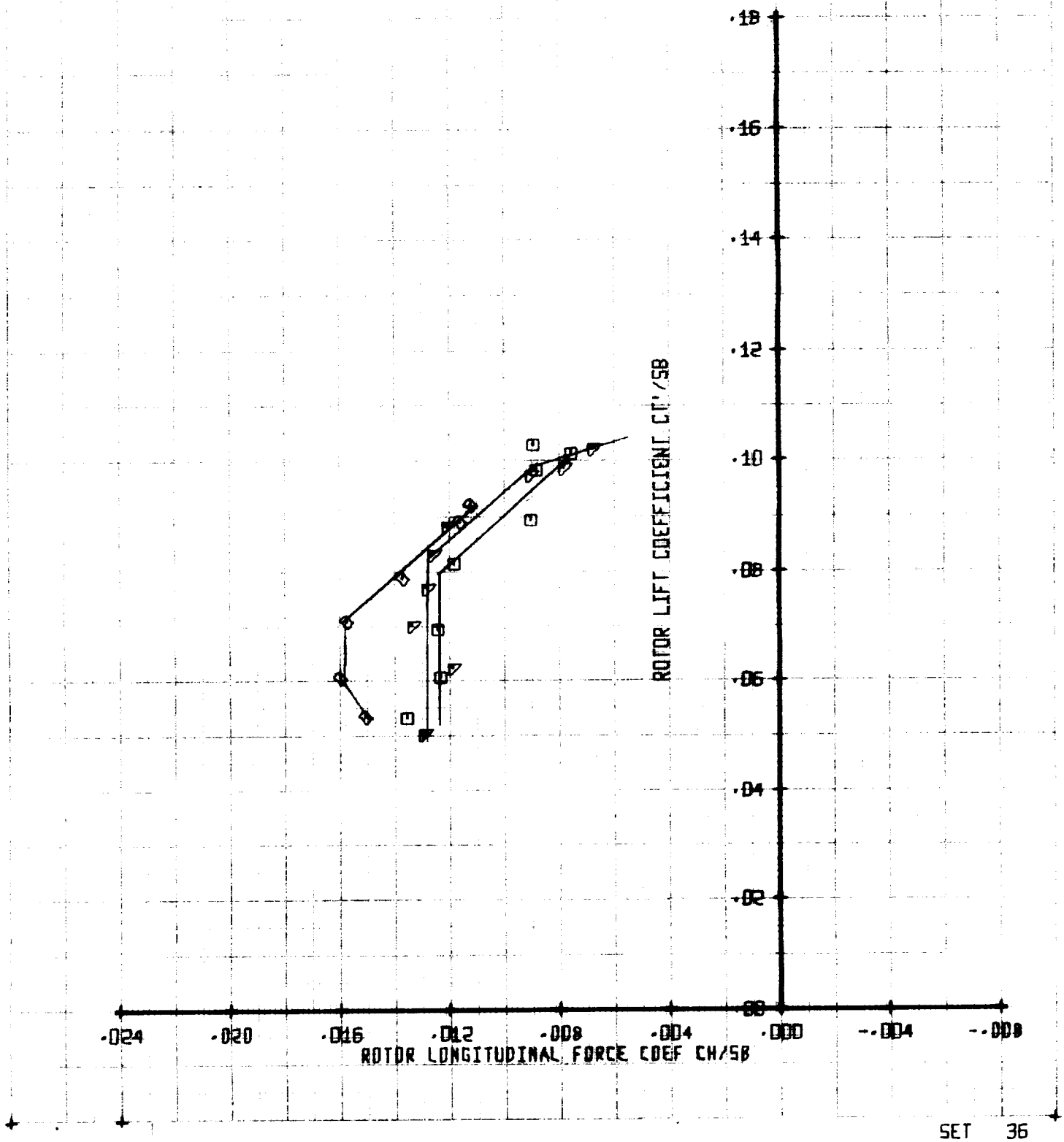
Figure A-197

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 36
WT 193

SET 36
BVWT 193

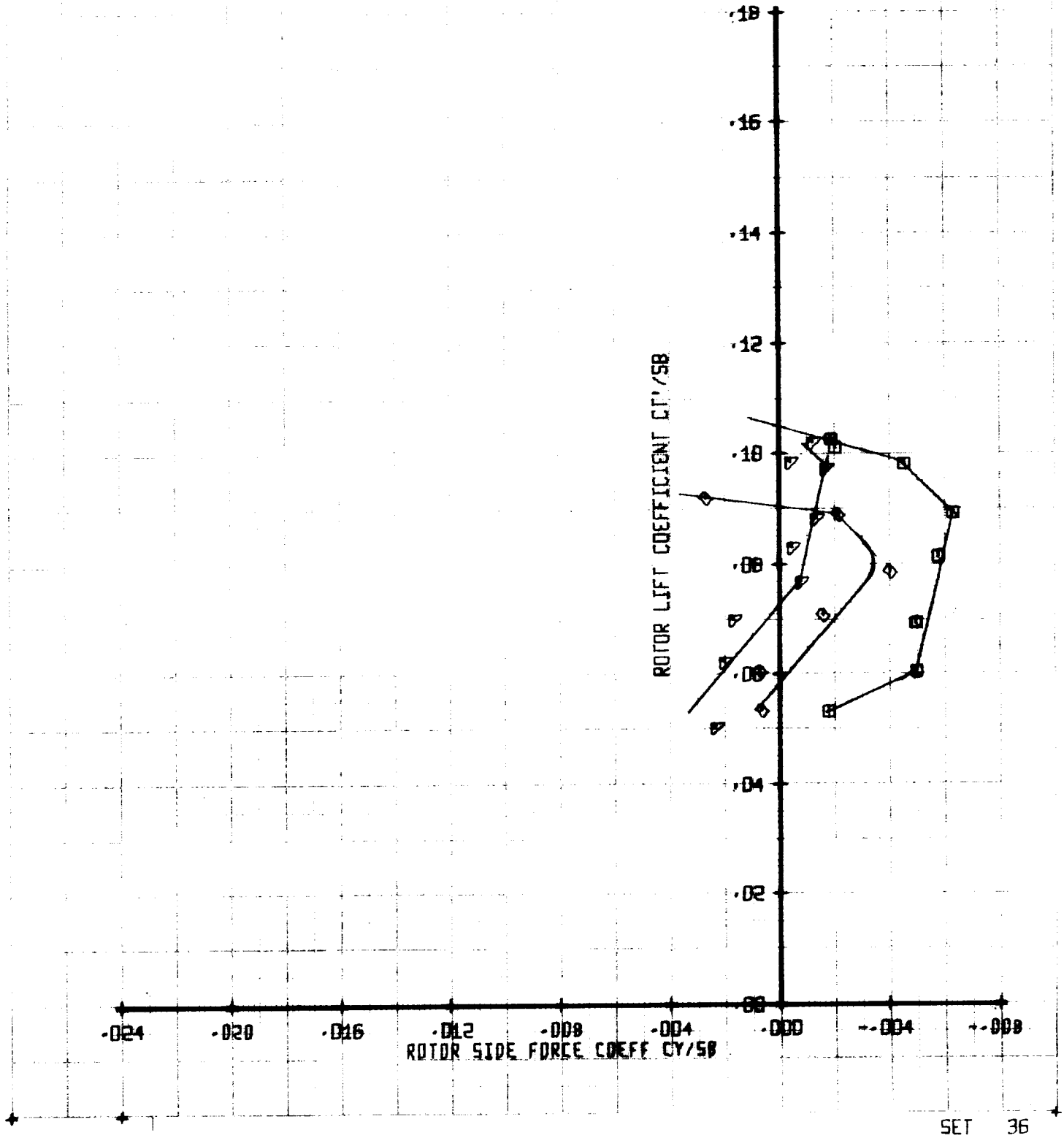
Figure A-198

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 36
WT 193

SET 36
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12

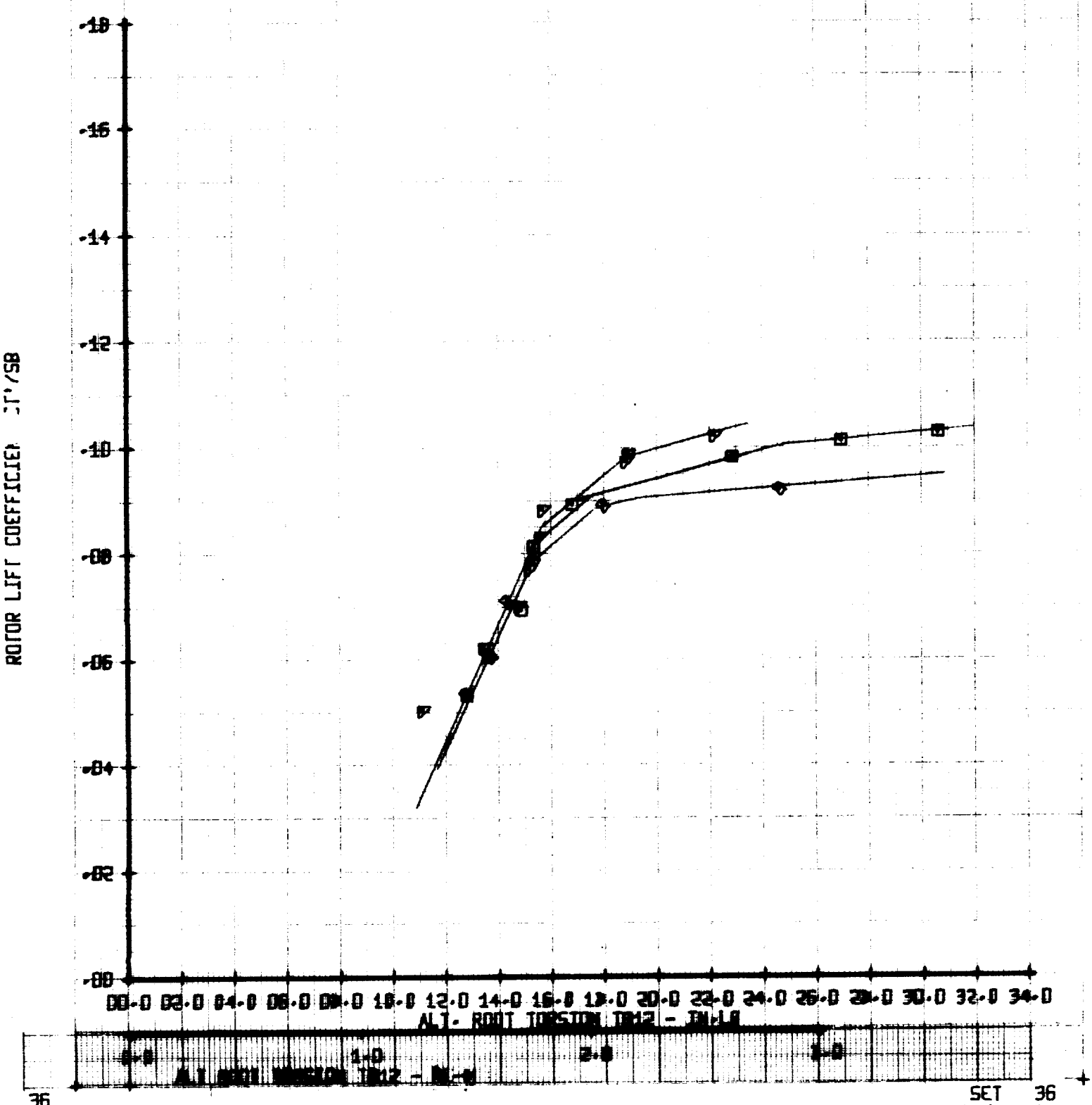
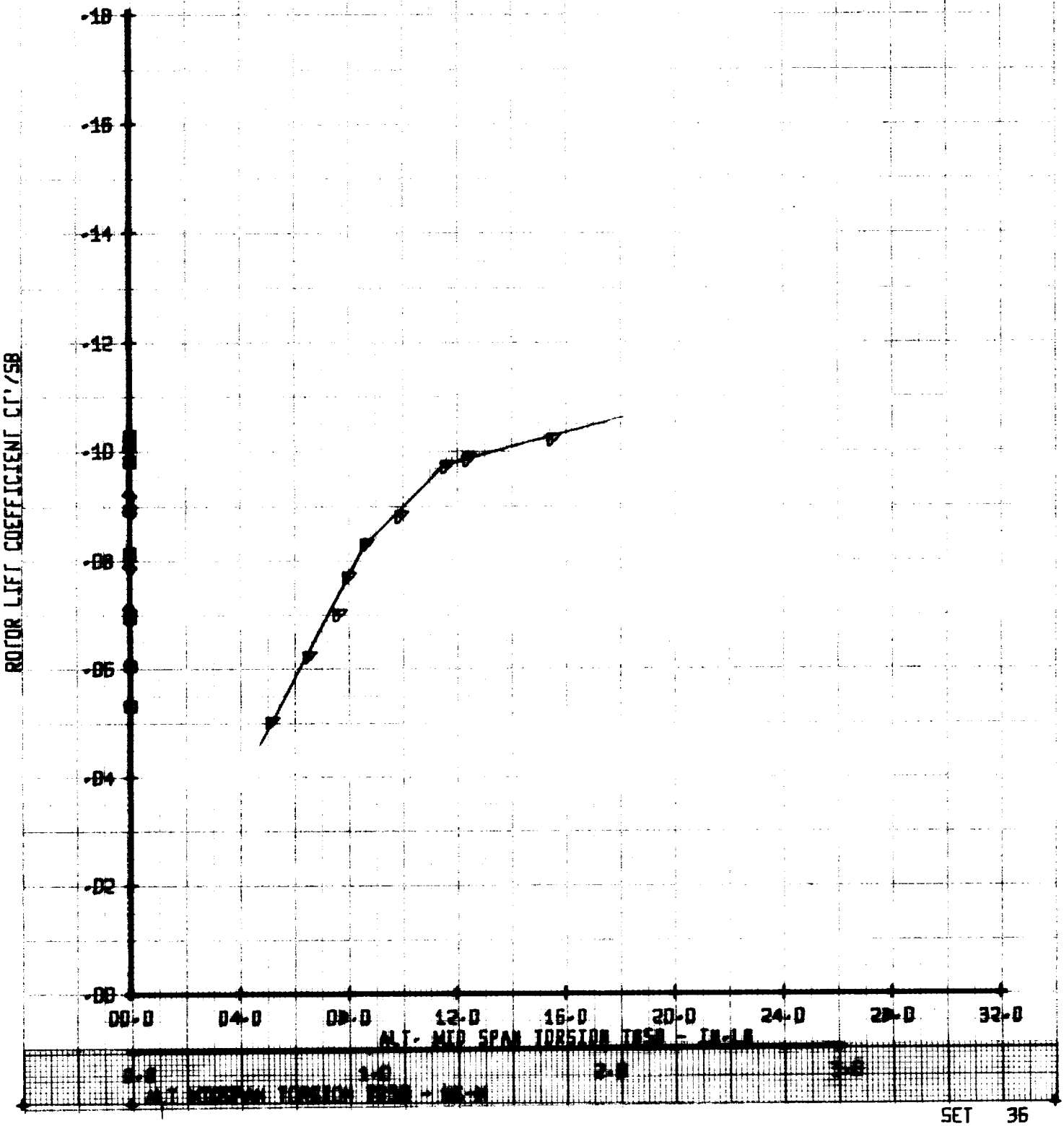


Figure A-200

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QQ2SB	VTUN
⊡	225	.50	.05	310
▽	261	.50	.05	310
◆	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 36
WT 193

SET 36
BVWT 193

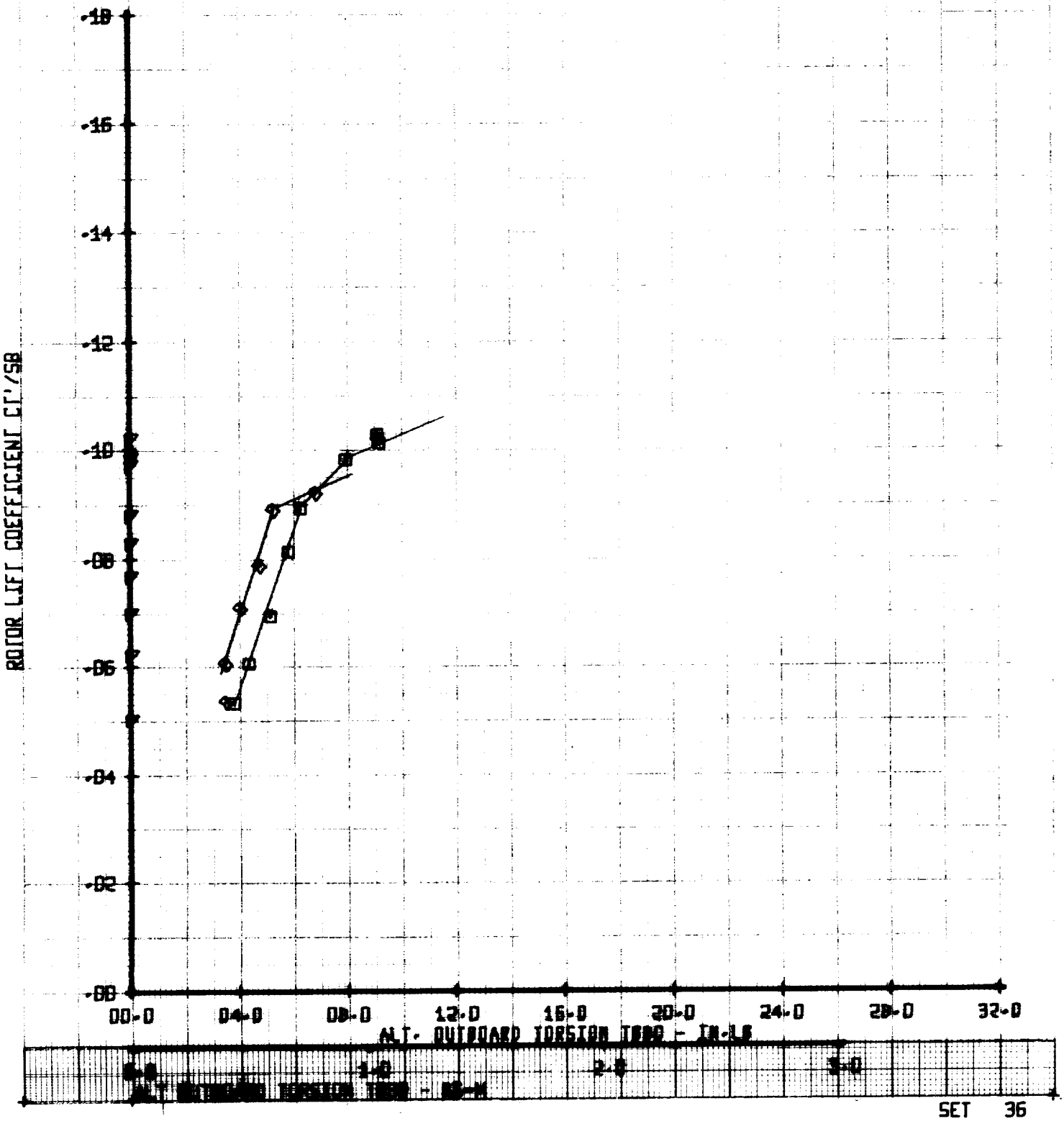
Figure A-201

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D025B	VTUN
○	225	.50	.05	310
□	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB50



ET 36
WT 193

SET 36
BVWT 193

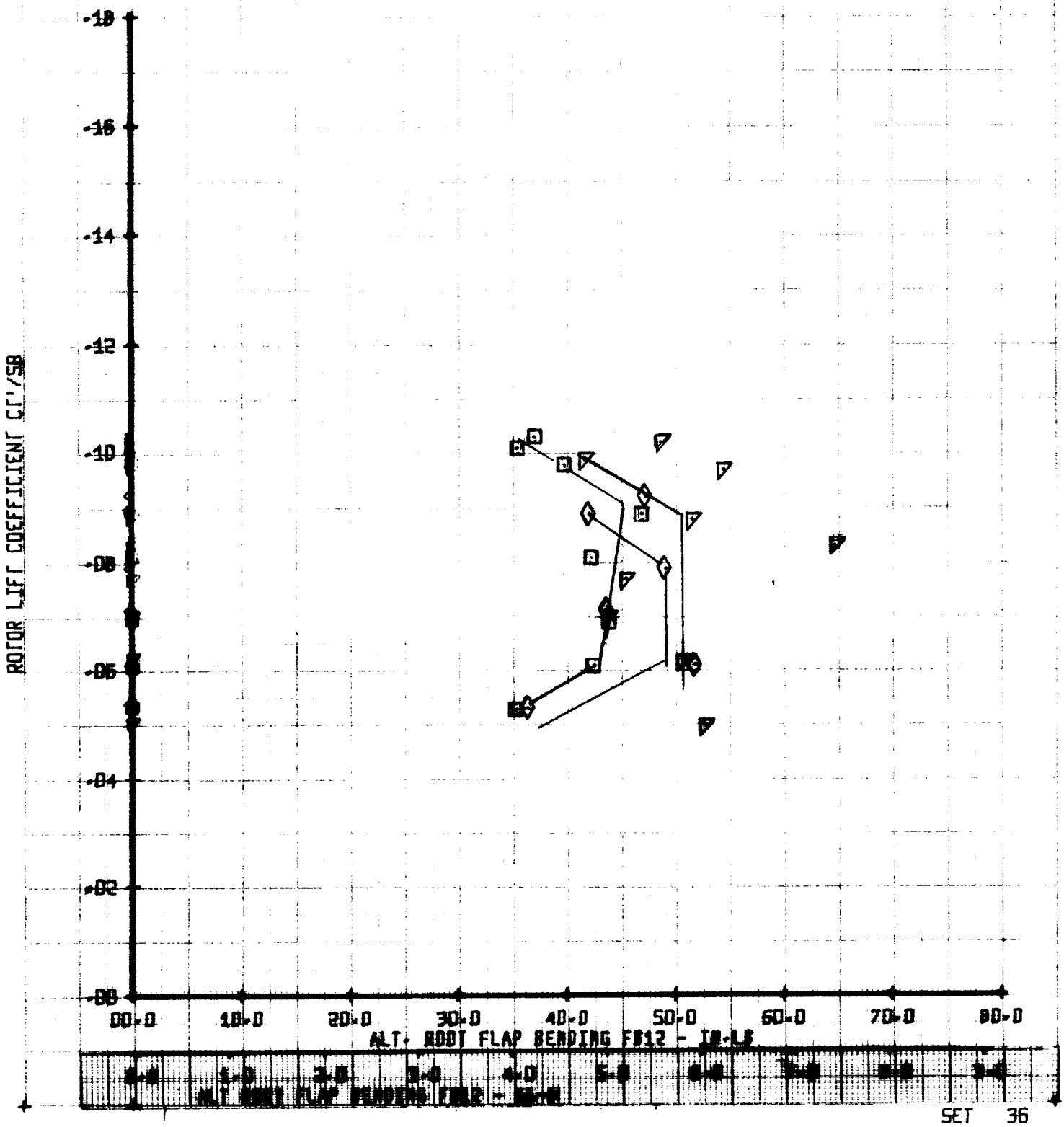
Figure A-202

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 36
WT 193

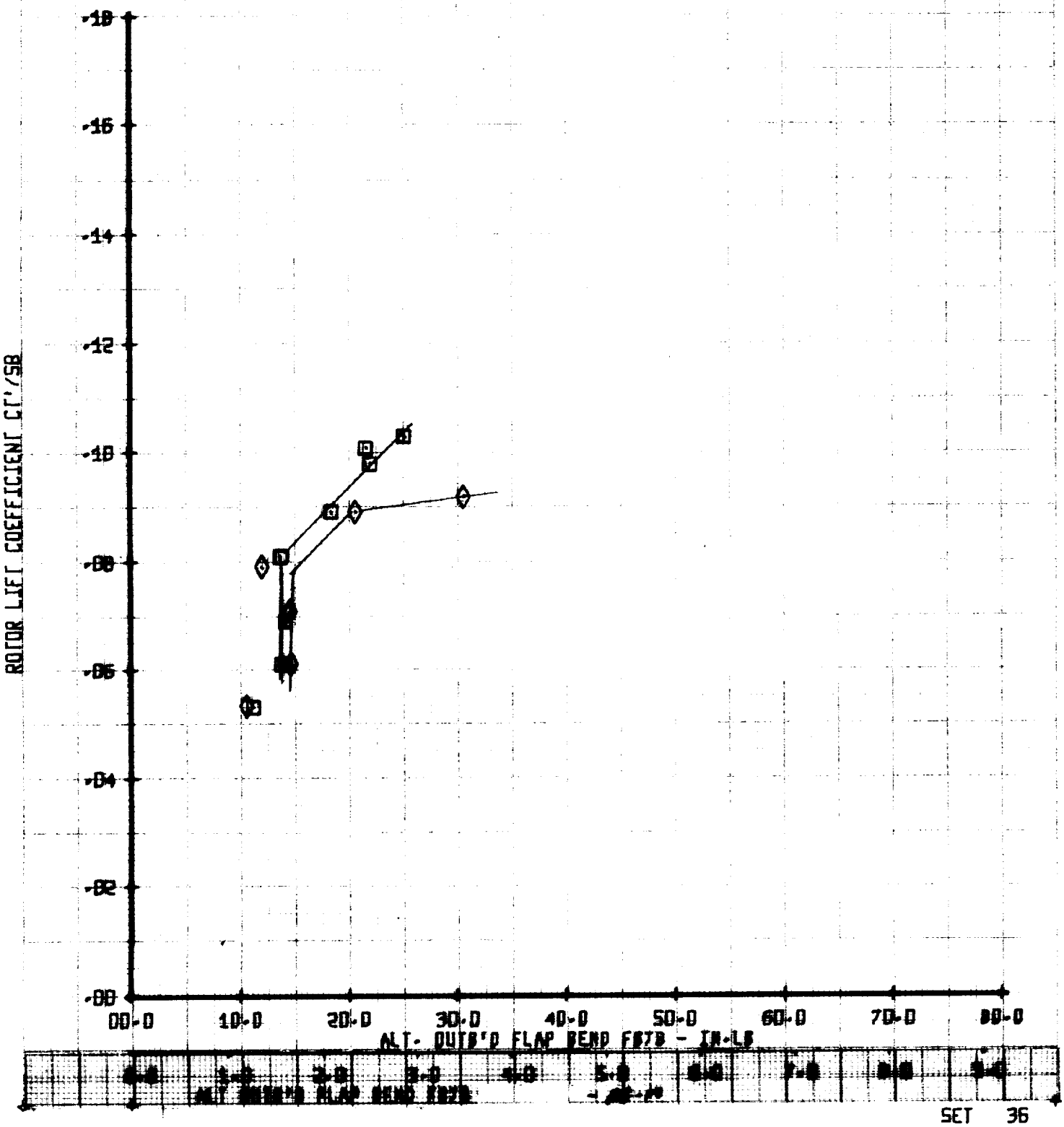
SET 36
BWT 193

Figure A-203

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD2SB	VTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	340

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



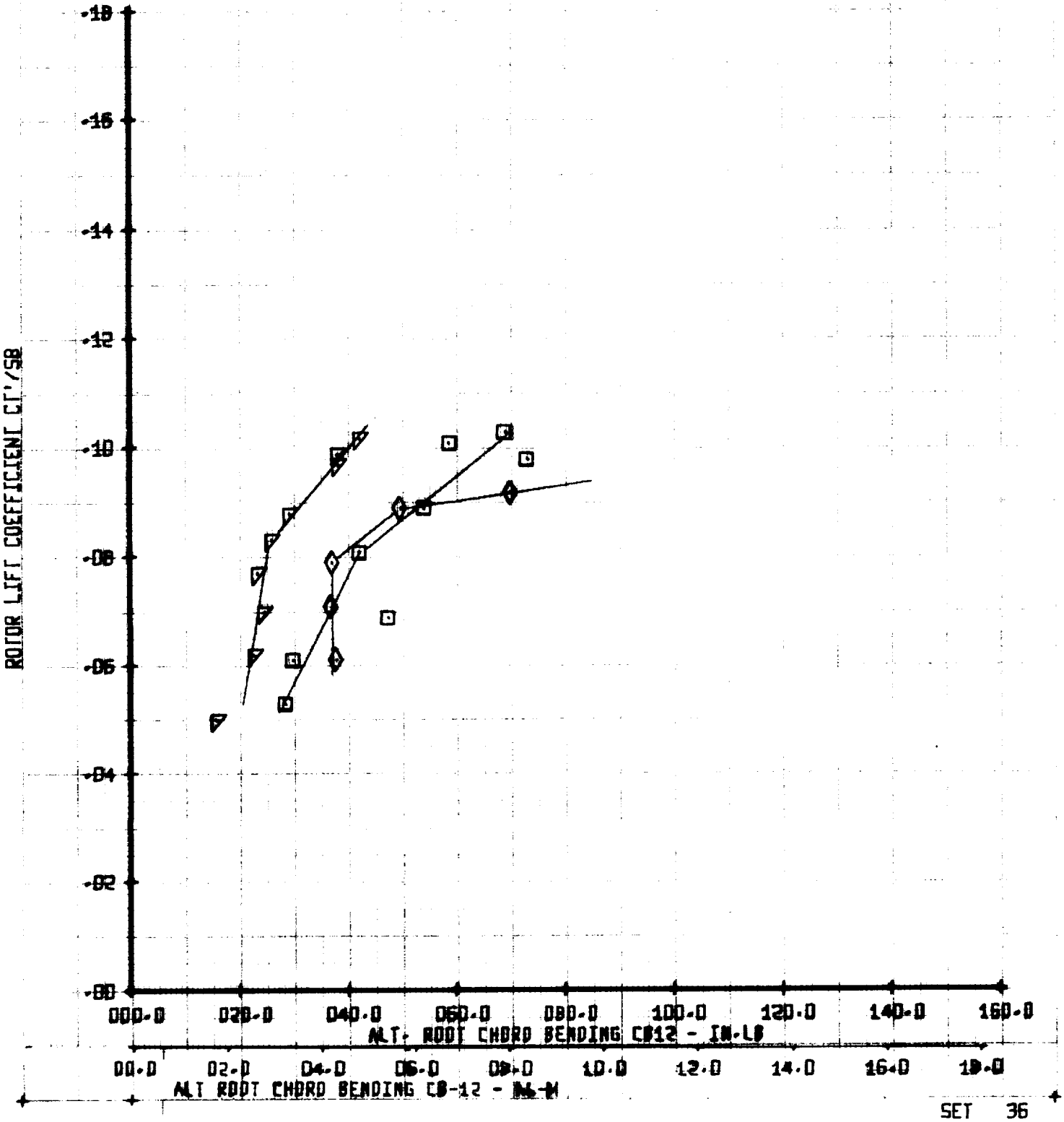
ET 36
WT 193

SET 36
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/D0298	YTUN
□	225	.50	.05	310
▽	261	.50	.05	310
◇	226	.50	.10	310

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 36
WT 193

SET 36
BVWT 193

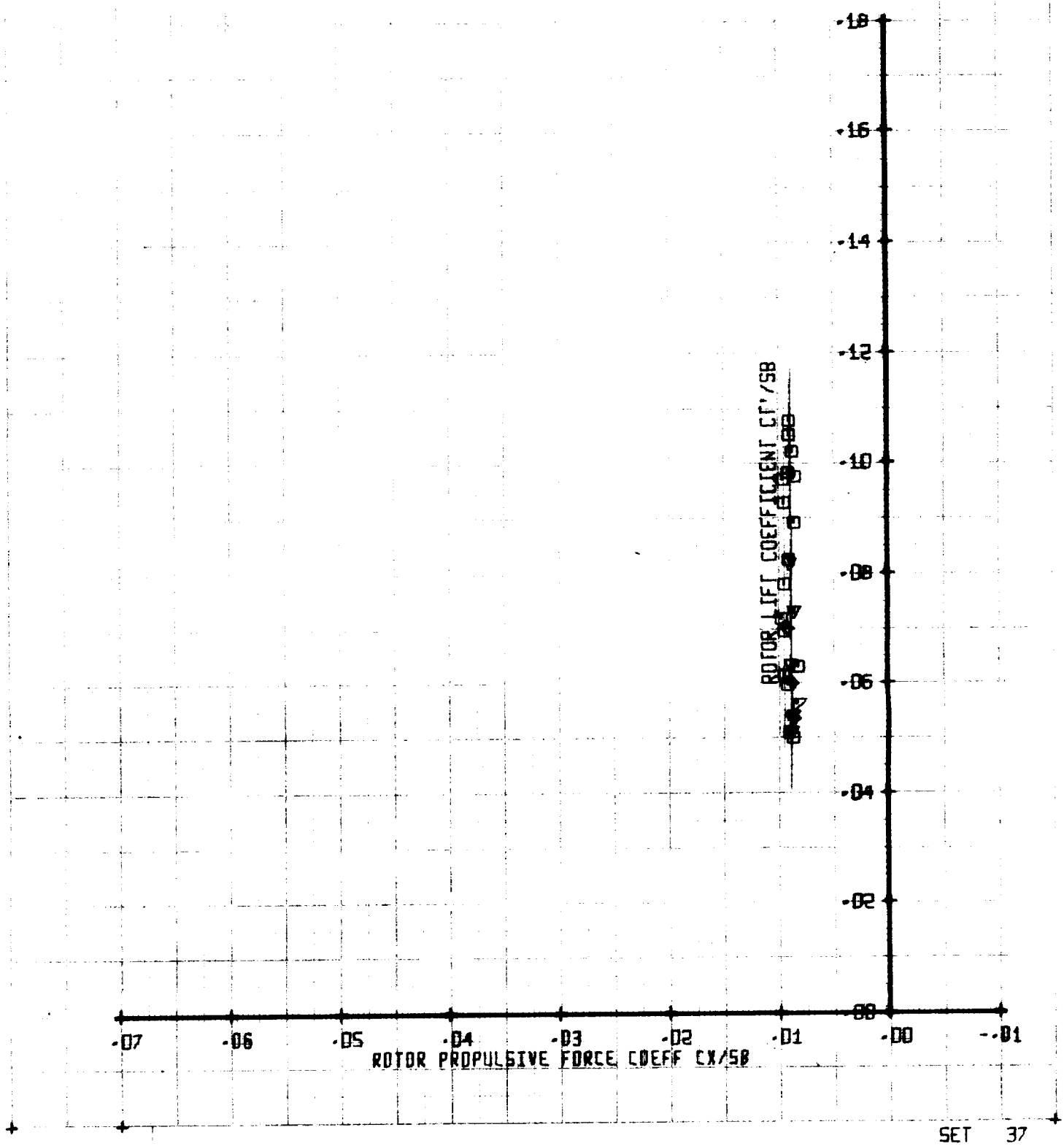
Figure A-205

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 37
WT 193

SET 37
BVWT 193

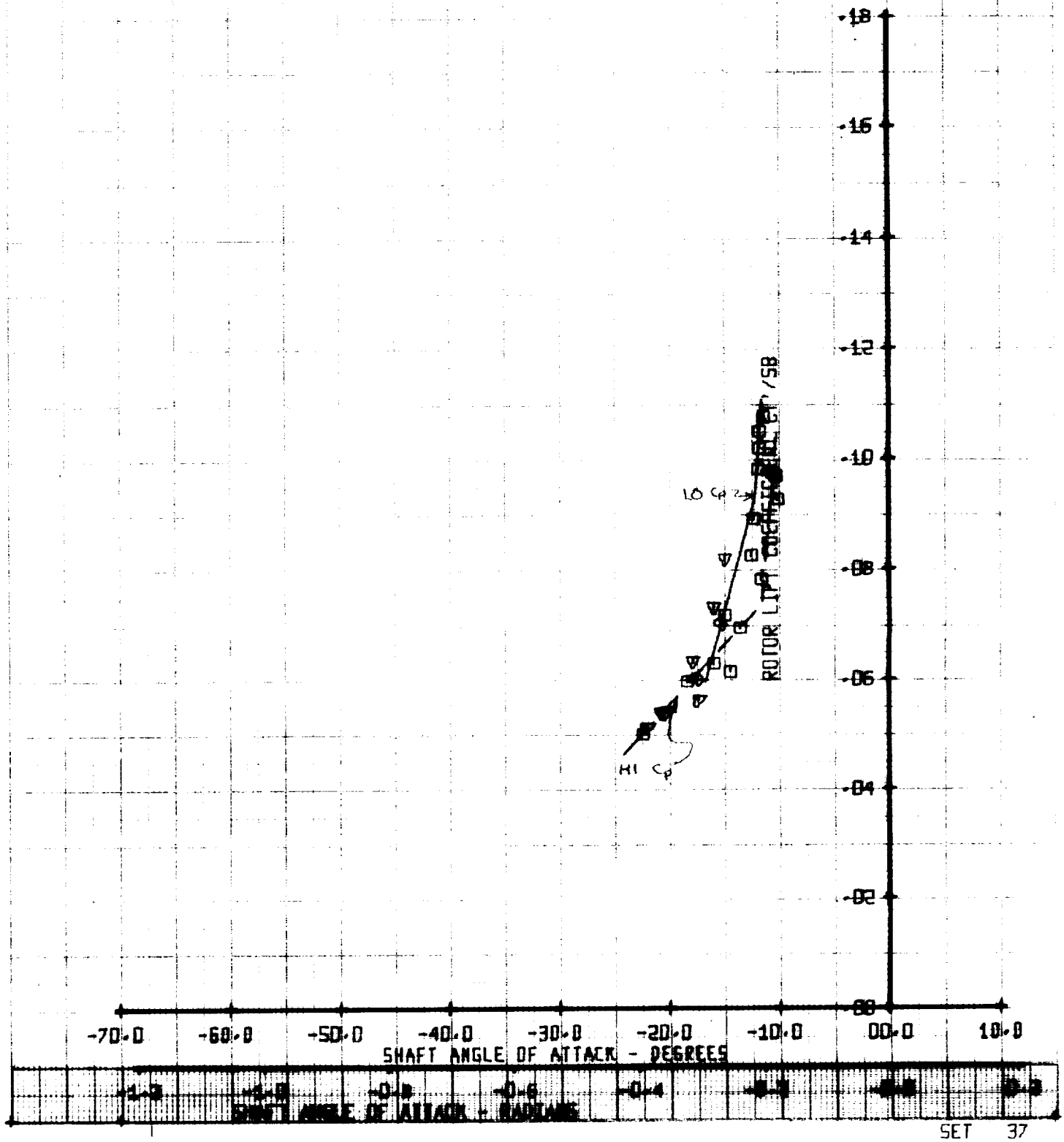
Figure A-206

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 37
WT 193

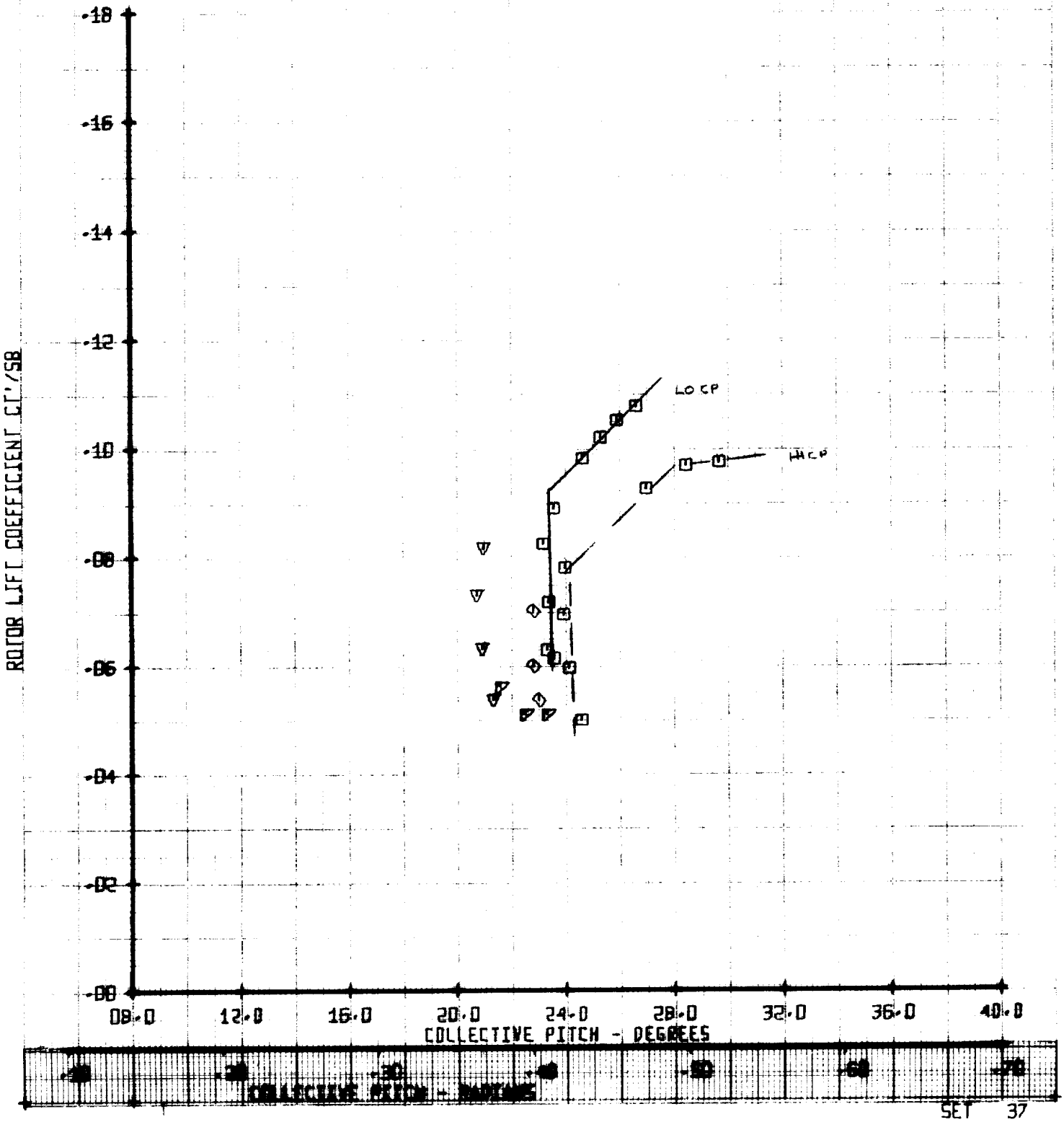
SET 37
BVWT 193

Figure A-207

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QD2SB	VTUN
□	224	.53	.05	320
▽	220	.53	.05	320
◇	221	.53	.05	320
▽	222	.53	.05	320

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 37
WT 193

SET 37
BVWT 193

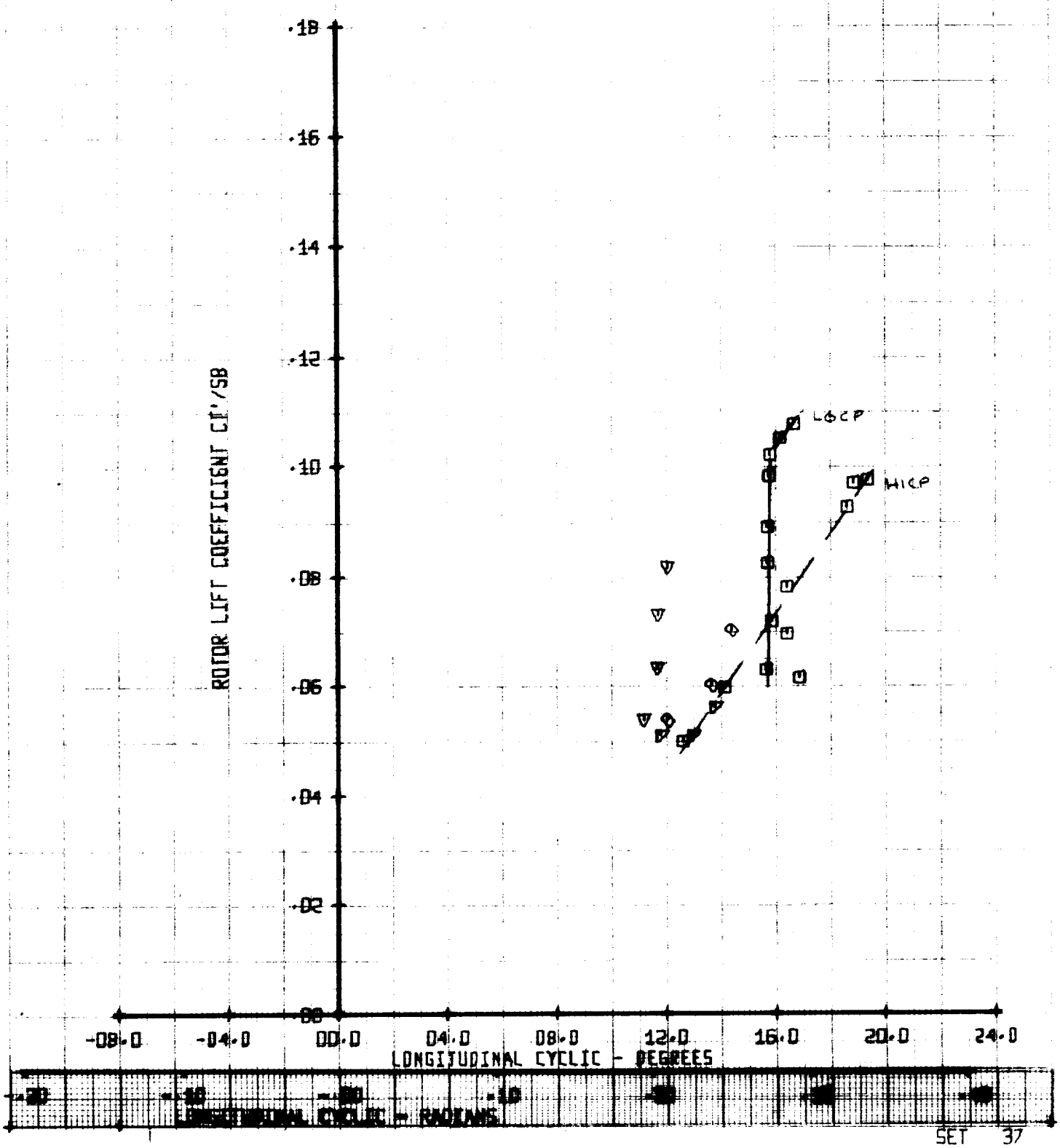
Figure A-208

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 37
WT 193

SET 37
BVWT 193

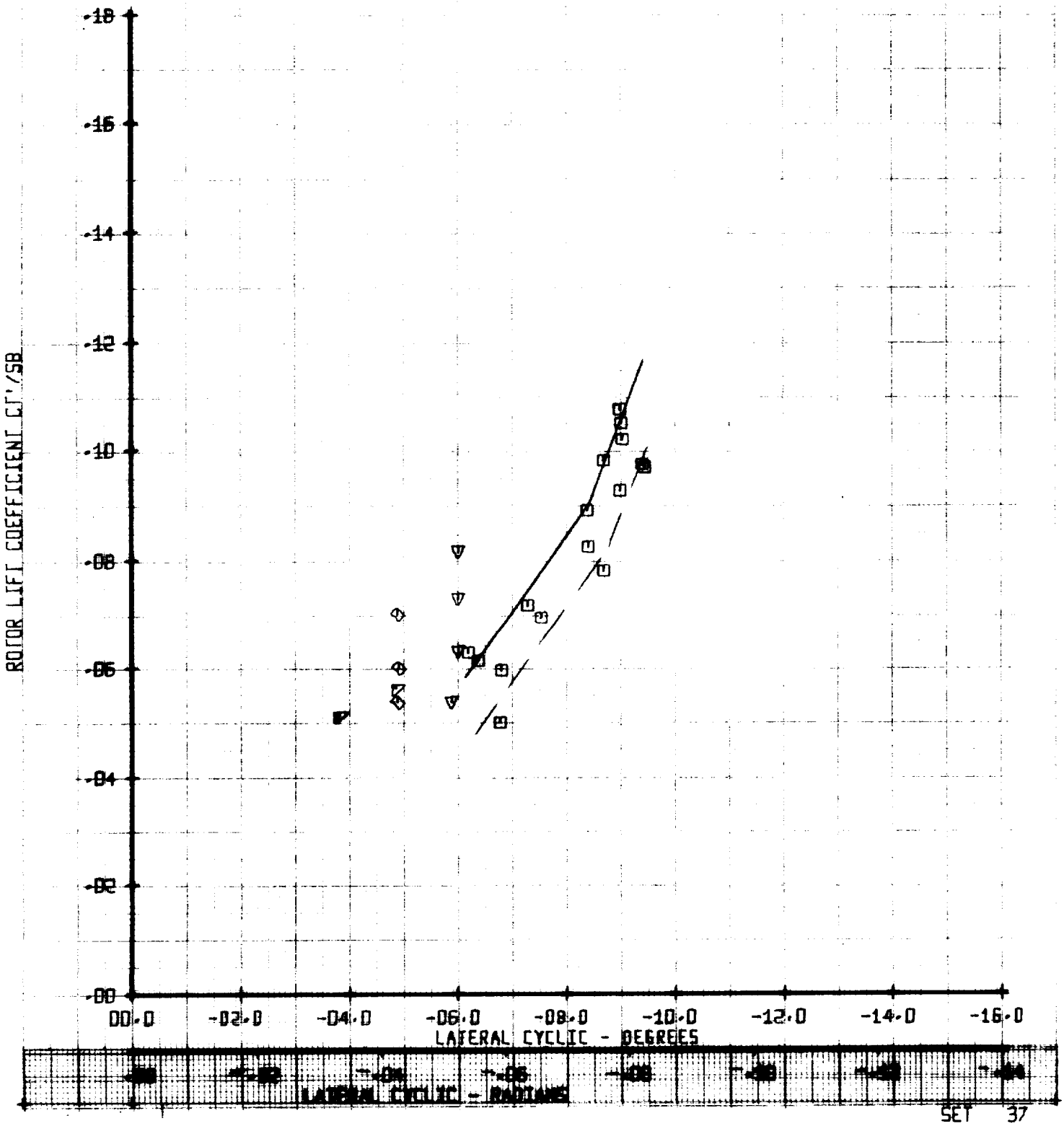
Figure A-209

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 37
WT 193

SET 37
BVWT 193

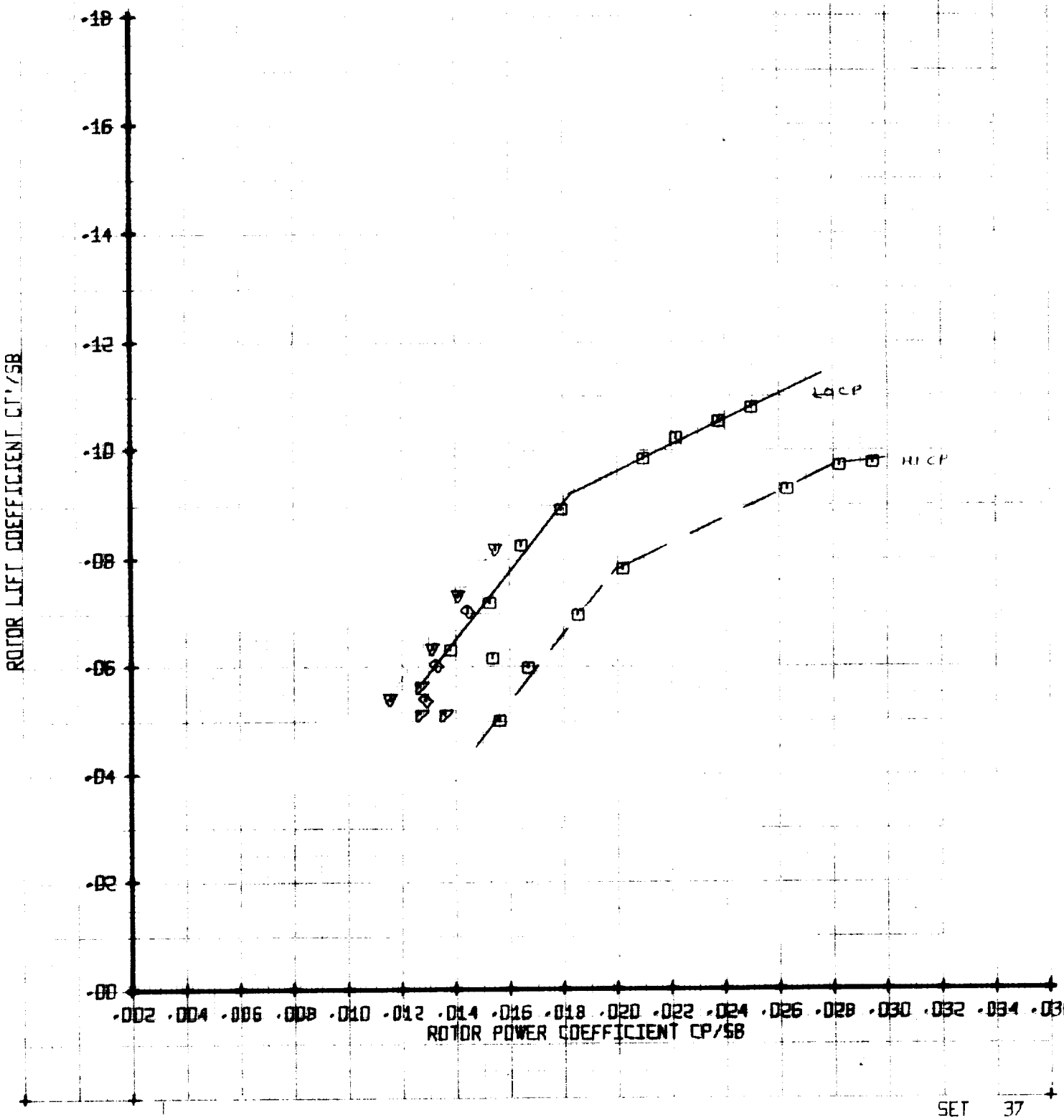
Figure A-210

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 37
WT 193

SET 37
BVWT 193

Figure A-210A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
▫	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

V_{TIP} = 620 FPS

ROTOR LIFT COEFFICIENT CT/SB

-18
-16
-14
-12
-10
-08
-06
-04
-02
-00

-00 -01 -02 -03 -04 -05 -06 -07 -08

ROTOR EFFECTIVE DRAG COEFF- CDE/SB

SET 37
BVWT 193

SET 37
BVWT 193

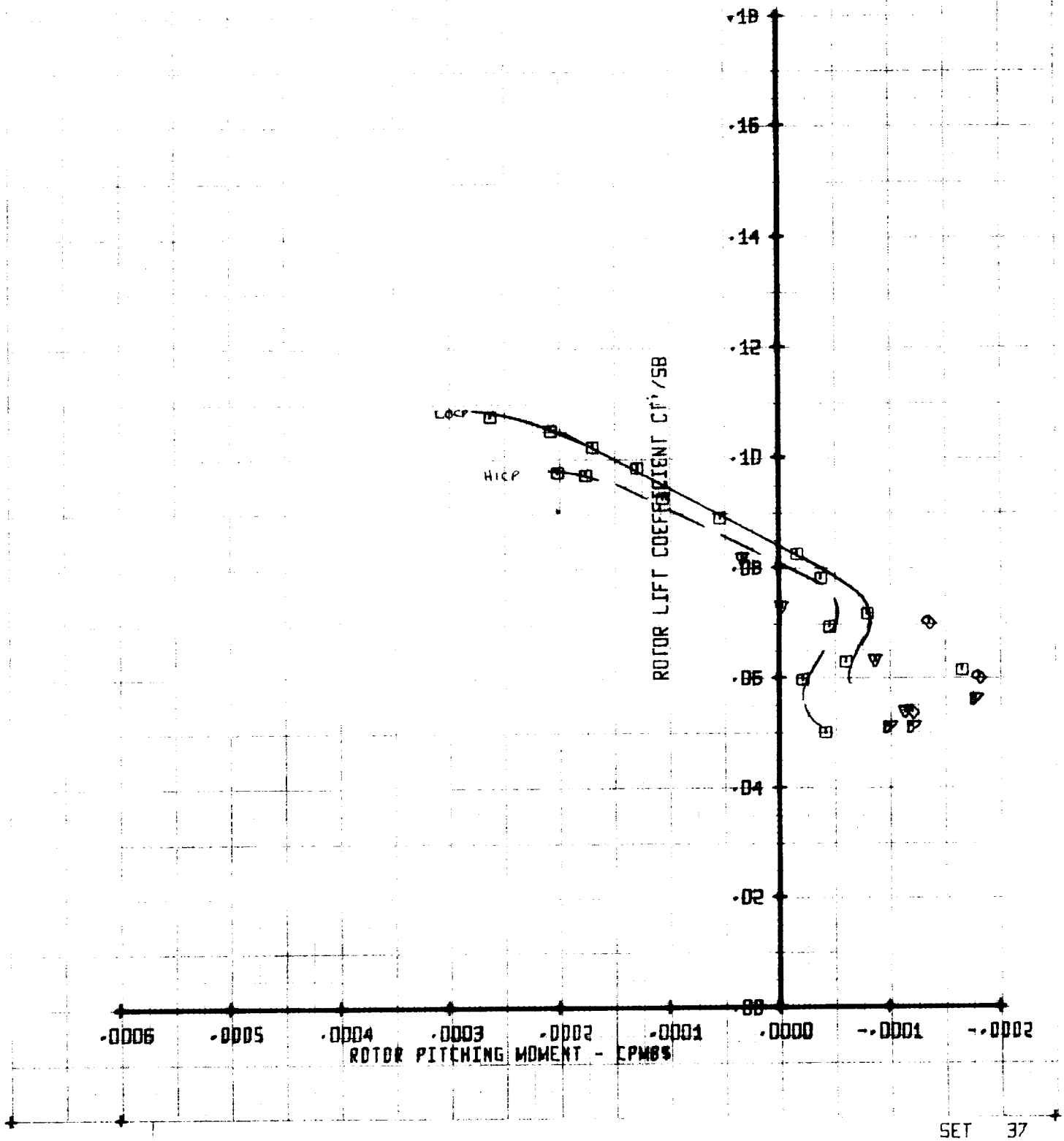
Figure A-211

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QDSB	VTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 37
WT 193

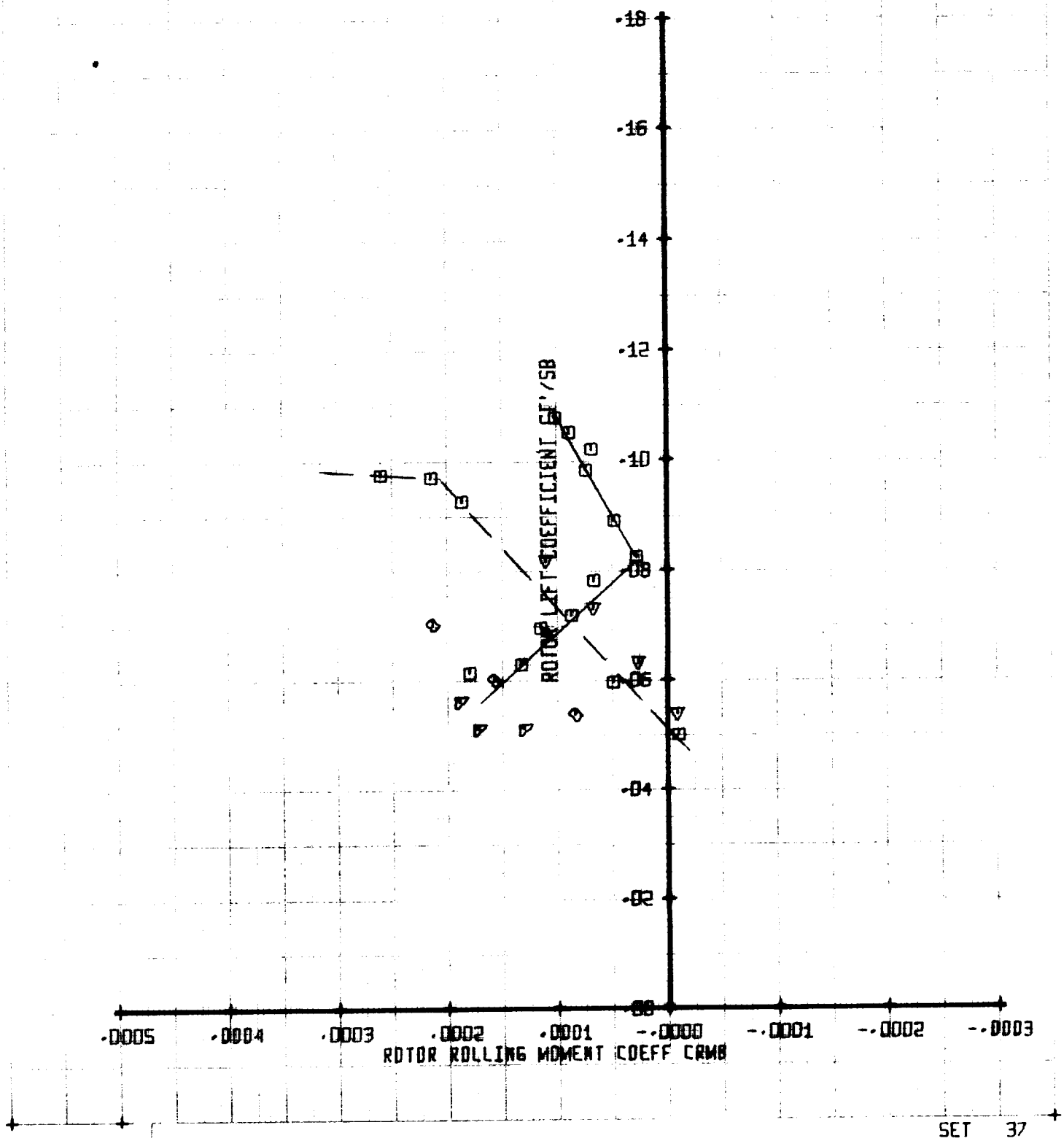
SET 37
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
□	224	.53	.05	320
▽	220	.53	.05	320
◇	221	.53	.05	320
▽	222	.53	.05	320

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 37
WT 193

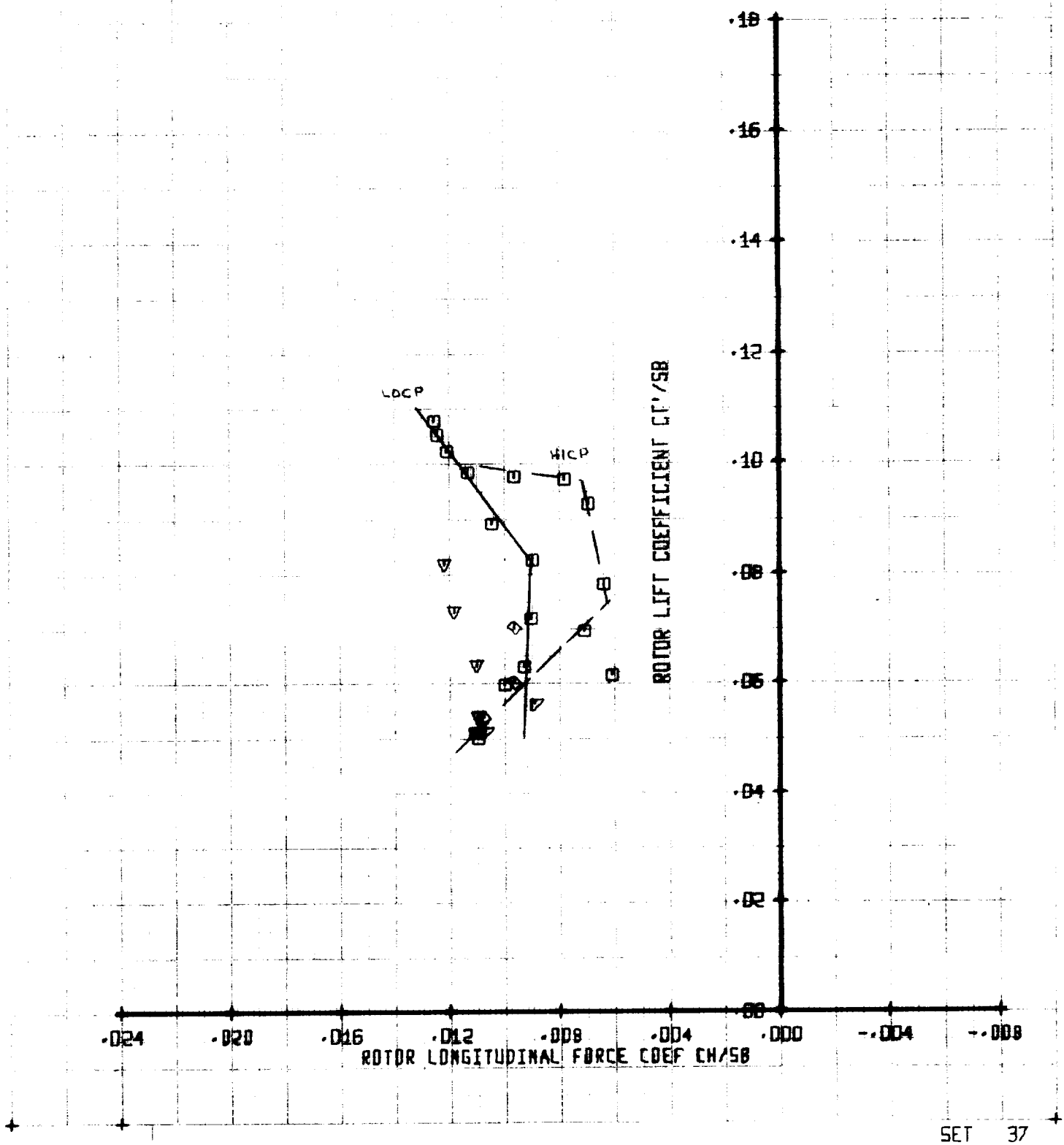
SET 37
BVWT 193

Figure A-213

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	224	.53	.05	320
▽	220	.53	.05	320
◇	221	.53	.05	320
▽	222	.53	.05	320

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 37
WT 193

SET 37
BVWT 193

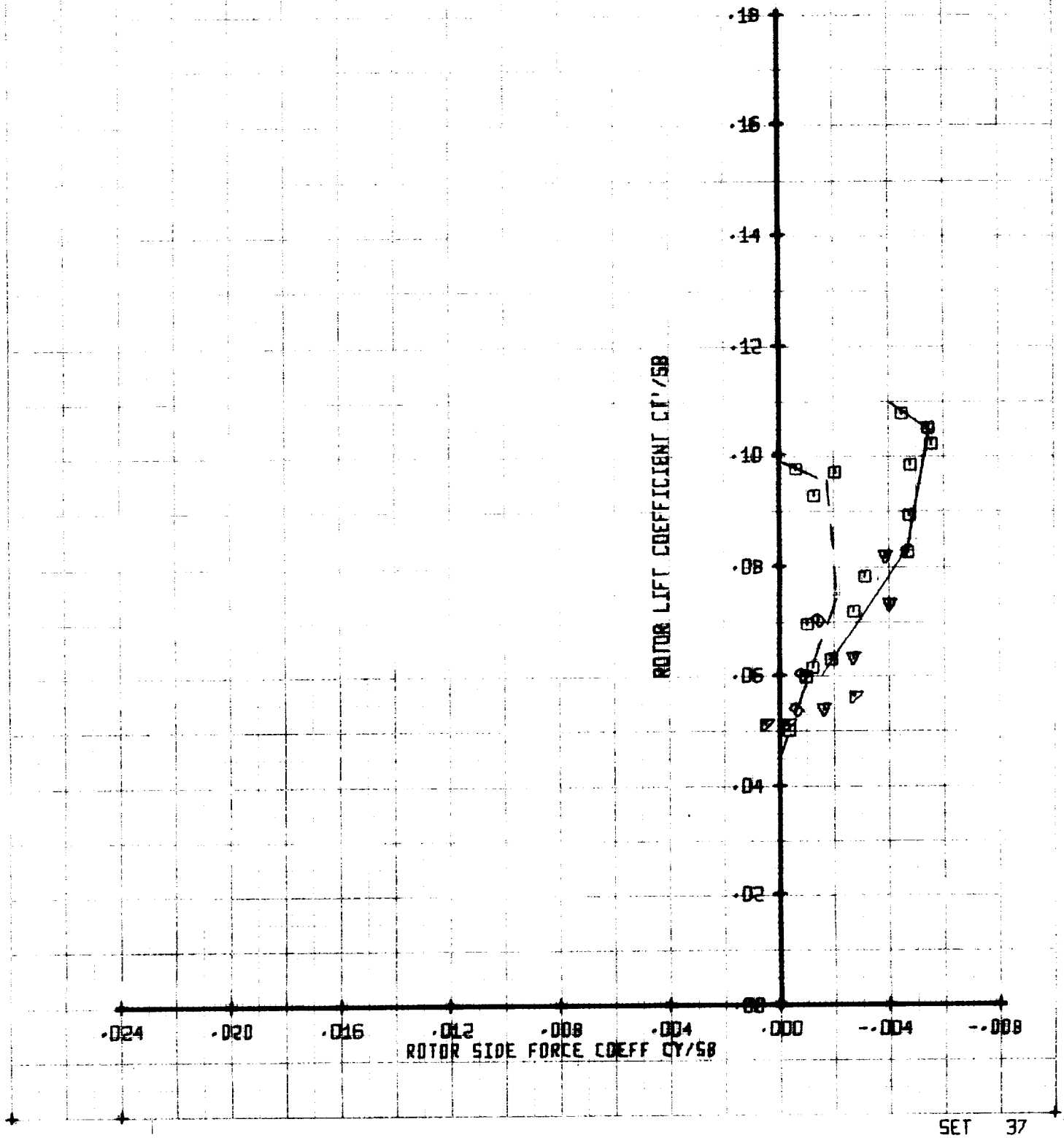
Figure A-214

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
□	224	.53	.05	329
▽	220	.53	.05	329
◇	221	.53	.05	329
▽	222	.53	.05	329

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 37
WT 193

SET 37
BVWT 193

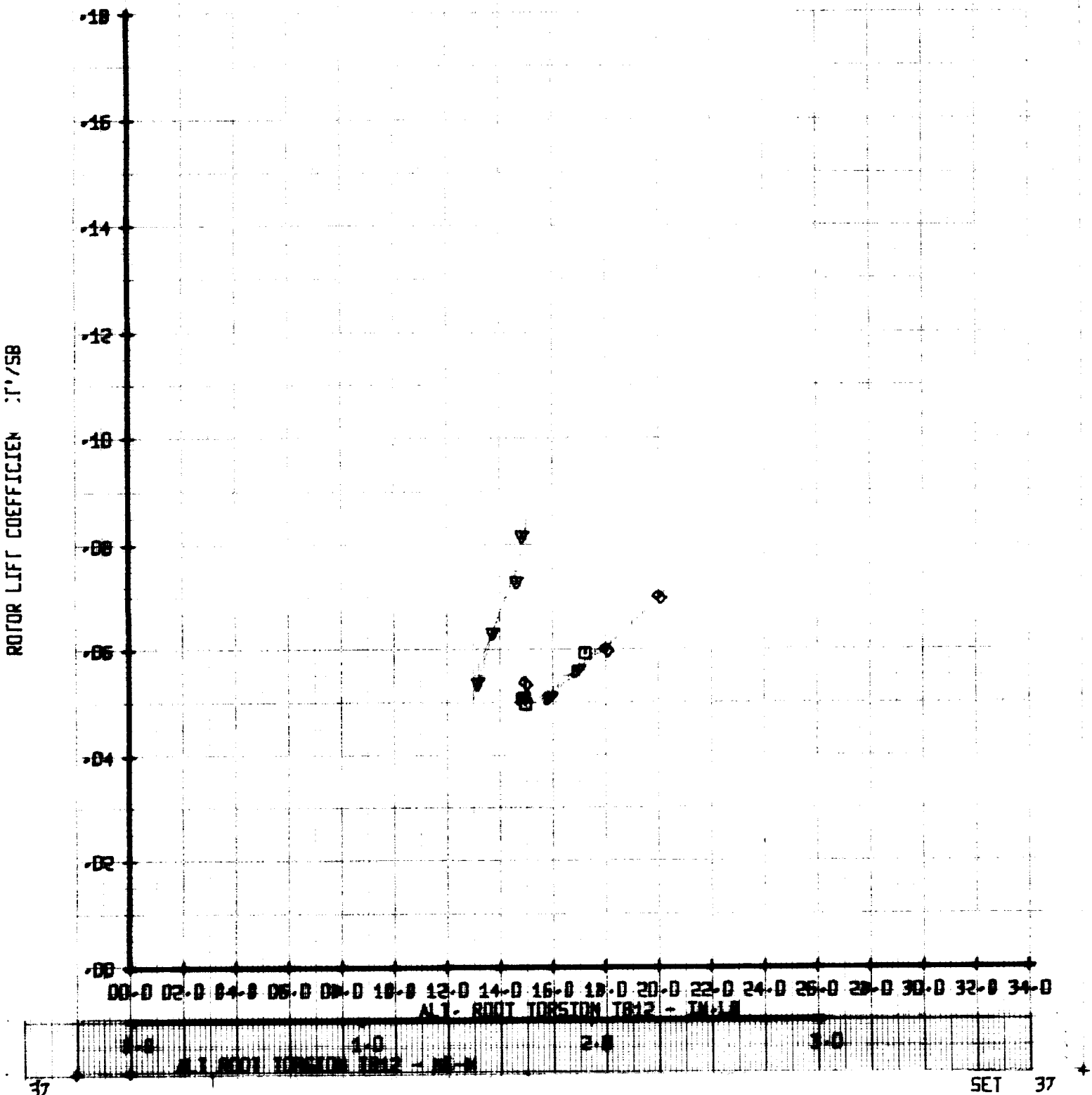
Figure A-215

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
▣	224	.53	.05	320
◐	220	.53	.05	320
◆	221	.53	.06	320
▼	222	.53	.05	320

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 37
WT 193

SET 37
BVWT 193

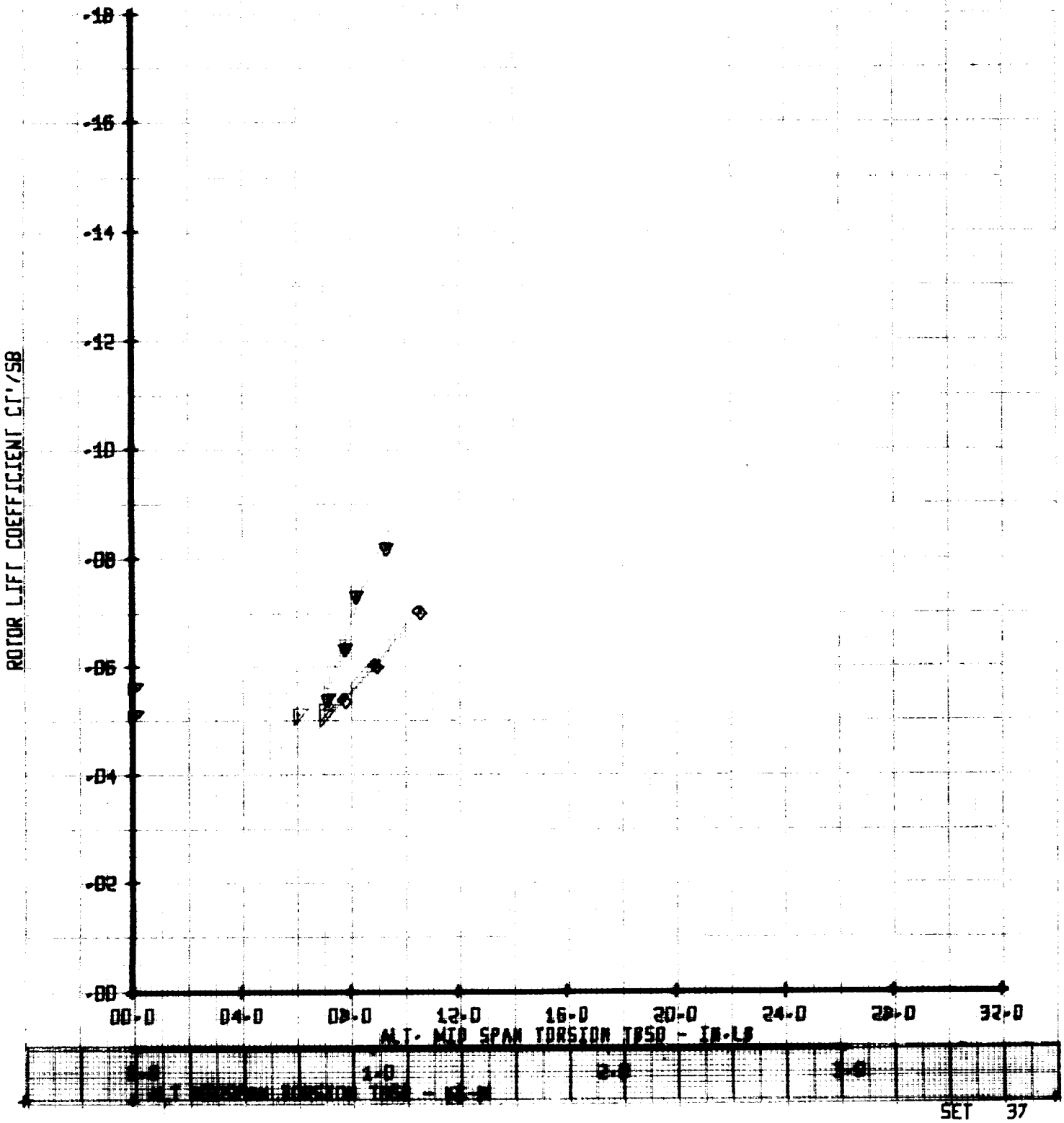
Figure A-216

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
⊙	224	.53	.05	329
▽	220	.53	.05	329
◇	221	.53	.05	329
▽	222	.53	.05	329

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 37
WT 193

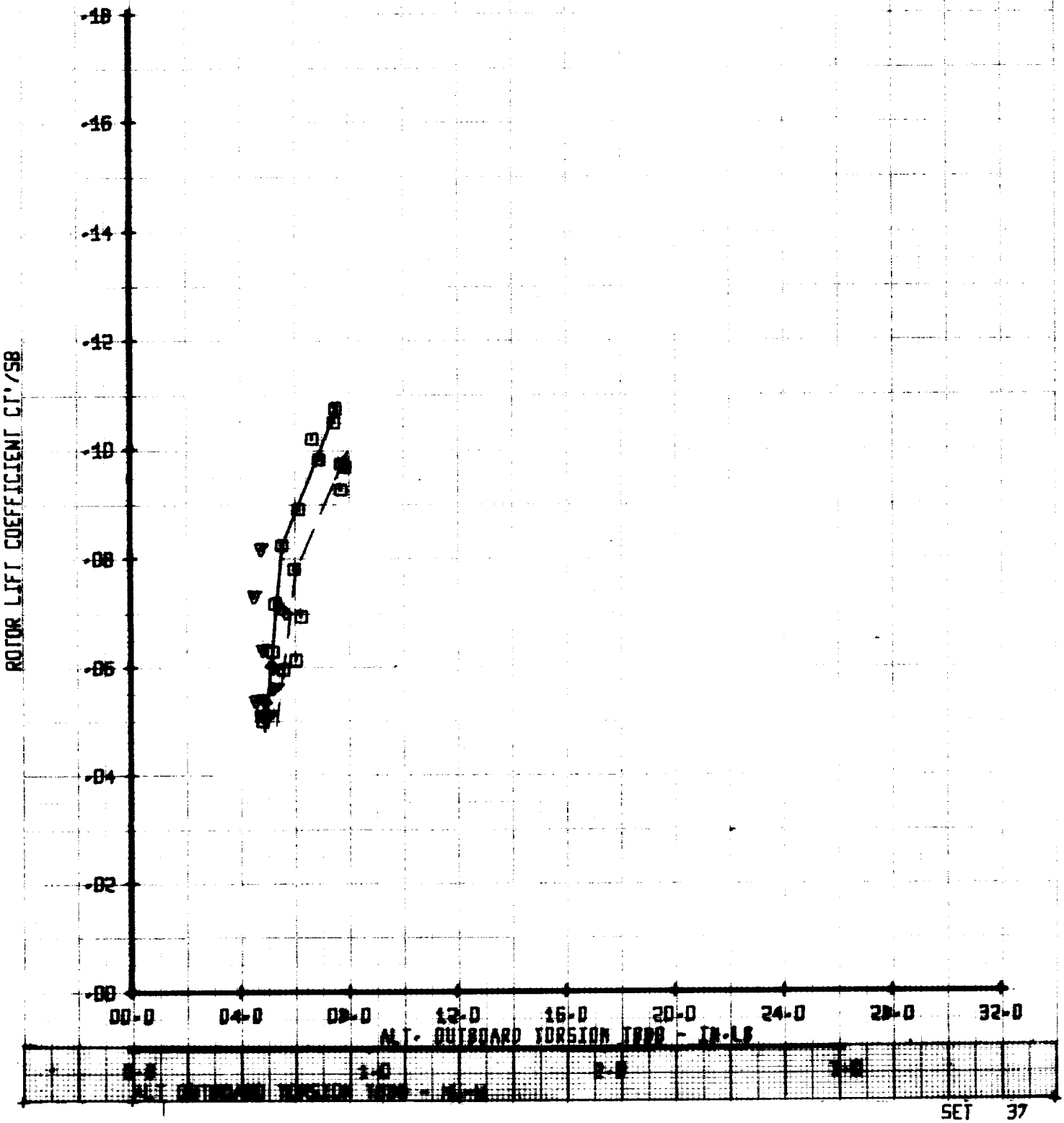
SET 37
BVWT 193

Figure A-217

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD29B	VTUN
▫	224	.53	.05	328
▽	220	.53	.05	328
◆	221	.53	.05	328
▽	222	.53	.05	328

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 37
WT 193

SET 37
BVWT 193

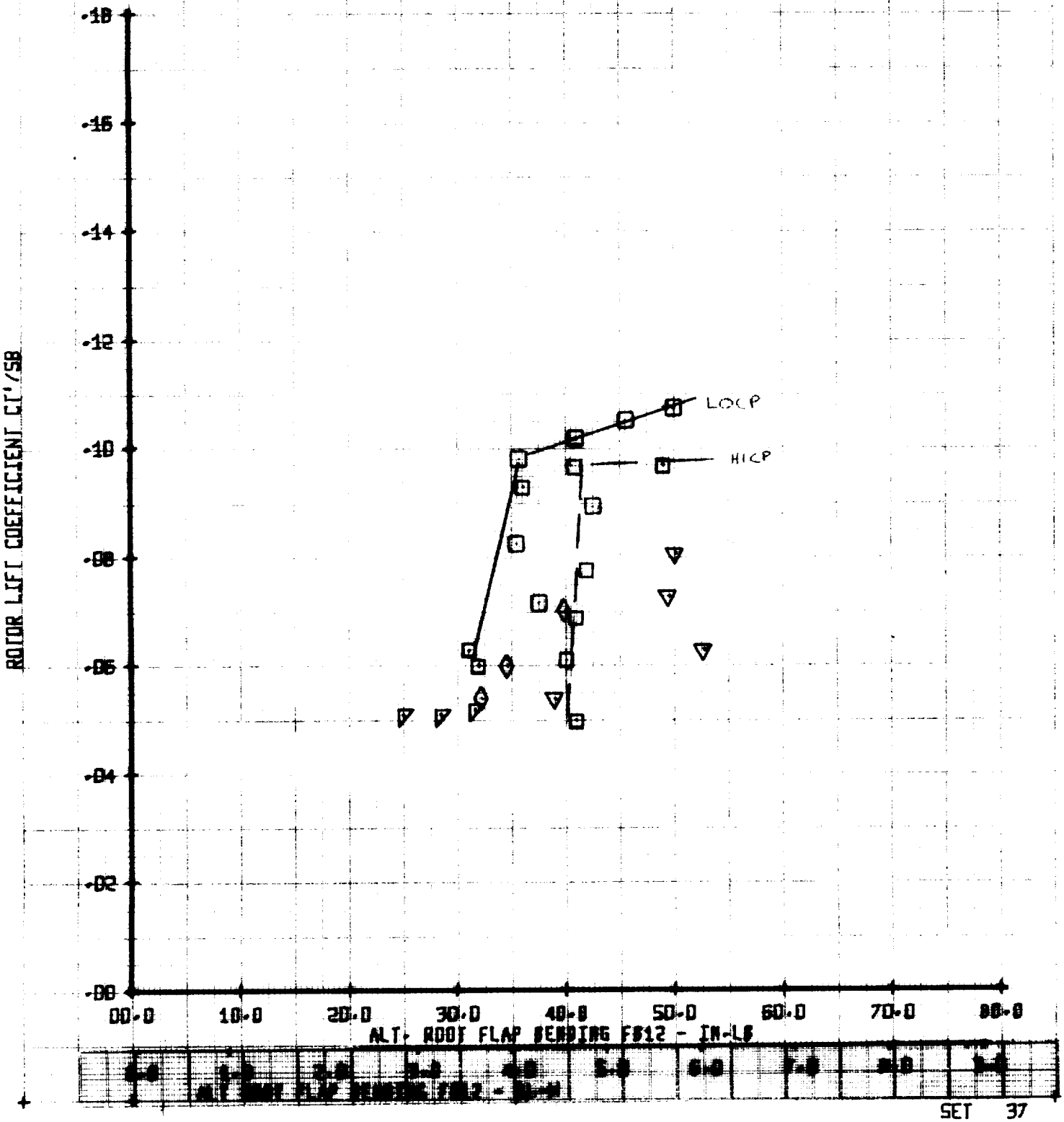
Figure A-218

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	224	.53	.05	32[illegible]
▽	220	.53	.05	32[illegible]
◇	221	.53	.05	32[illegible]
▼	222	.53	.05	32[illegible]

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 37
WT 193

SET 37
BVWT 193

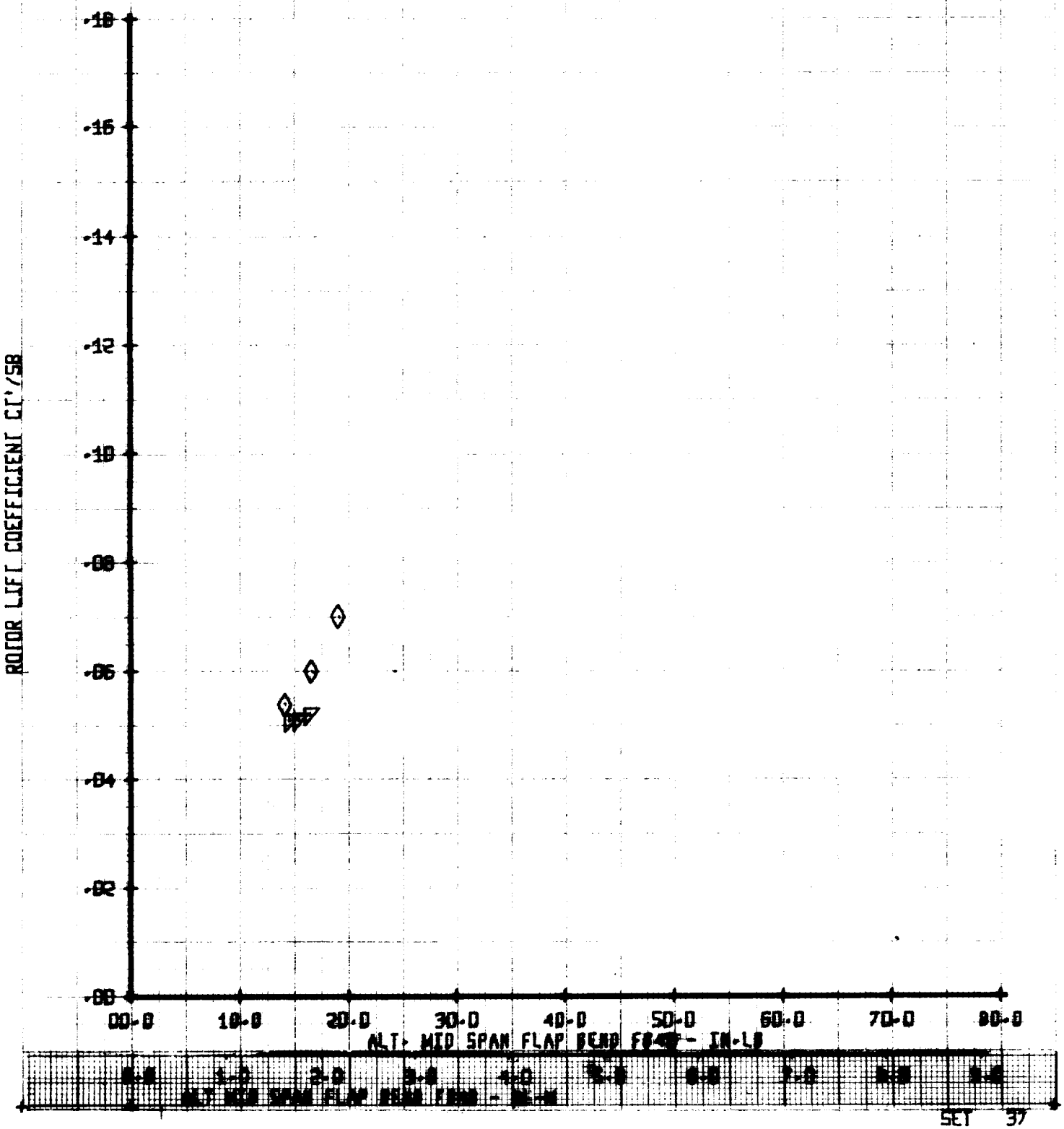
Figure A-219

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QDSB	YTUN
⊡	224	.53	.05	320
▽	220	.53	.05	320
◇	221	.53	.05	320
▼	222	.53	.05	320

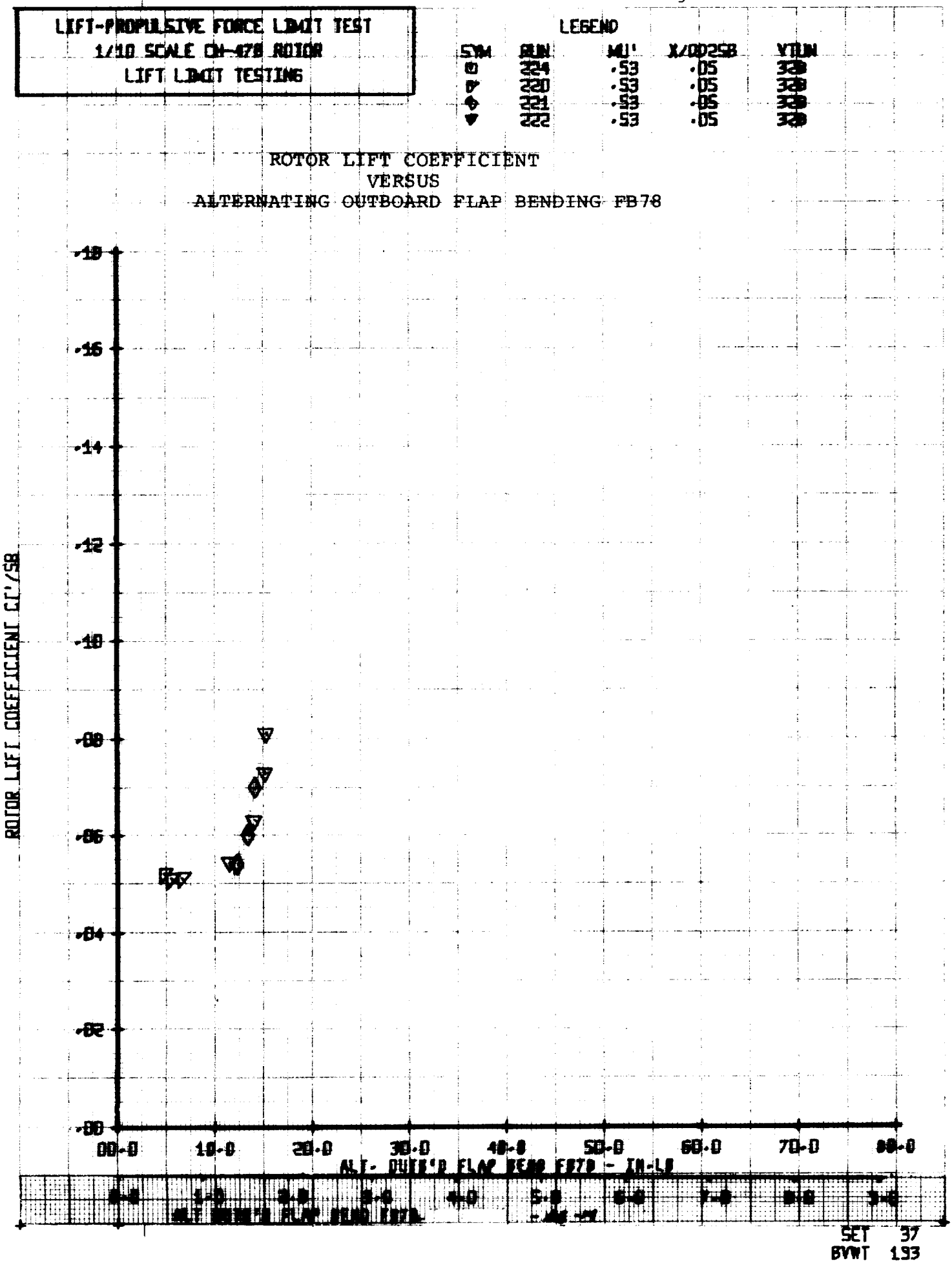
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB4



ET 37
WT 193

SET 37
BVWT 193

Figure A-220



SET 37
WT 193

Figure A-221

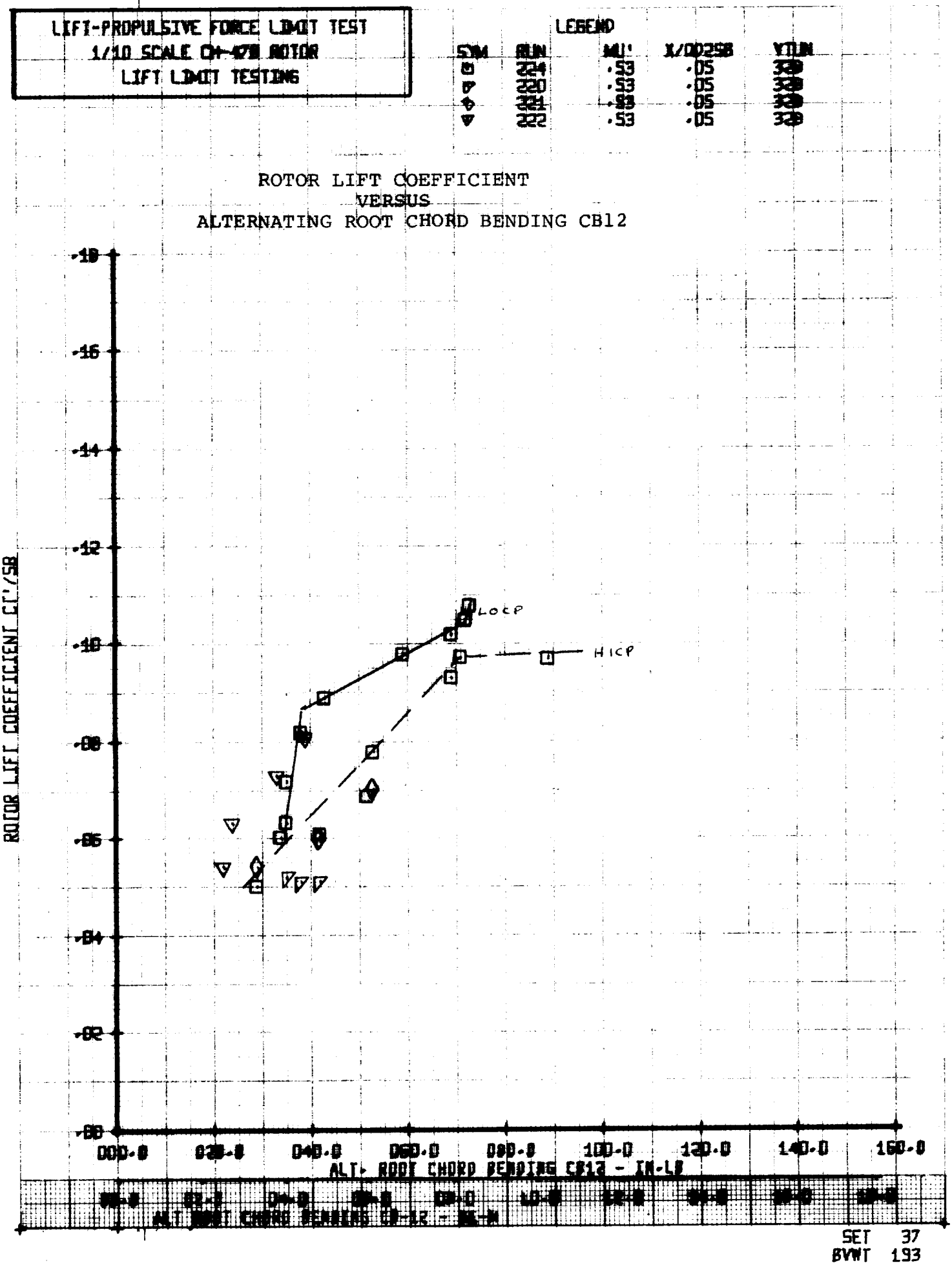

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/D2SB YTUN
224 .53 .05
220 .53 .05
221 .53 .05
222 .53 .05
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12
ROTOR LIFT COEFFICIENT CT/SB
LOCP
HICP
ALT. ROOT CHORD BENDING CB12 - IN-LB
ET 37
WT 193
SET 37
BVWT 193

Figure A-222

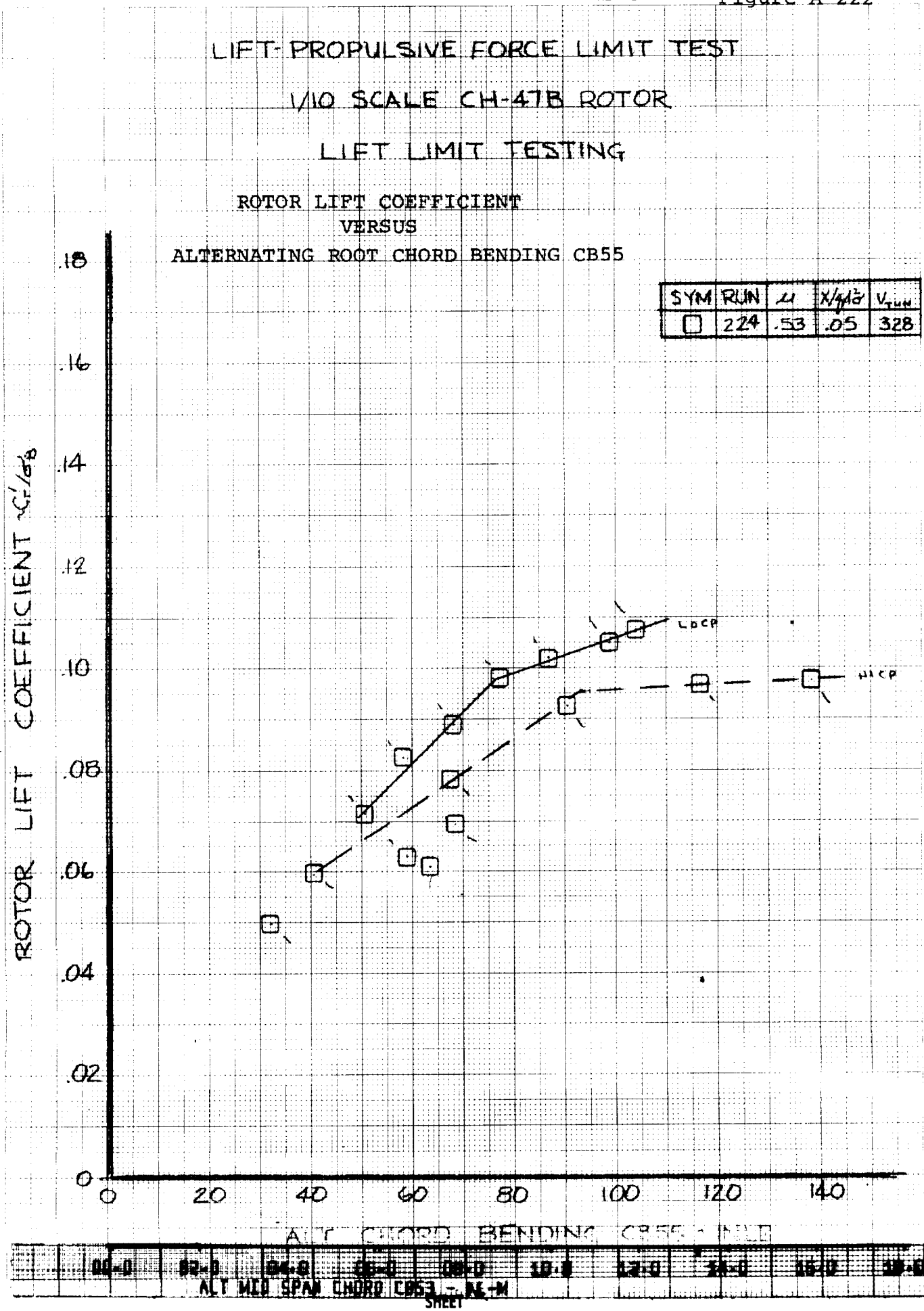


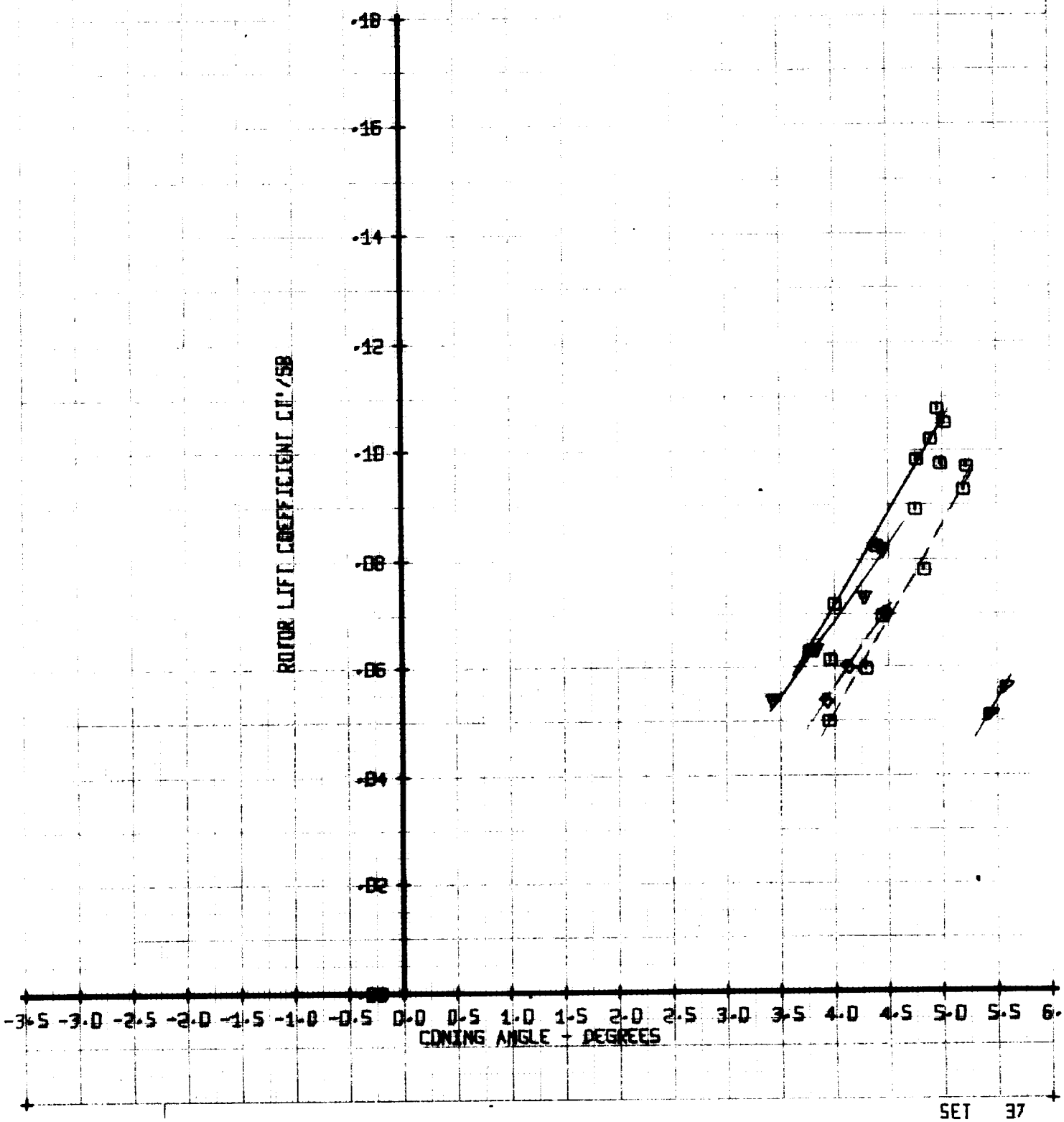
Figure A-222A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
▫	219	.53	.05	32[illegible]
▽	220	.53	.05	32[illegible]
◇	221	.53	.05	32[illegible]
▽	222	.53	.05	32[illegible]

ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE



ET 37
WT 193

SET 37
BVWT 193

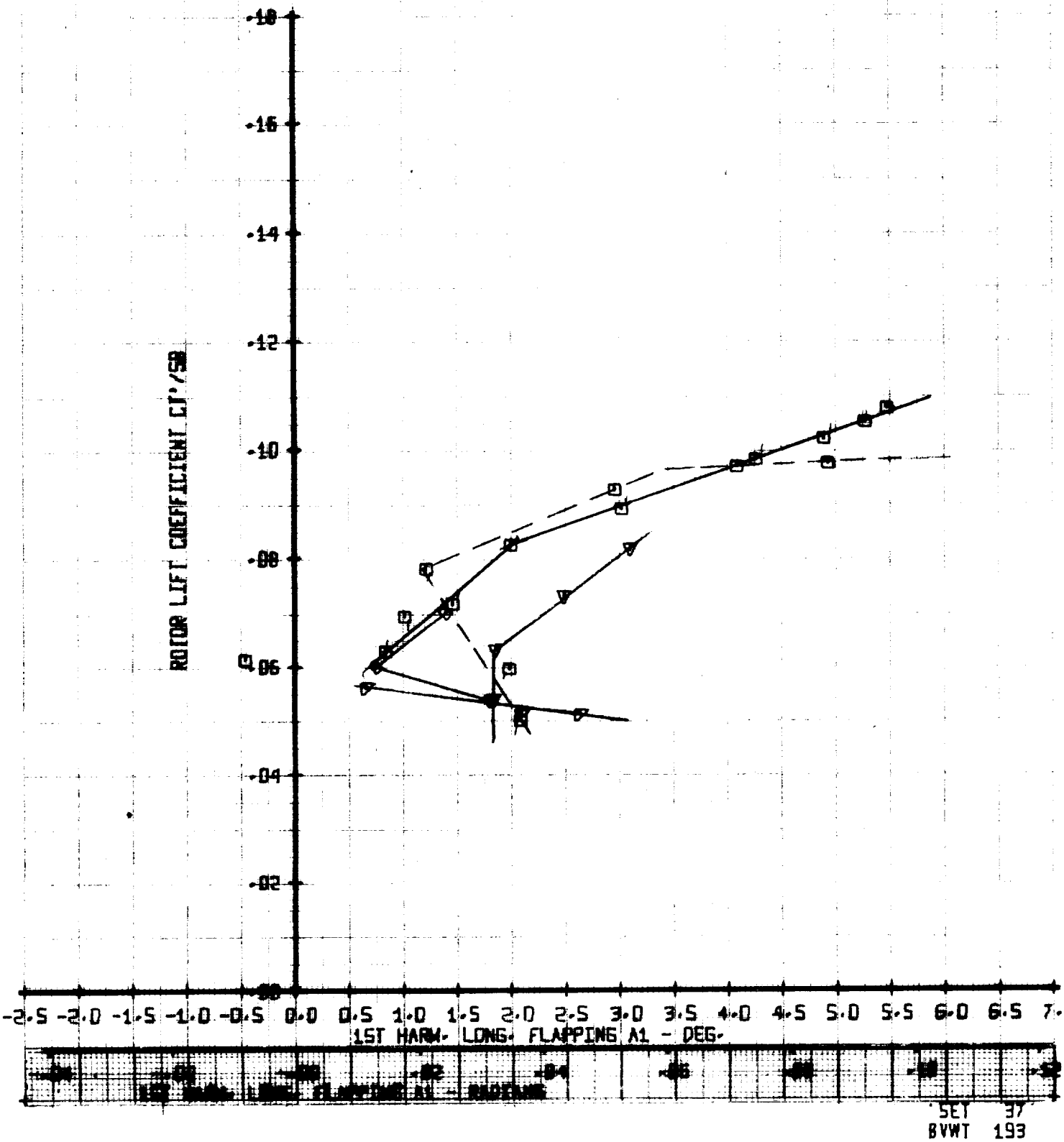
Figure A-222B

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/RD25B	YTUN
□	224	.53	.05	32B
▽	220	.53	.05	32B
◇	221	.53	.05	32B
▽	222	.53	.05	32B

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 37
WT 193

SET 37
BVWT 193

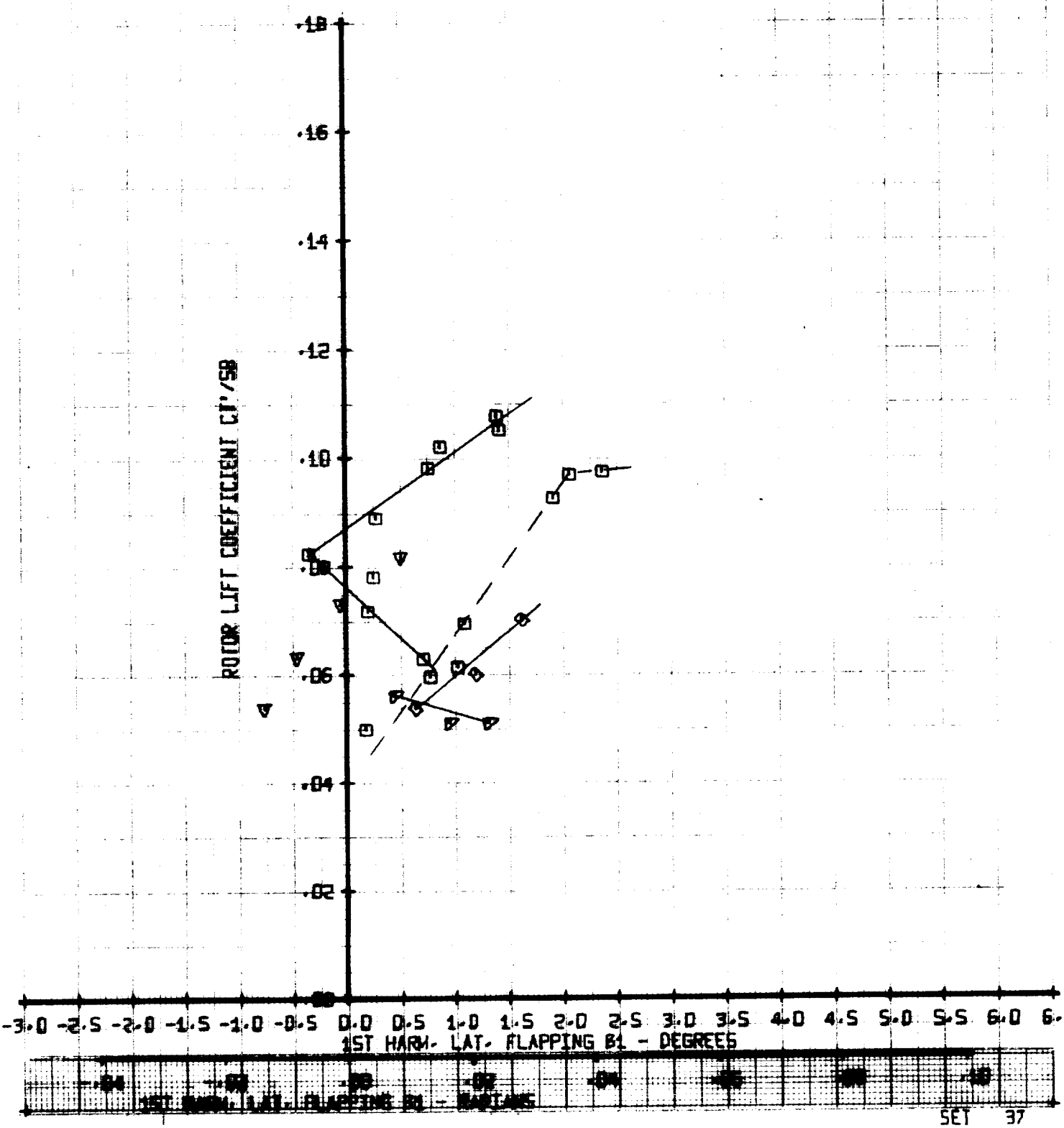
Figure A-223

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTLN
□	224	.53	.05	32
▽	220	.53	.05	32
◇	221	.53	.05	32
△	222	.53	.05	32

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 37
WT 193

SET 37
BVWT 193

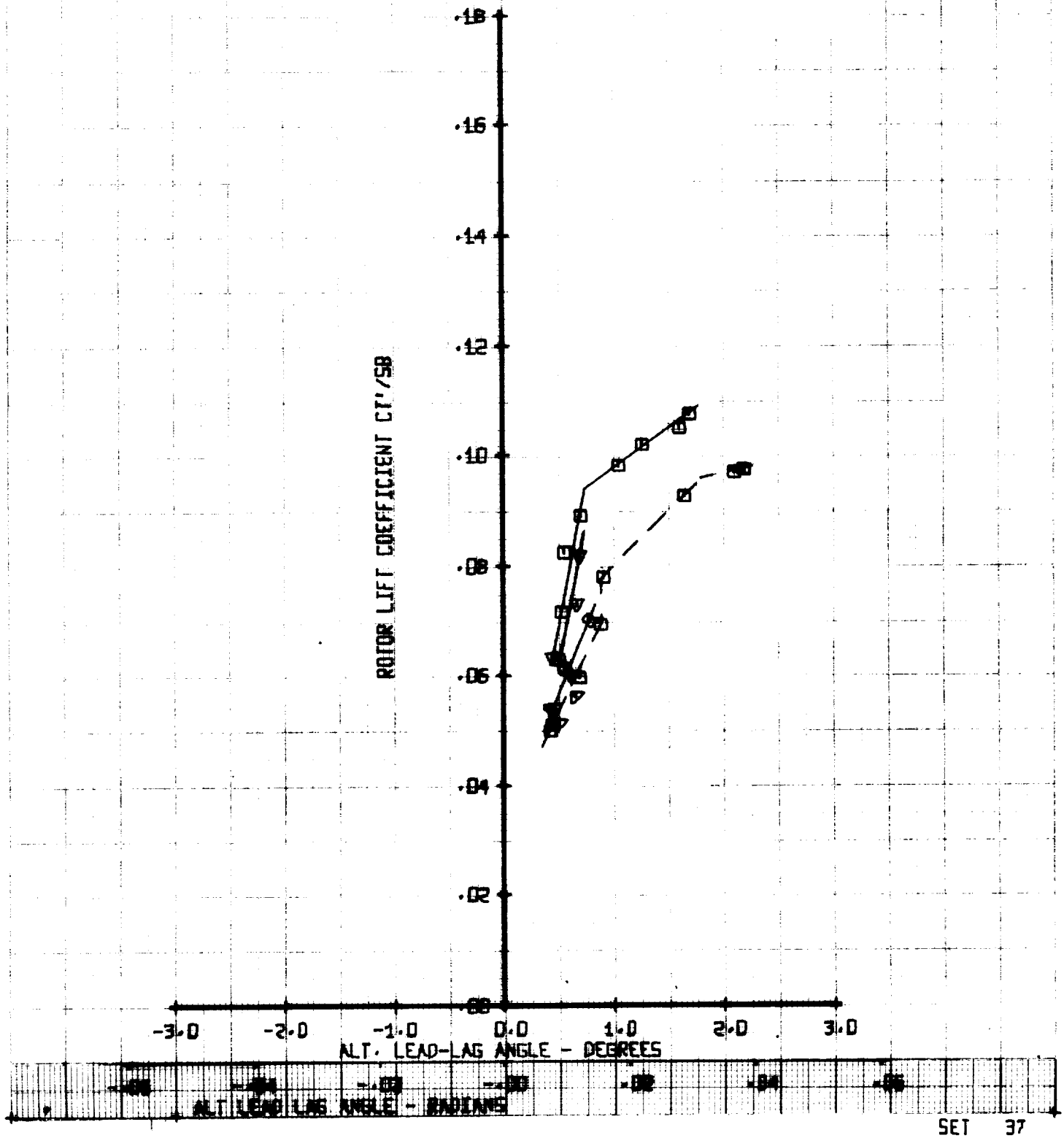
Figure A-224

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTLN
□	224	.53	.05	32[illegible]
▷	220	.53	.05	33[illegible]
◇	221	.53	.05	32[illegible]
▽	222	.53	.05	32[illegible]

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 37
WT 193

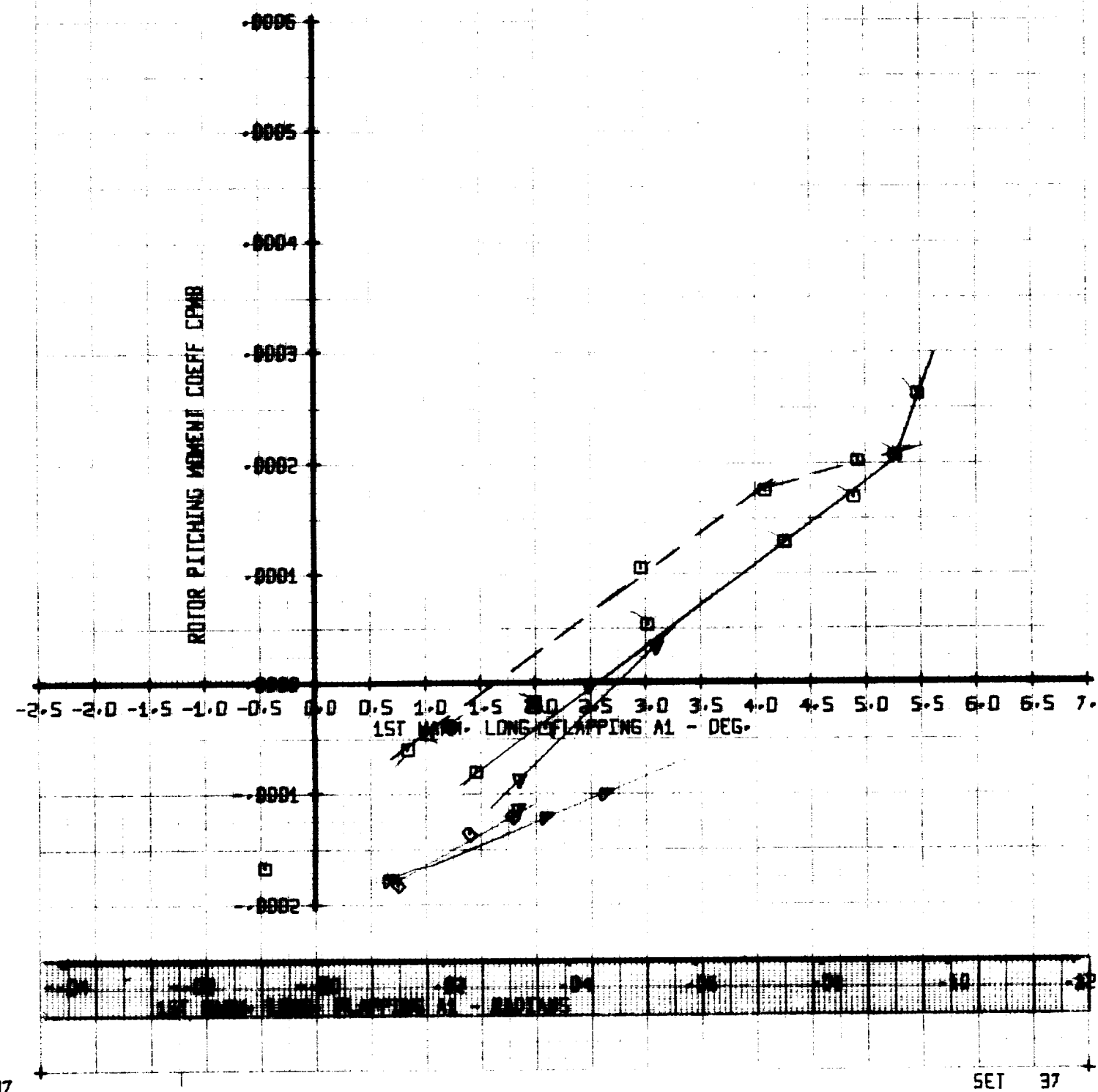
SET 37
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	YTUN
□	224	.53	.05	320
▽	220	.53	.05	320
◇	221	.53	.05	320
▽	222	.53	.05	320

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 37
WT 193

SET 37
BVWT 193

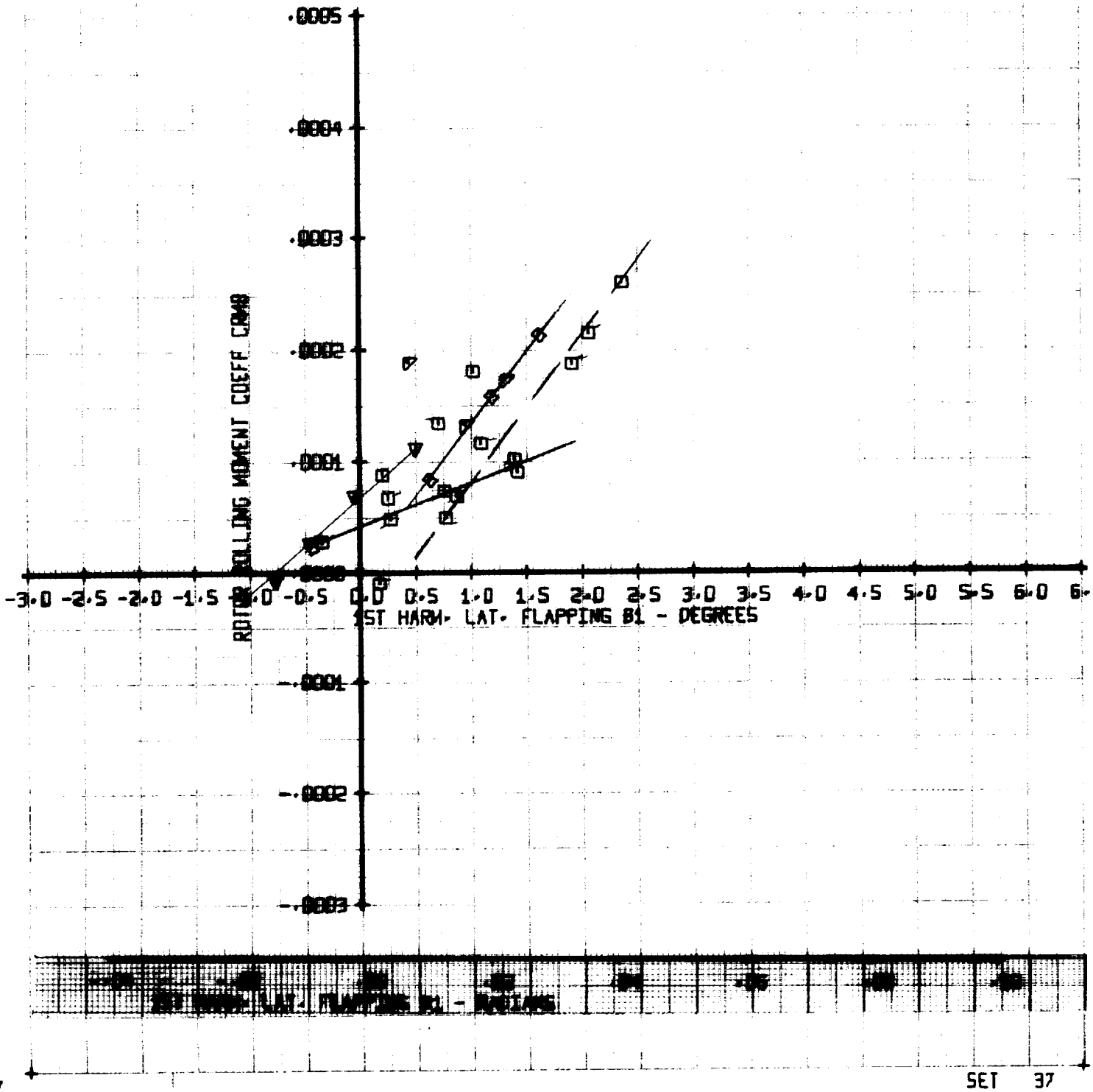
Figure A-226

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	224	.53	.05	328
▽	220	.53	.05	328
◇	221	.53	.05	328
▼	222	.53	.05	328

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 37
WT 193

SET 37
BVWT 193

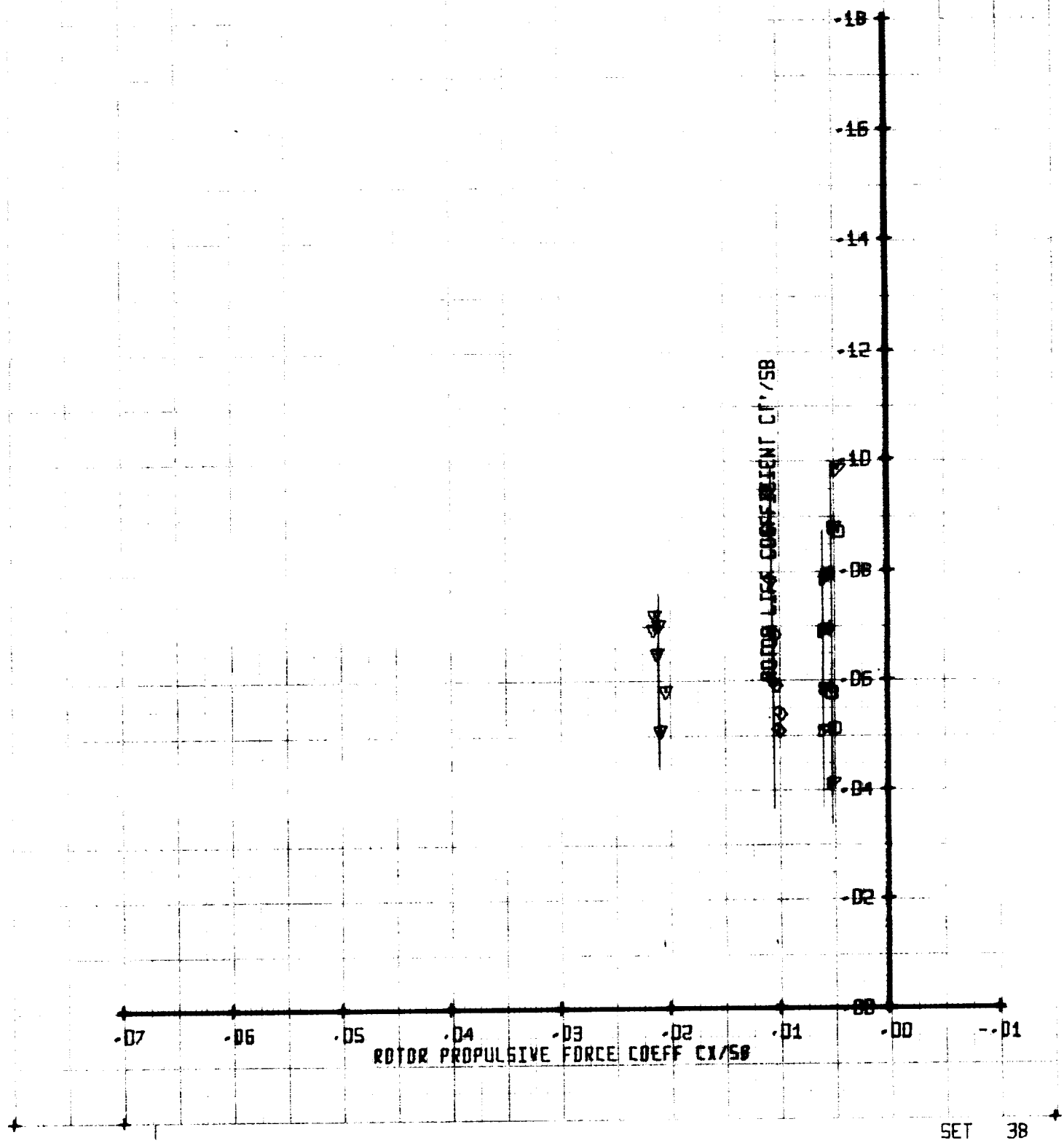
Figure A-227

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	246	.57	.025	358
▽	249	.57	.025	358
◇	228	.57	.05	358
▽	245	.57	.10	358

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 38
WT 193

SET 38
BVWT 193

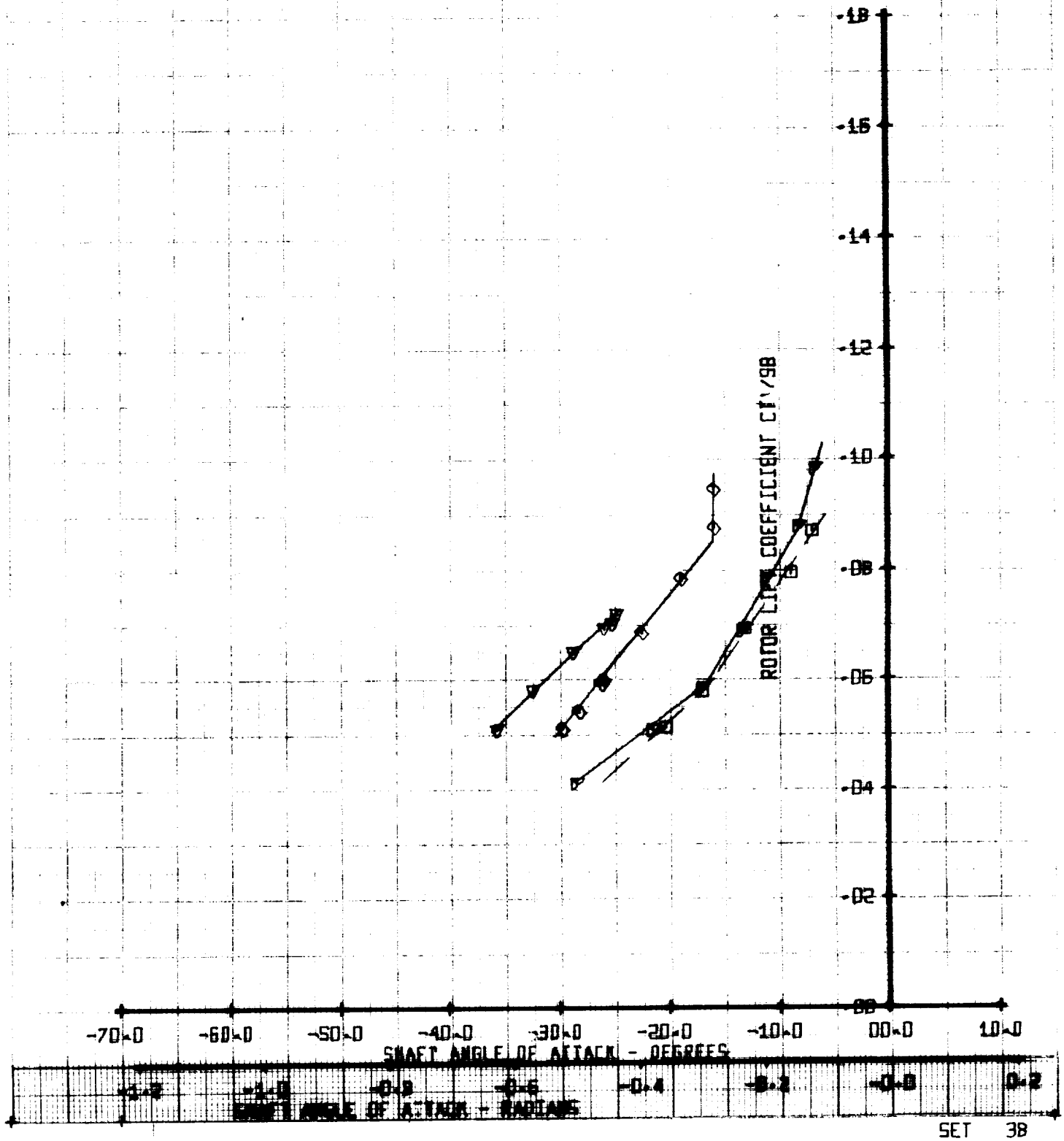
Figure A-228

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	229	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 38
WT 193

SET 38
BVWT 193

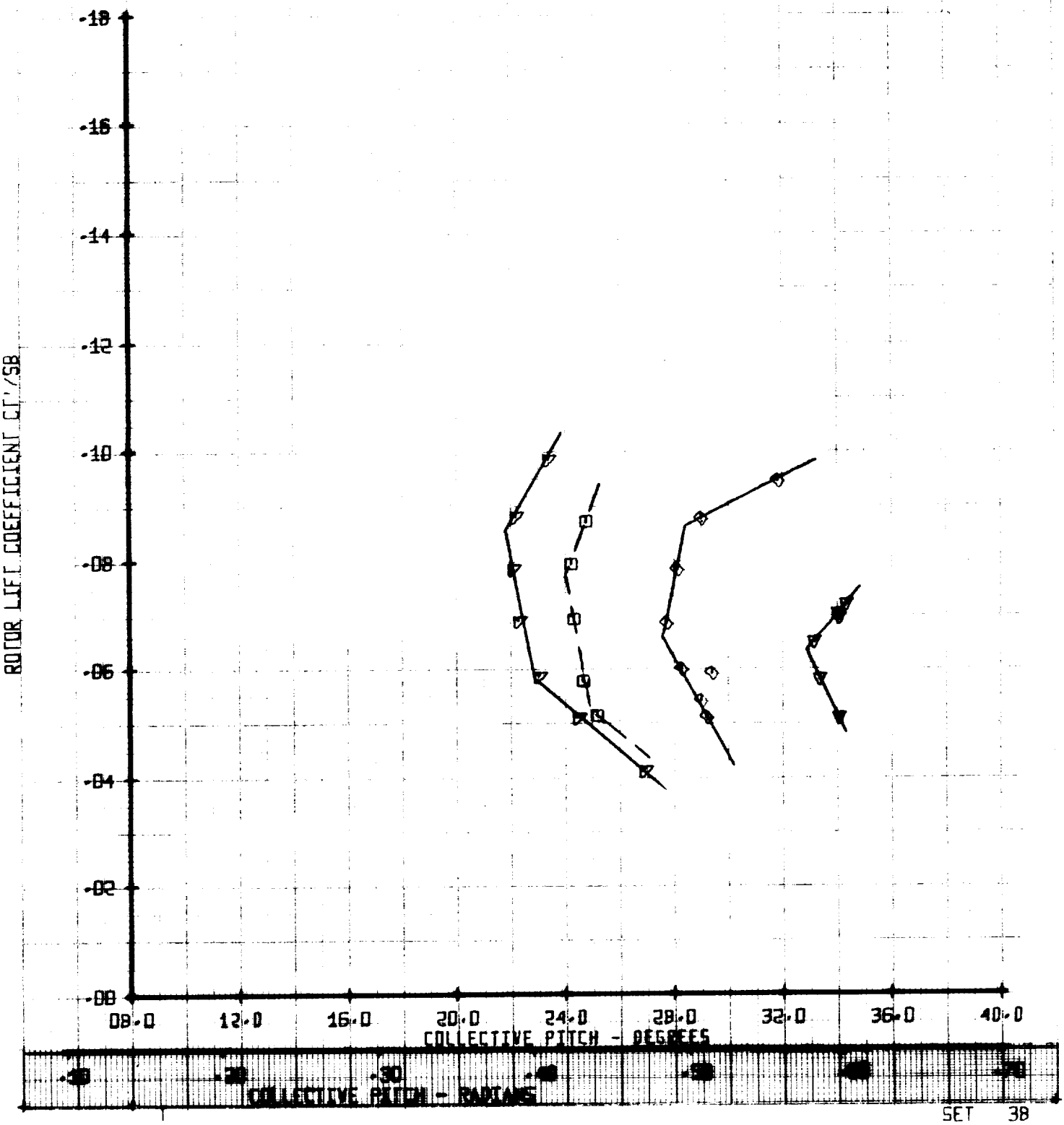
Figure A-229

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10-SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	228	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 38
WT 193

SET 38
RVWT 193

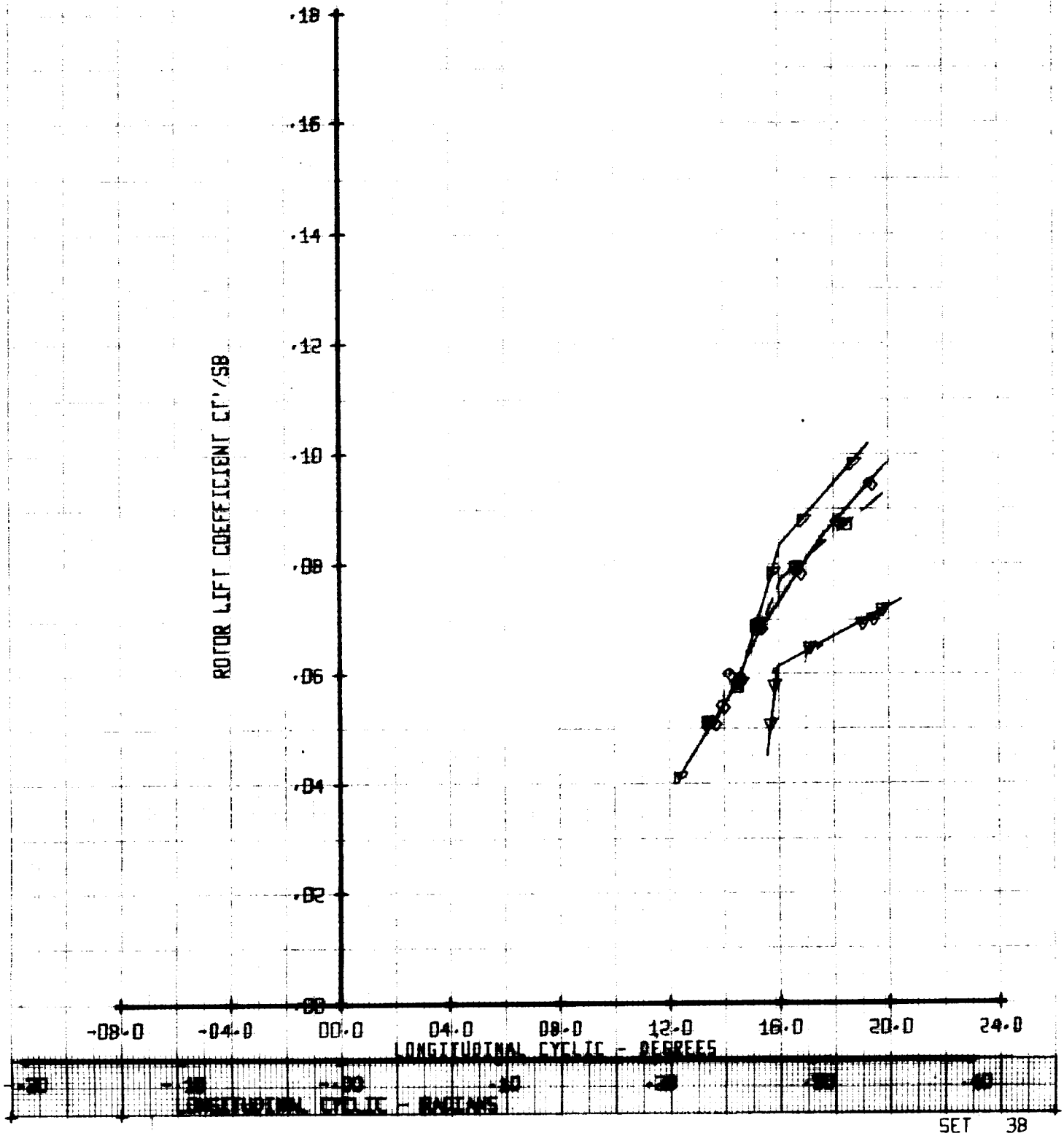
Figure A-230

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VIUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	228	.57	-.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 38
WT 193

SET 38
BVWT 193

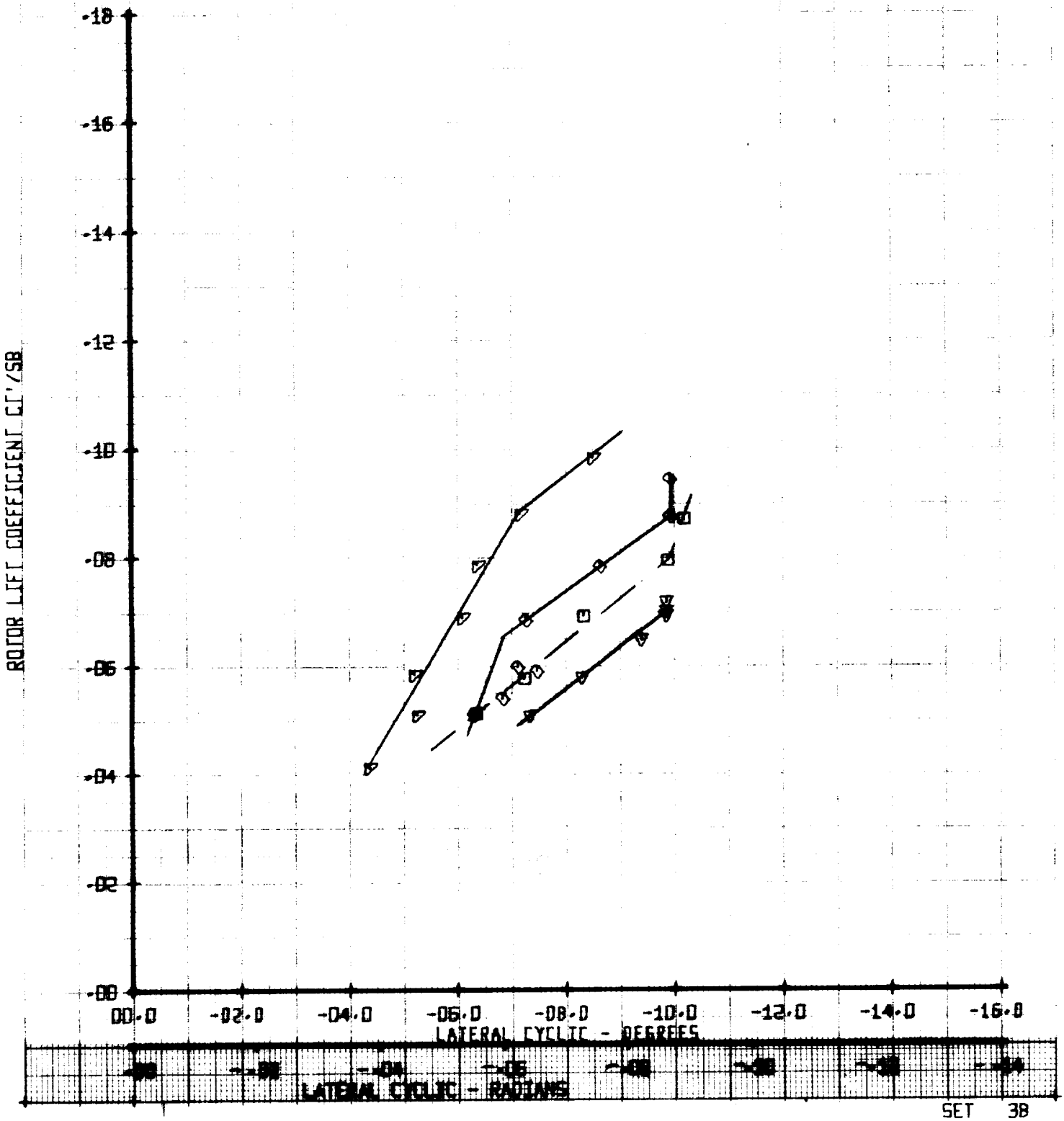
Figure A-231

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	228	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 38
WT 193

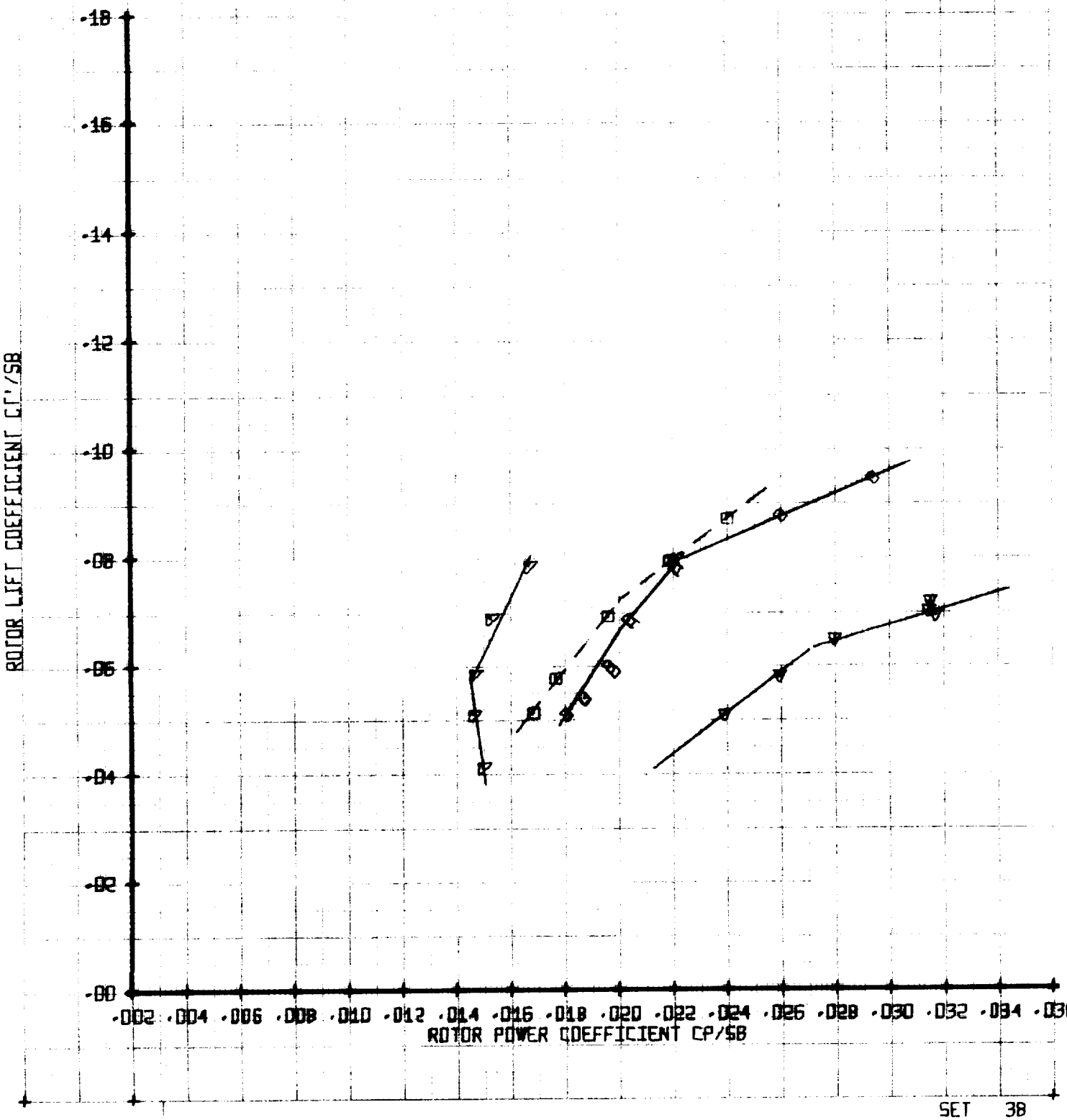
SET 38
BVWT 193

Figure A-232

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD2SB	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	228	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 38
WT 193

SET 38
BVWT 193

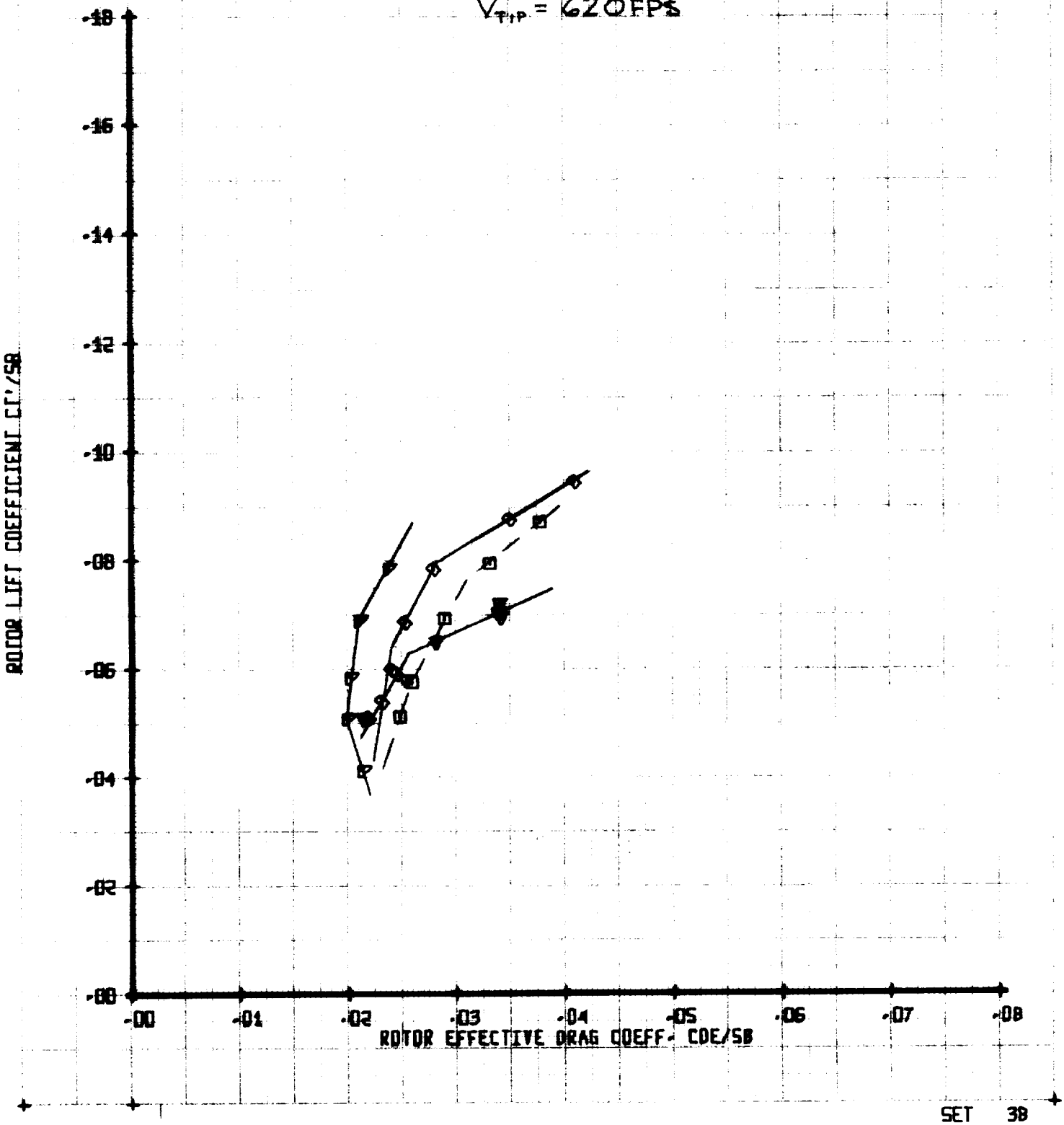
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/D2SB	YTUN
▫	246	.57	.025	353
▽	249	.57	.025	353
◇	248	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

V_{TIP} = 620 FPS



SET 38
WT 193

SET 38
BVWT 193

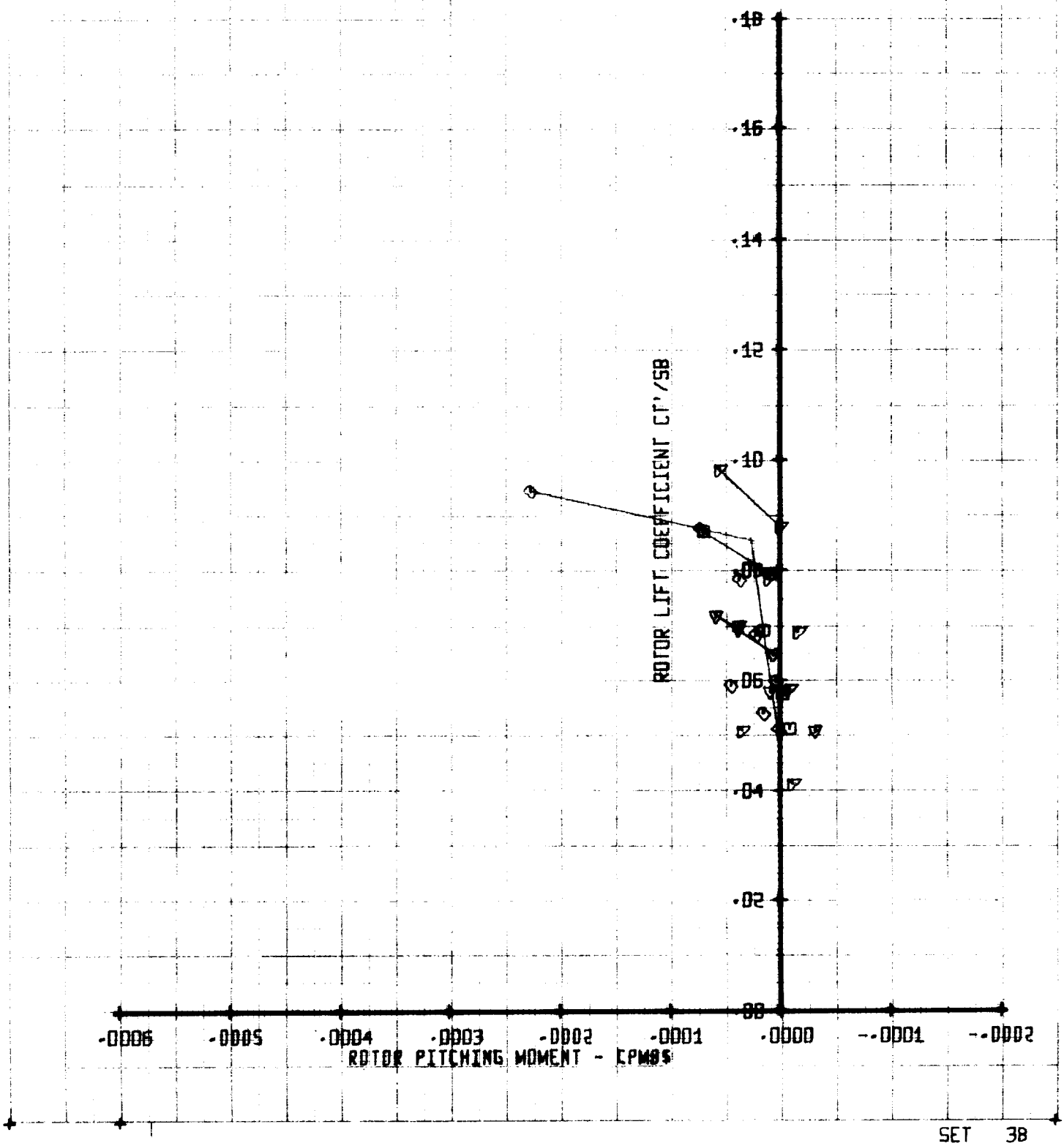
Figure A-233

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
◻	246	.57	.025	353
◸	249	.57	.025	353
◇	228	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 38
WT 193

SET 38
BVWT 193

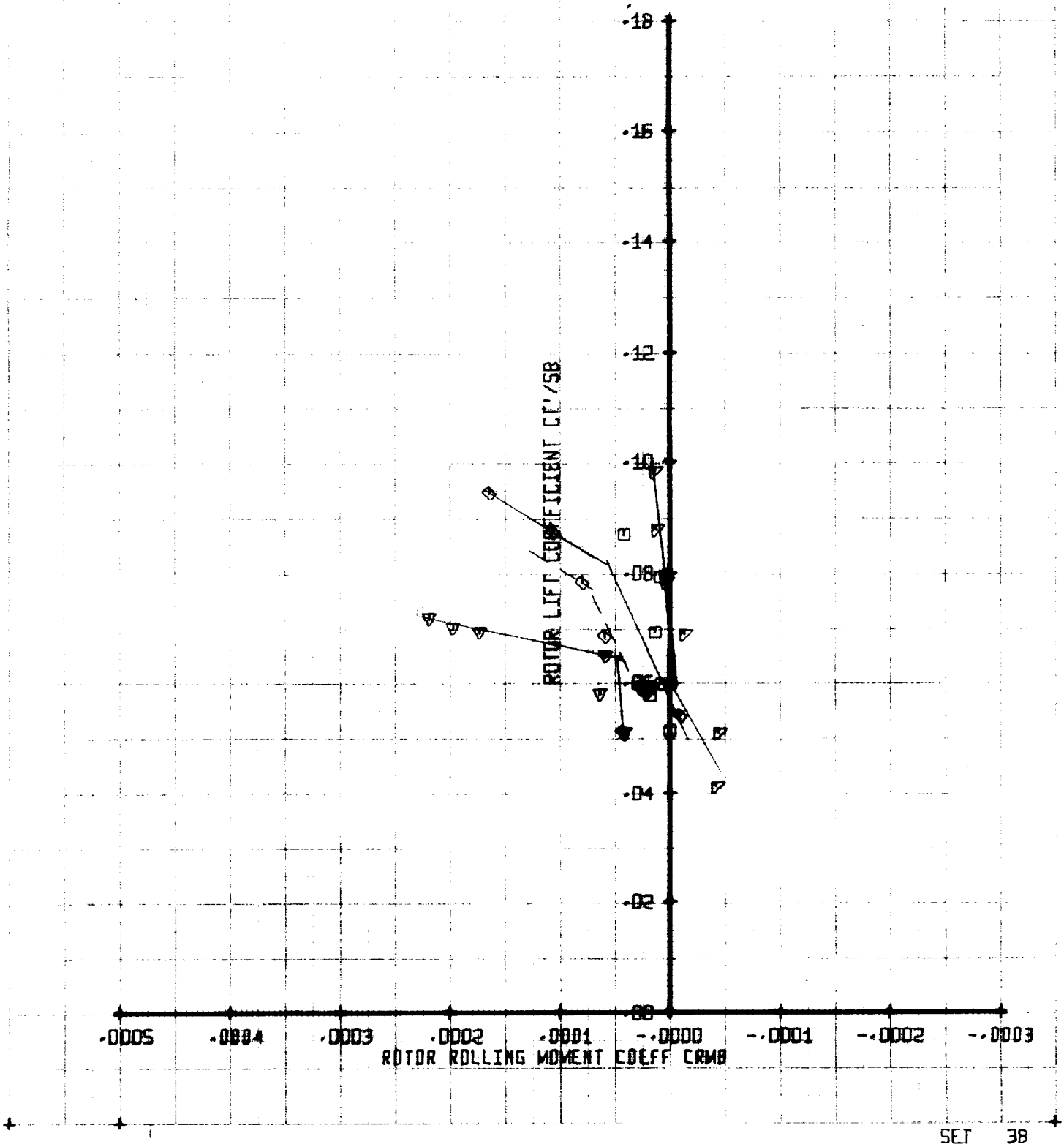
Figure A-234

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	229	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 38
WT 193

SET 38
BVWT 193

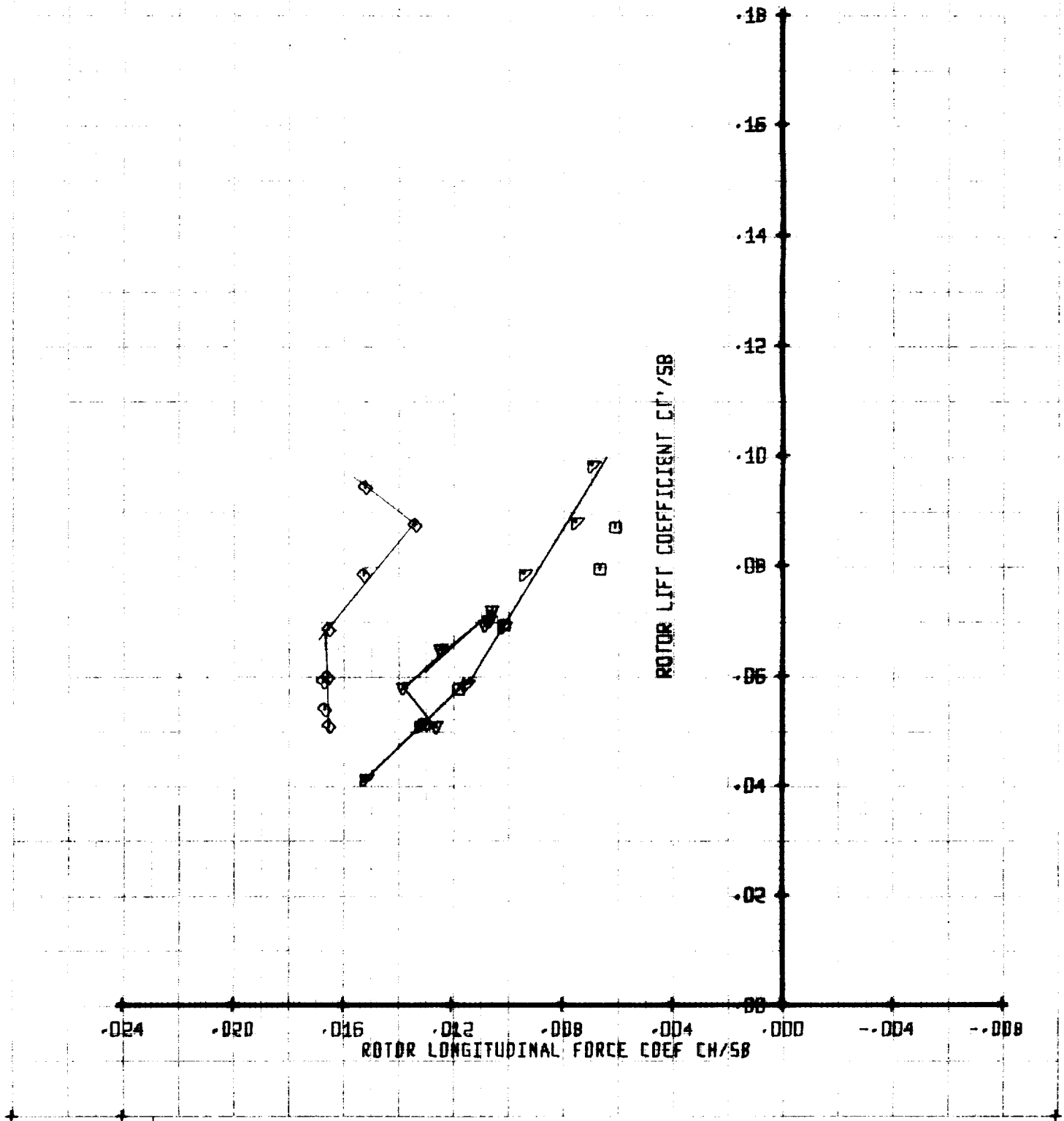
Figure A-235

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ25B	YTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	229	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 38
WT 193

SET 38
BVWT 193

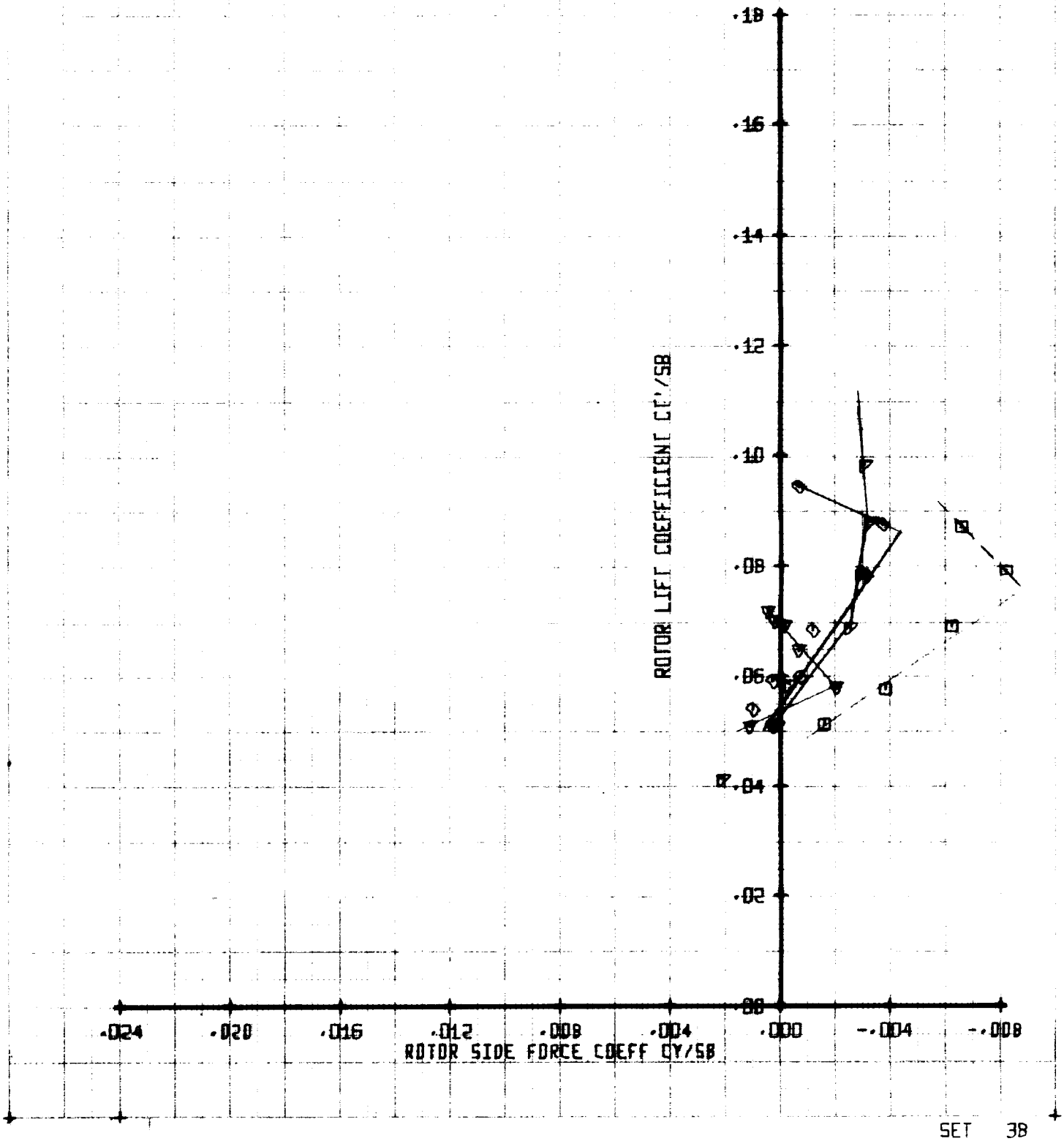
Figure A-236

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	246	.57	.025	353
▽	249	.57	.025	353
◇	228	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 38
WT 193

SET 38
RVWT 193

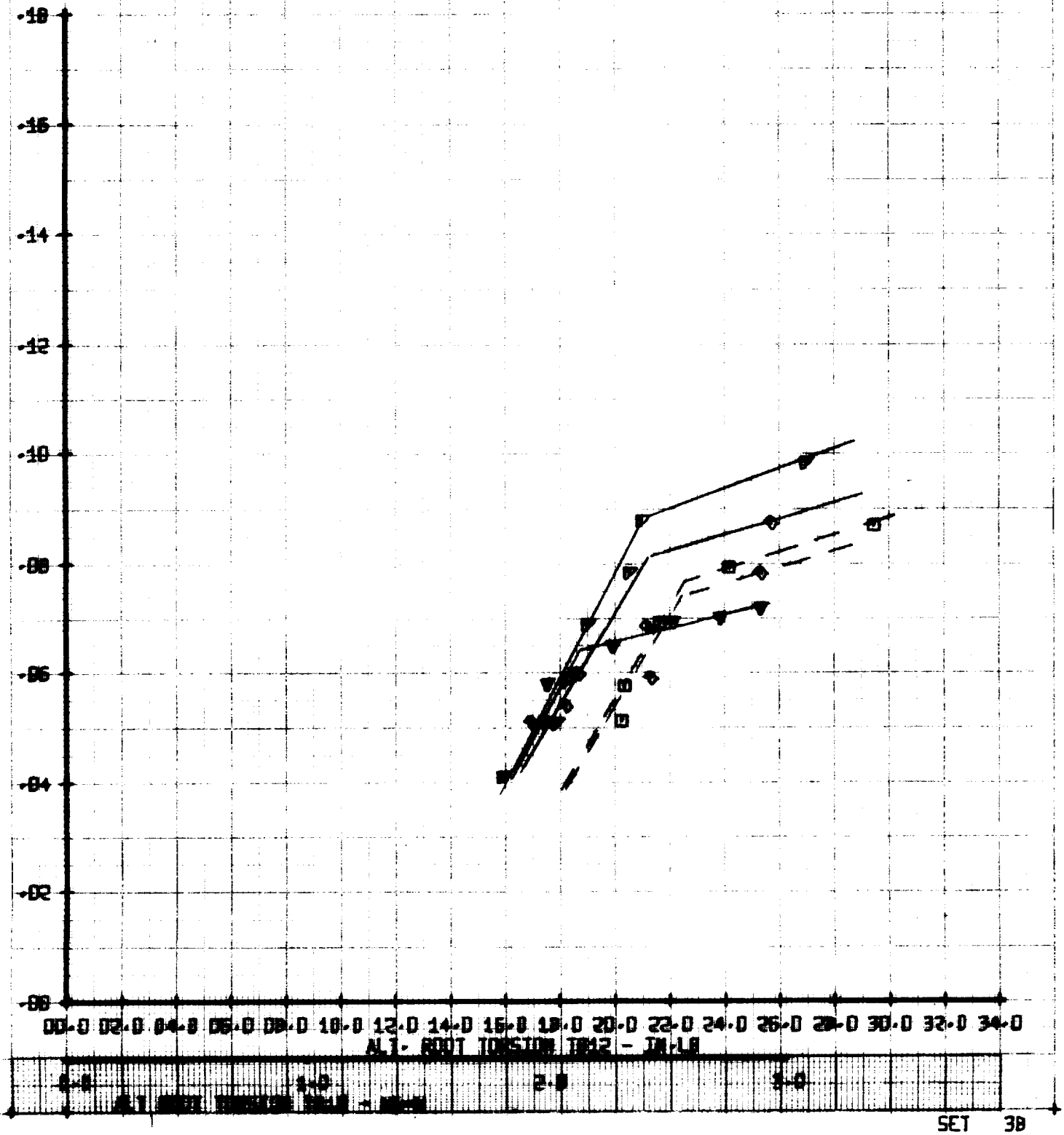
Figure A-237

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	YTUN
▣	246	.57	.025	353
▽	249	.57	.025	353
◆	220	.57	.05	353
▼	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 38
WT 193

SET 38
BVWT 193

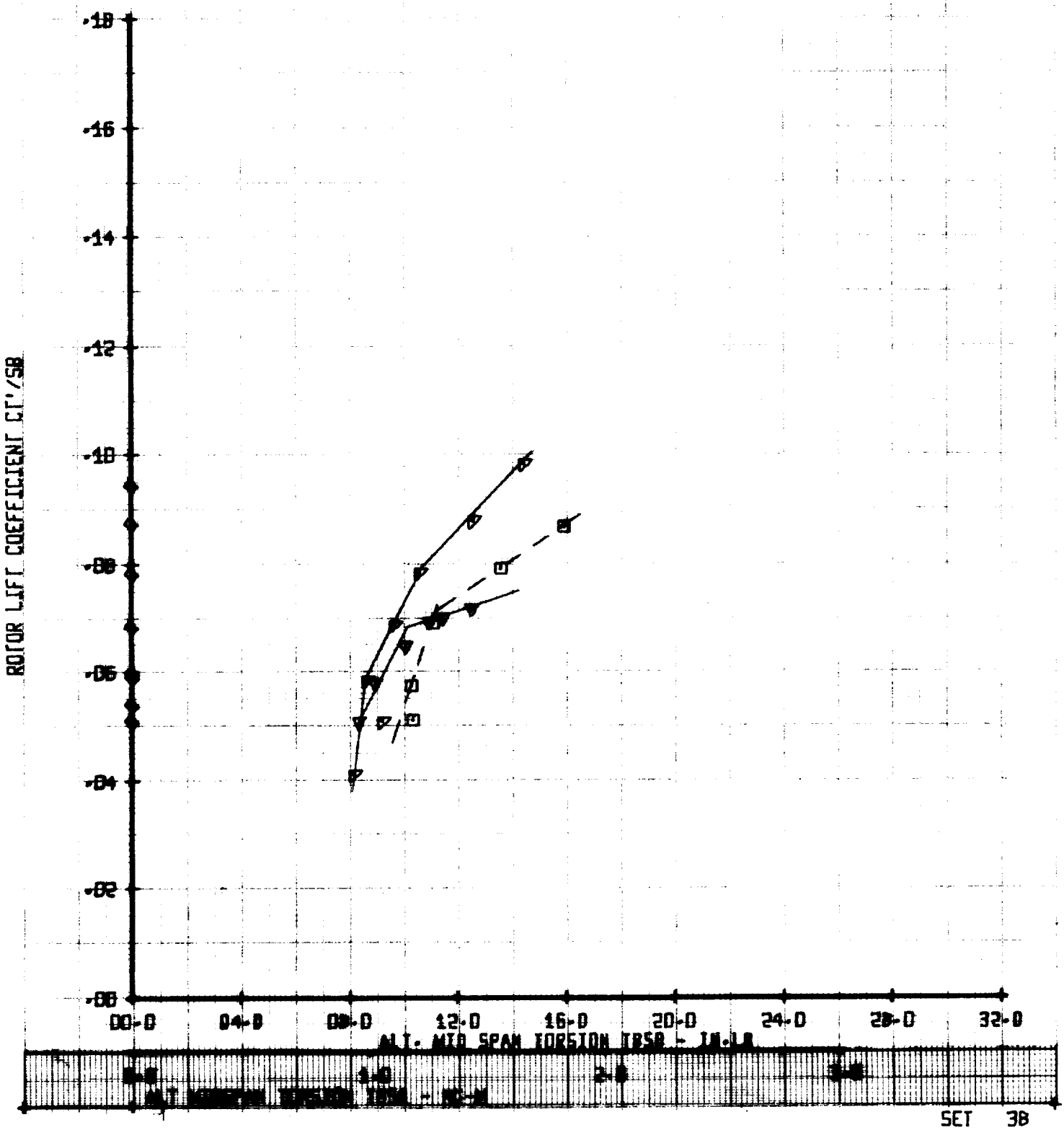
Figure A-238

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
▫	246	.57	.025	350
▽	249	.57	.025	350
◇	228	.57	.05	350
▽	245	.57	.10	350

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 38
WT 193

SET 38
BVWT 193

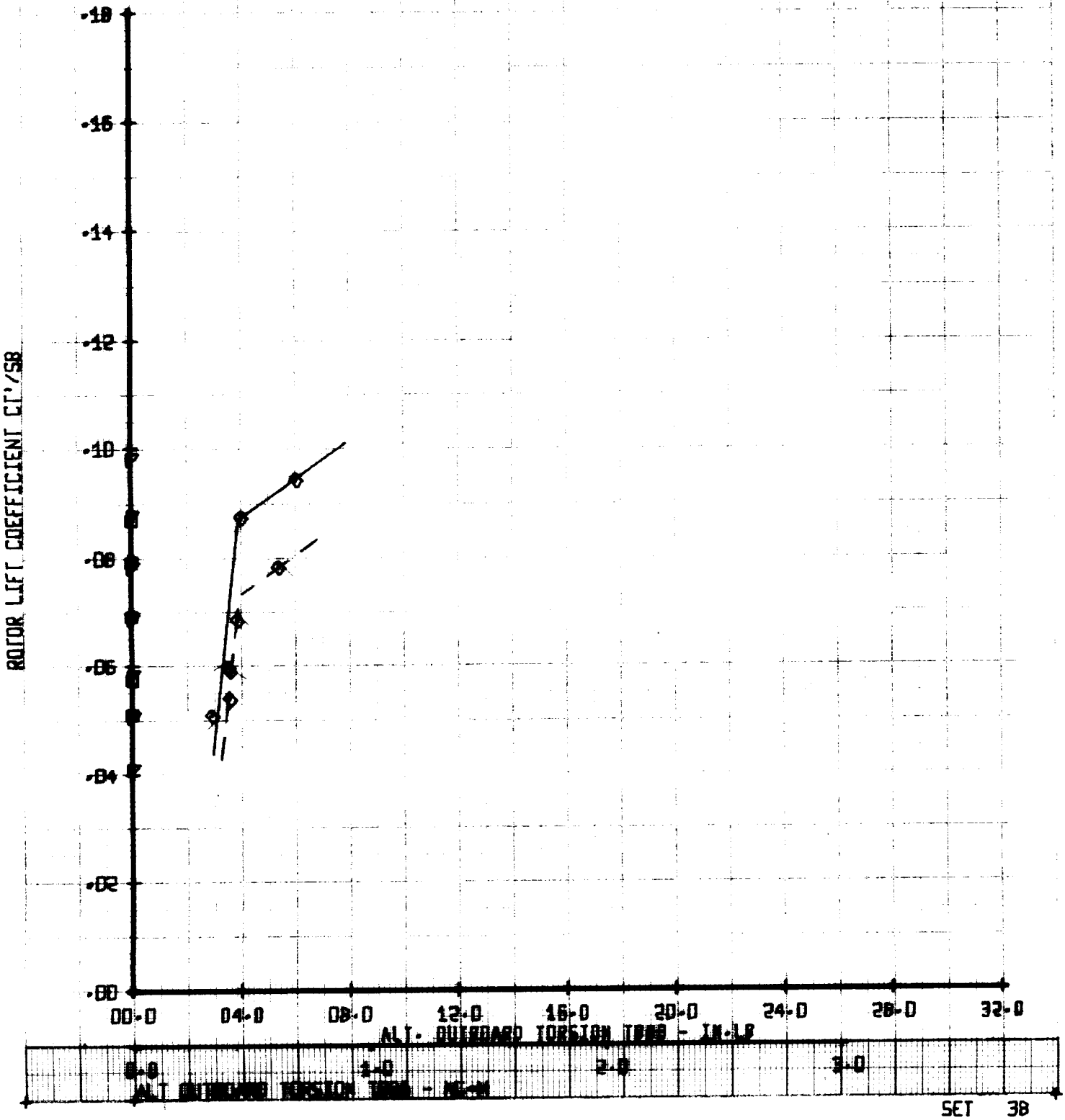
Figure A-239

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	246	.57	.025	350
▽	249	.57	.025	350
◈	220	.57	.05	350
▼	245	.57	.10	350

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 38
WT 193

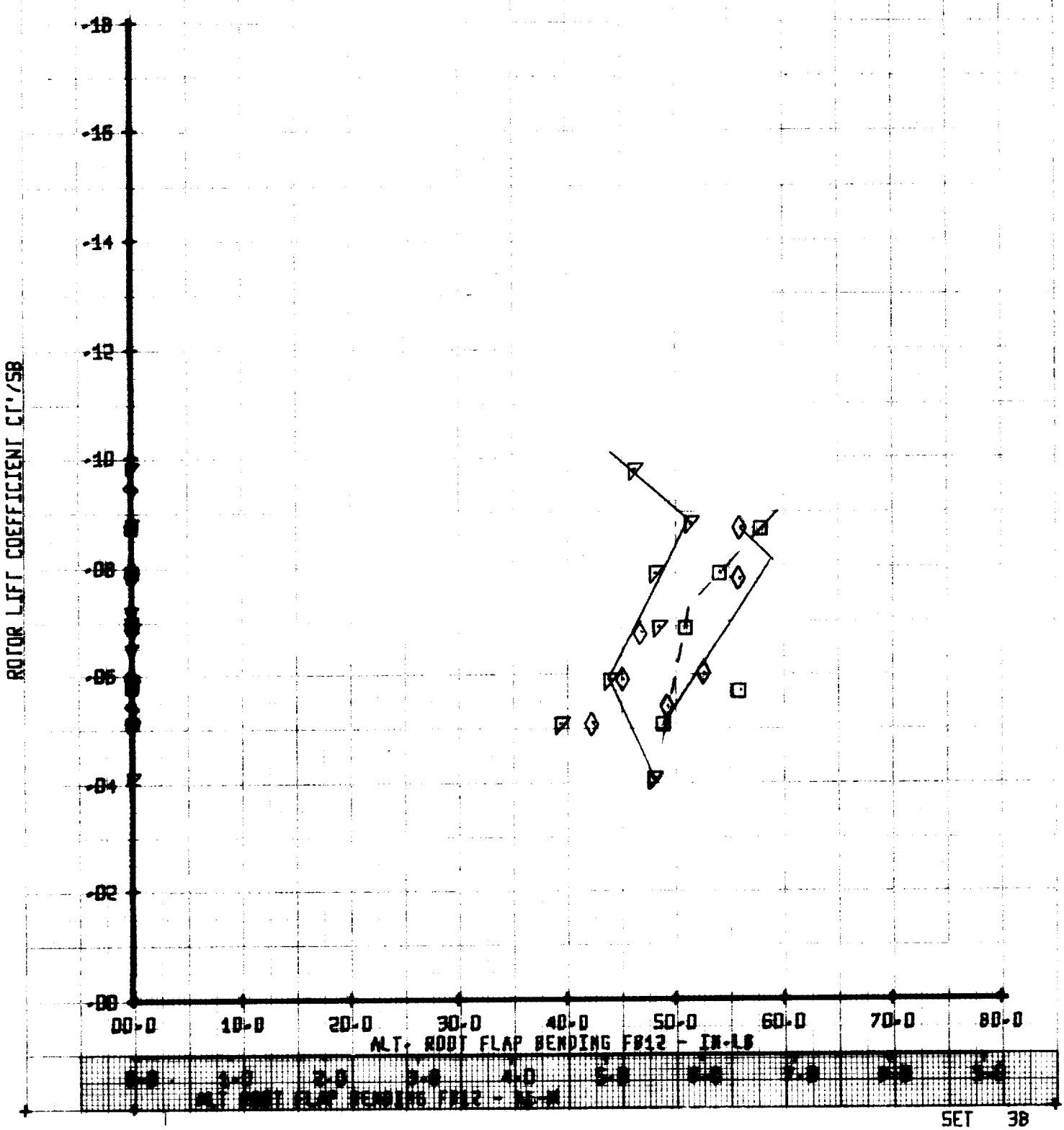
SET 38
BVWT 193

Figure A-240

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	246	.57	.025	358
▽	249	.57	.025	358
◇	228	.57	.05	358
▼	245	.57	.10	358

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 38
WT 193

SET 38
BVWT 193

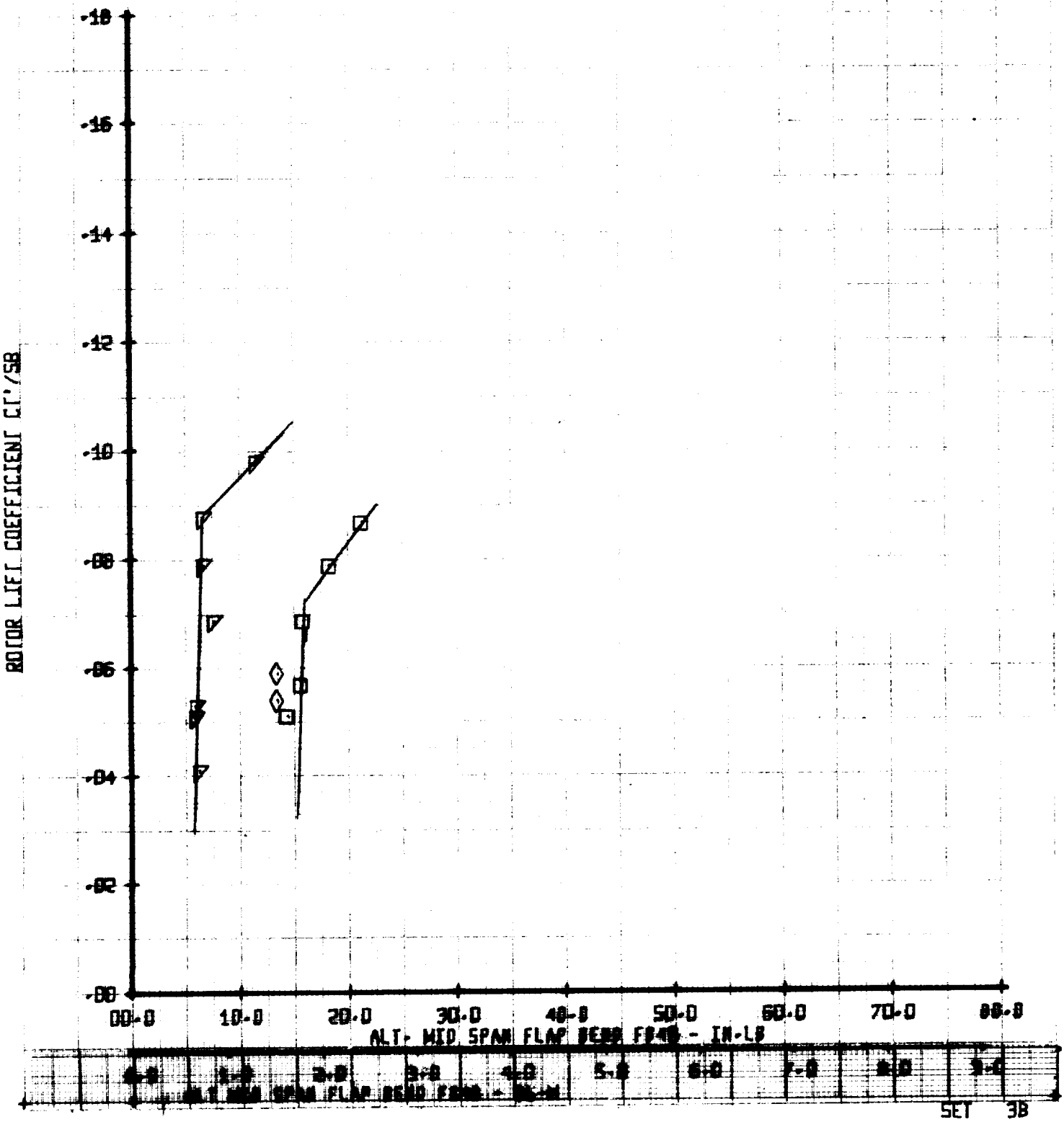
Figure A-241

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	246	.57	.025	358
▽	249	.57	.025	358
◇	239	.57	.06	358
▽	245	.57	.10	358

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BEND FB48



ET 38
WT 193

SET 3B
BVWT 193

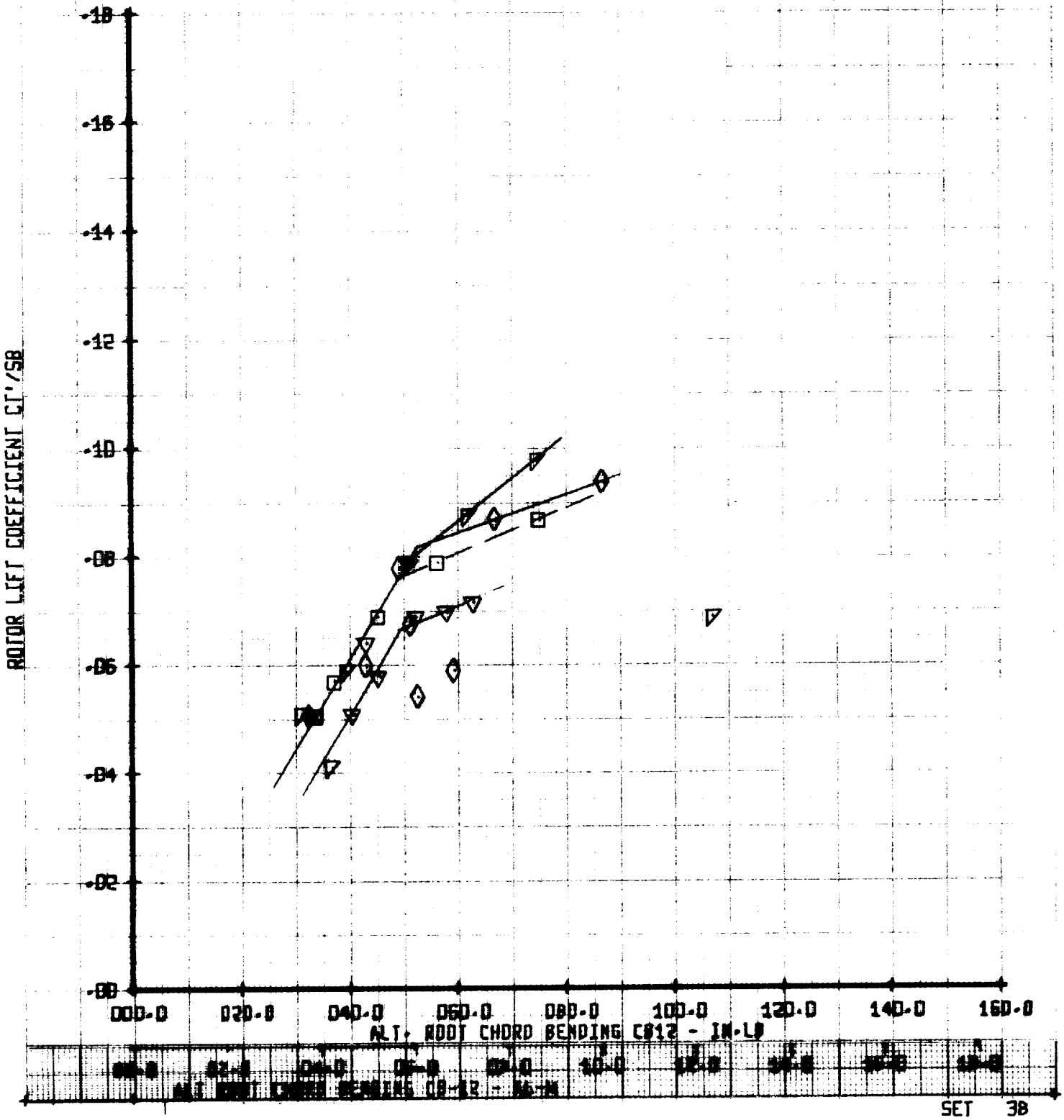
Figure A-242

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	246	.57	.025	358
▽	249	.57	.025	358
◇	220	.57	.05	358
▽	245	.57	.10	358

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 38
WT 193

SET 38
BVWT 193

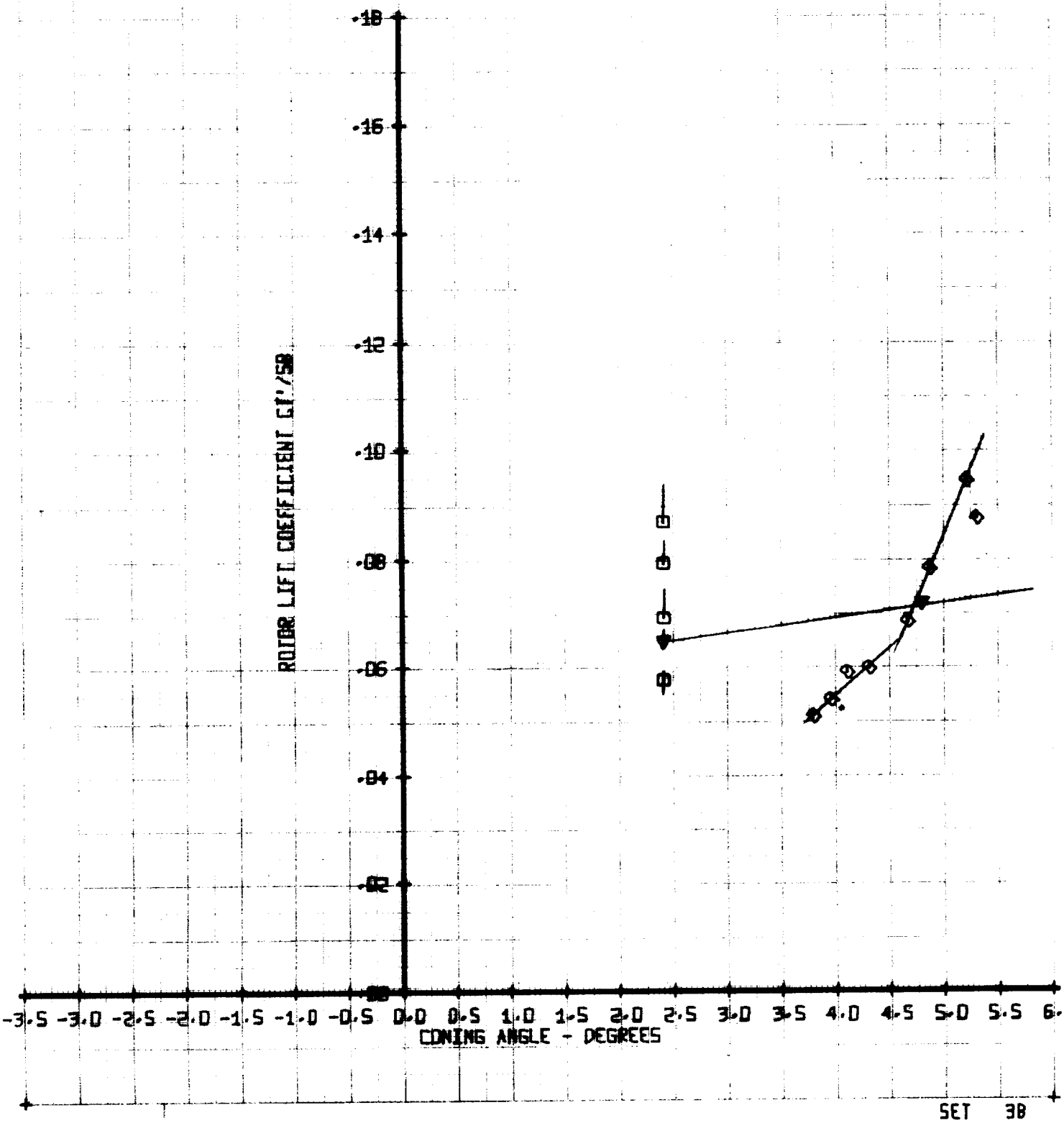
Figure A-243

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTLN
□	246	.57	.025	358
▽	249	.57	.025	358
◇	248	.57	.05	358
▽	245	.57	.10	358

ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE



ET 38
WT 193

SET 38
BVWT 193

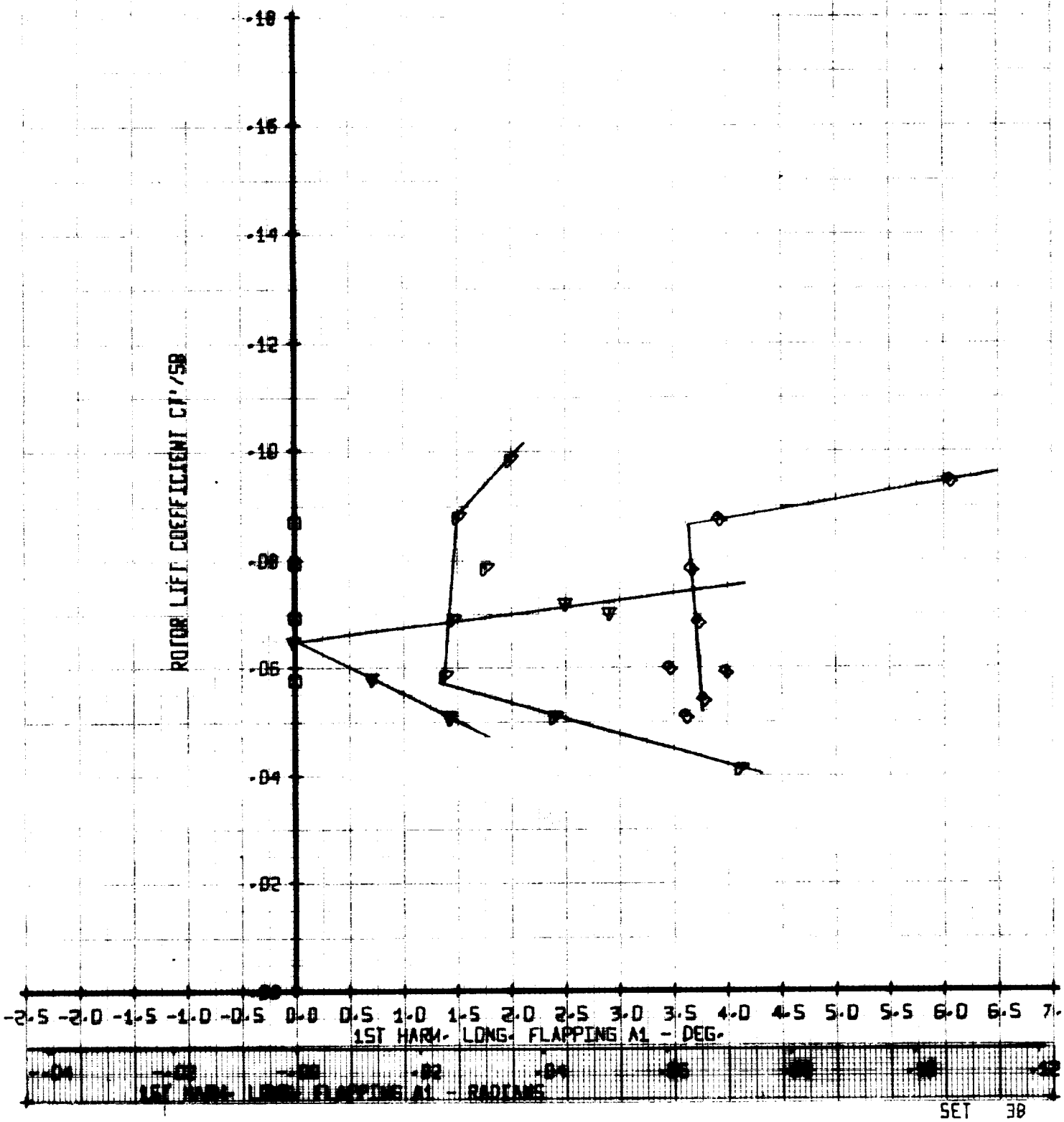
Figure A-244

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	246	.57	.025	353
▽	249	.57	.025	353
◇	220	.57	.05	353
▽	245	.57	.10	353

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING A1



ET 38
WT 193

SET 38
BVWT 193

Figure A-245

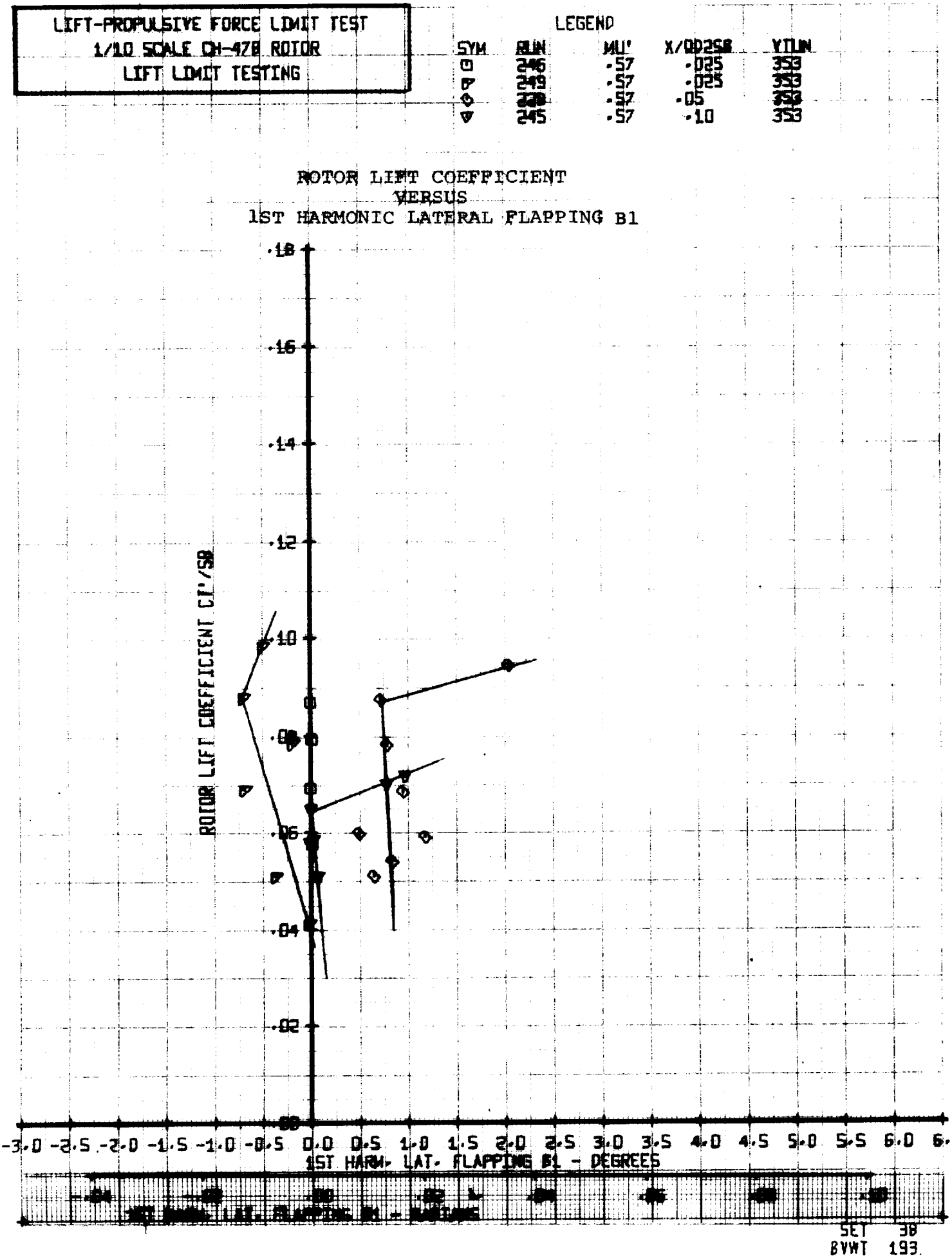
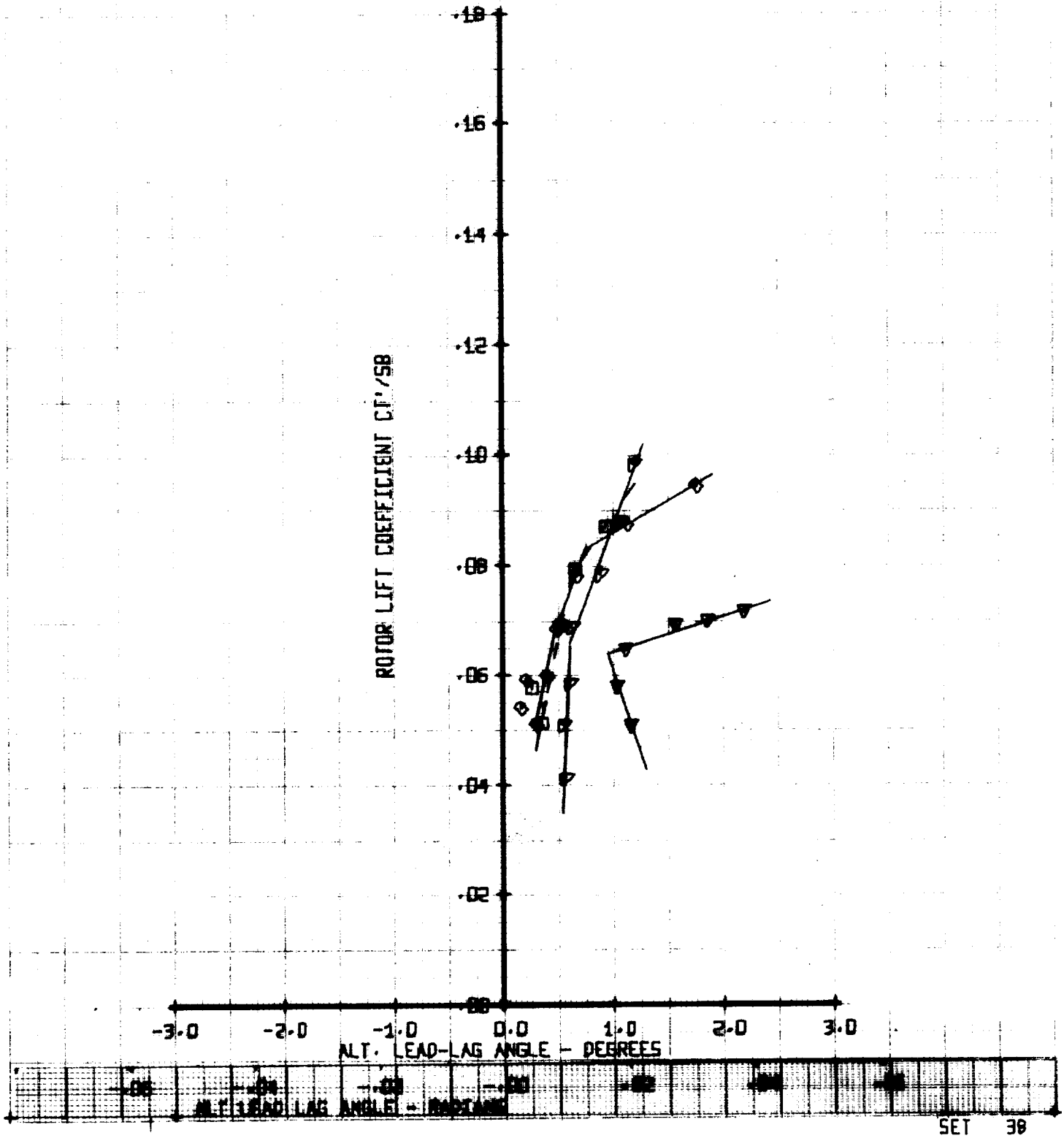

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
246 .57 .025 358
249 .57 .025 358
.57 .05
245 .57 .10 353
ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM. LAT. FLAPPING B1 - DEGREES
ET 38
WT 193
SET 38
BVWT 193

Figure A-246

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
□	246	.57	.025	3[illegible]
▽	249	.57	.025	3[illegible]
◇	229	.57	.05	3[illegible]
▽	245	.57	.10	3[illegible]

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 38
WT 193

SET 38
BVWT 193

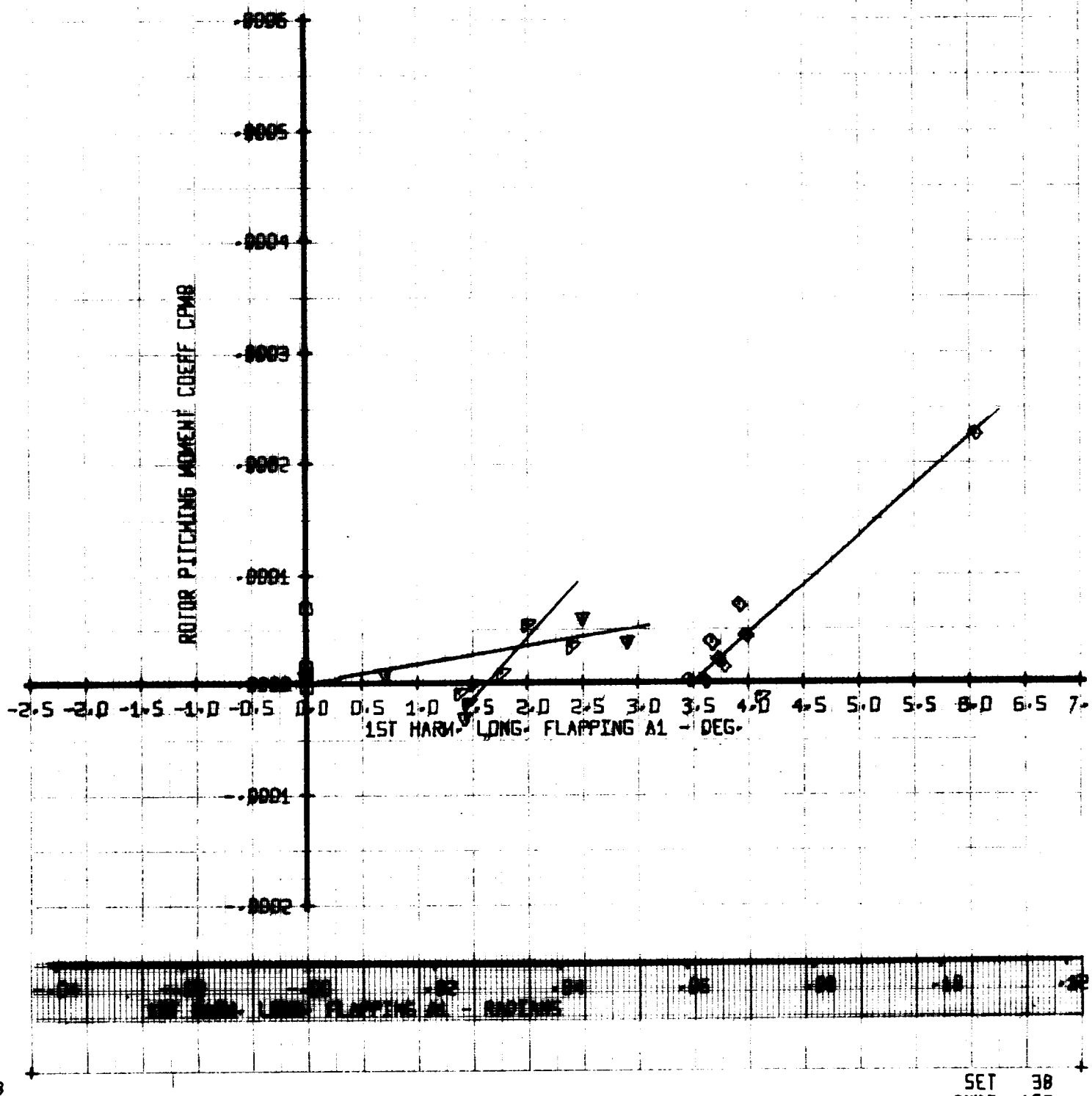
Figure A-247

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	YTUN
□	246	.57	.025	350
▽	249	.57	.025	350
◇	228	.57	-.05	350
▽	245	.57	.10	350

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 38
WT 193

SET 38
BVWT 193

Figure A-248

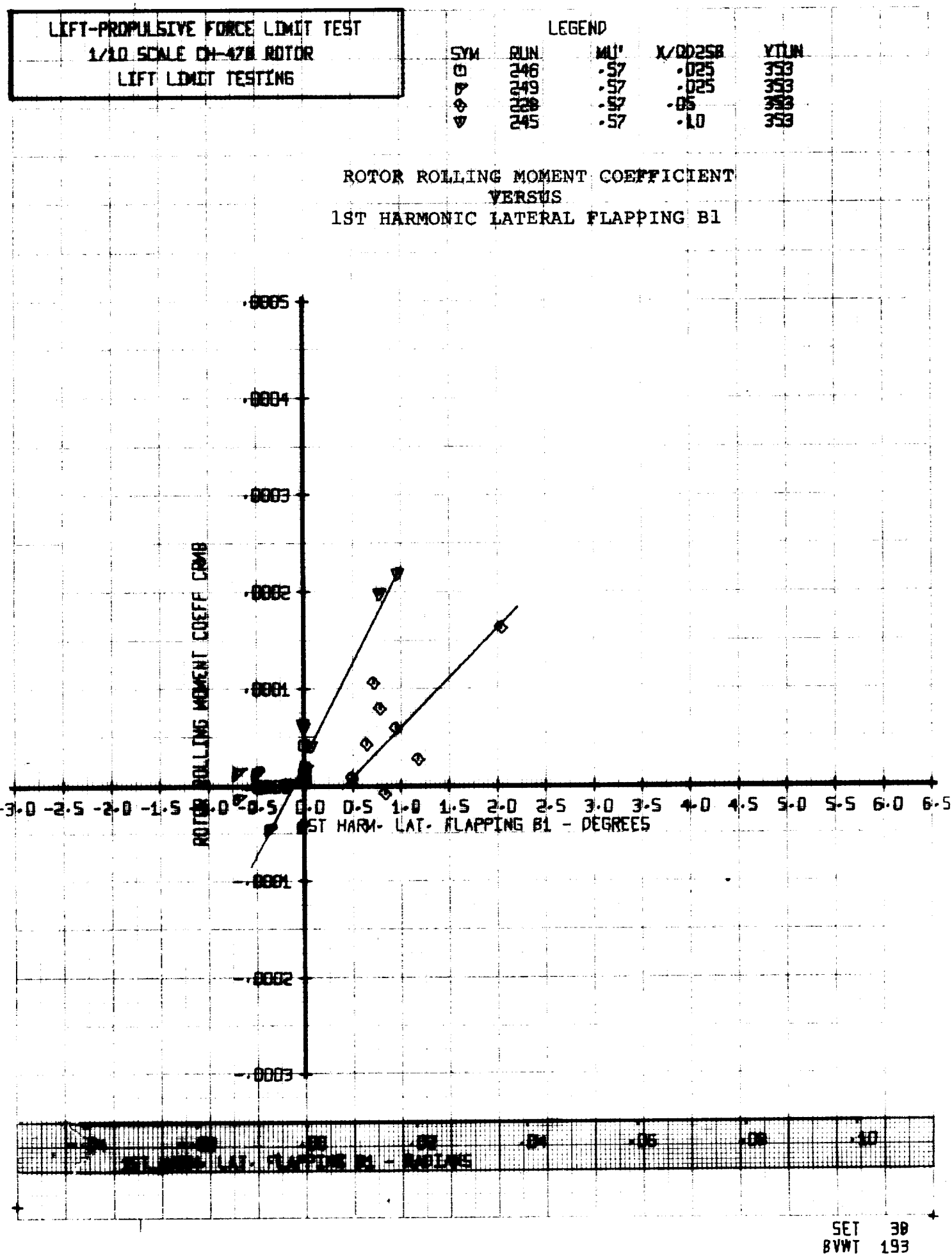
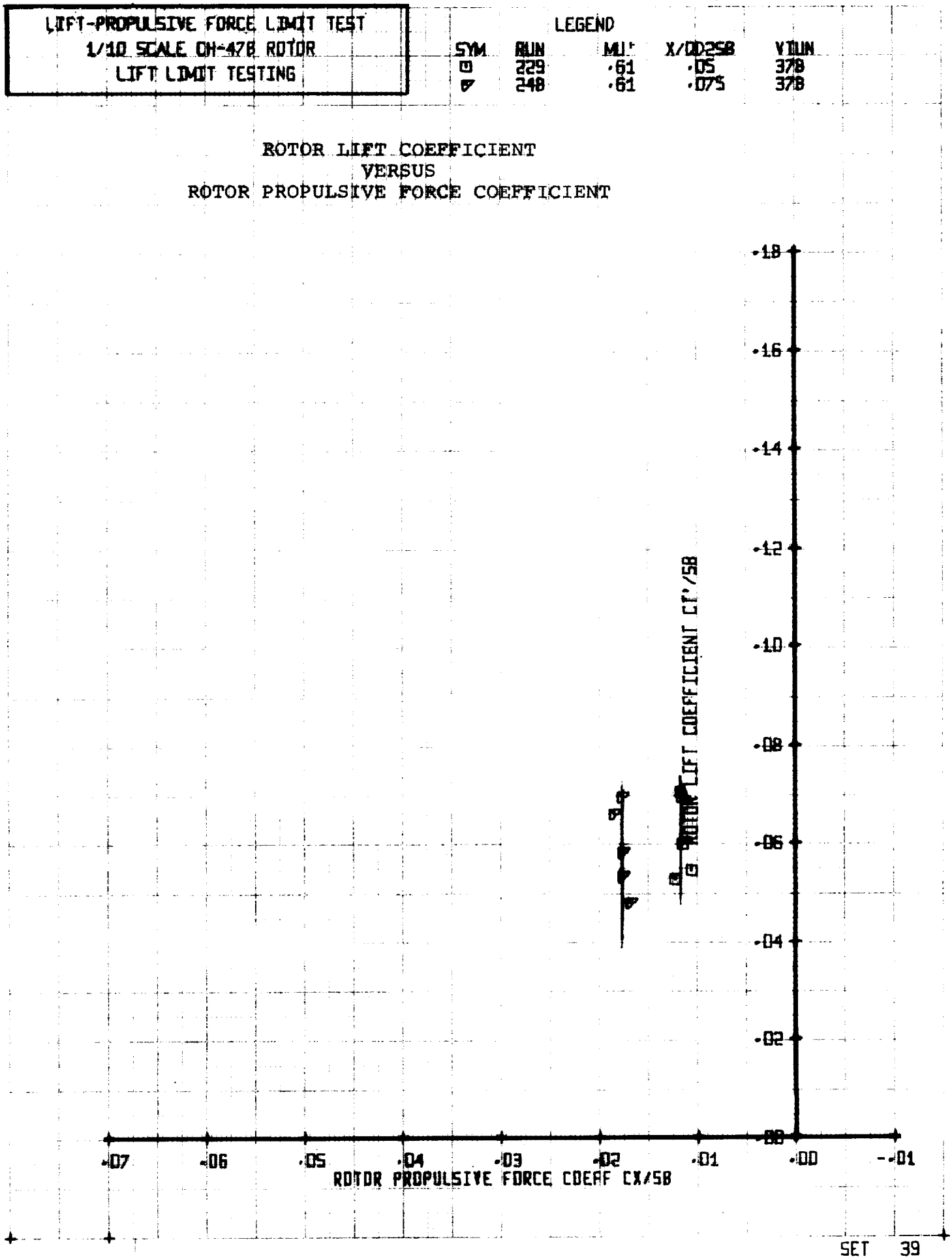

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
246 .57 .025 353
249 .57 .025 353
.57 -.05
245 .57 -.10 353
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
ROTOR ROLLING MOMENT COEFF CRMB
.0005
.0004
.0003
.0002
.0001
-.0001
-.0002
-.0003
-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5
1ST HARM- LAT- FLAPPING B1 - DEGREES
ET 38
WT 193
SET 38
BVWT 193

Figure A-249



SET 39
WT 193

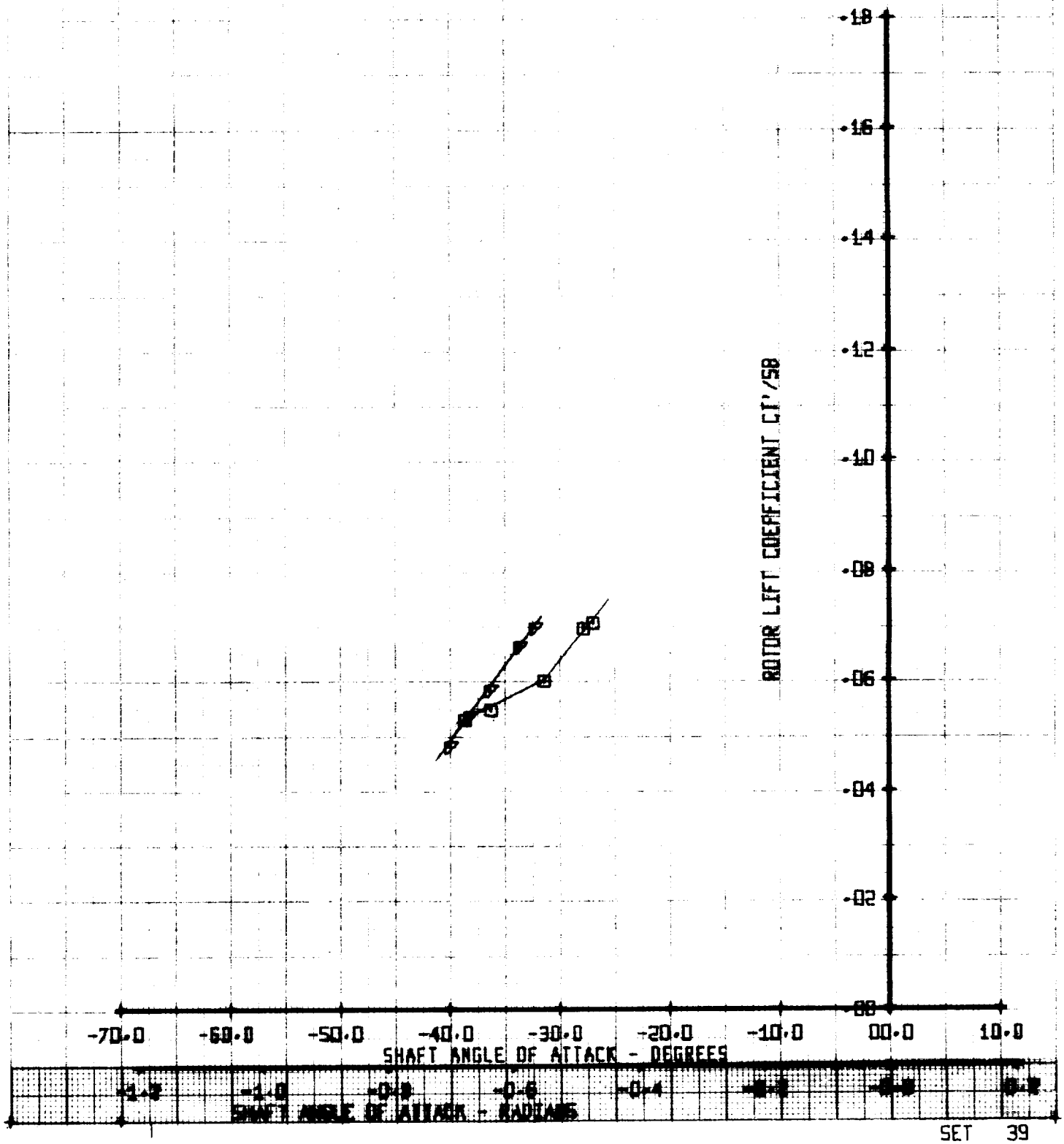
Figure A-250

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
⊡	229	.61	.05	378
⊽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 39
WT 193

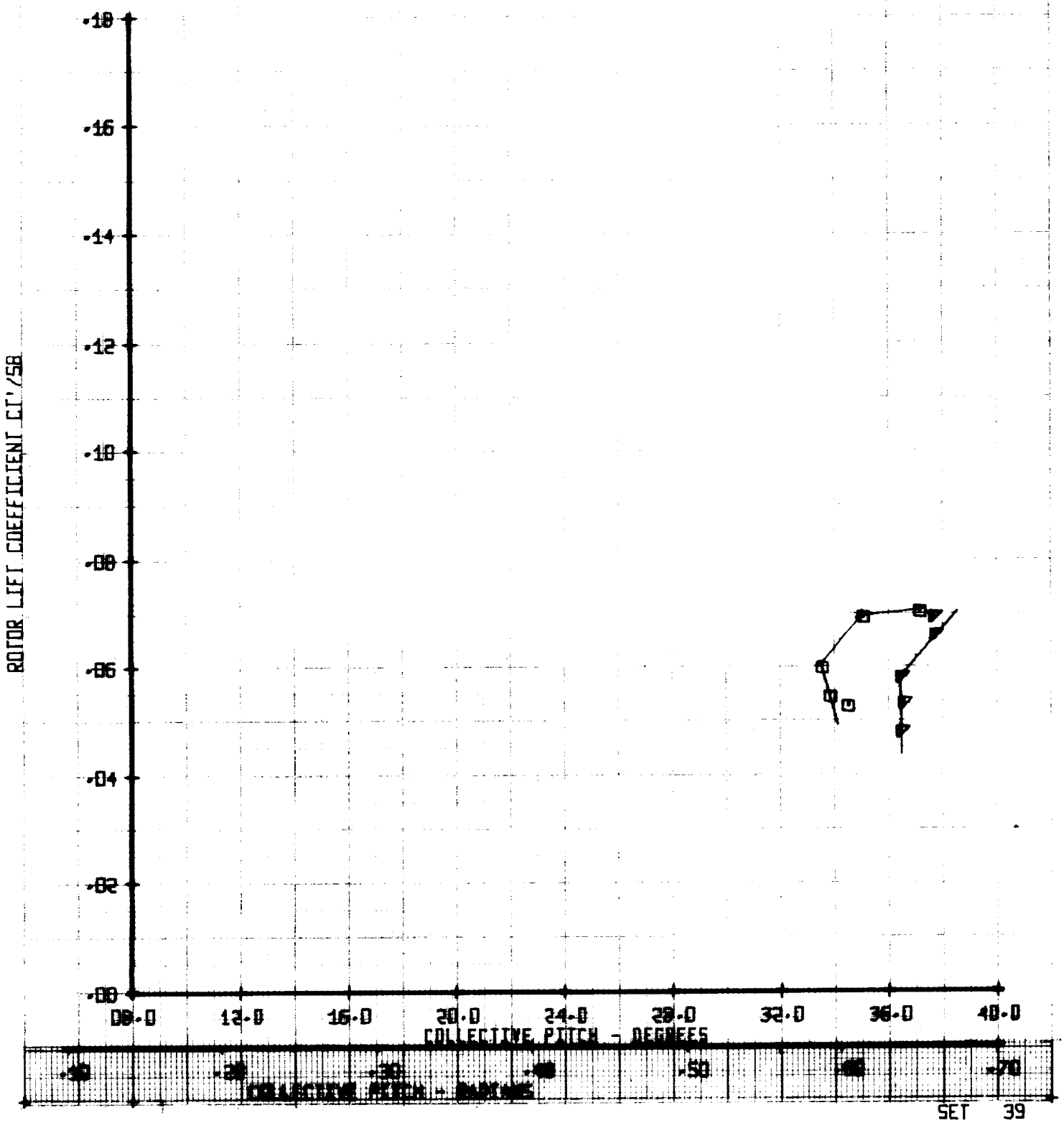
SET 39
BVWT 193

Figure A-251

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD25B	YTUN
⊡	229	.61	.05	378
⊽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 39
WT 193

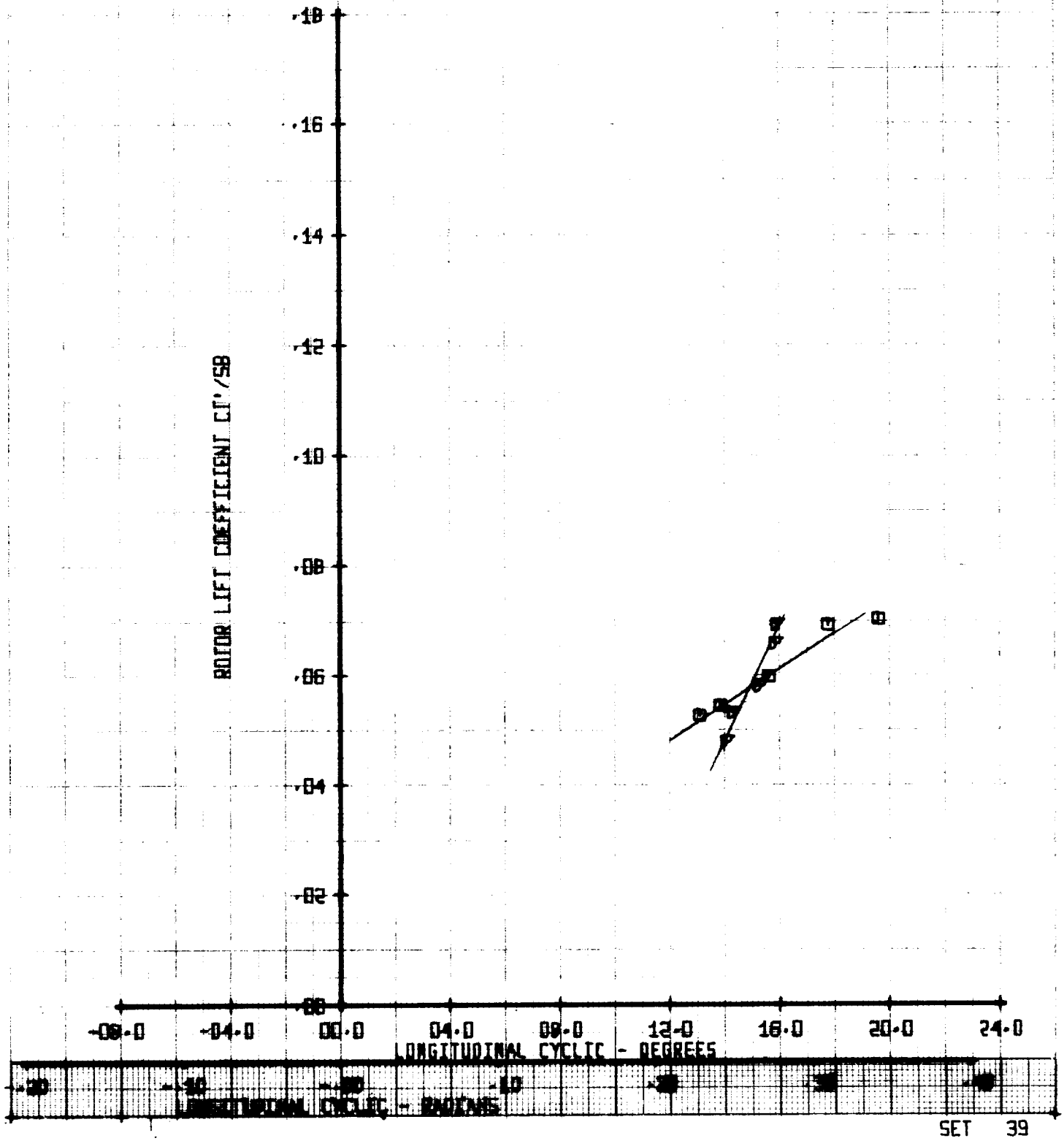
SET 39
BVWT 193

Figure A-252

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YIUN
⊡	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 39
WT 193

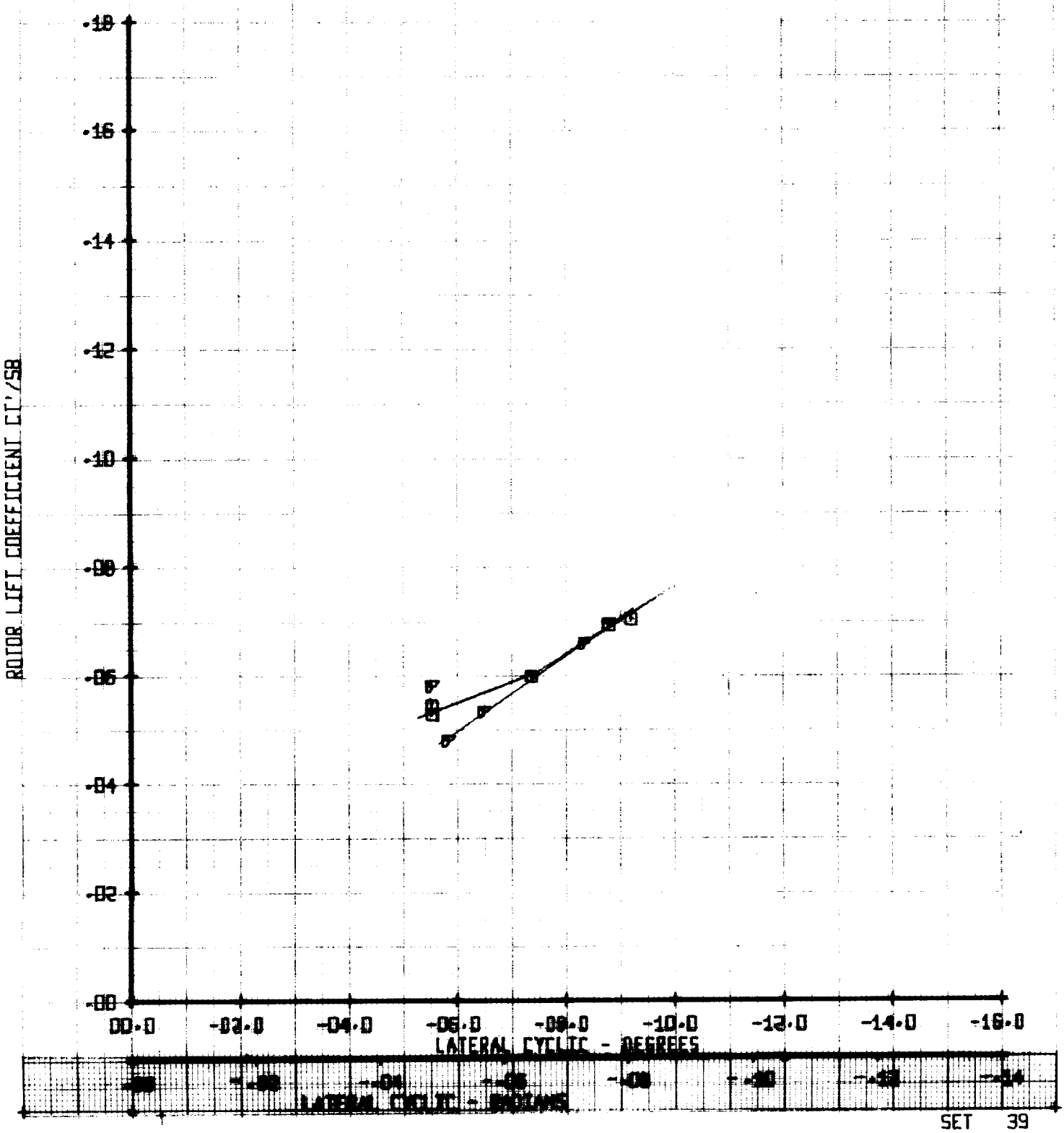
SET 39
BVWT 193

Figure A-253

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
⊠	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 39
WT 193

SET 39
BVWT 193

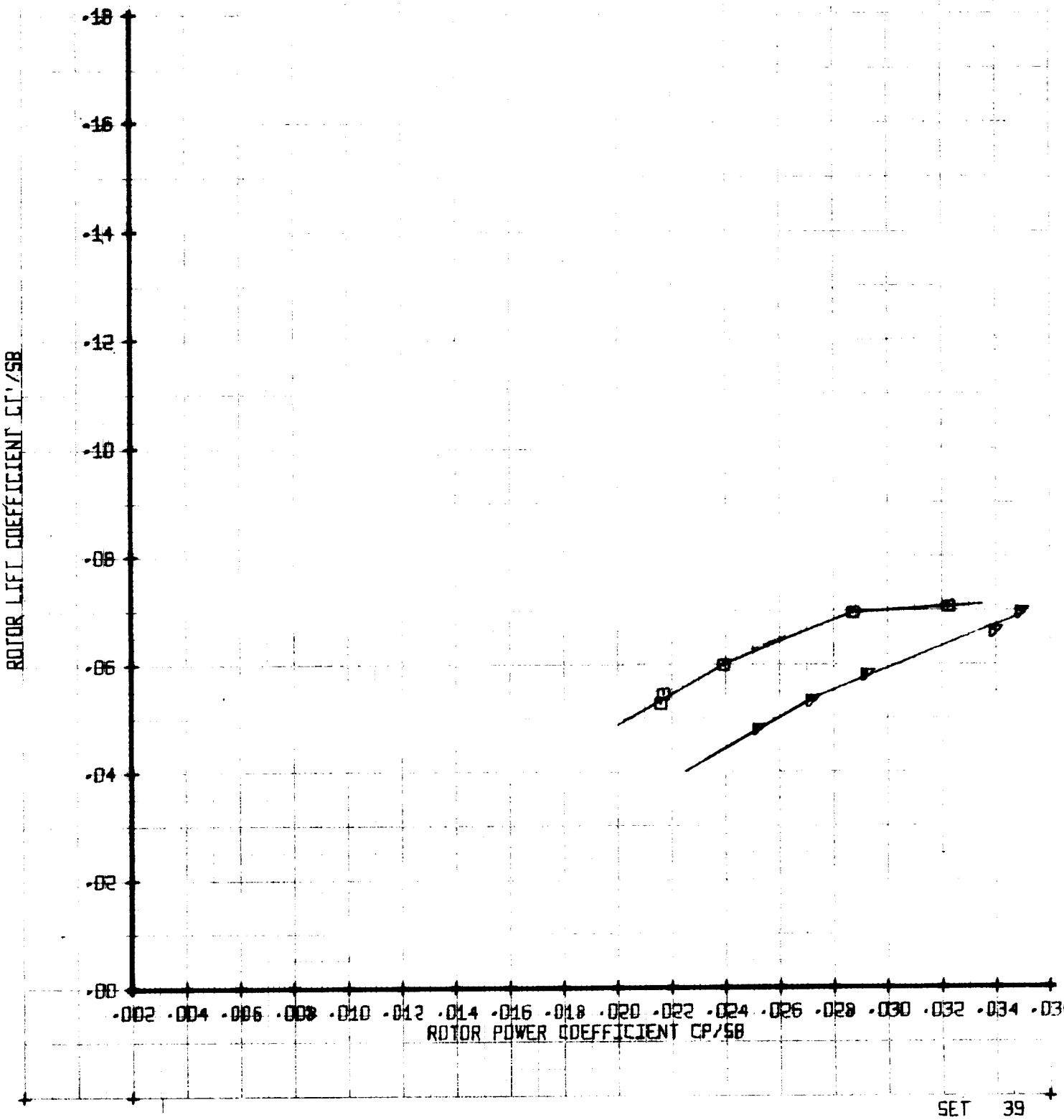
Figure A-254

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	VTUN
□	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 39
WT 193

SET 39
BVWT 193

Figure A-255

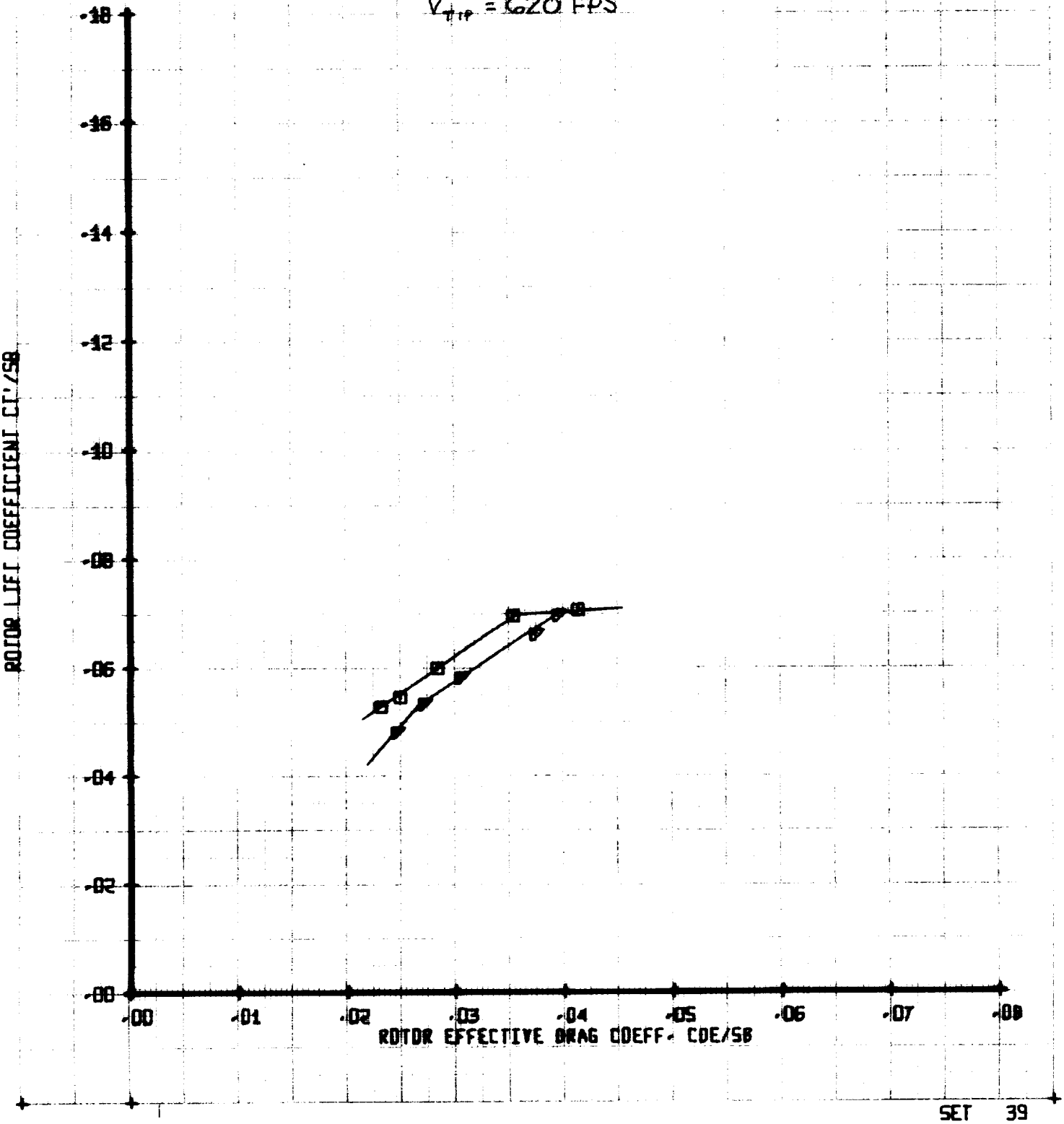
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QBSB	VTUN
□	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

V_{TIP} = 620 FPS



SET 39
BVWT 193

SET 39
WT 193

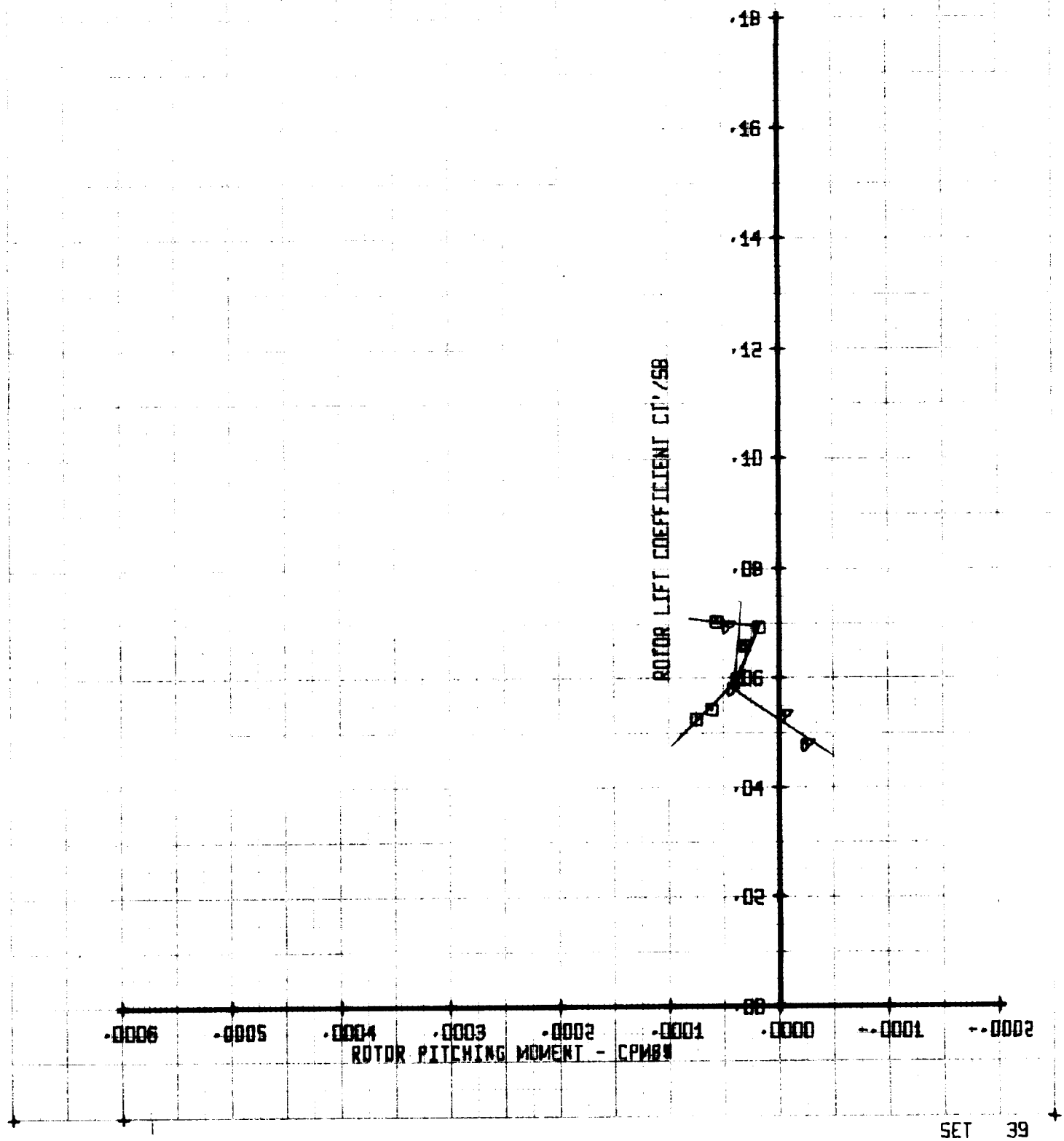
Figure A-256

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VIUN
⊡	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



SET 39
BWT 193

SET 39
BWT 193

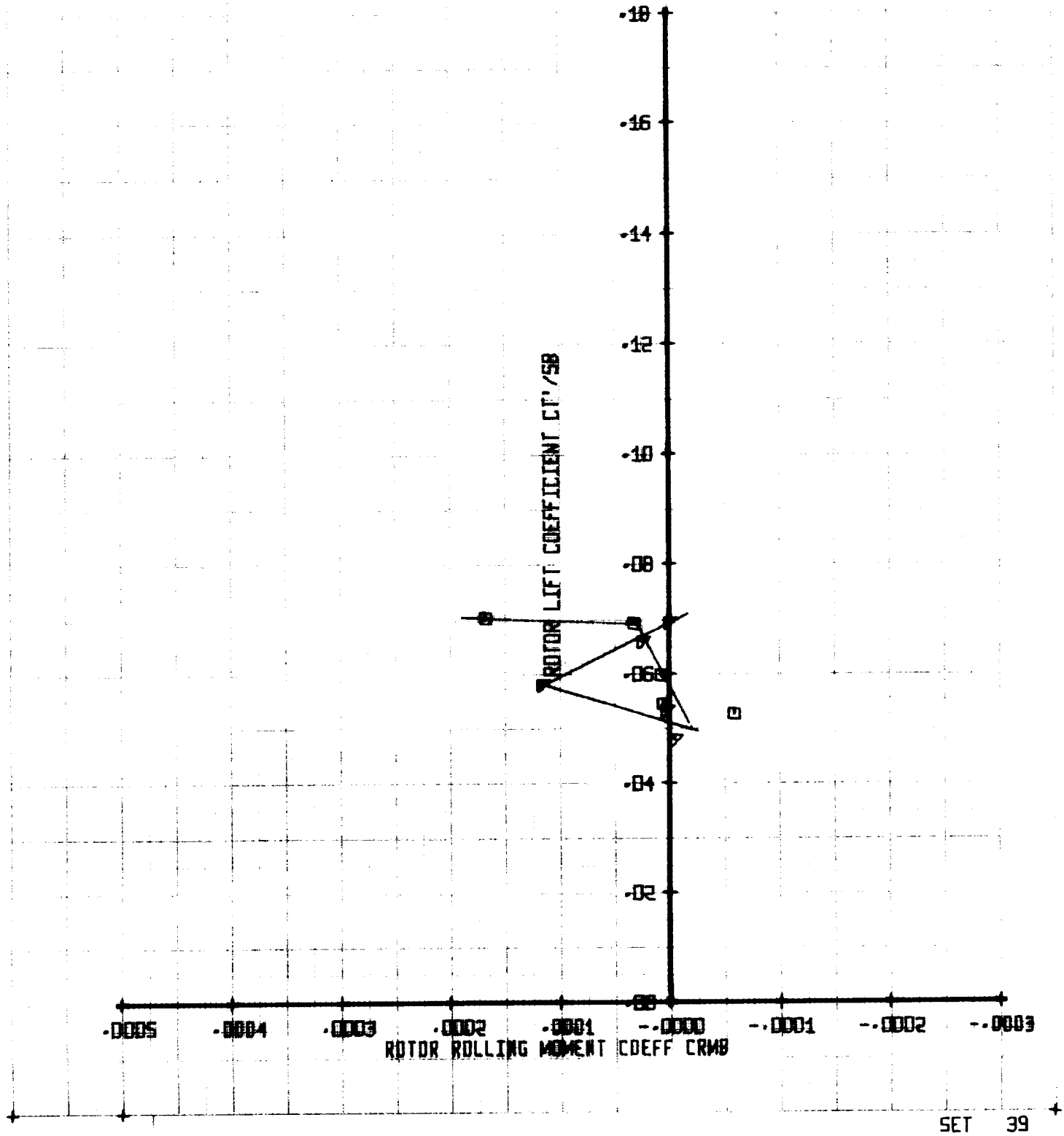
Figure A-257

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25B	YTUN
□	229	.61	.05	370
▽	248	.61	.075	370

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 39
WT 193

SET 39
BVWT 193

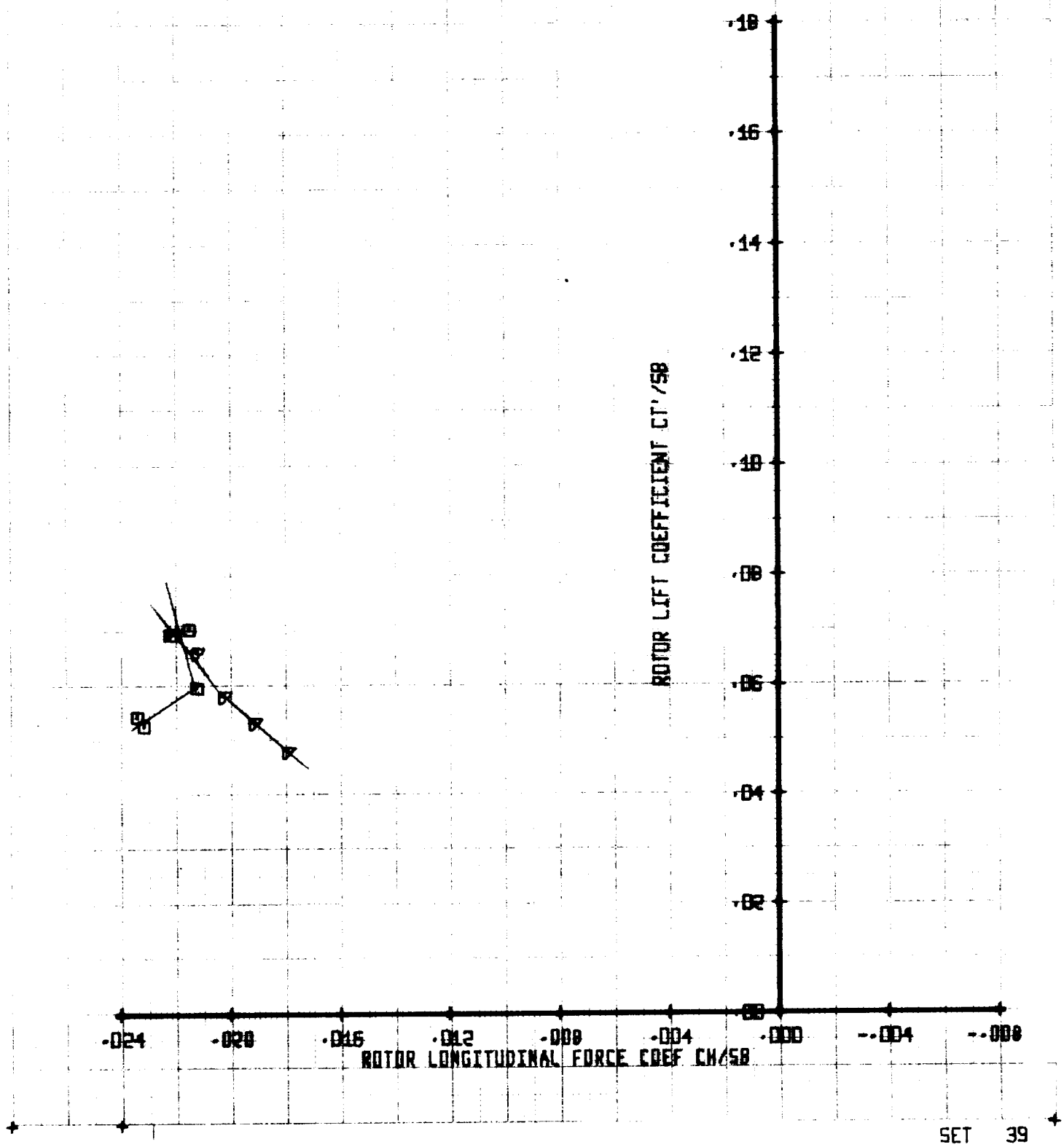
Figure A-258

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 39
WT 193

SET 39
BVWT 193

Figure A-259

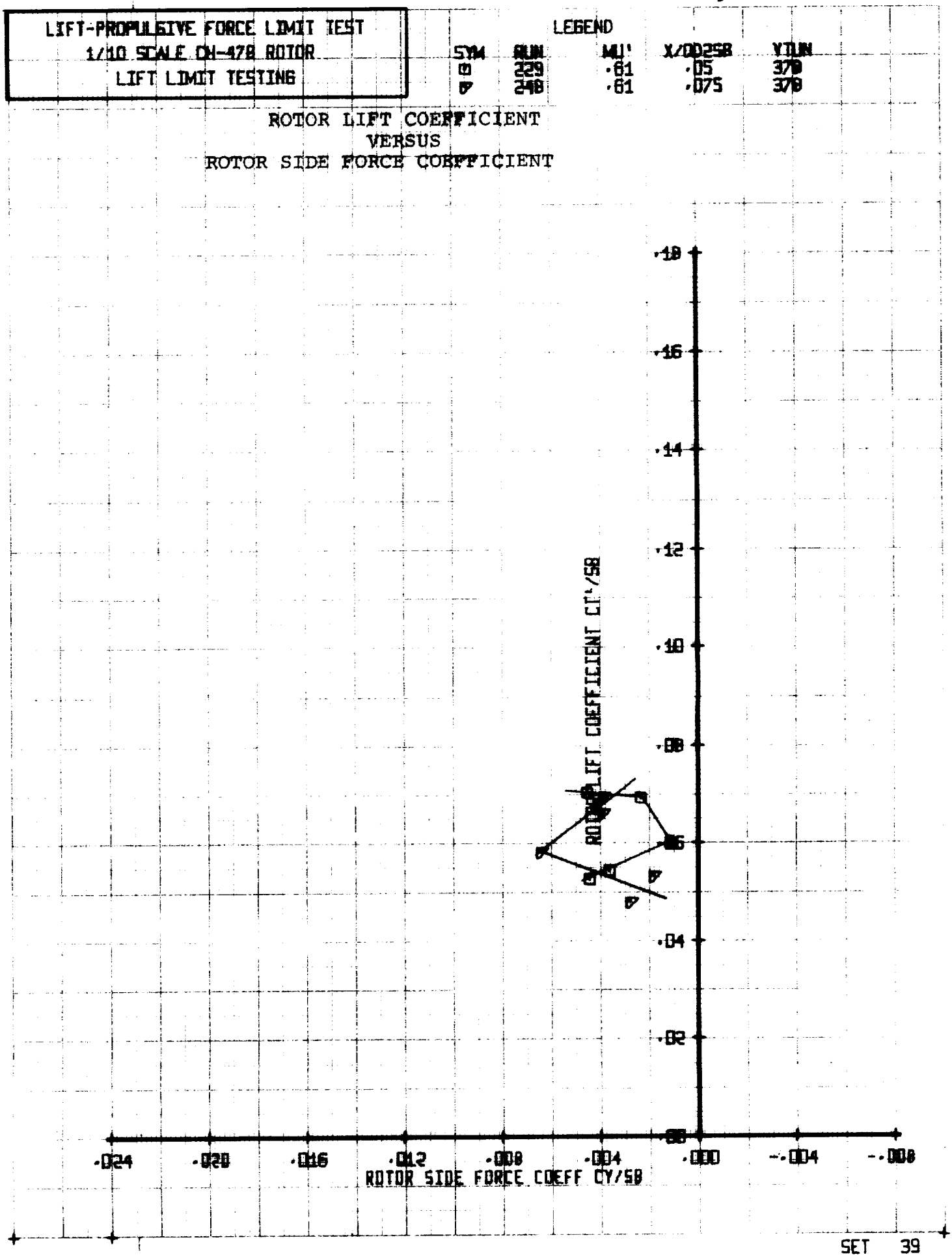
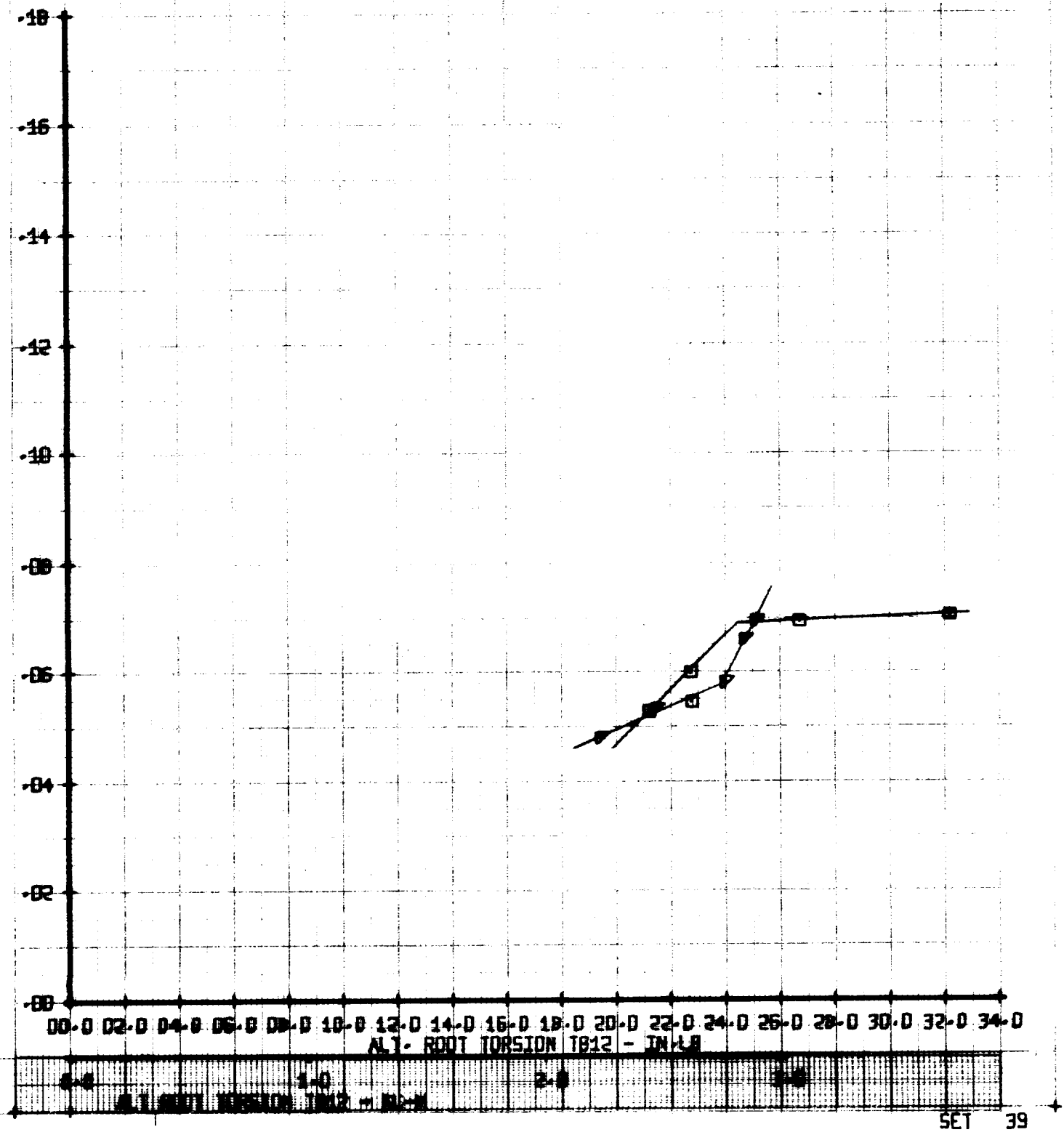

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/DD25B YIUN
229 .61 .05 370
248 .61 .075 370
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
ROTOR LIFT COEFFICIENT CT'/SB
.024
.020
.016
.012
.008
.004
.000
-.004
-.008
ROTOR SIDE FORCE COEFF CY/SB
ET 39
WT 193
SET 39
BVWT 193

Figure A-260

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QQ2SB	VTUN
⊡	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 39
WT 193

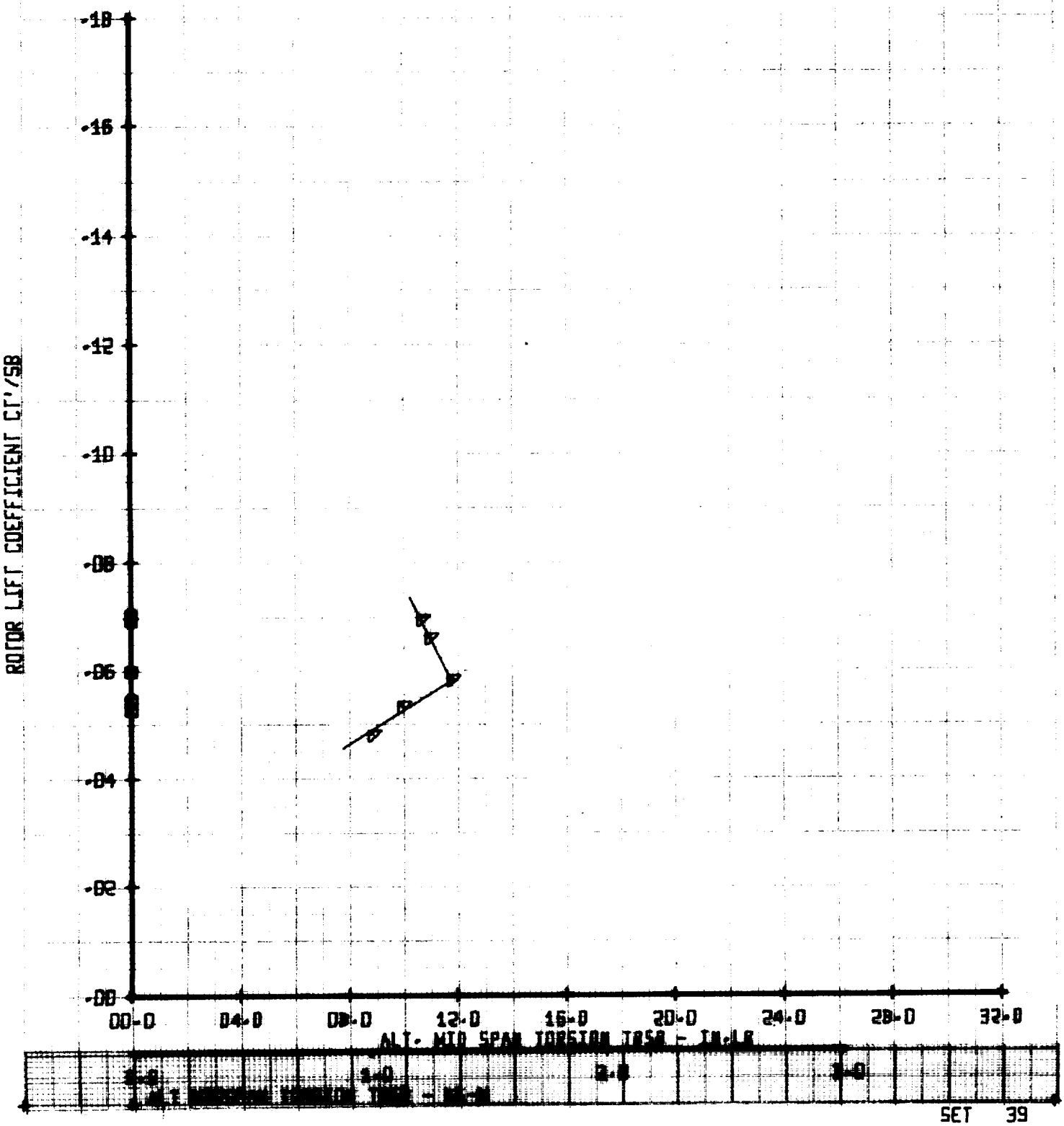
SET 39
BVWT 193

Figure A-261

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD2SB	VTUN
⊡	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



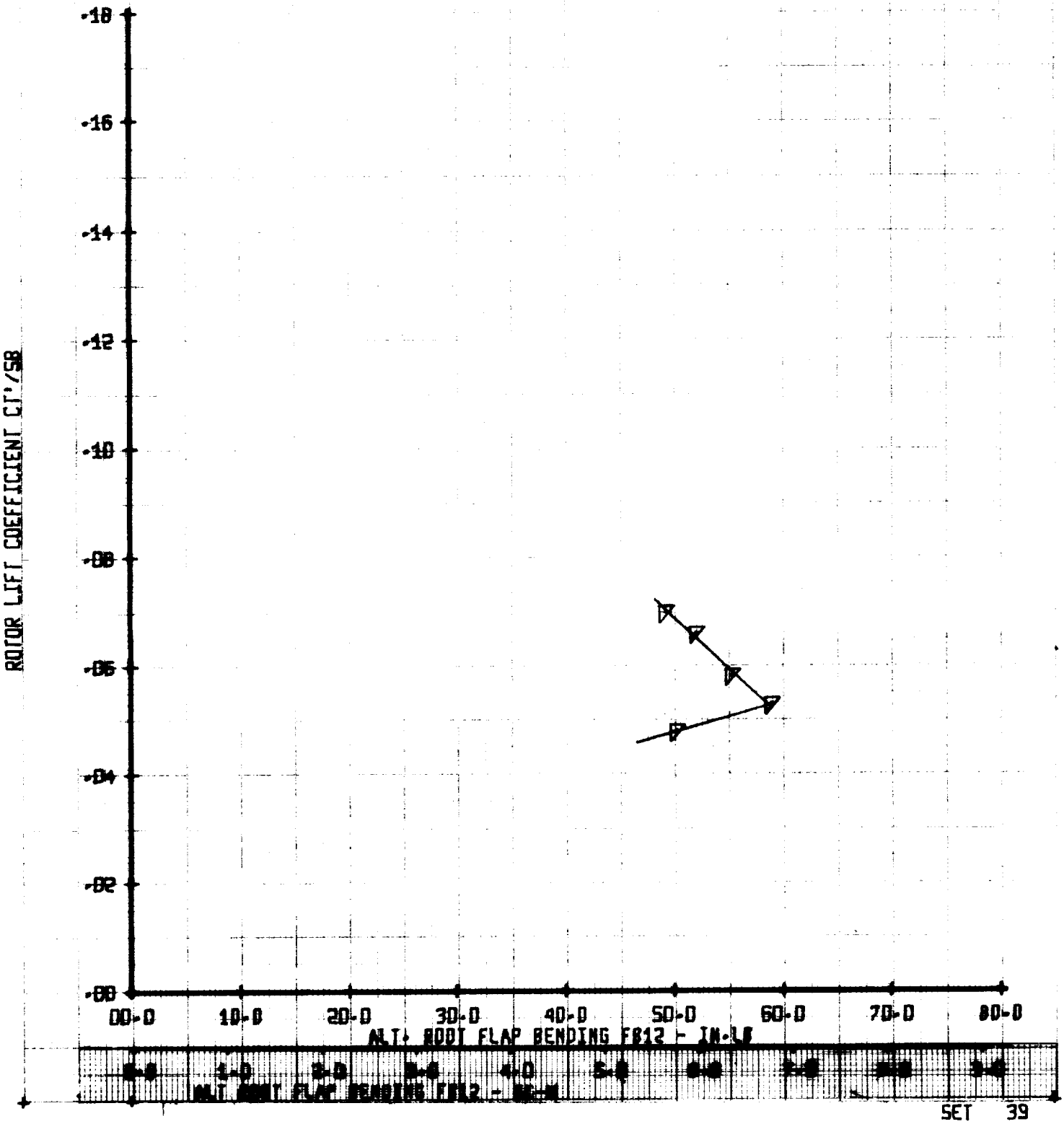
ET 39
WT 193

SET 39
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD2SB	VTUN
⊙	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 39
WT 193

SET 39
BVWT 193

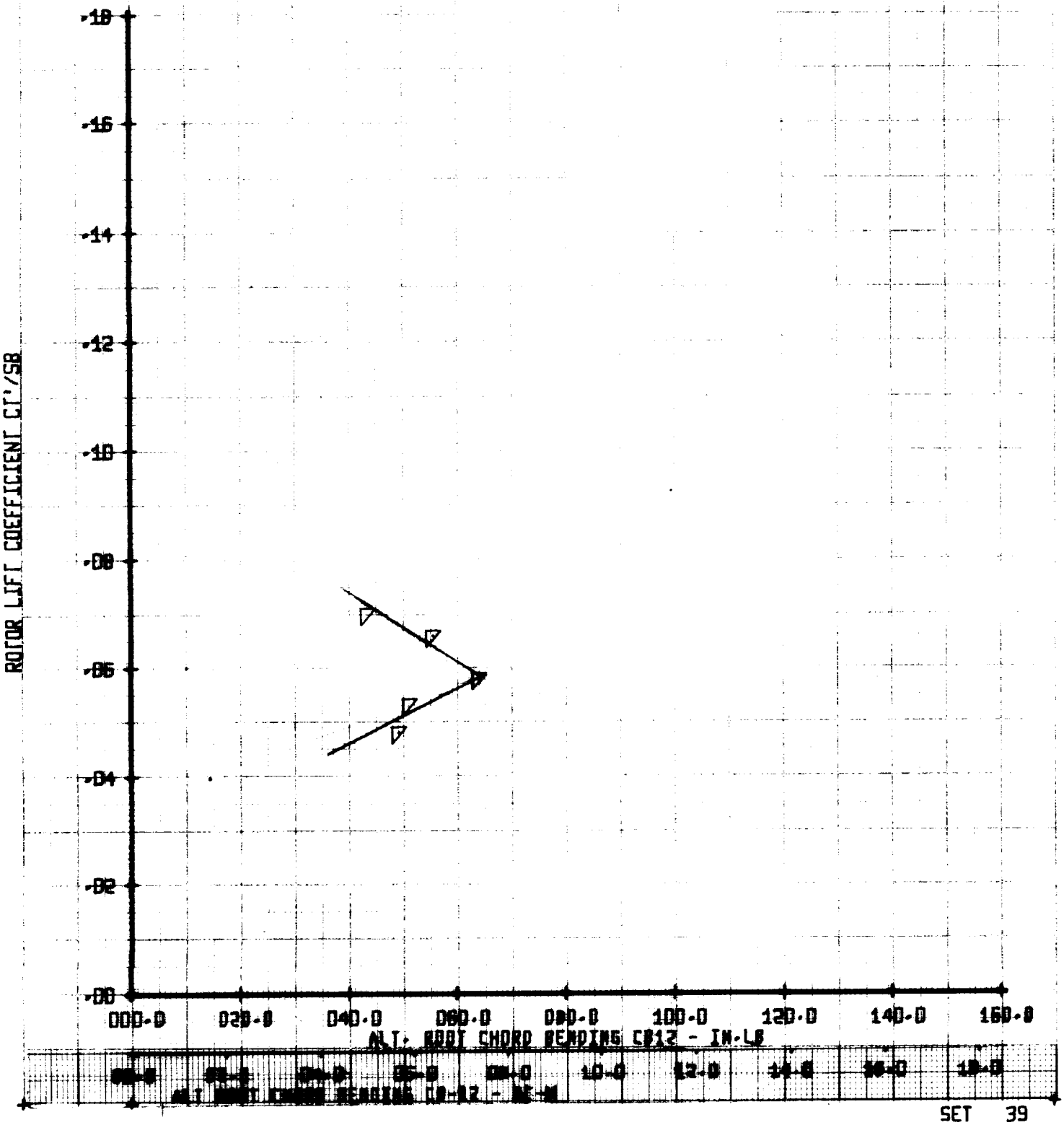
Figure A-263

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
⊡	229	.61	.05	378
⊡	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 39
WT 193

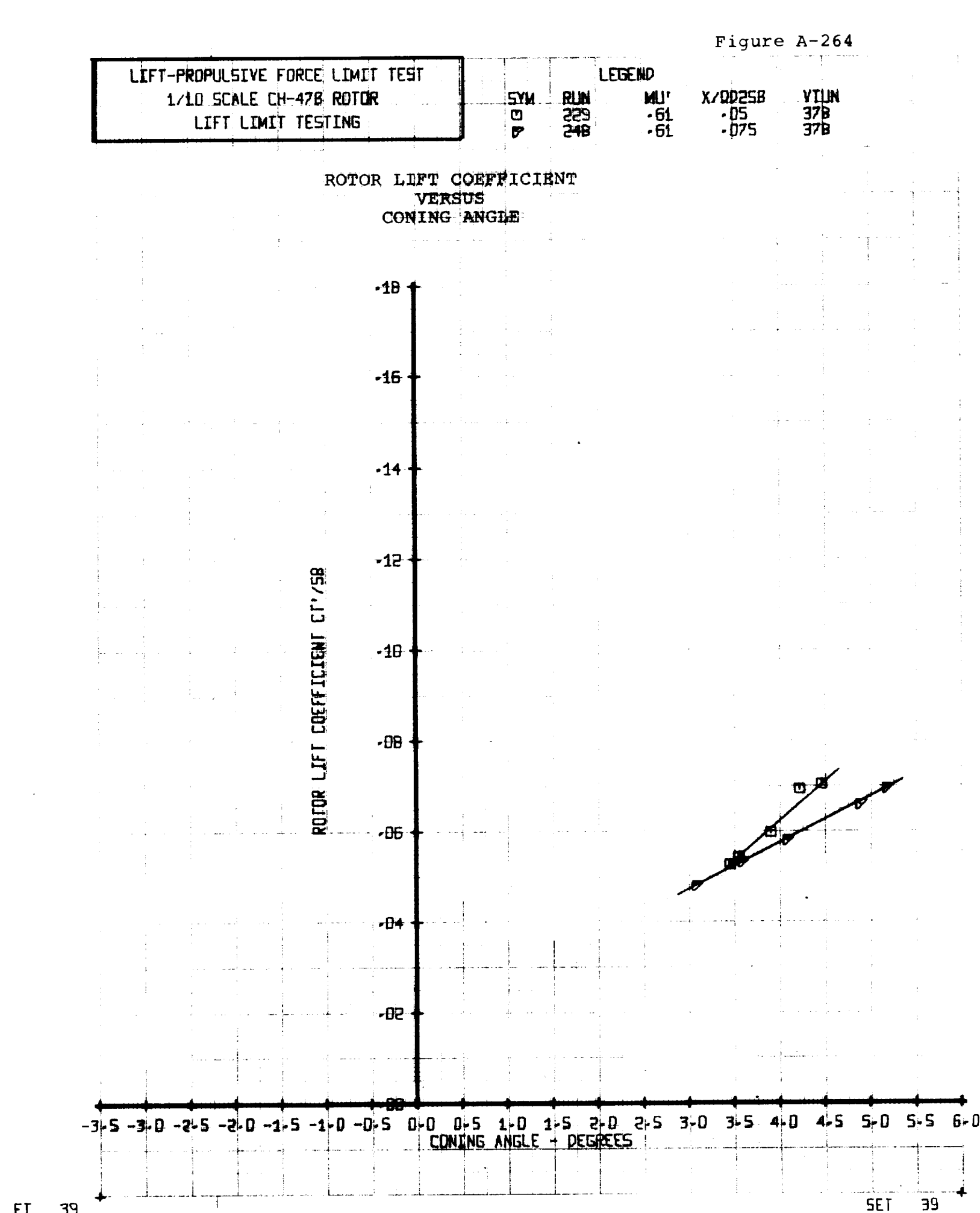
SET 39
BVWT 193

Figure A-264

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QD2SB	VTUN
□	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
CONING ANGLE



ET 39
WT 193

SET 39
BVWT 193

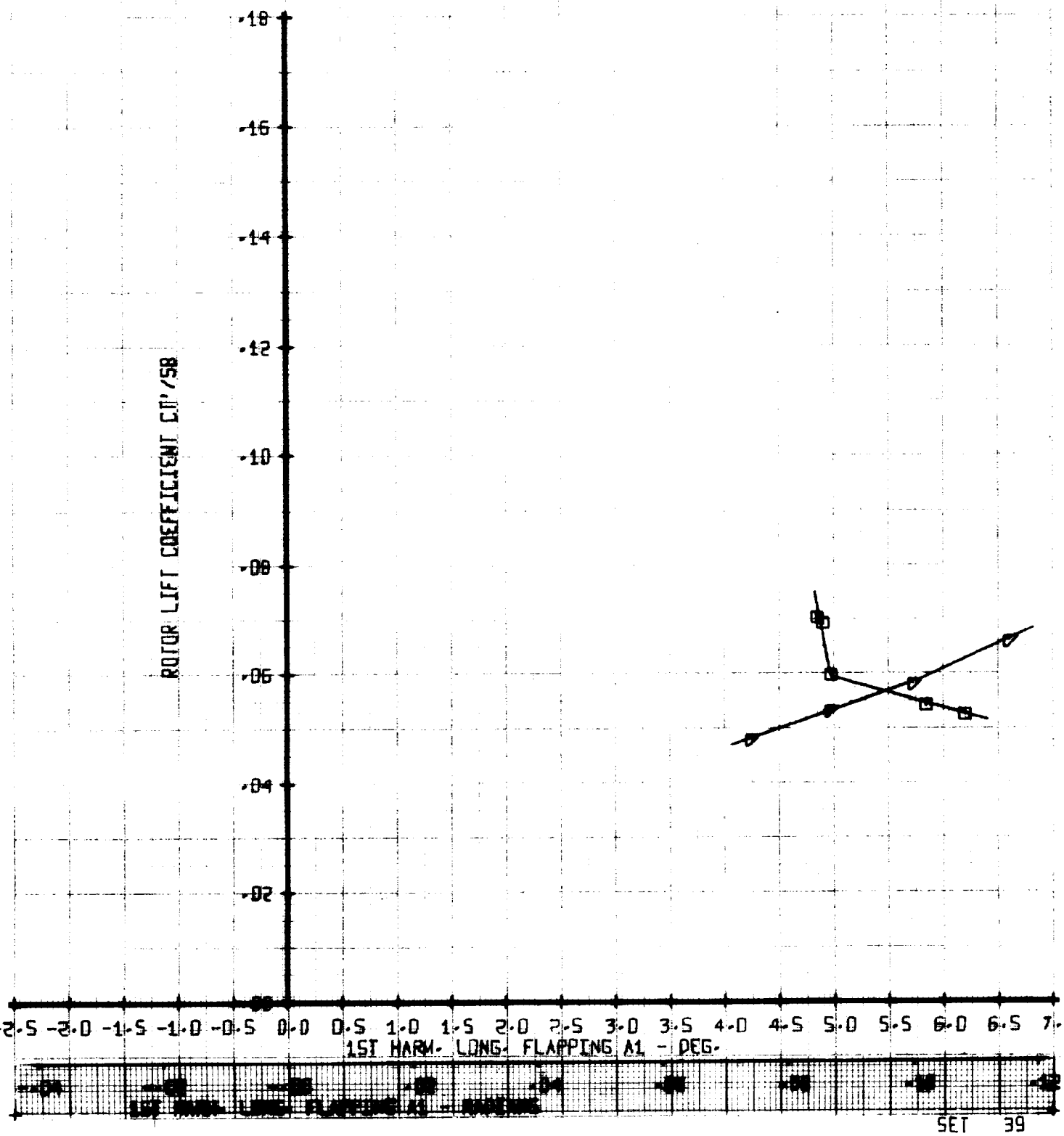
Figure A-265

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	229	.61	.05	37B
⊡	248	.61	.075	37B

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 39
WT 193

SET 39
BVWT 193

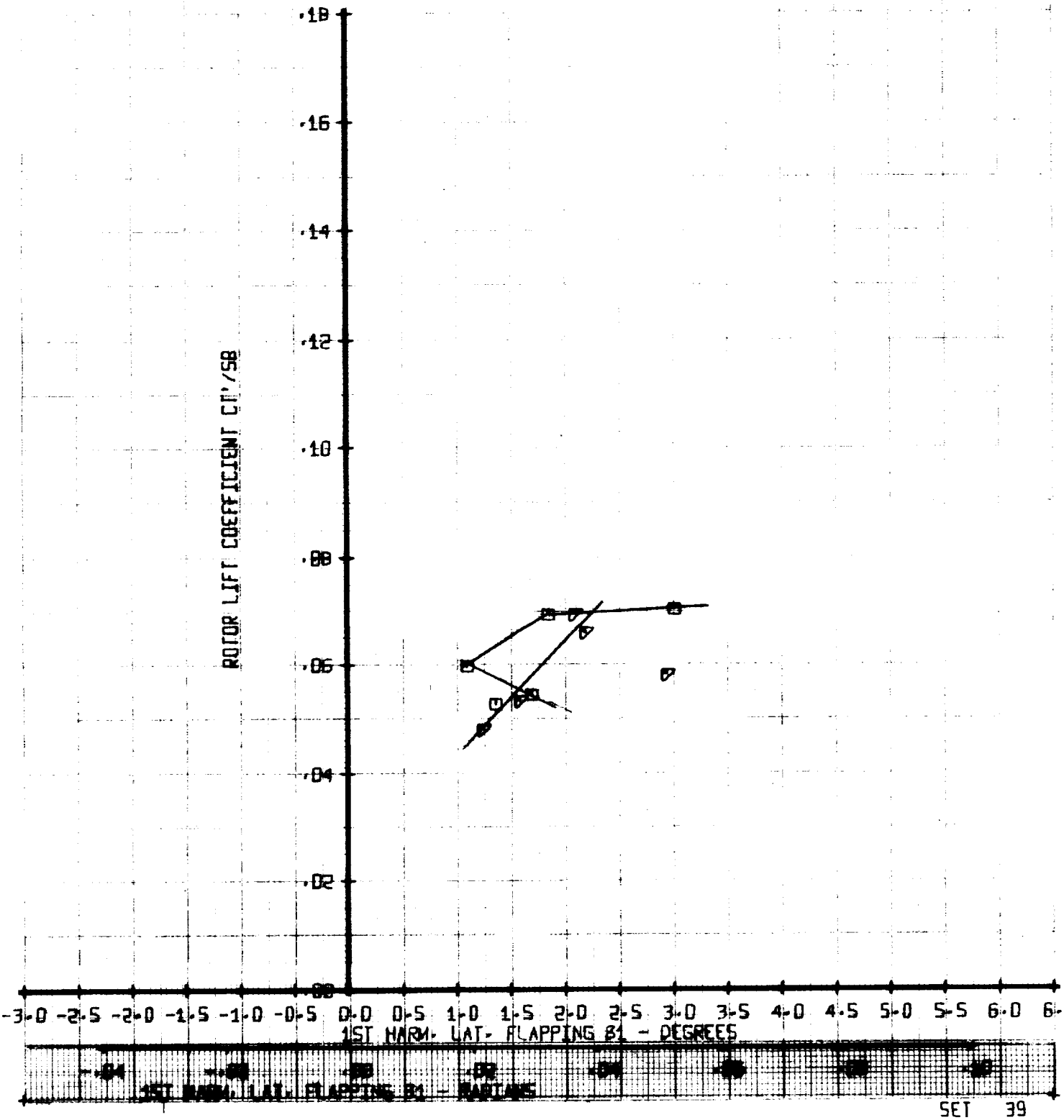
Figure A-266

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
◻	229	.61	.05	378
◸	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 39
WT 193

SET 39
BVWT 193

Figure A-267

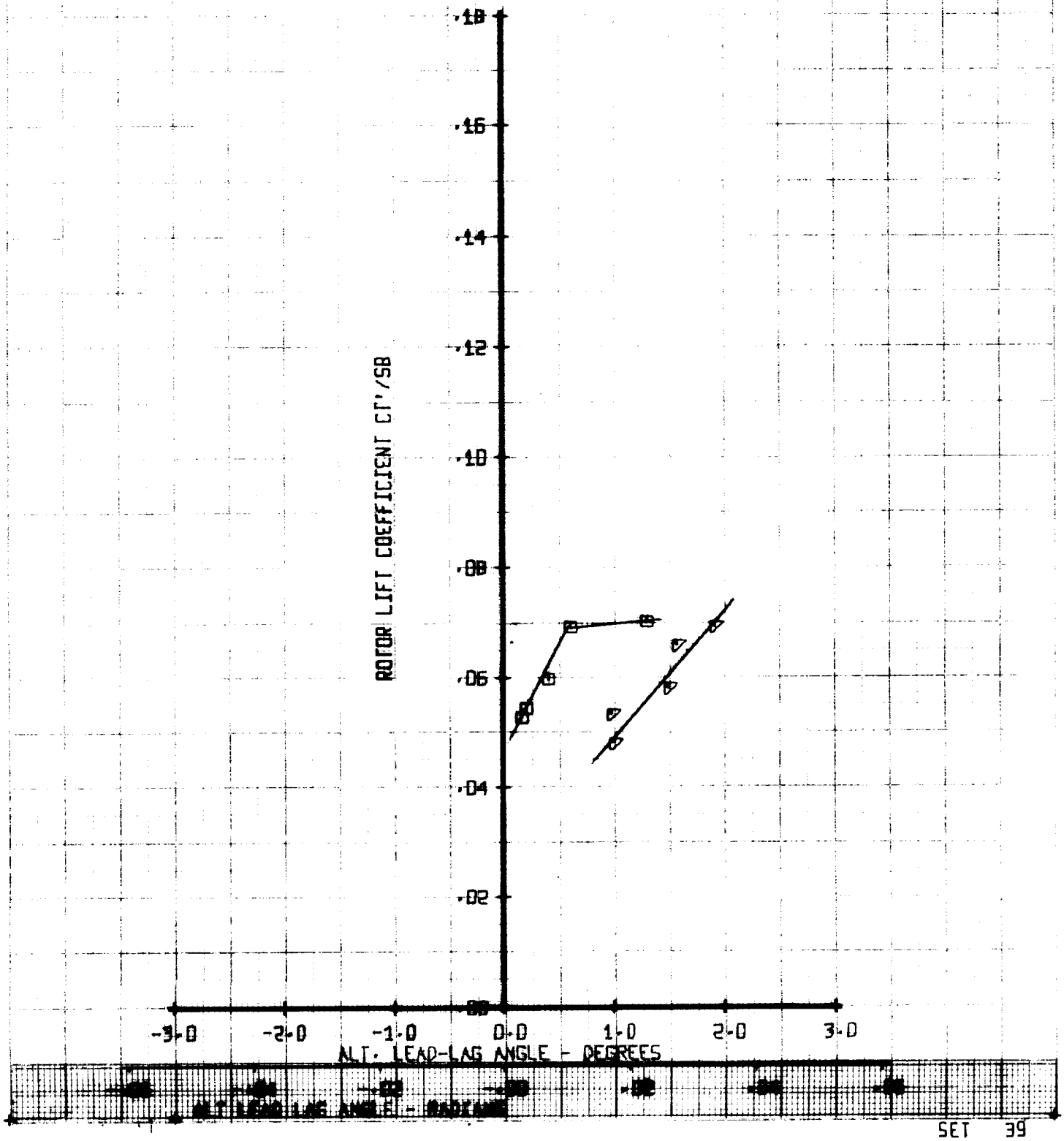
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
○	229	.61	.05	378
▽	248	.61	.075	378

ROTOR LIFT COEFFICIENT
VERSUS

ALTERNATING LEAD-LAG ANGLE



ET 39
WT 193

SET 39
BVWT 193

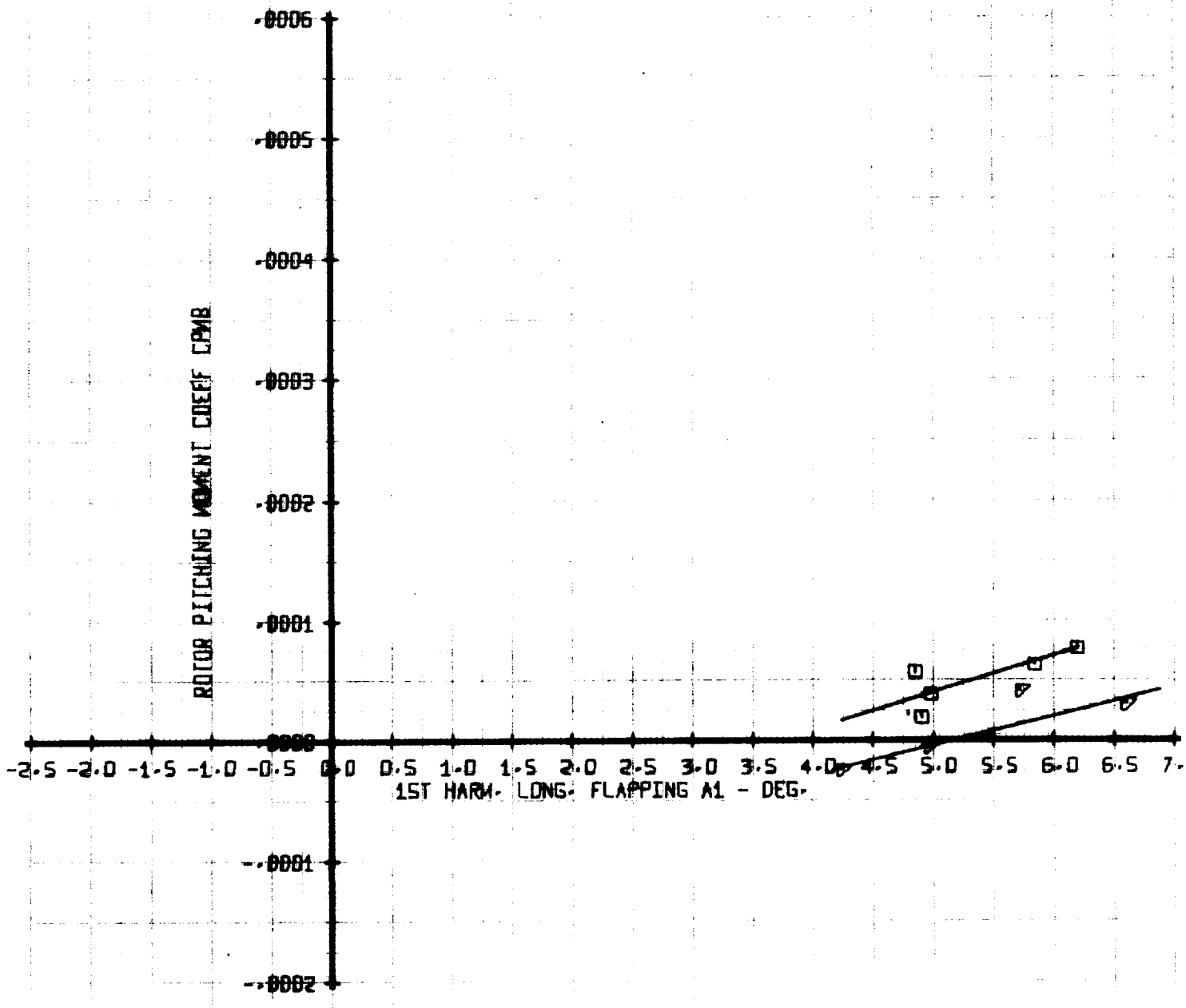
Figure A-268

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	229	.61	.05	37B
▽	248	.61	.075	37B

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 39
WT 193

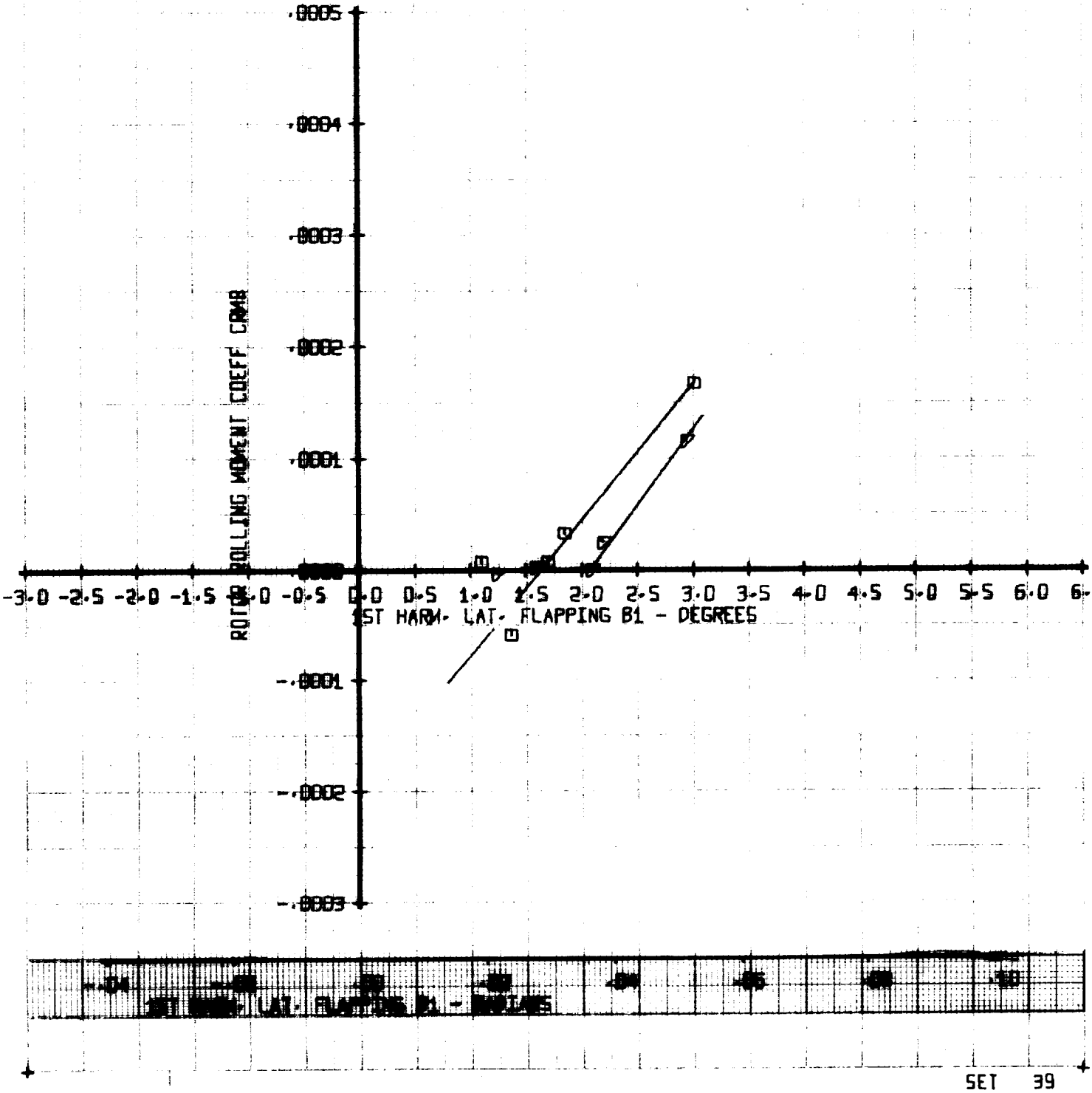
SET 39
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	229	.61	.05	37B
▽	248	.61	.075	37B

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 39
WT 193

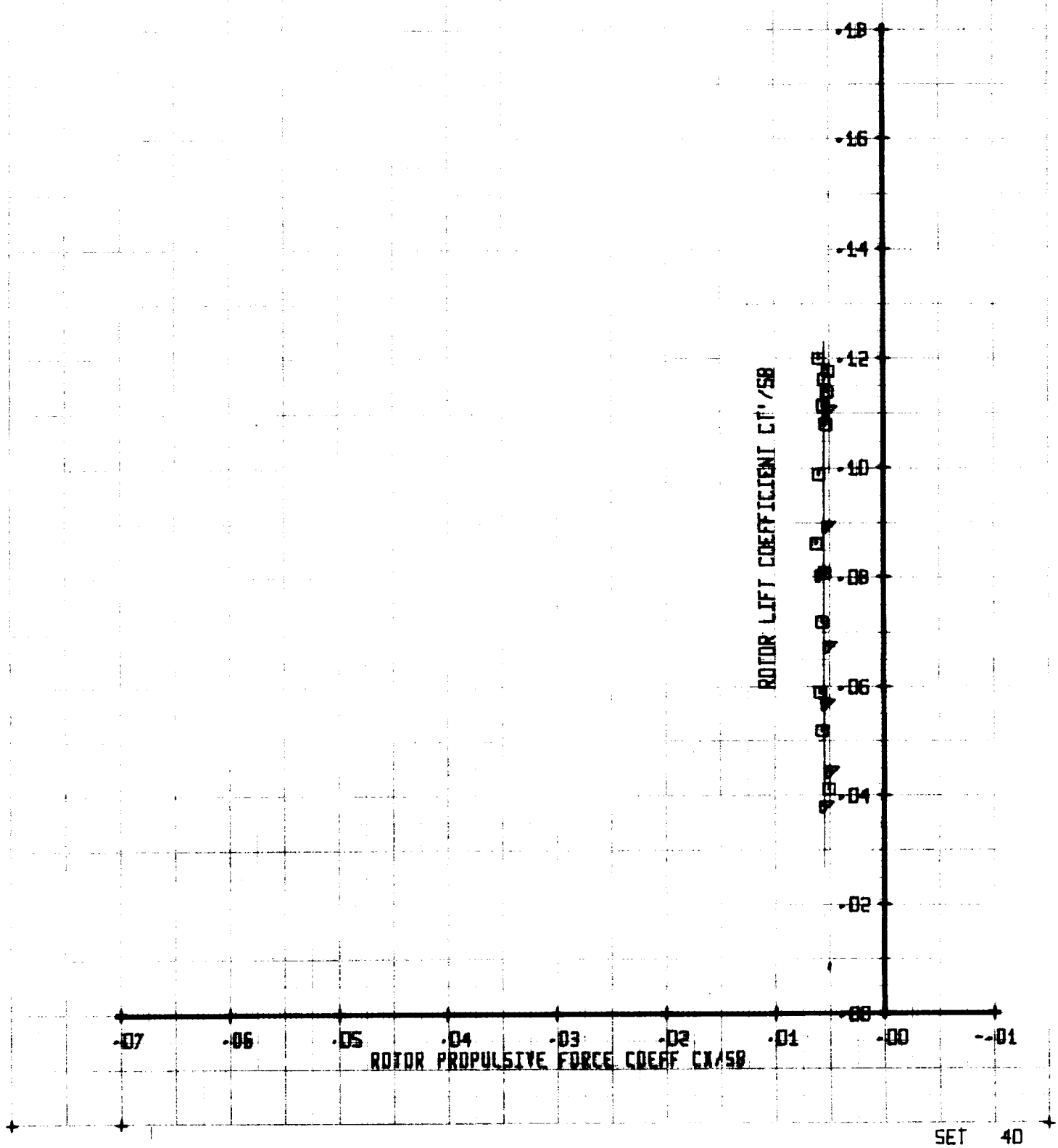
SET 39
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	VTUN
⊡	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

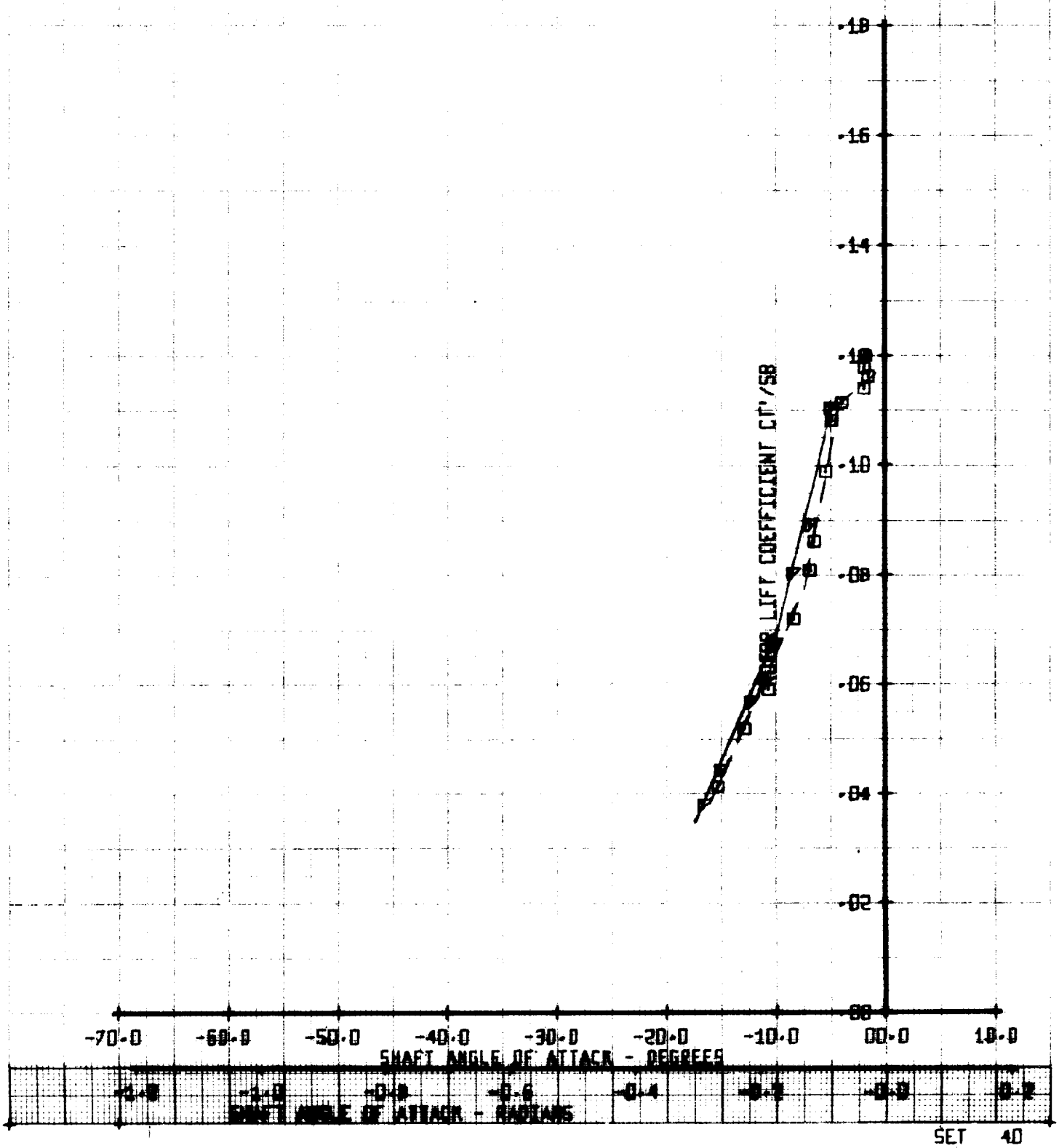
Figure A-271

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	YTUN
□	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK
REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

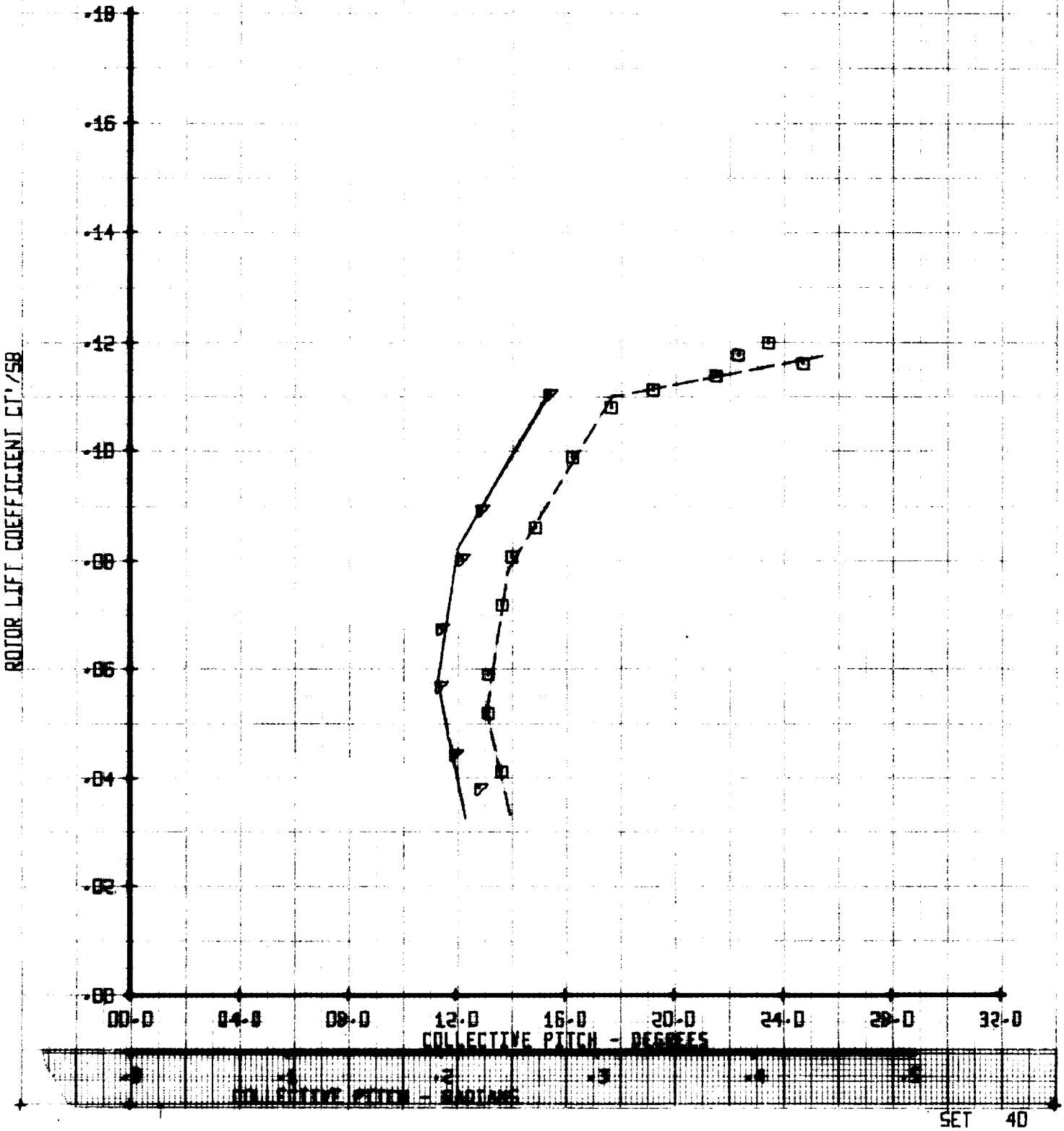
Figure A-272

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47A ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD25B	YTUN
⊡	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BWT 193

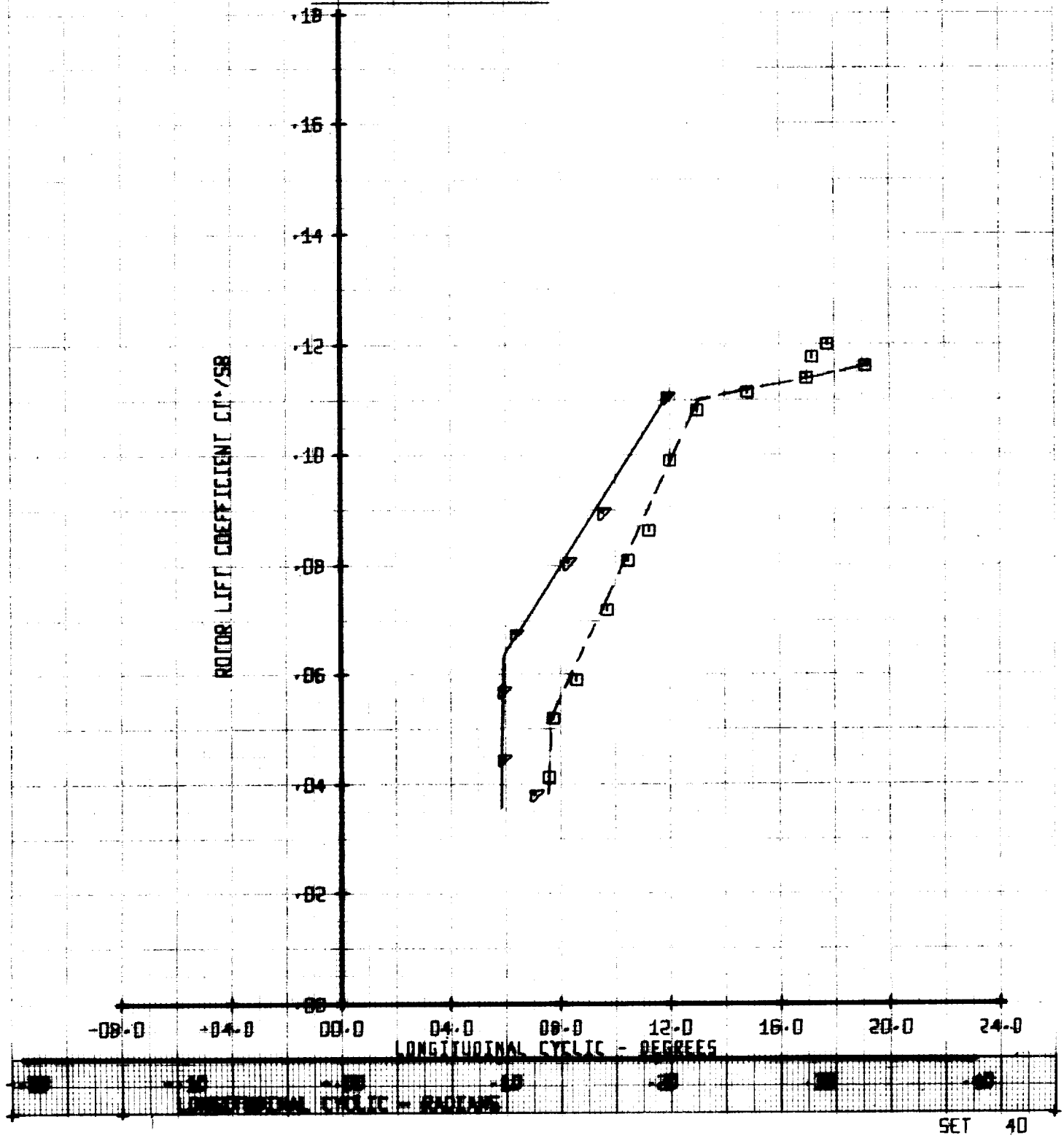
Figure A-273

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/DD258	VTUN
□	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-274

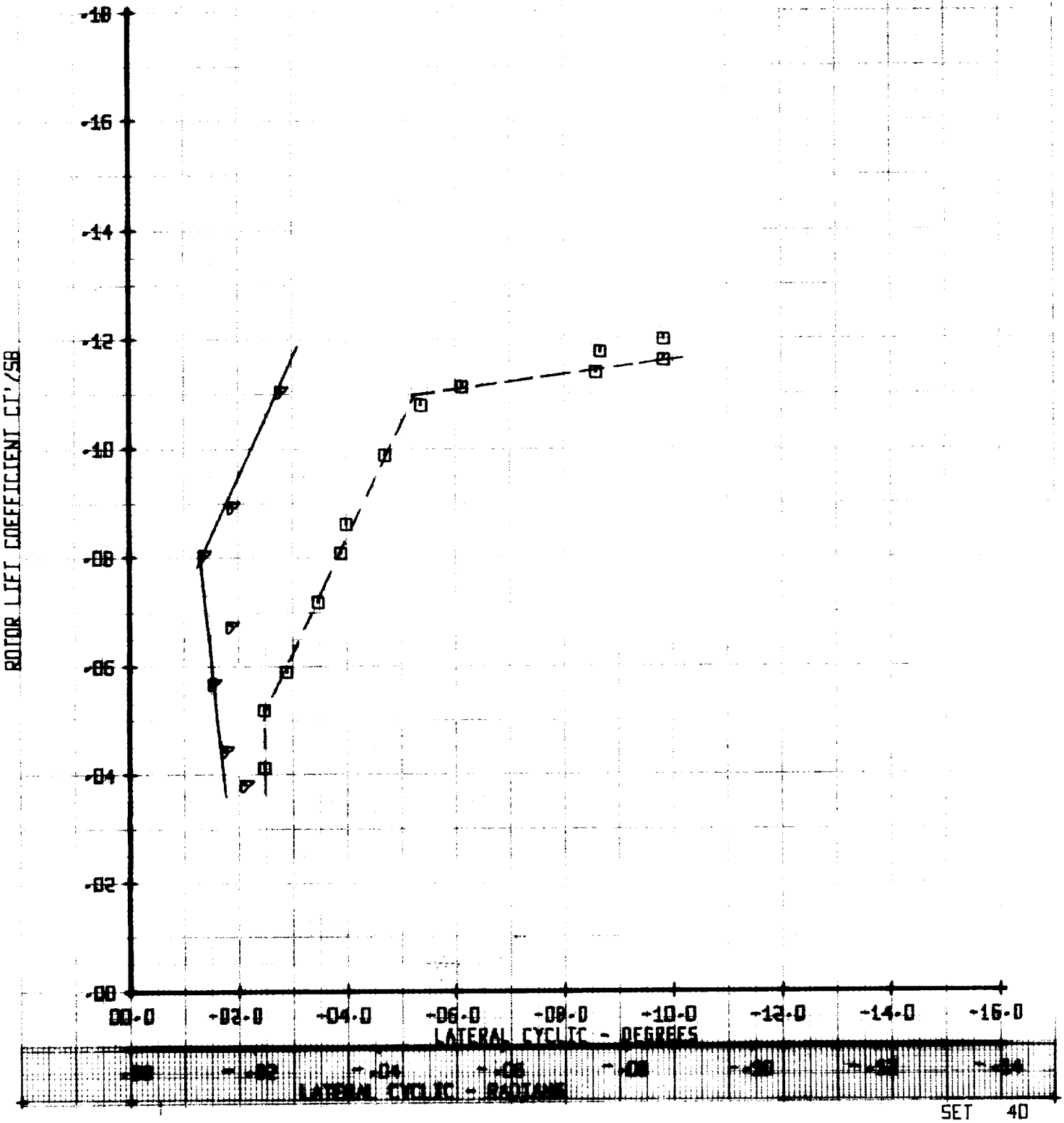
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD25R	YRUN
⊡	250	.40	.05	230
▽	256	.40	.05	230

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-275

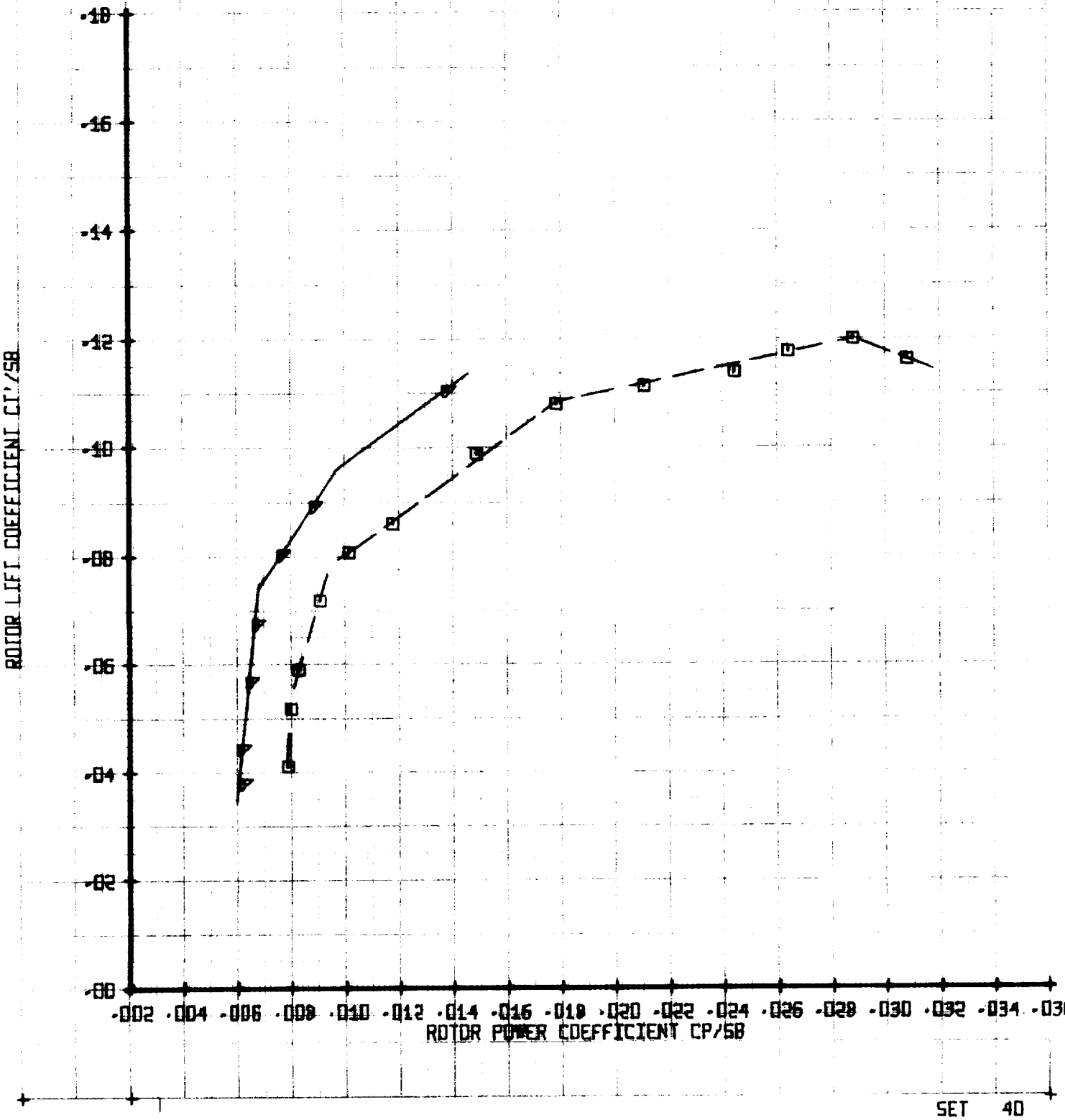
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VIUN
◻	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT

REDUCED TIP SPEED



SET 40
BVWT 193

SET 40
WT 193

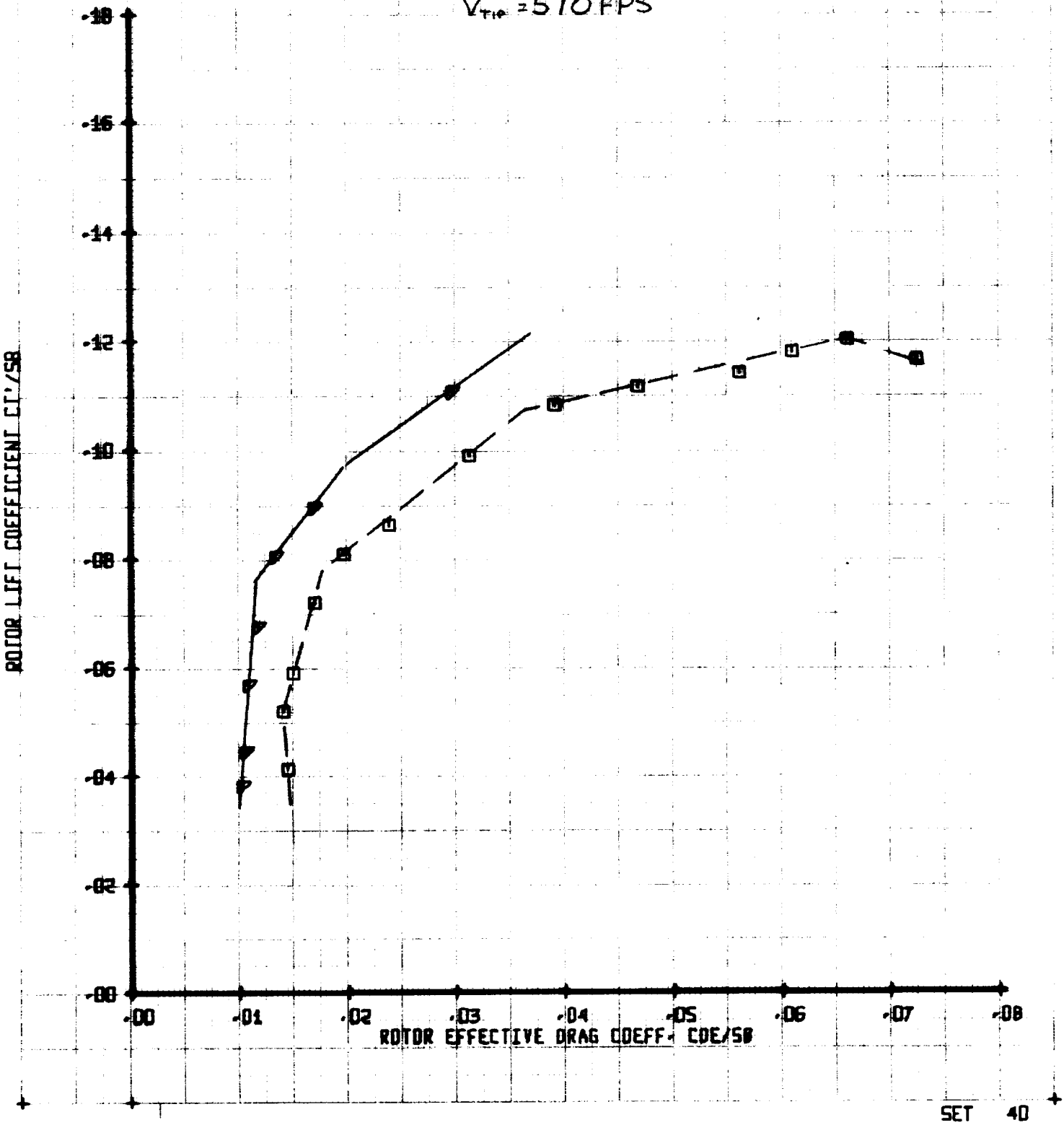
Figure A-275A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/D25R	VTUN
□	250	.40	.05	228
▽	256	.40	.05	228

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT
~~REDUCED~~ TIP SPEED

V_{TIP} = 570 FPS



ET 40
WT 193

SET 40
BVWT 193

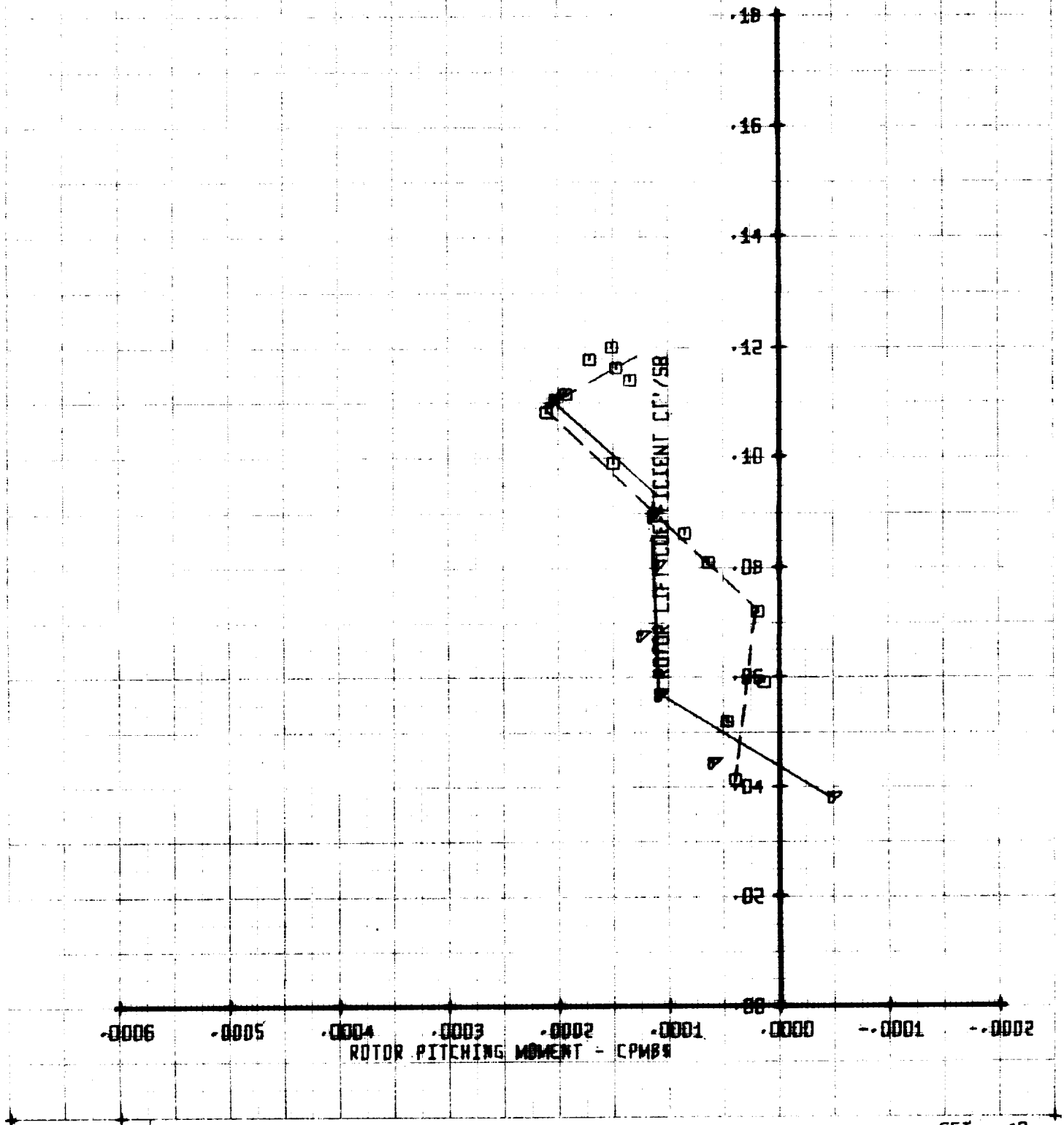
Figure A-276

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/DD2SB	VRUN
□	250	.40	.05	228
▽	256	.40	.05	228

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

REDUCED TIP SPEED



SET 40
BVWT 193

Figure A-277

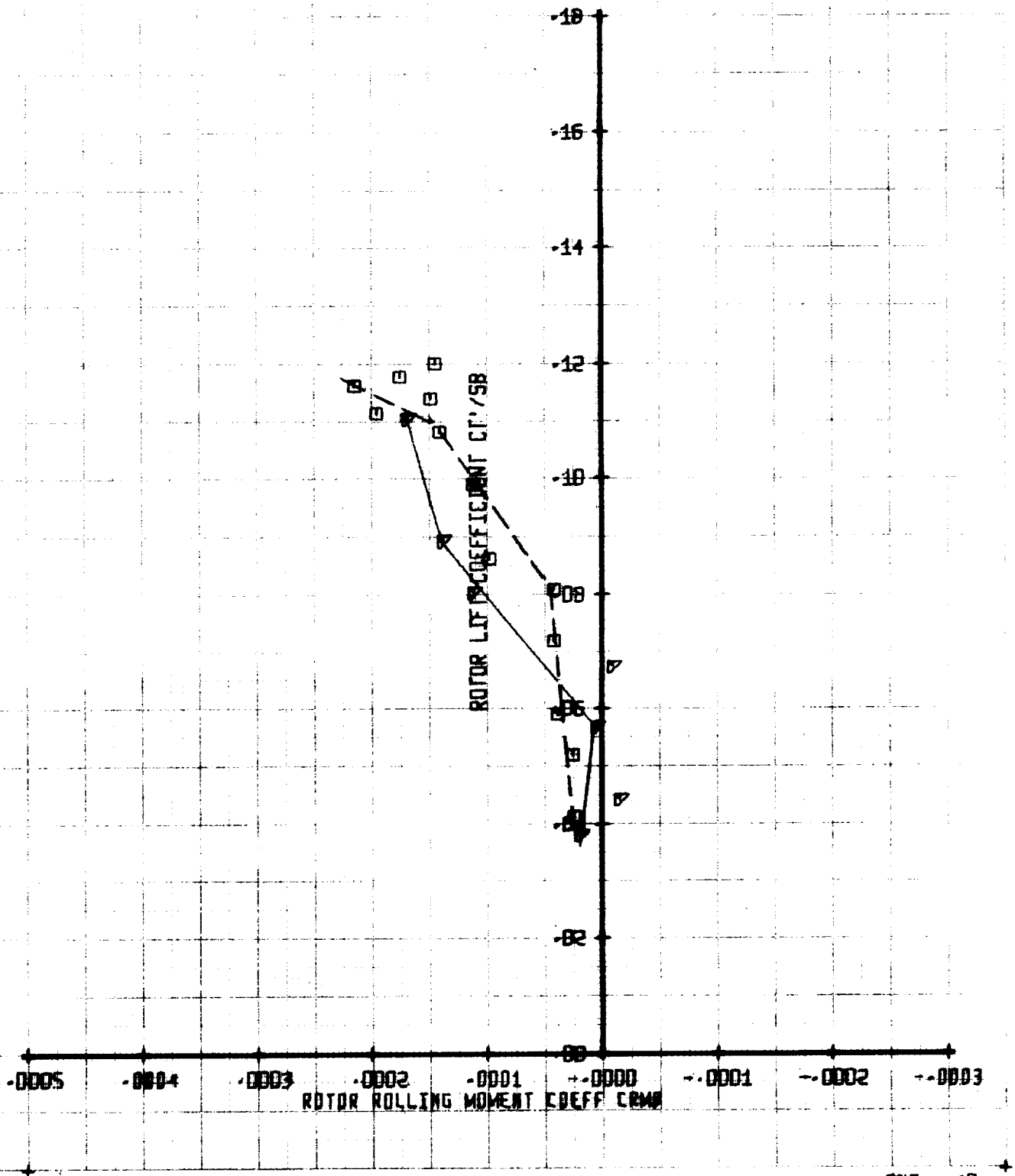
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
☐	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-278

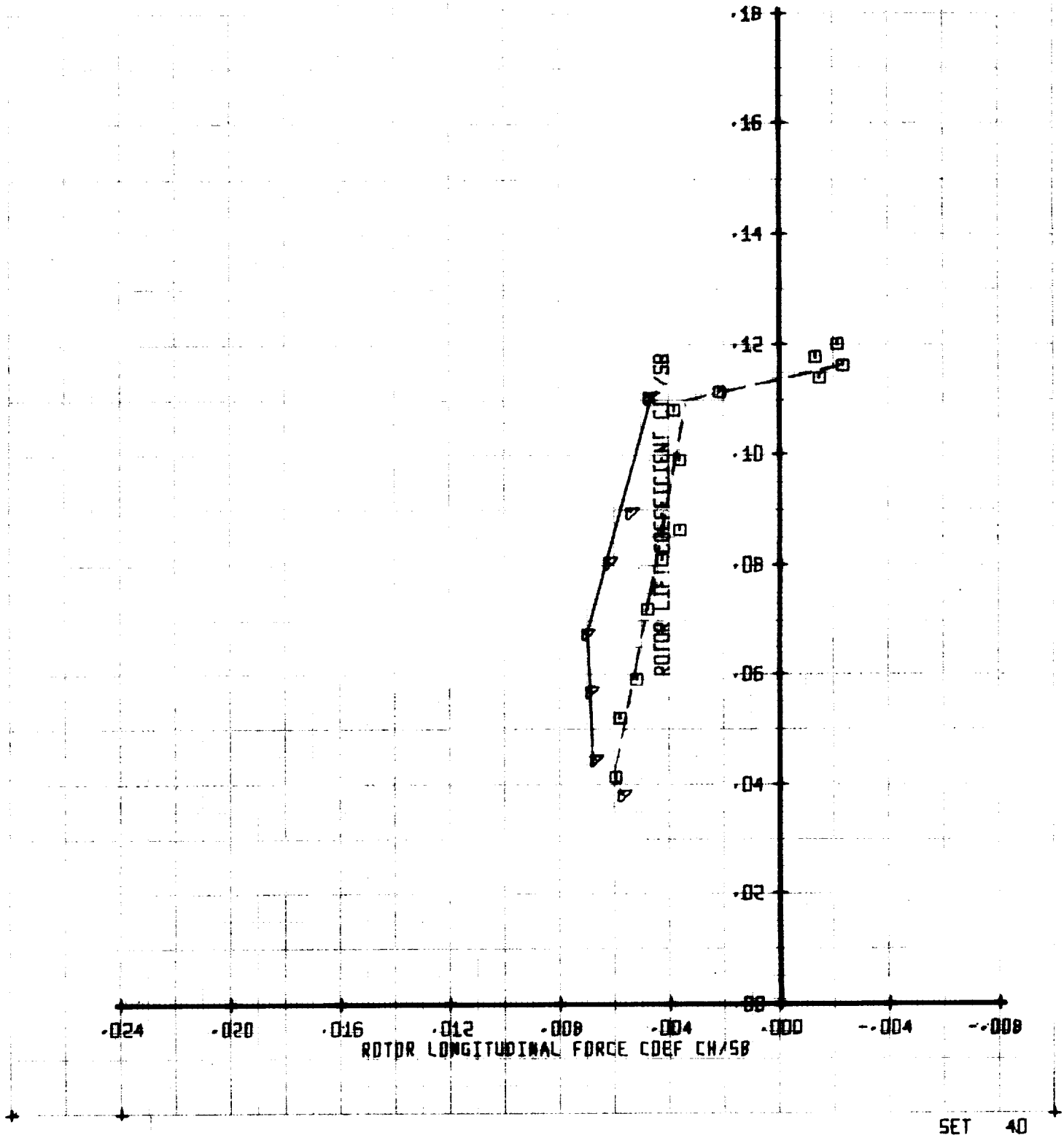
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	250	.40	.05	228
▽	256	.40	.05	228

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT

REDUCED TIP SPEED



SET 40
BVWT 193

SET 40
BVWT 193

Figure A-279

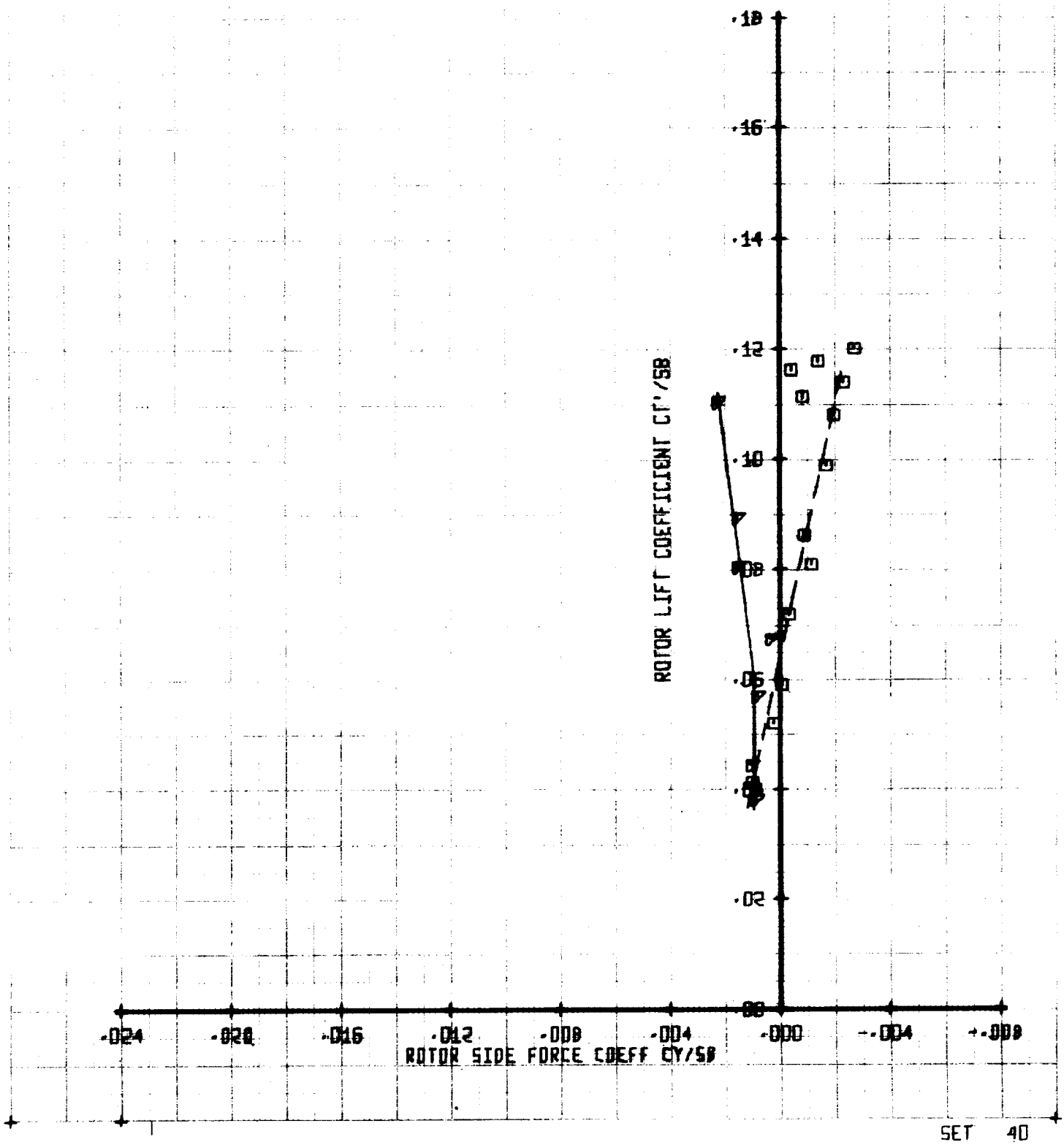
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD25B	YTUN
□	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-280

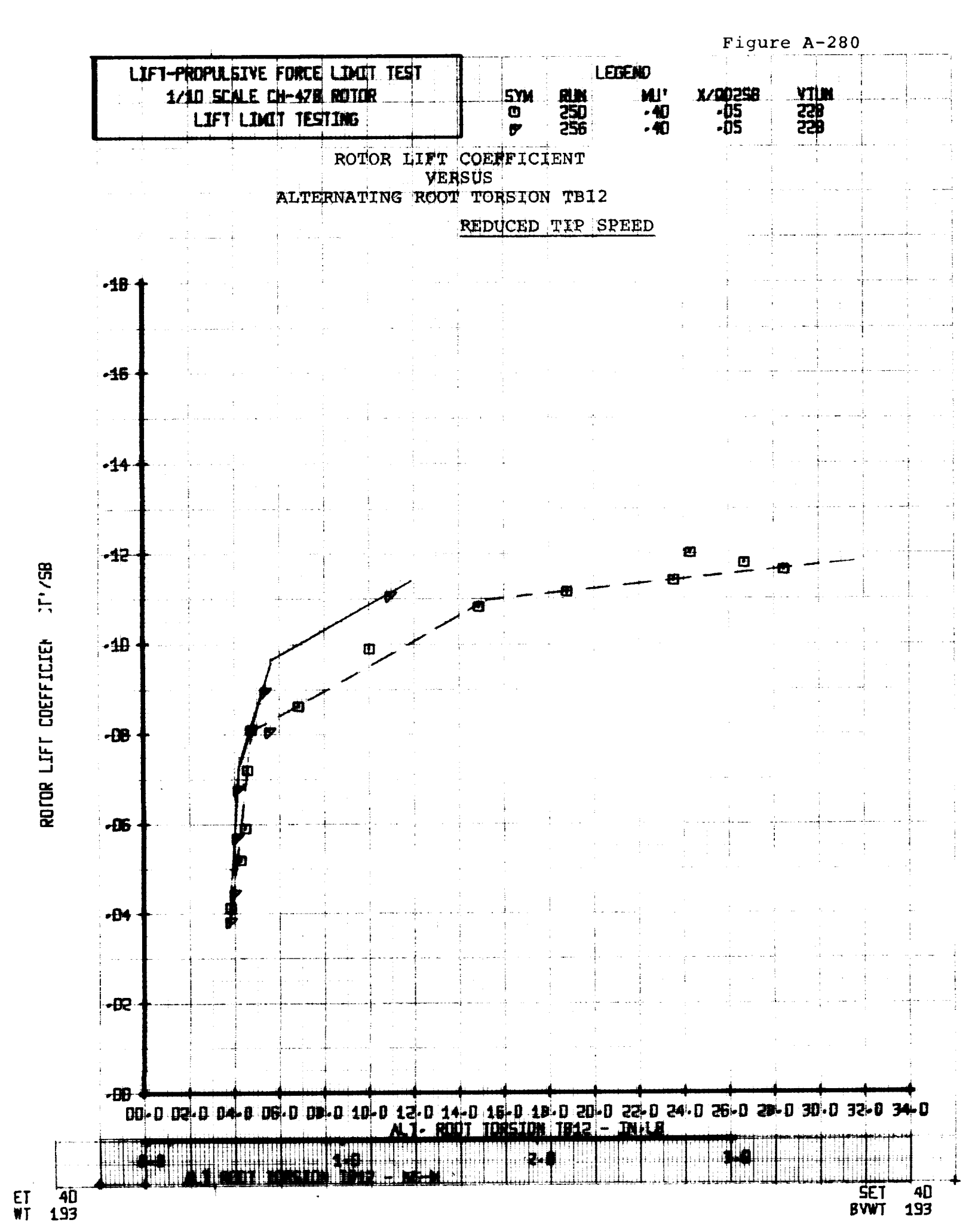

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QQ2SB YTUN
250 .40 -05 228
256 .40 -05 228
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12
REDUCED TIP SPEED
ROTOR LIFT COEFFICIEN CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0 02.0 04.0 06.0 08.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0
A1- ROOT TORSION TB12 - IN-LB
1.0
2.0
ET 40
WT 193
SET 40
BVWT 193

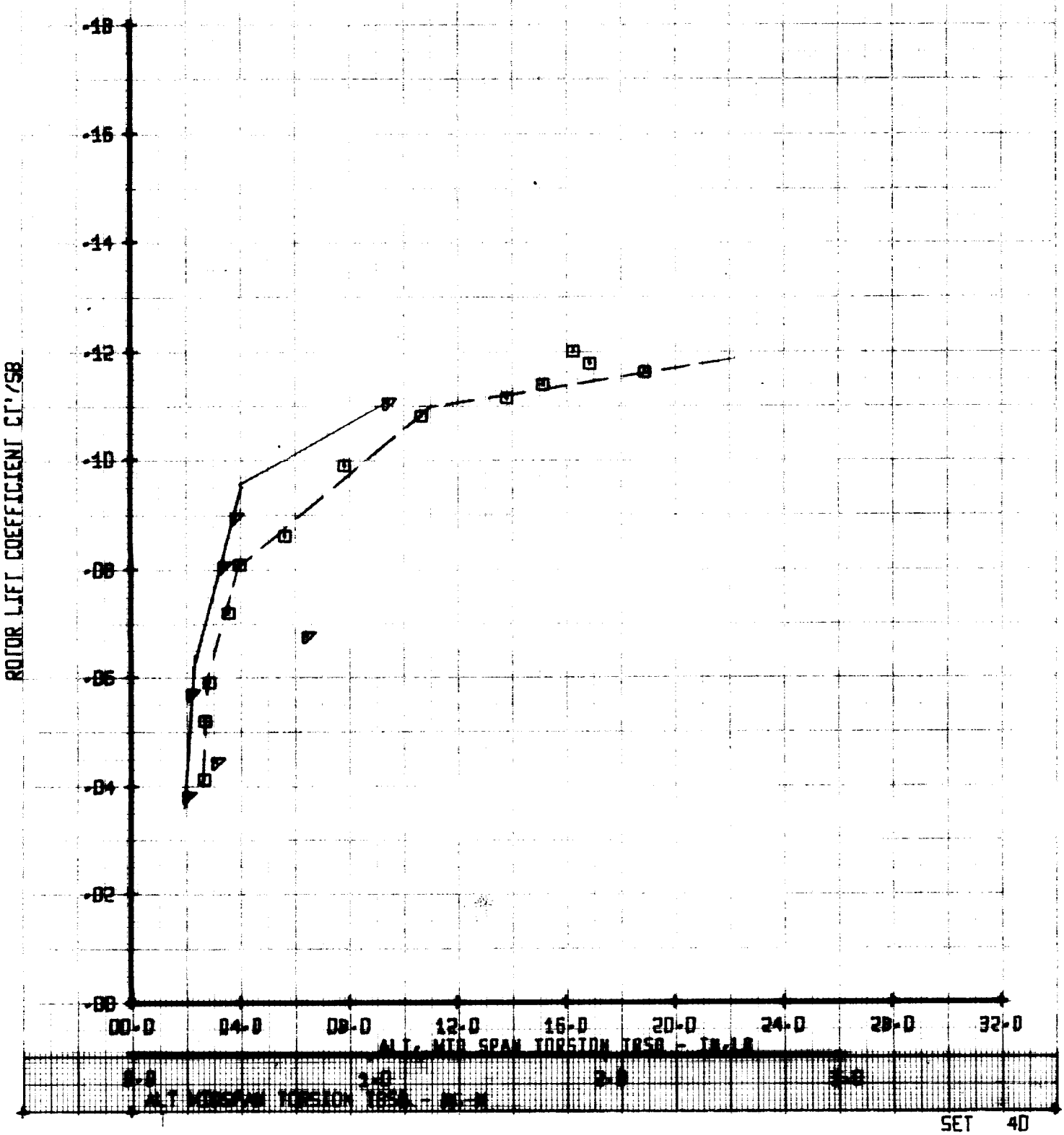
Figure A-281

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/RO25R	VTUN
□	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50
REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-282

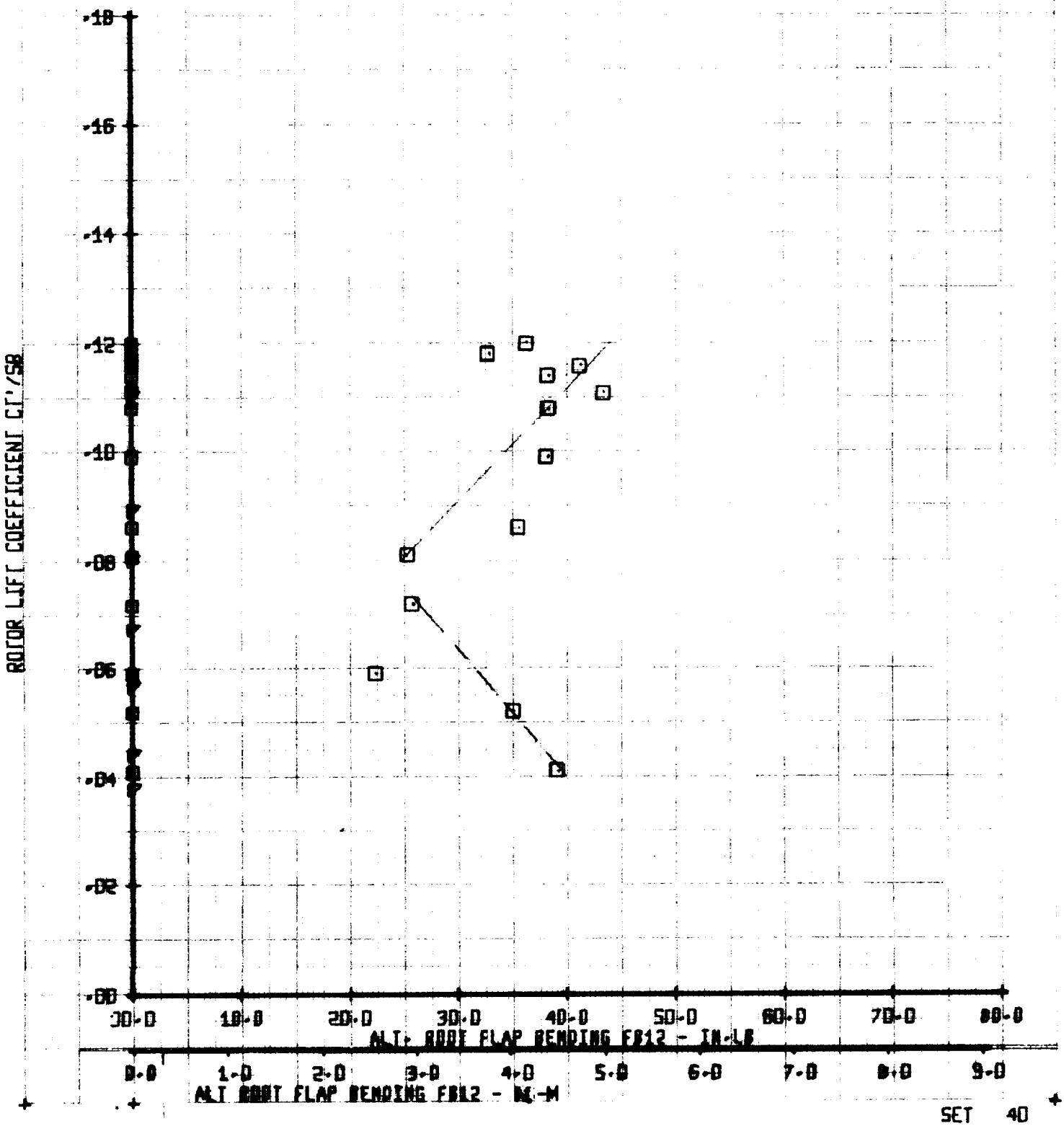
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	250	.40	.05	220
⊡	250	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-283

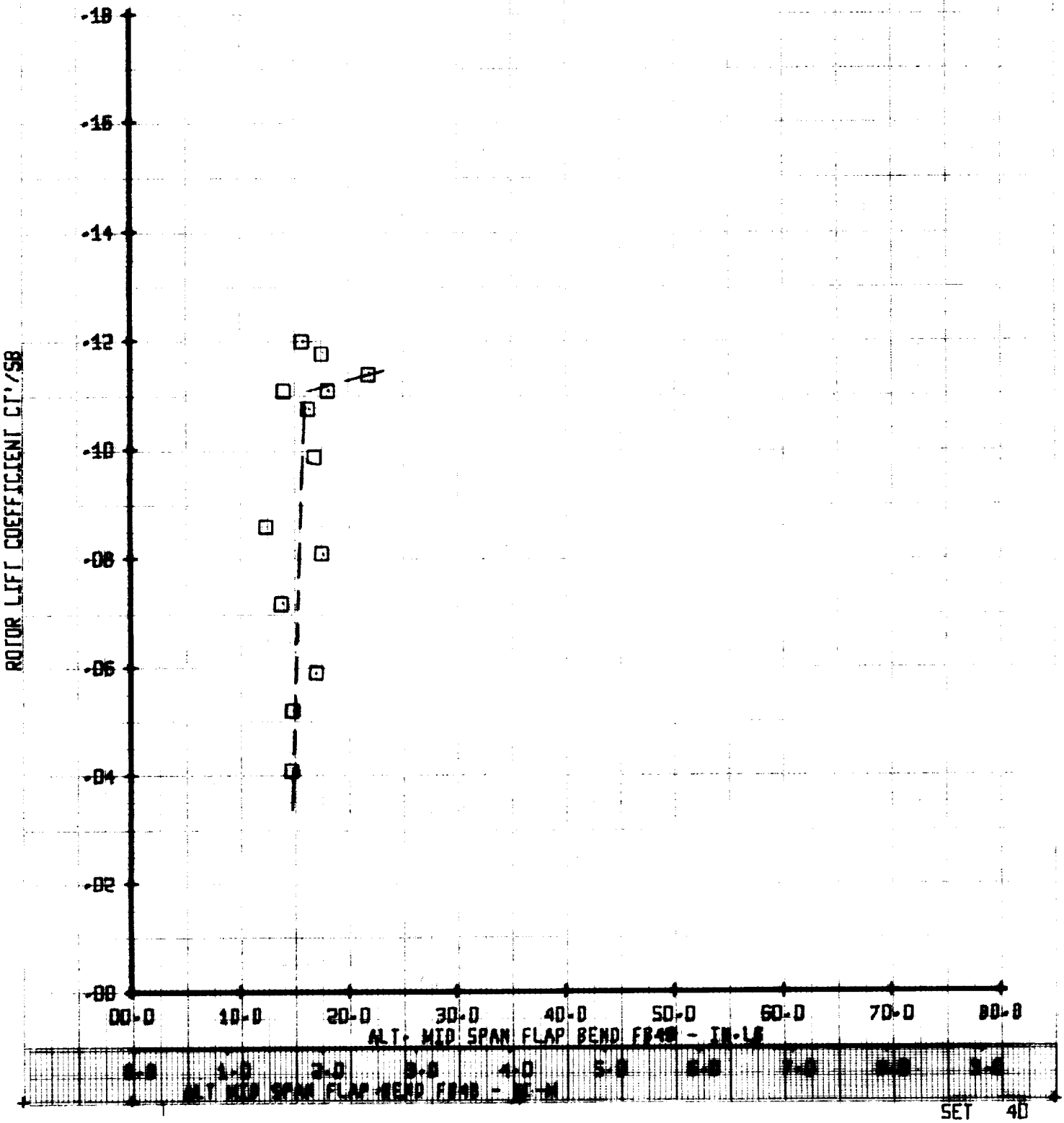
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB4[illegible]

REDUCED TIP SPEED



ET 40
WT 193

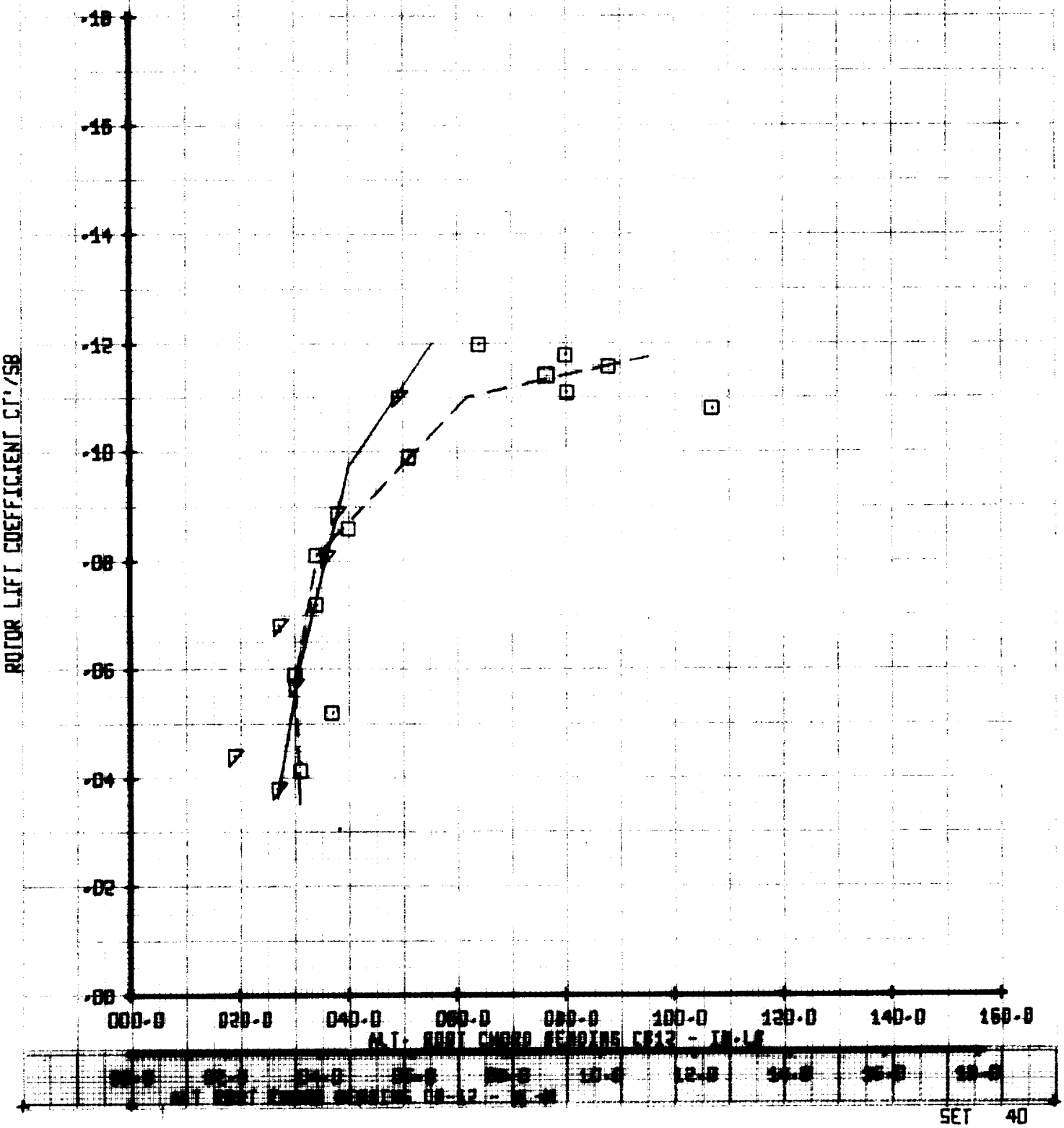
SET 40
BVWT 193

Figure A-284

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	250	.40	.05	220
▽	256	.40	.05	220

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12
REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-285

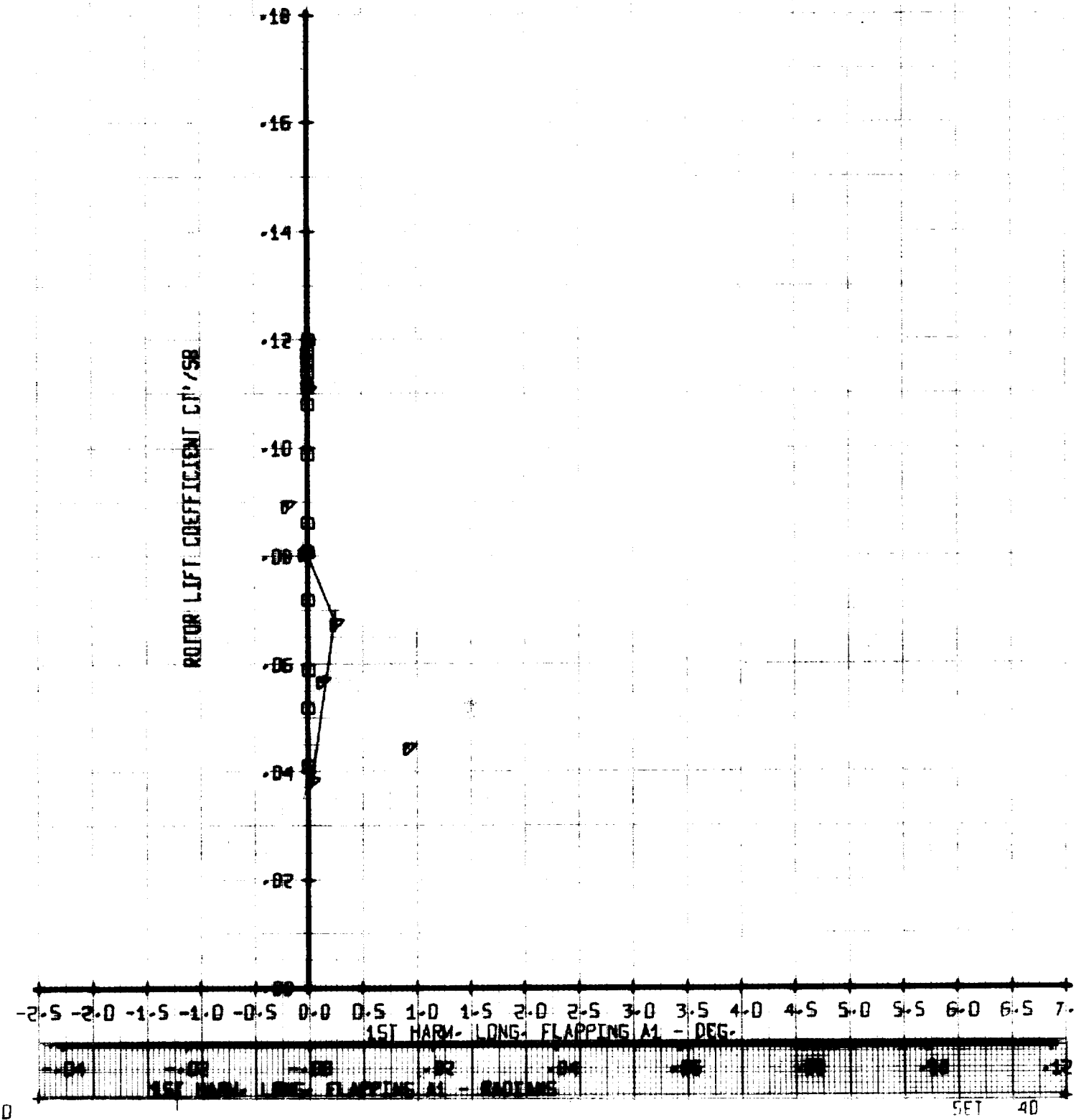
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
◻	250	.40	.05	22B
▽	256	.40	.05	22B

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

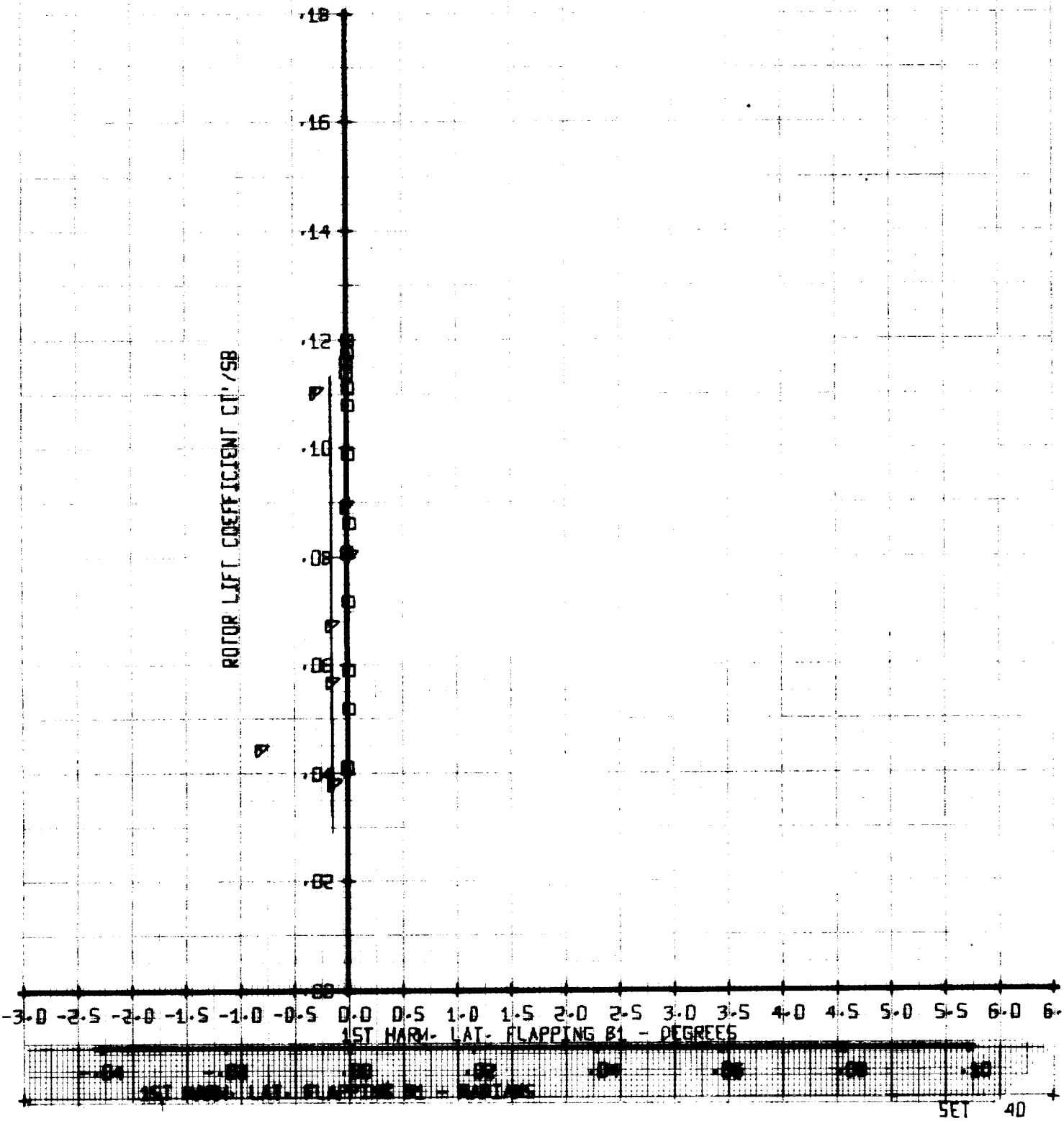
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
○	250	.40	.05	228
▽	256	.40	.05	228

ROTOR LIFT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

Figure A-287

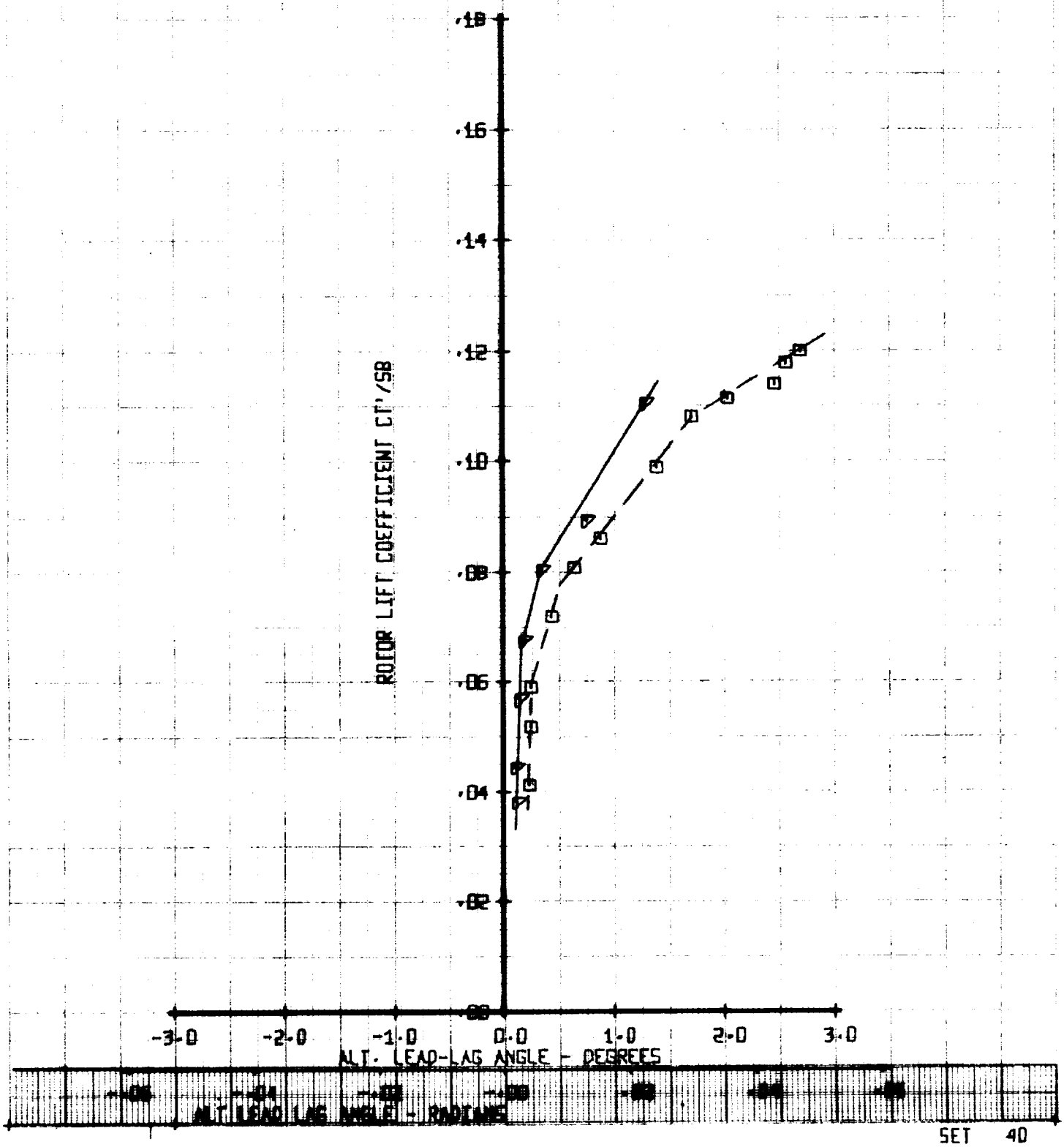
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	250	.40	.05	228
▽	256	.40	.05	228

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

REDUCED TIP SPEED



ET 40
WT 193

SET 40
BVWT 193

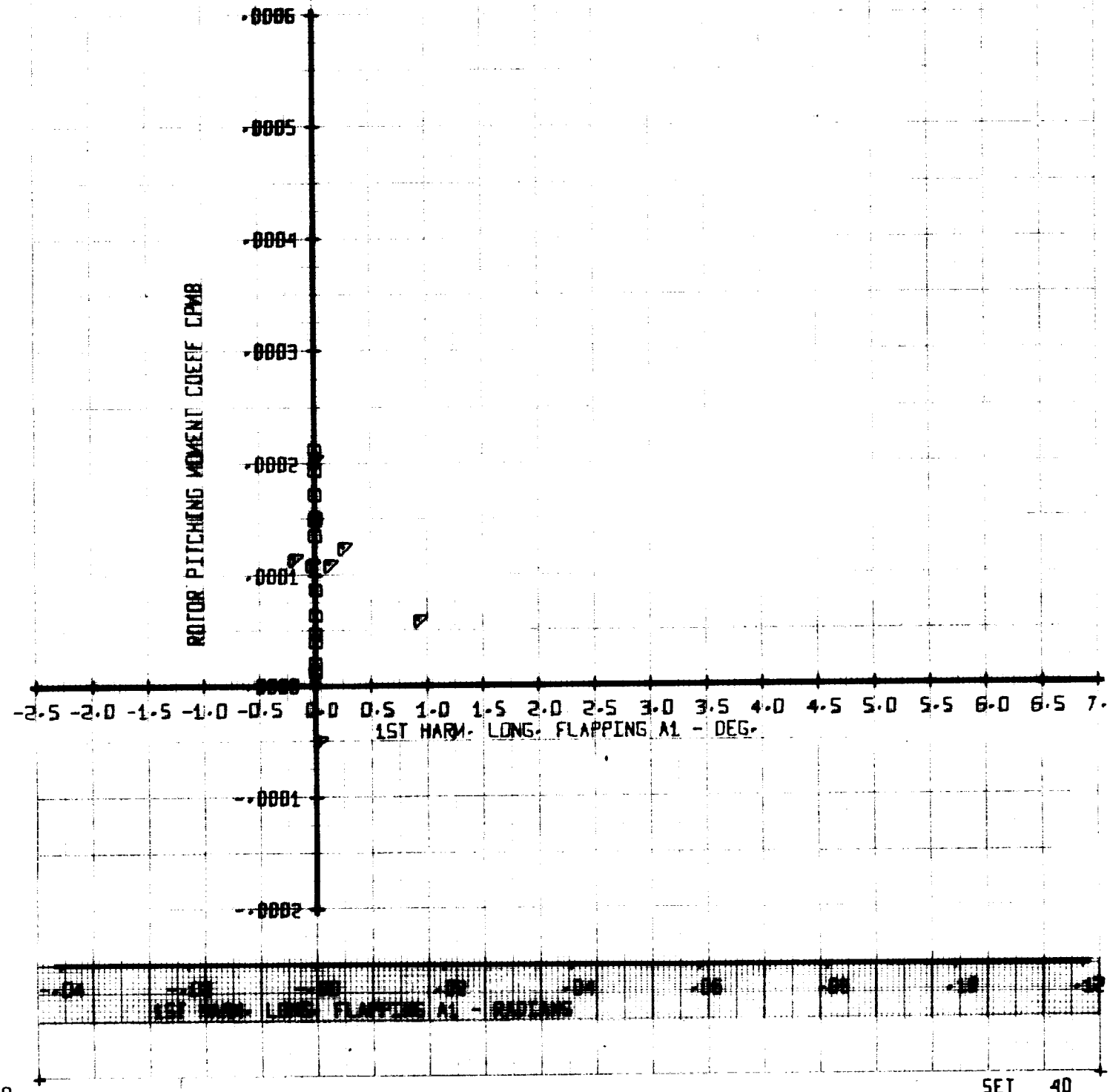
Figure A-288

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
○	250	.40	.05	228
▽	256	.40	.05	228

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

REDUCED TIP SPEED



ET 40
WT 193

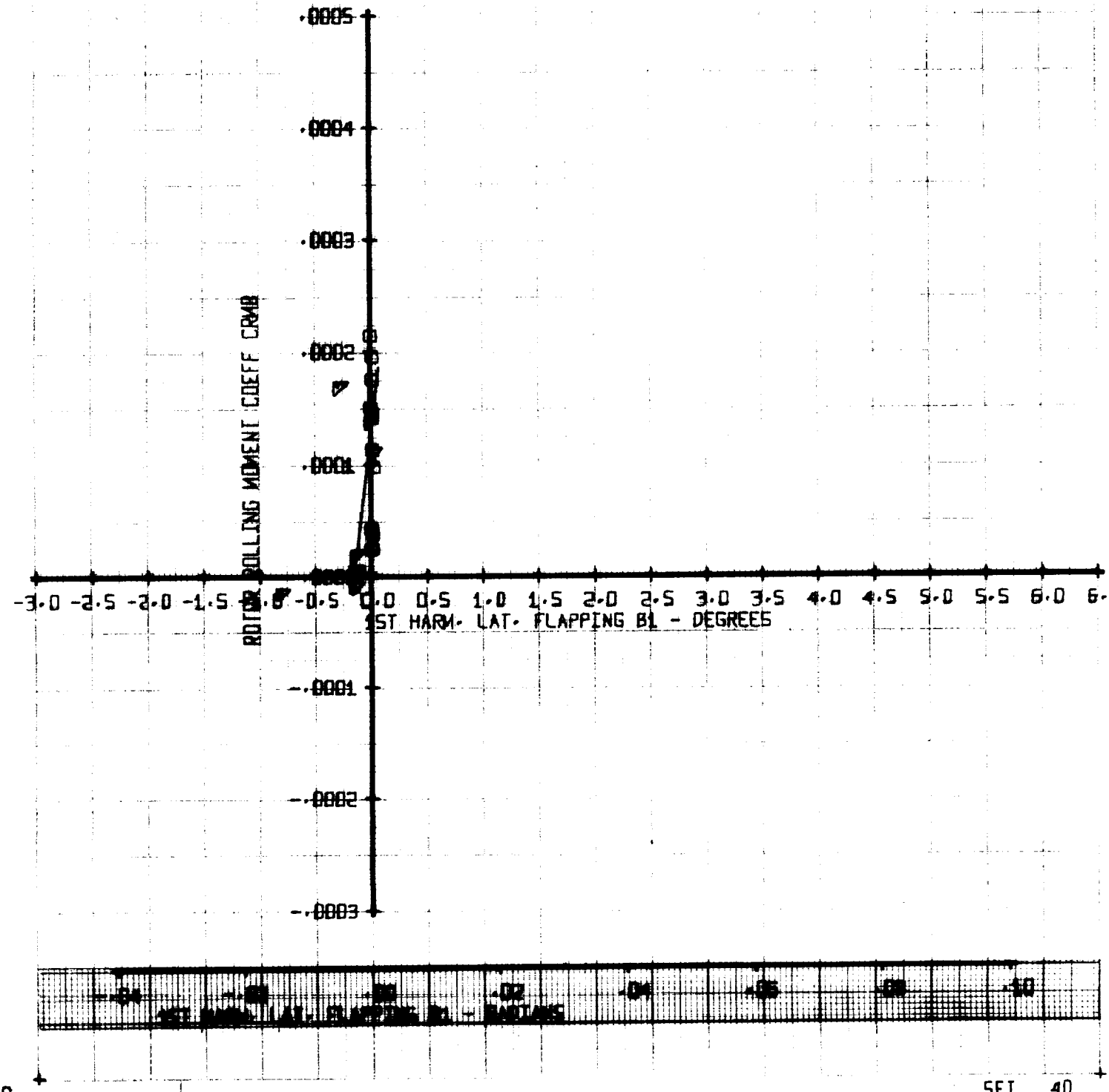
SET 40
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	250	.40	.05	228
▽	256	.40	.05	228

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1
REDUCED TIP SPEED



SET 40
WT 193

SET 40
BVWT 193

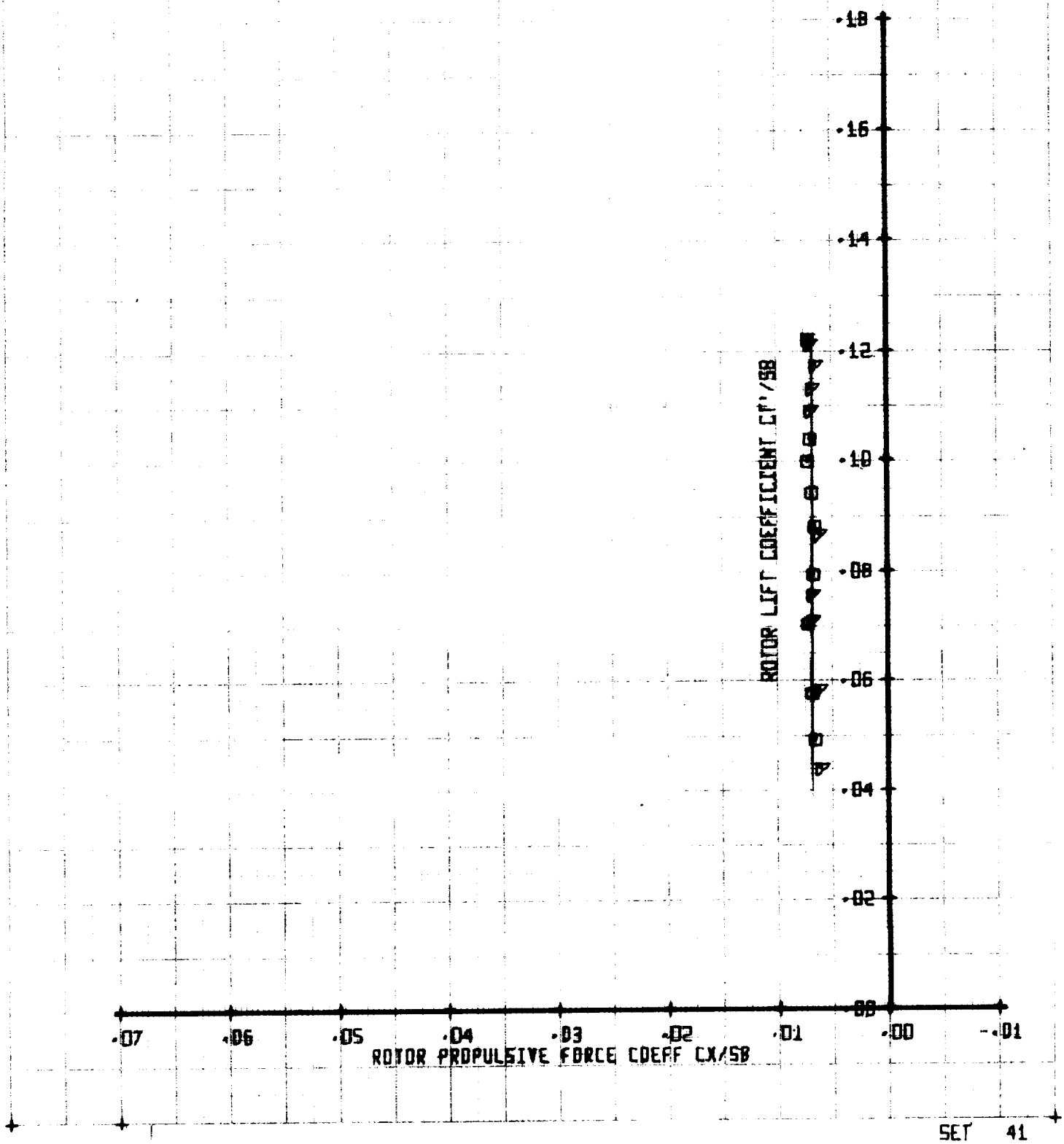
Figure A-290

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
REDUCED TIP SPEED



SET 41
BVWT 193

SET 41
WT 193

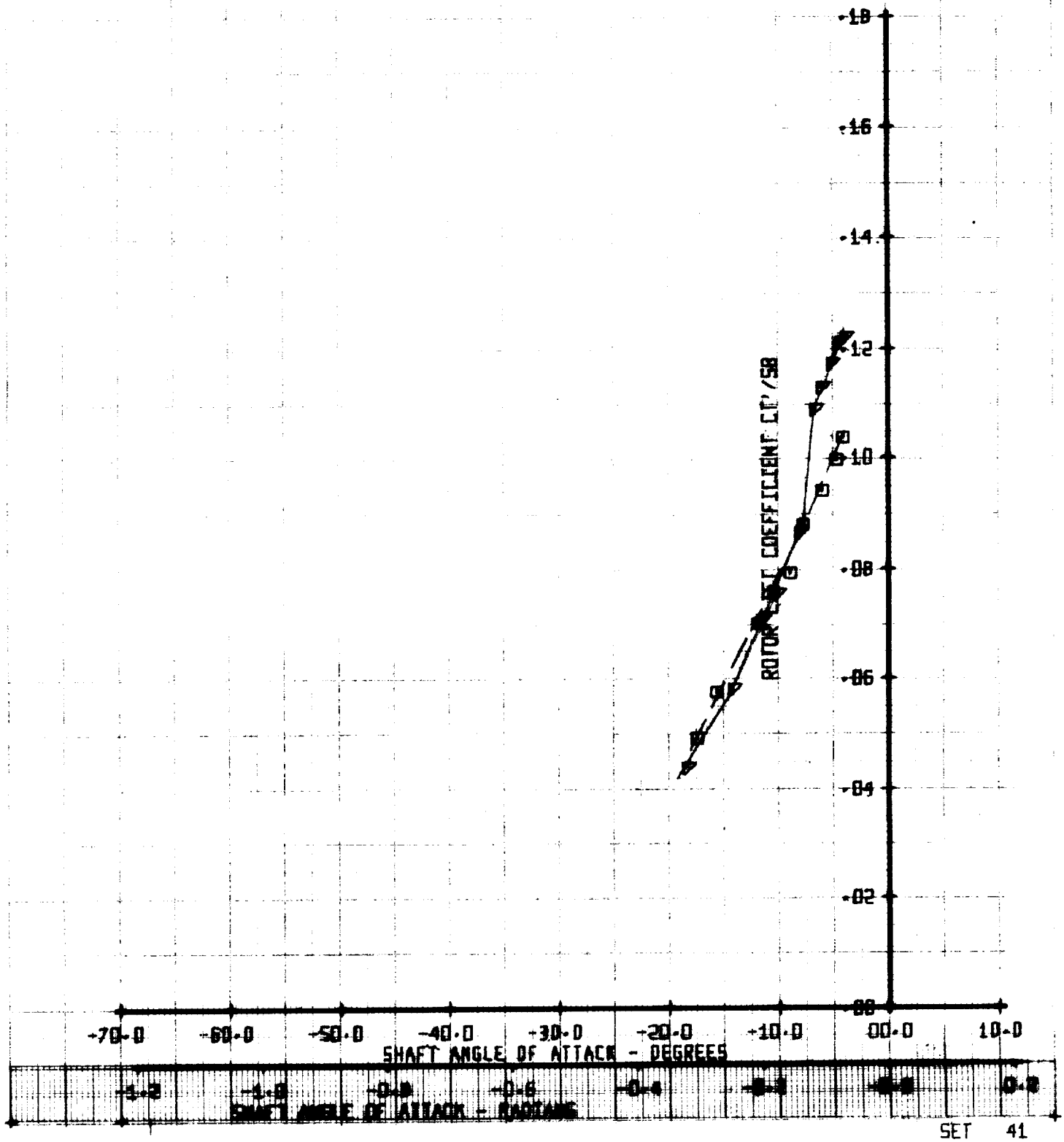
Figure A-291

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK
REDUCED TIP SPEED



SET 41
WT 193

SET 41
BVWT 193

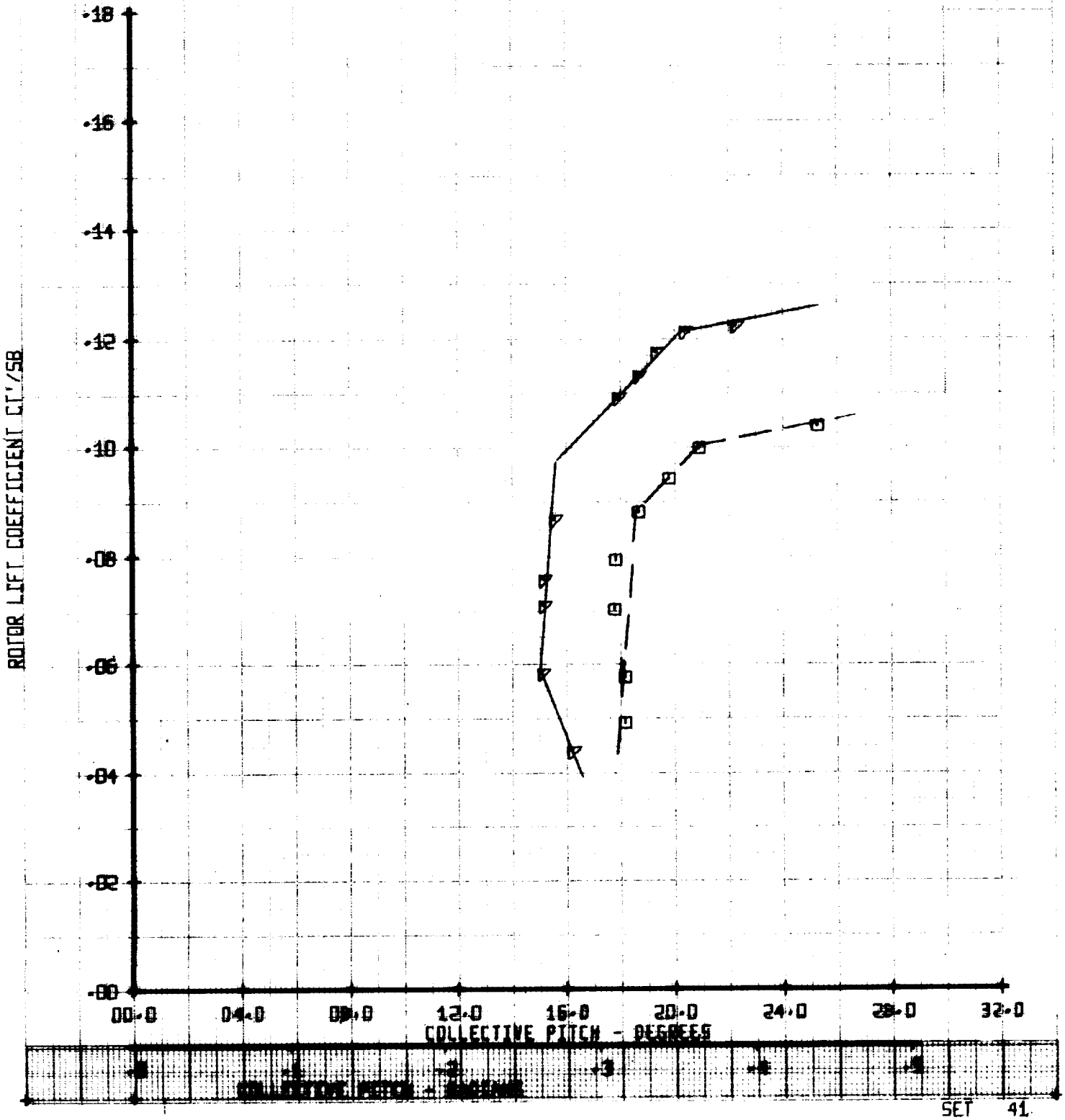
Figure A-292

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/DD258	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH

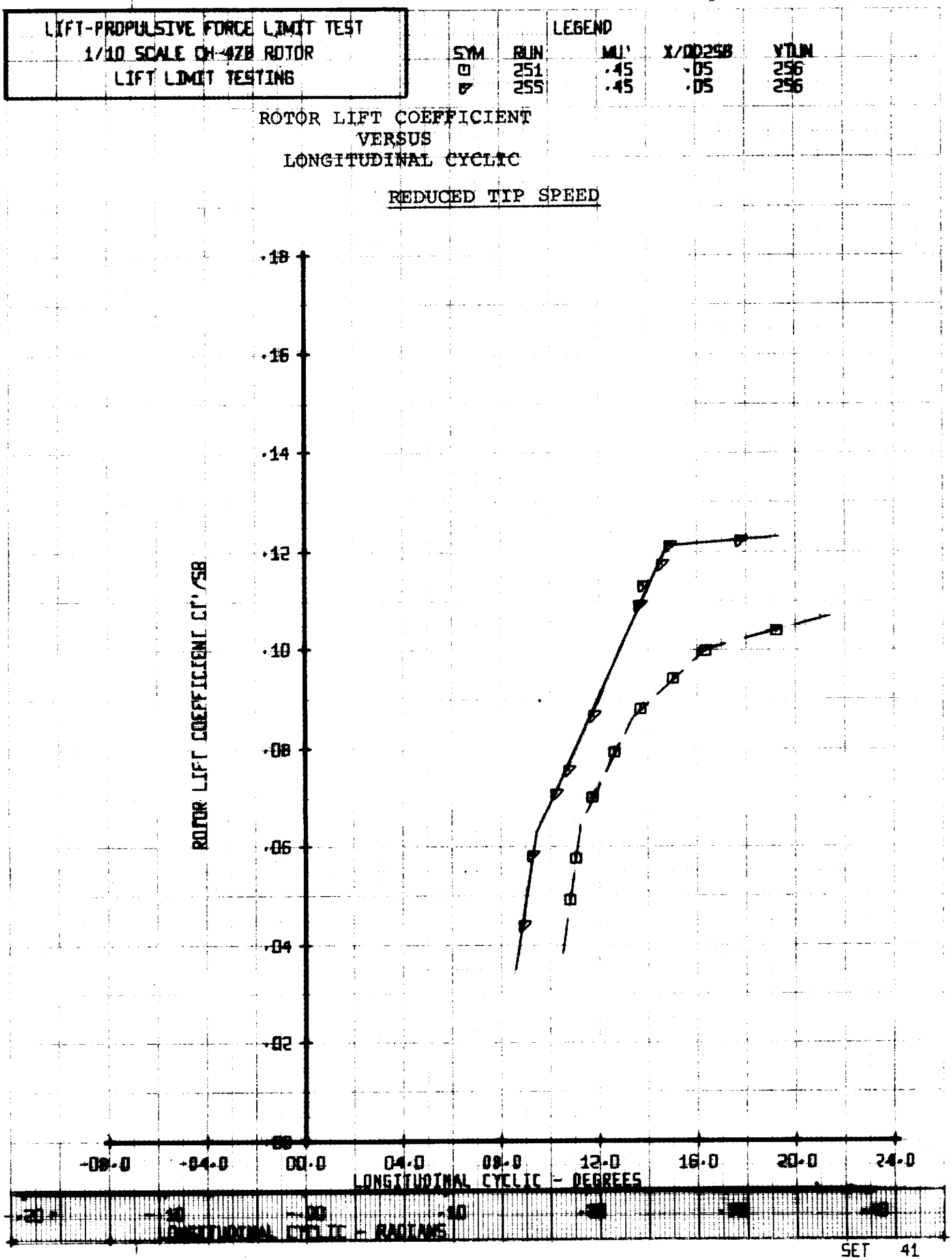
REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

Figure A-293



ET 41
WT 193

Figure A-294

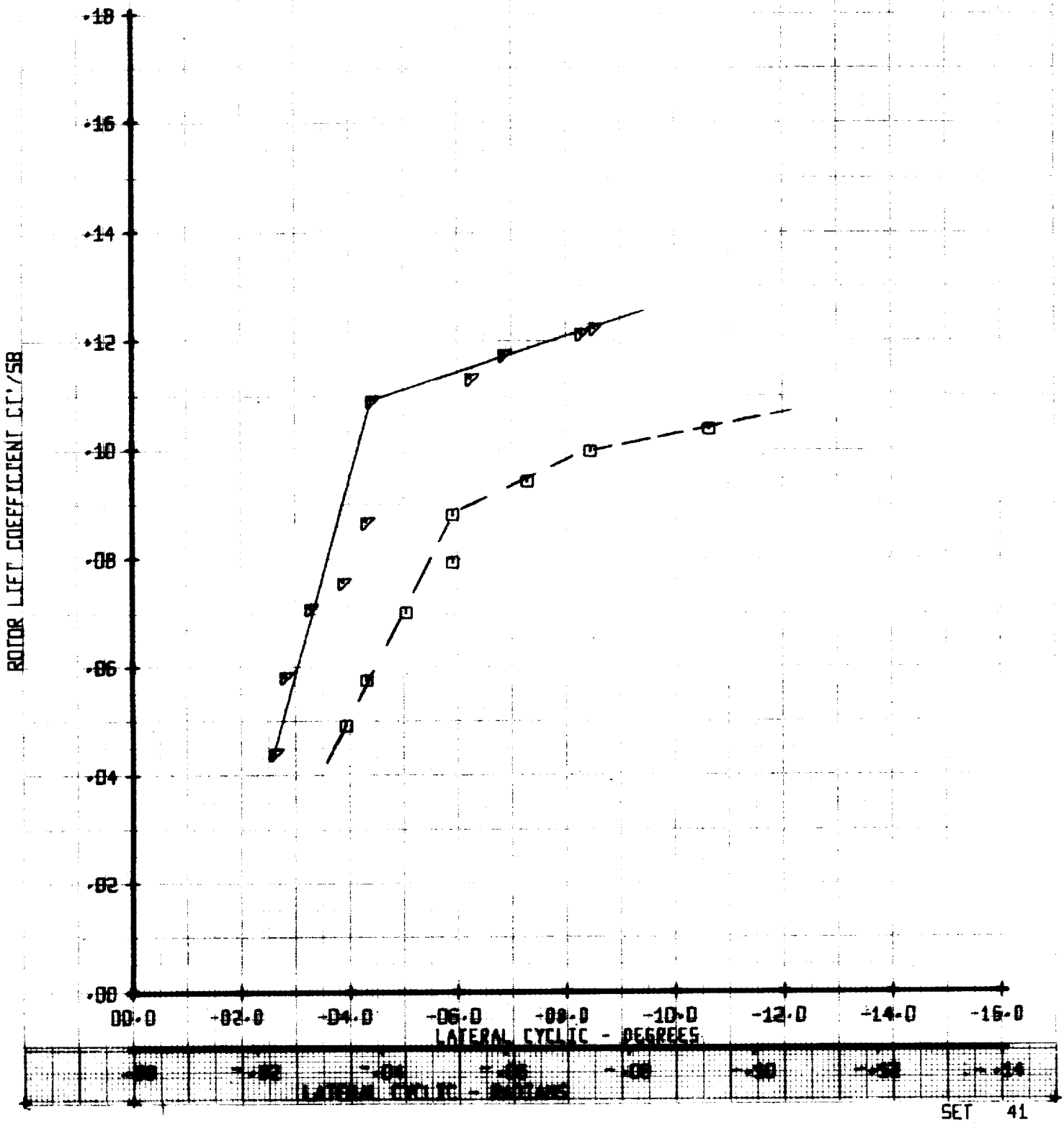
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QD2SB	VTUN
▣	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC

REDUCED TIP SPEED



SET 41
BVWT 193

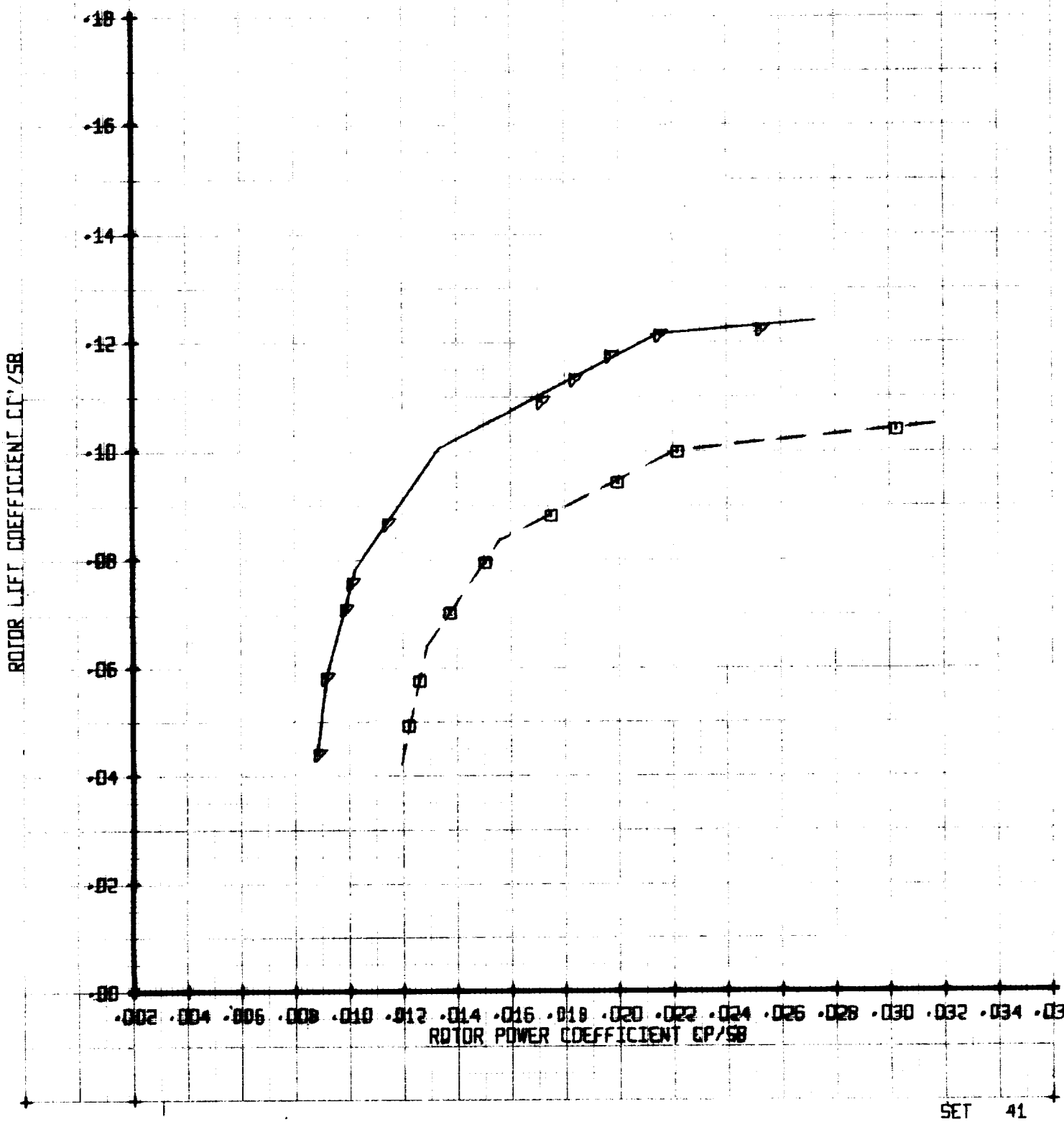
SET 41
BVWT 193

Figure A-295

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT
REDUCED TIP SPEED



SET 41
BVWT 193

SET 41
WT 193

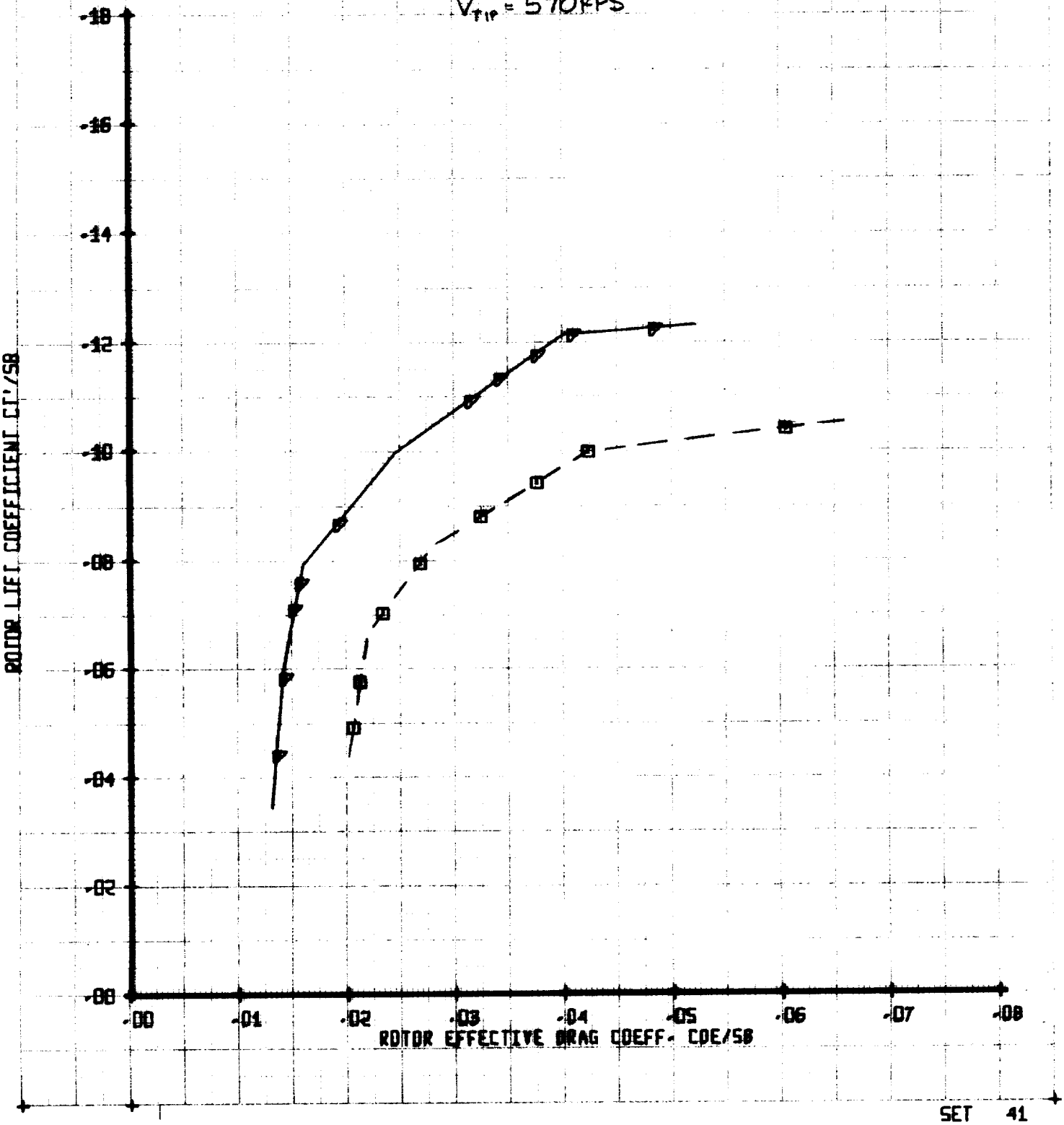
Figure A-295A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/D25R	YTUN
◻	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT
REDUCED TIP SPEED

V_{TIP} = 570FPS



SET 41
BWT 193

SET 41
BWT 193

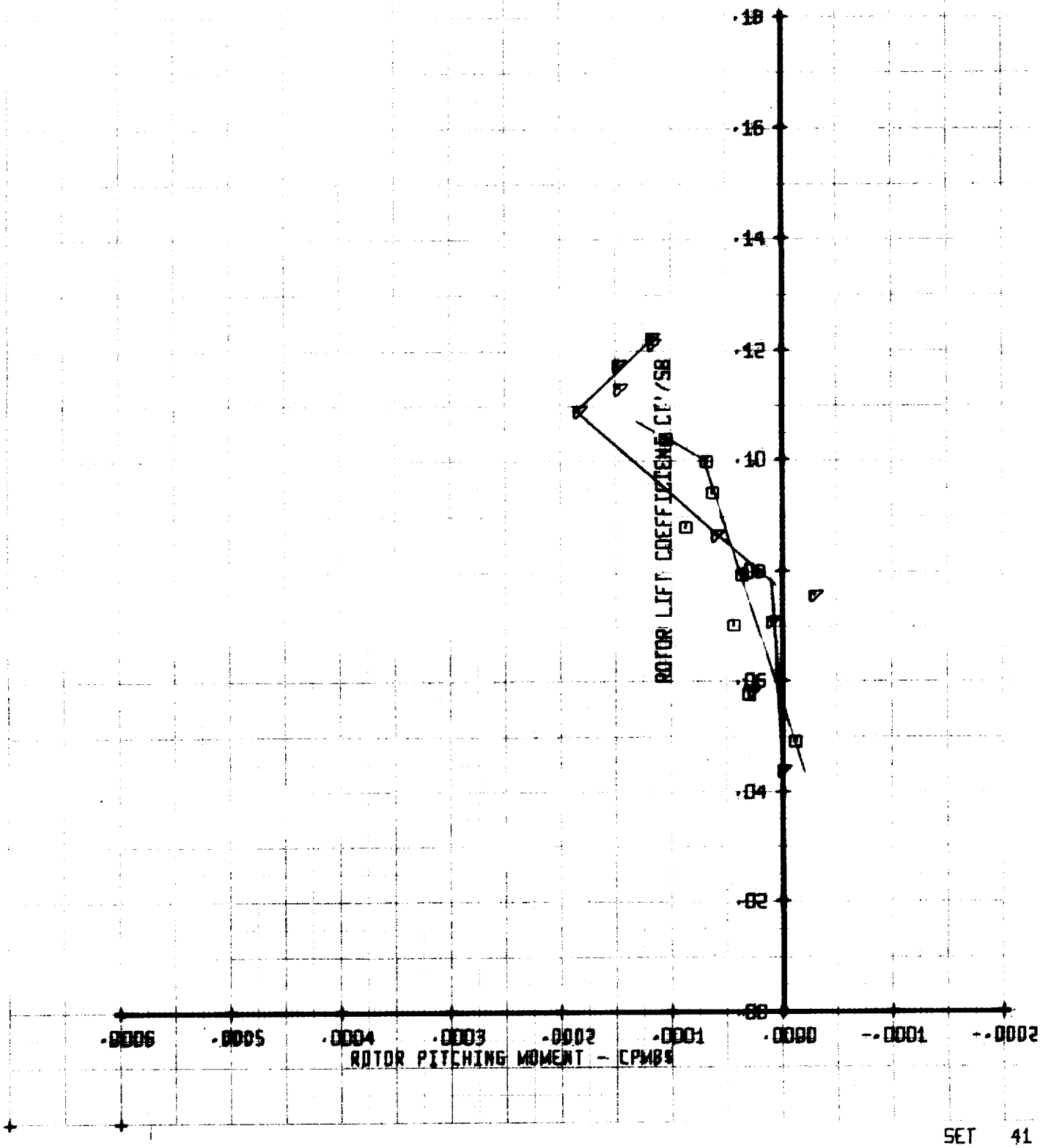
Figure A-296

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU	X/DD25B	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

REDUCED TIP SPEED



ET 41
WT 193

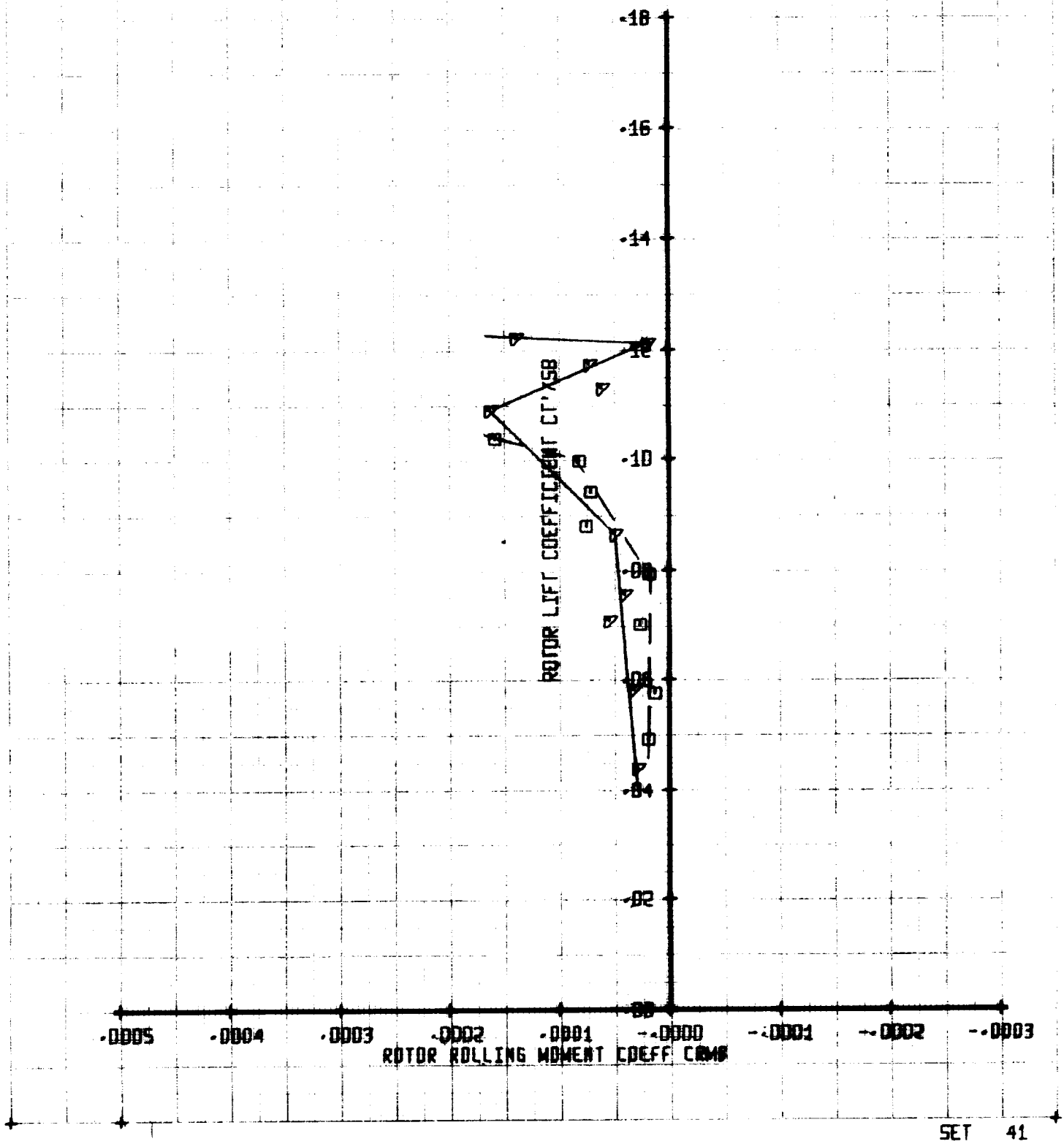
SET 41
BVWT 193

Figure A-297

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT
REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

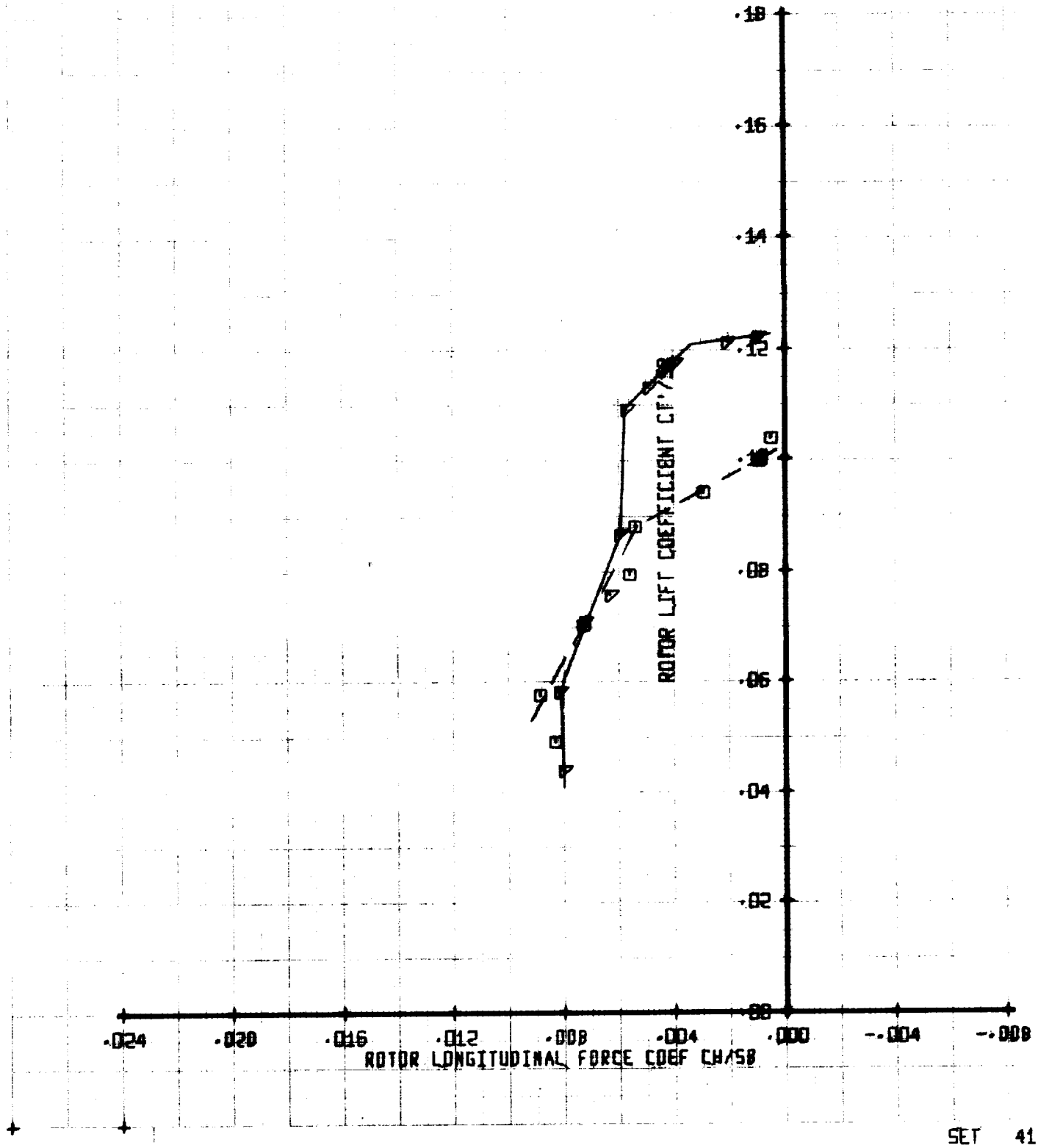
Figure A-298

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT

REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

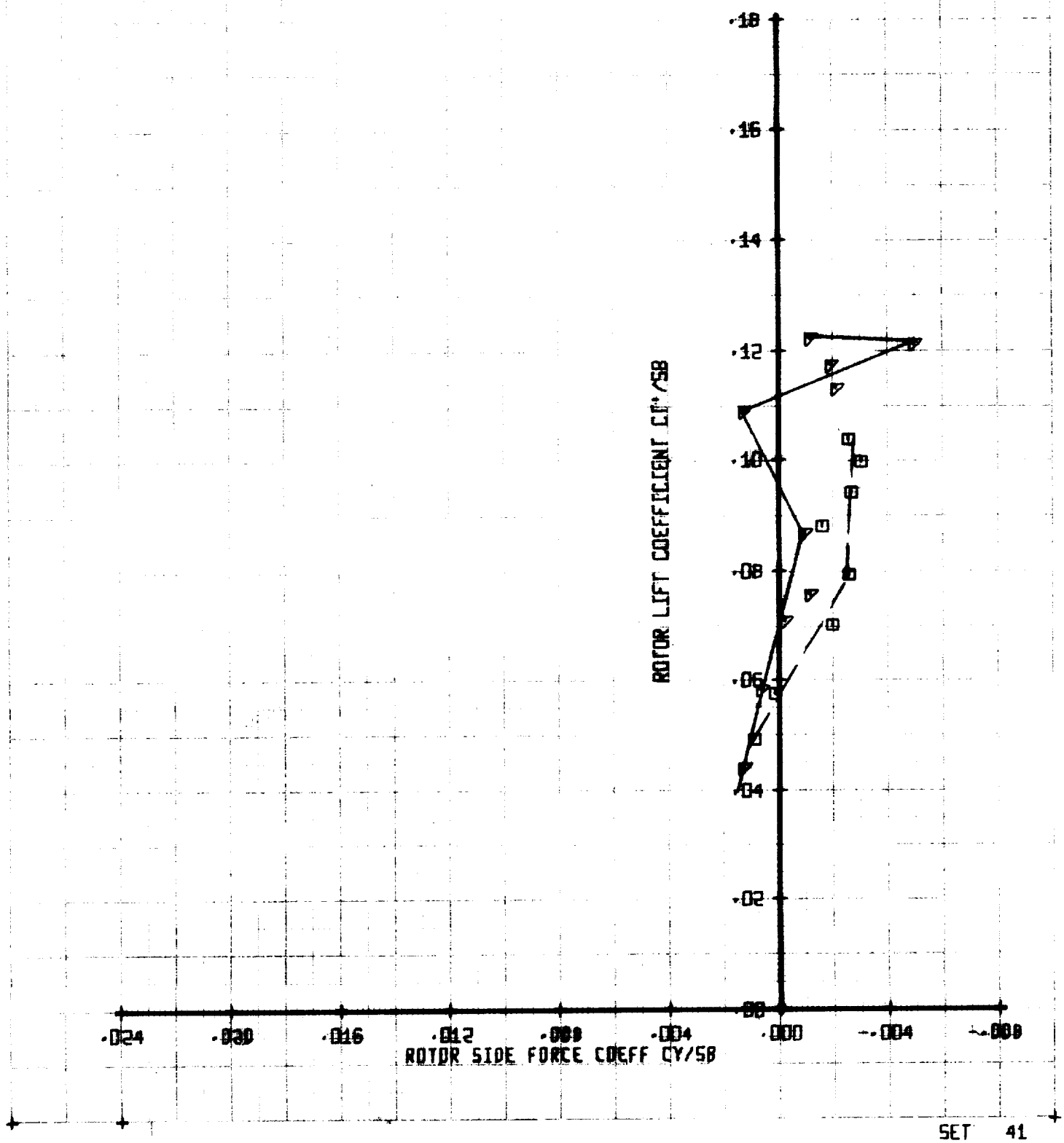
Figure A-299

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
⊡	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

REDUCED TIP SPEED



SET 41
BVWT 193

SET 41
WT 193

Figure A-300

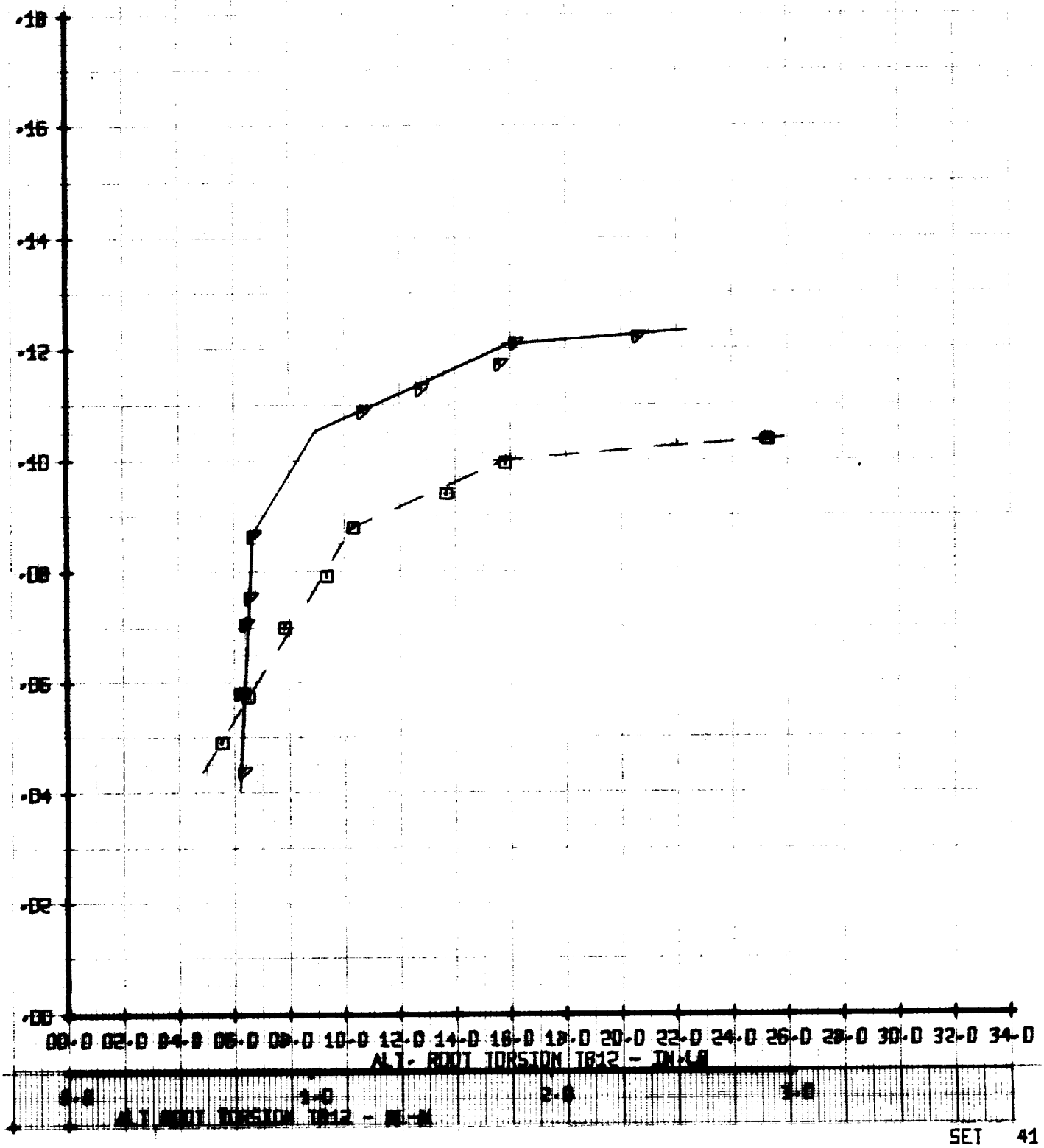
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/00258	VTUN
□	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12

REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

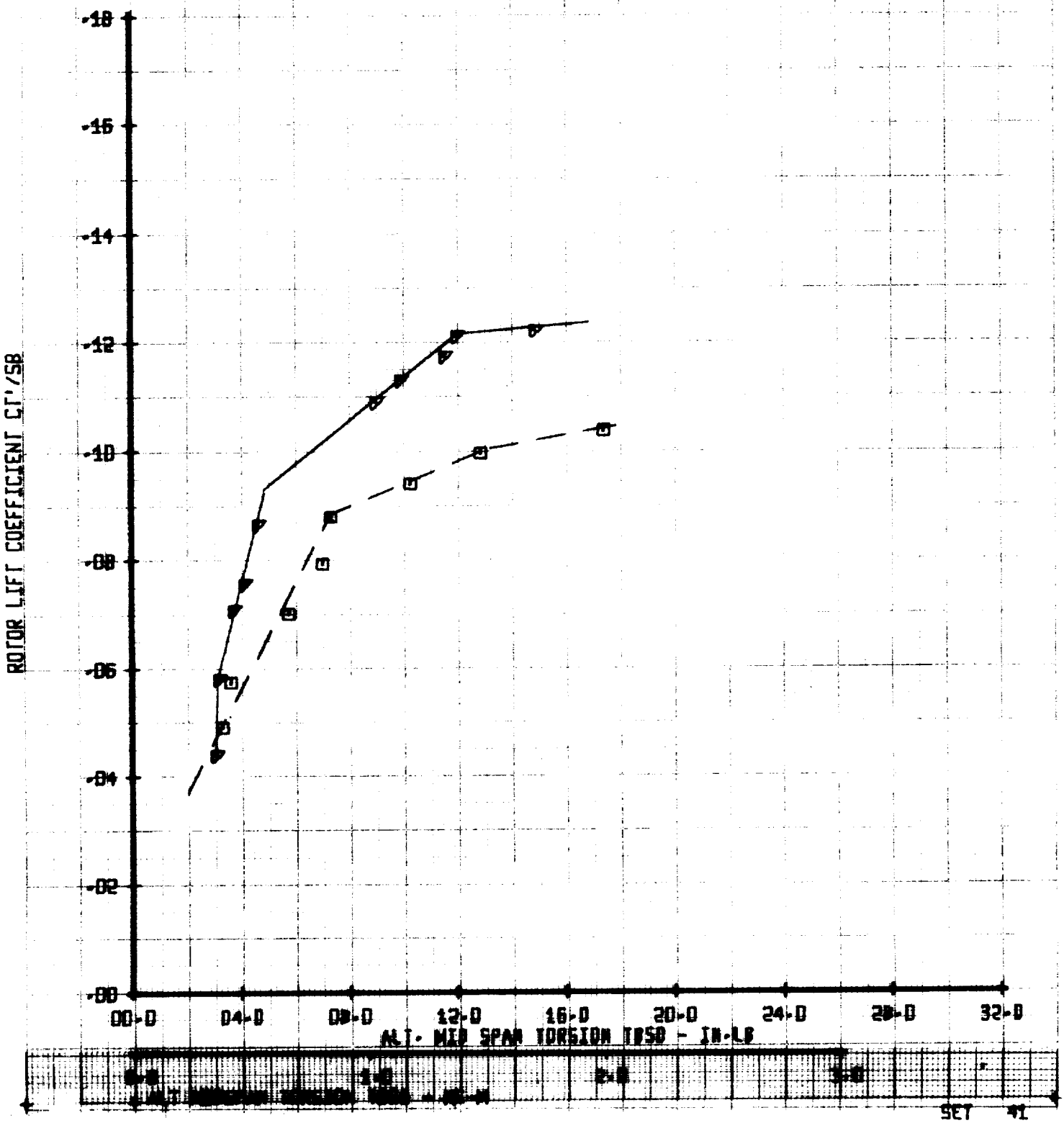
Figure A-301

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTIN
⊡	251	.45	.05	256
▽	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50

REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

Figure A-302

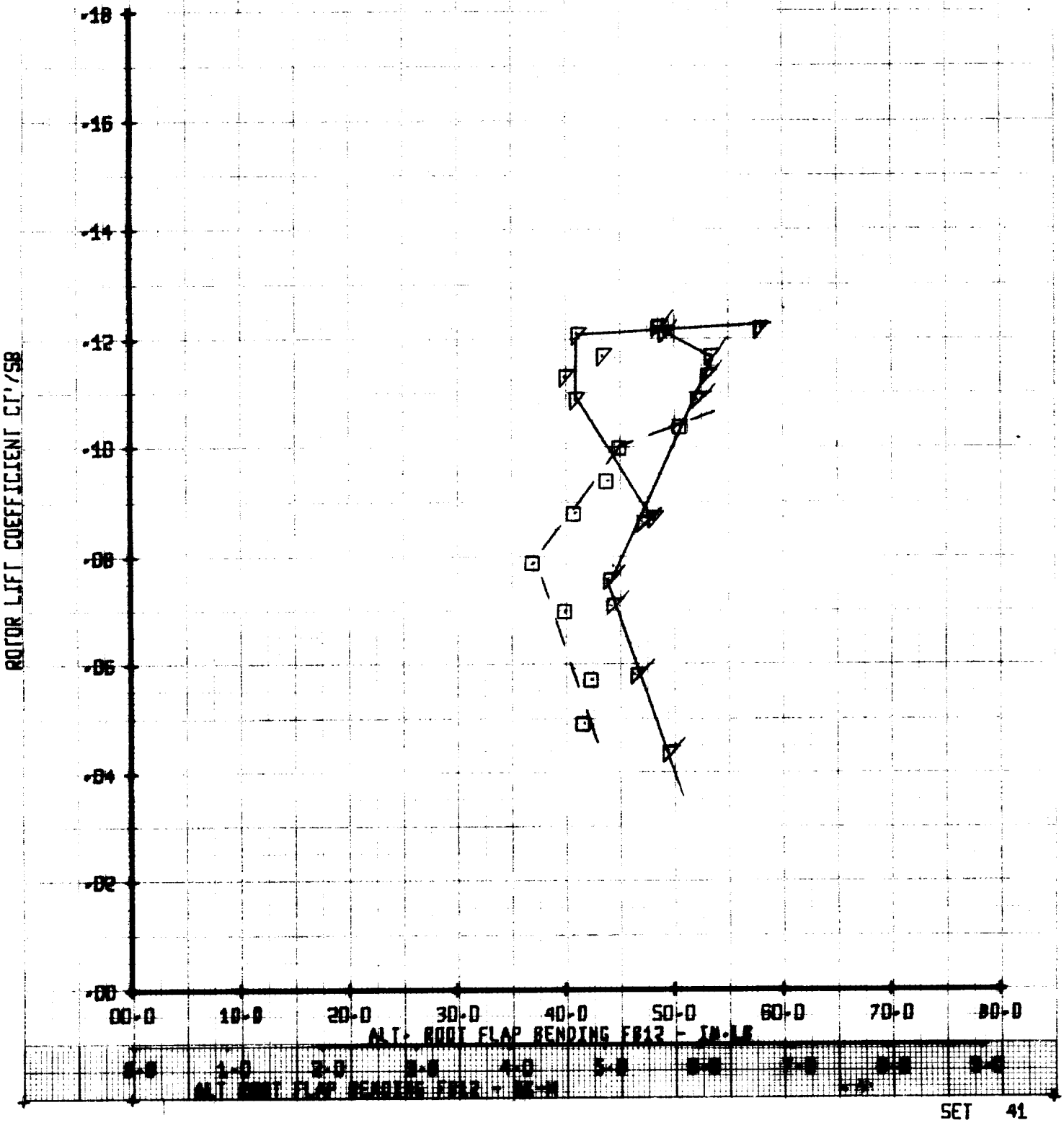
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	VTUN
⊡	251	.45	.05	256
⊡	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12

REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

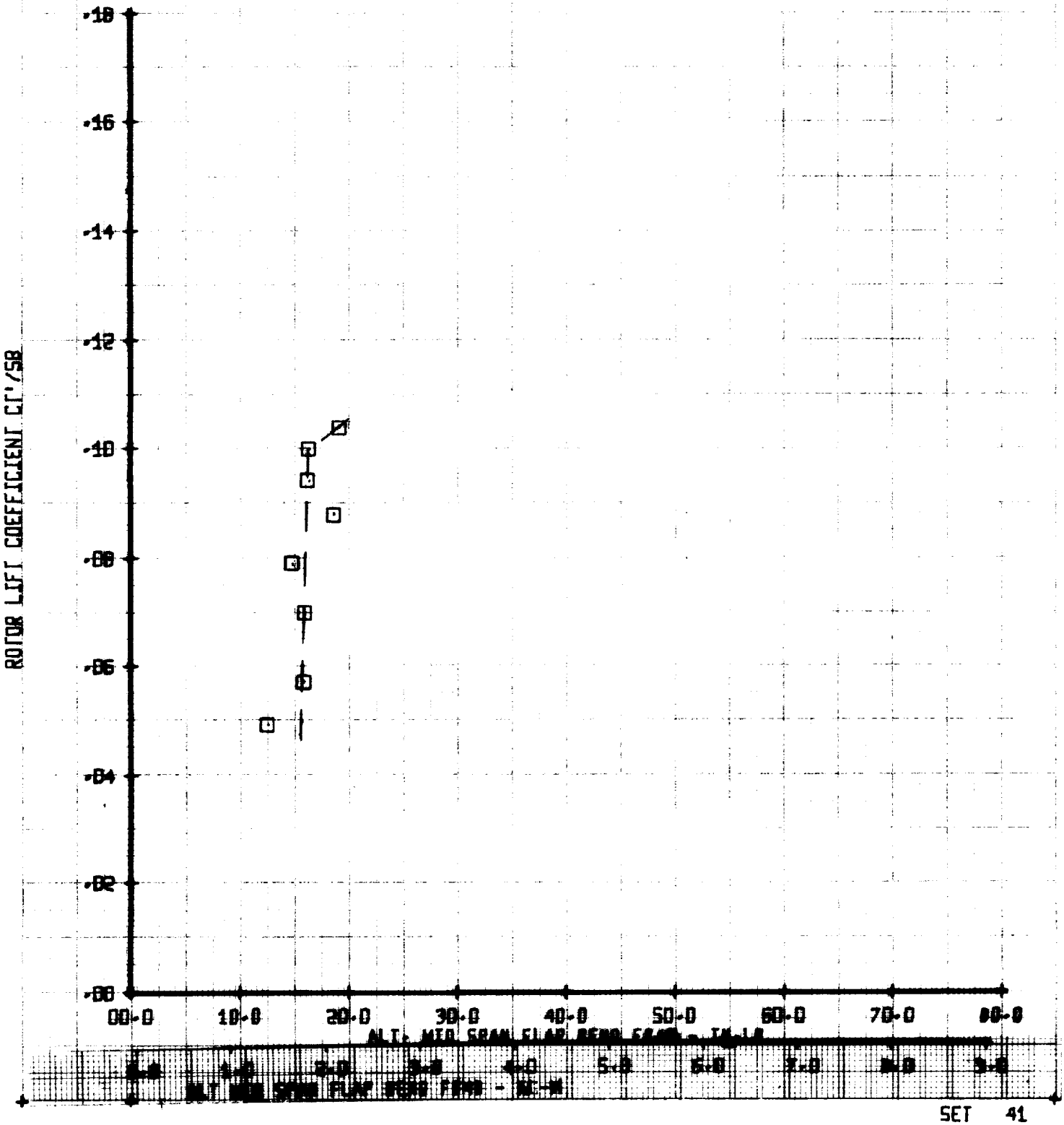
Figure A-303

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
⊡	251	.45	.05	256
⊡	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB45
REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

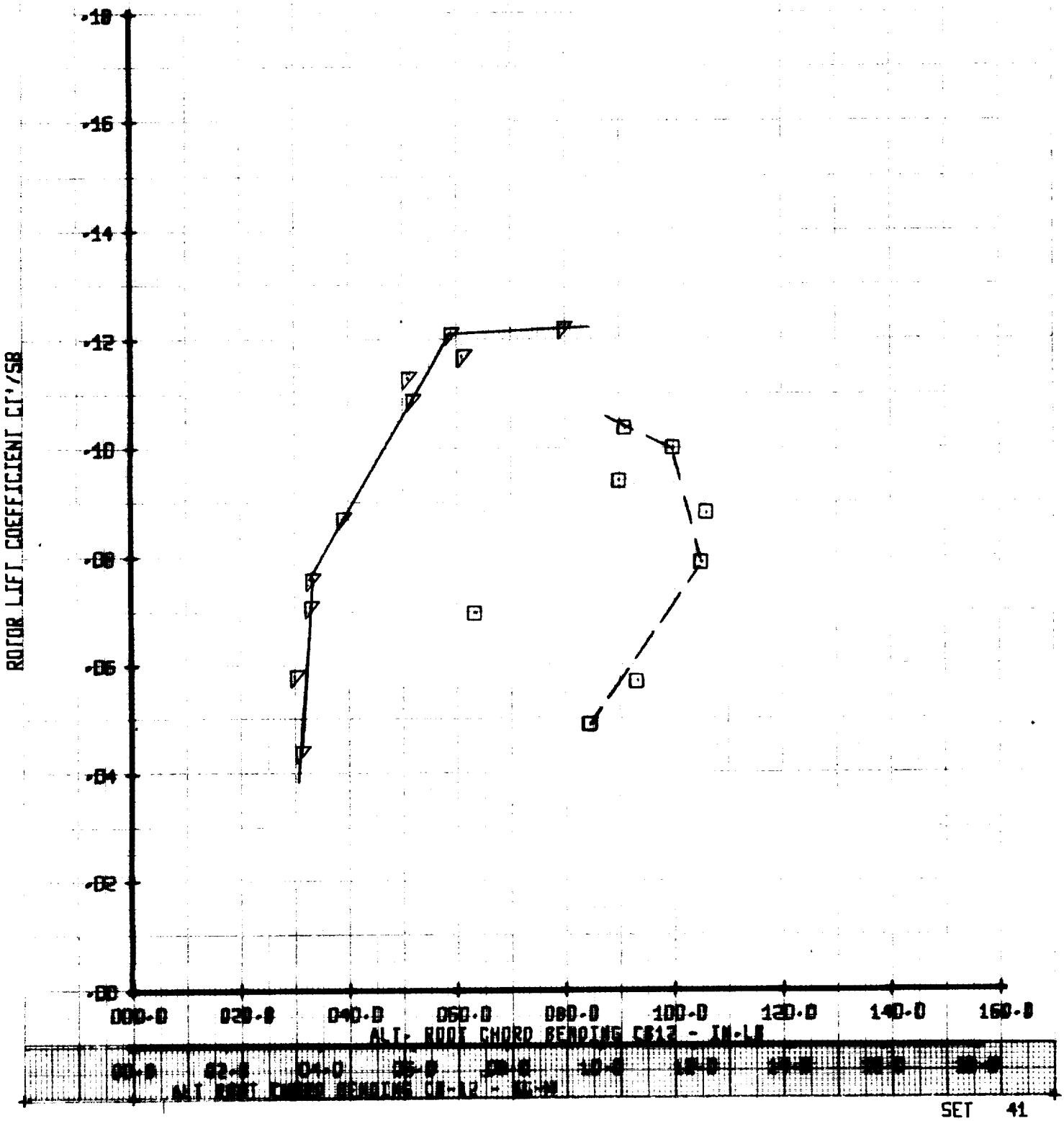
Figure A-304

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	YTUN
◻	251	.45	.05	256
◇	255	.45	.05	256

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12
REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

Figure A-305

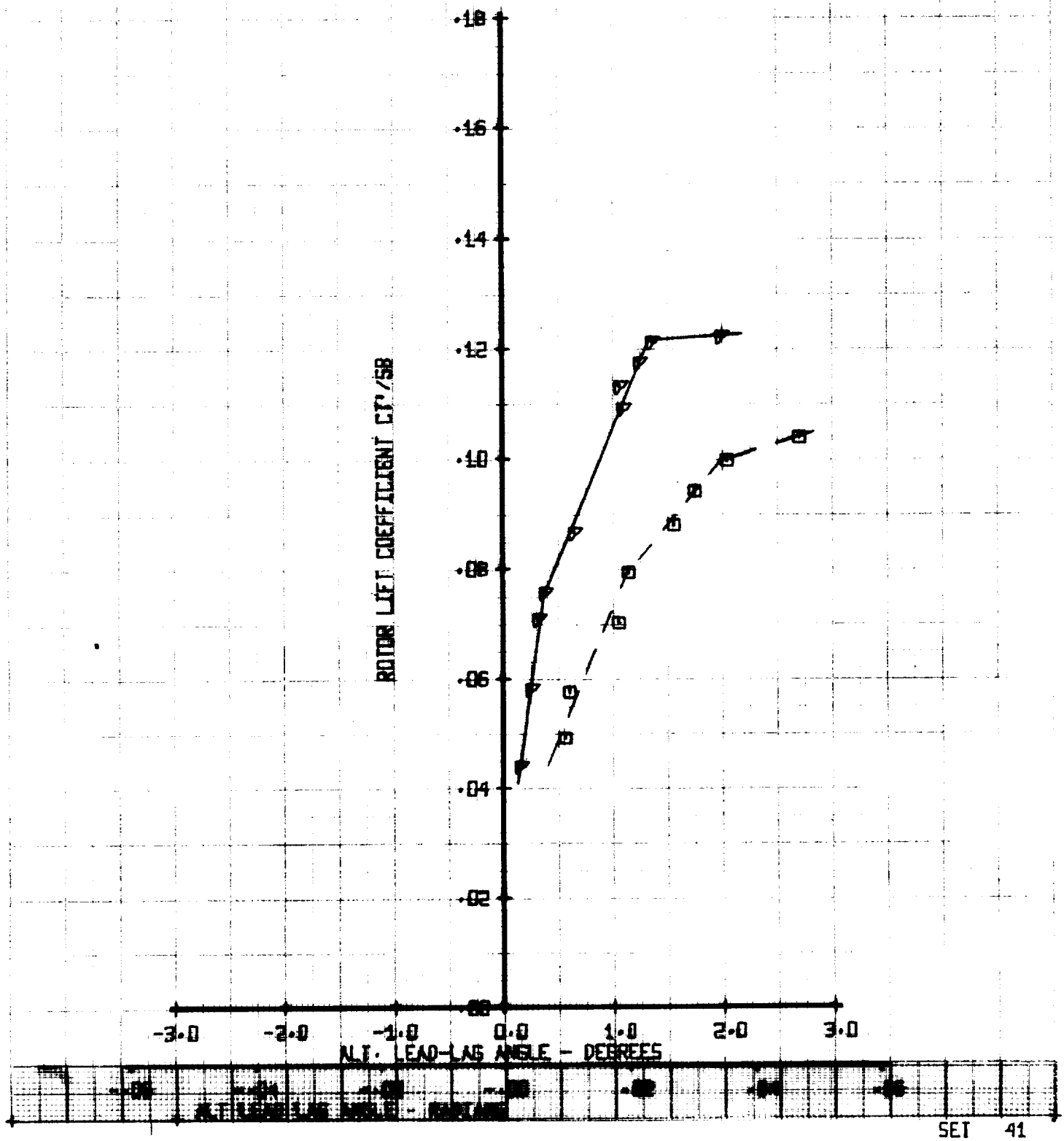
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	Y/RD25B	YTUN
□	251	.45	.05	236
▽	255	.45	.03	236

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

REDUCED TIP SPEED



ET 41
WT 193

SET 41
BVWT 193

Figure A-306

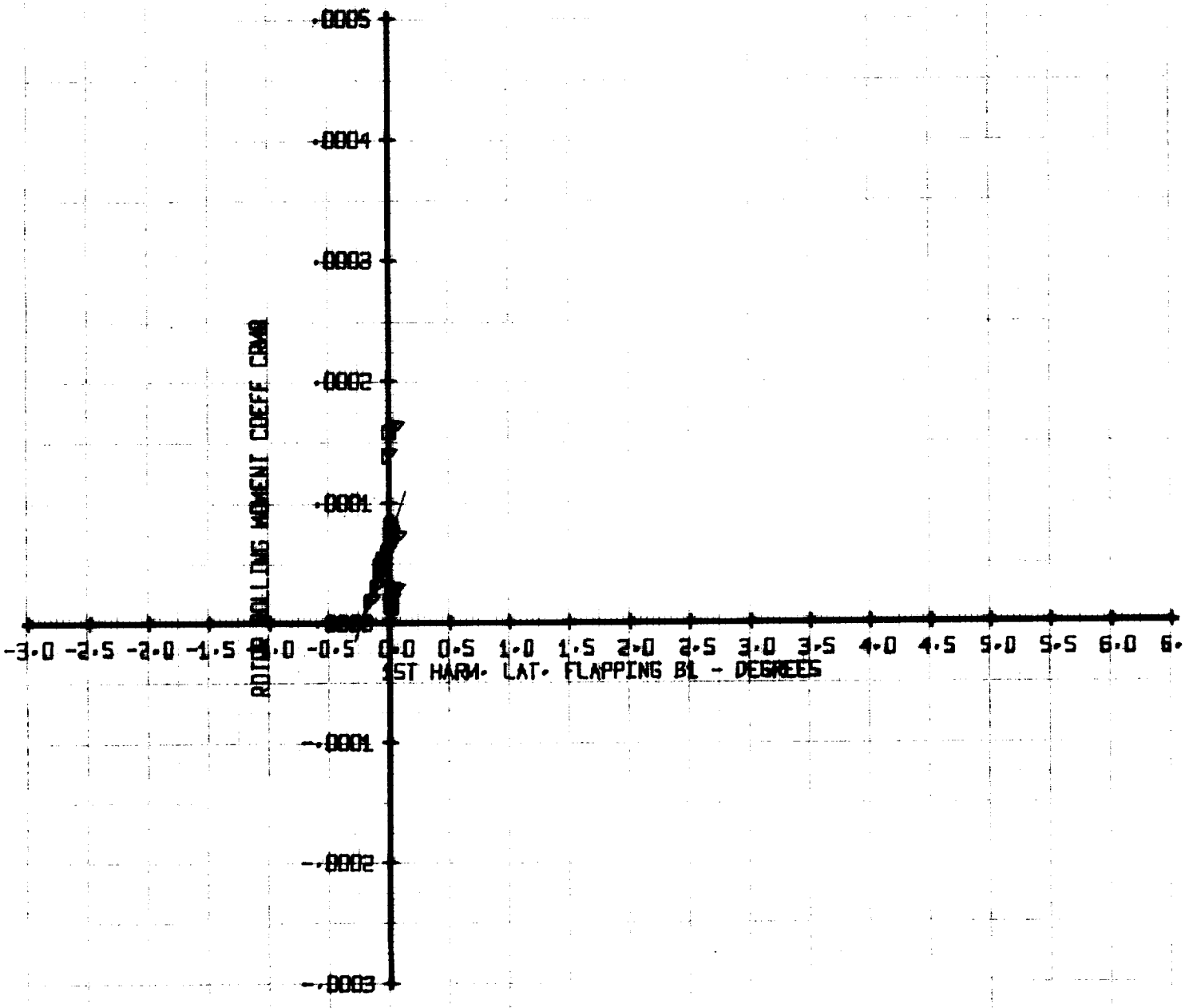
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
⊡	251	.45	.05	256
▽	255	.45	-.05	256

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

REDUCED TIP SPEED



SET 41
WT 193

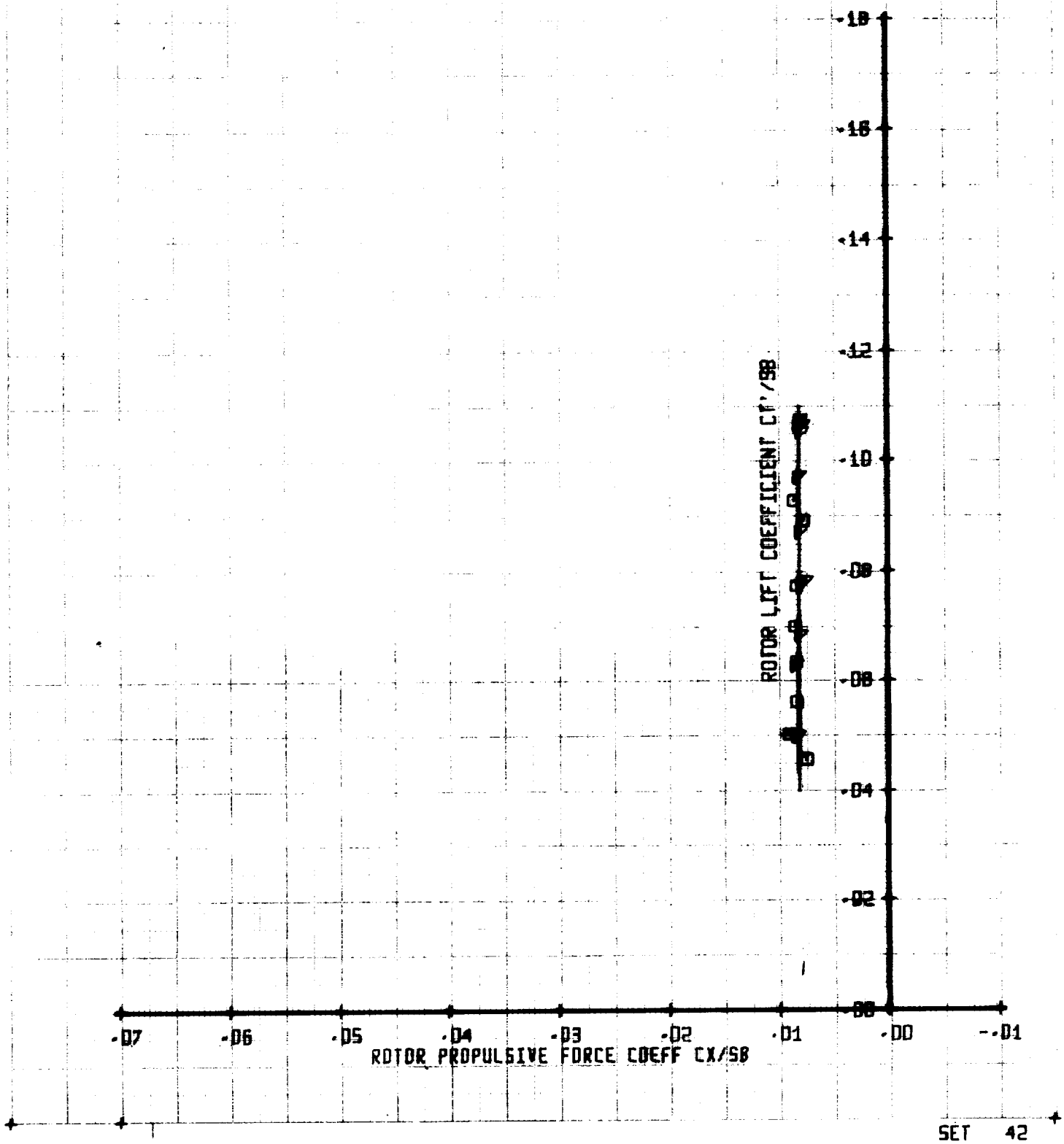
SET 41
BVWT 193

Figure A-307

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT
REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

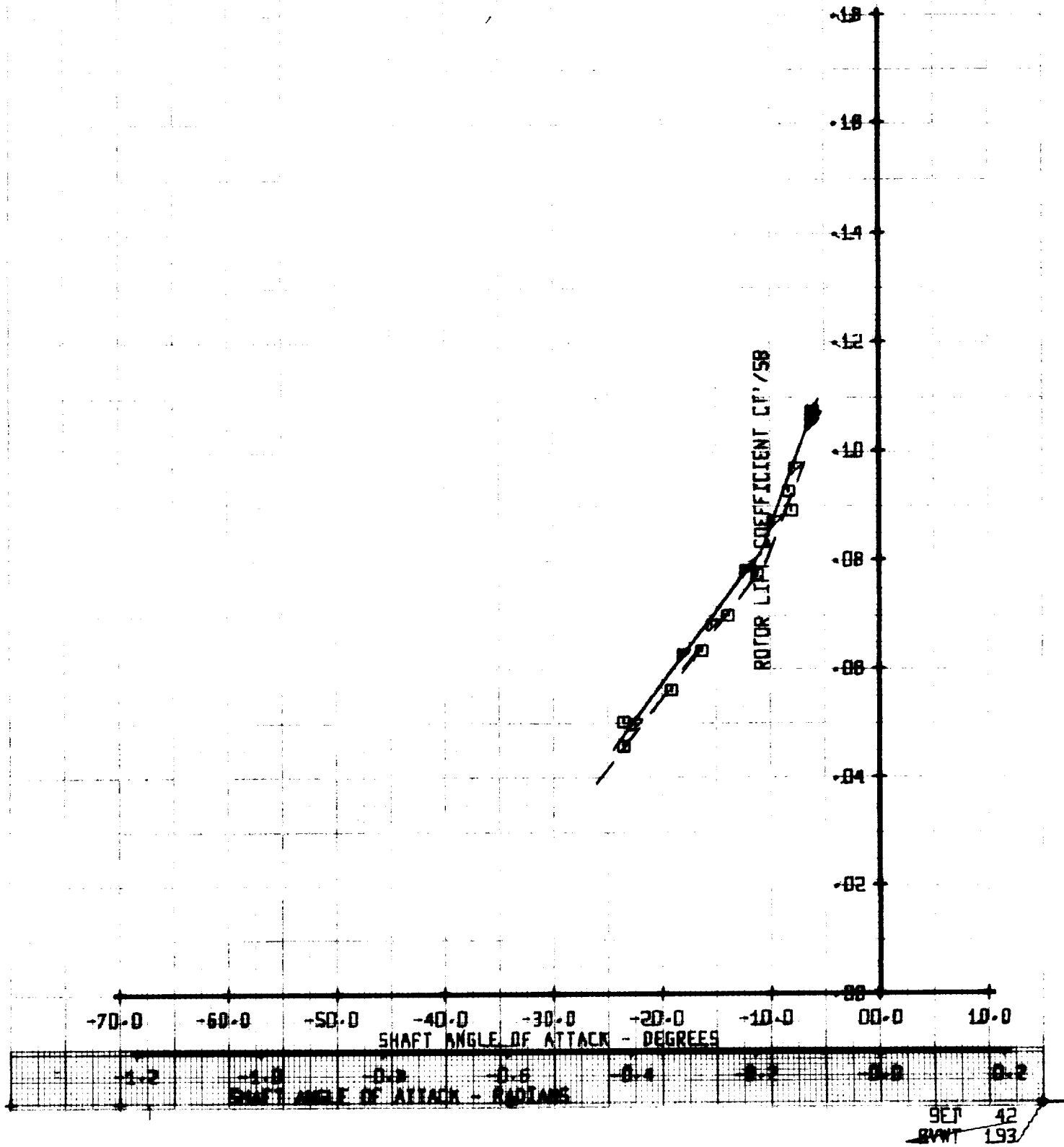
Figure A-308

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YTUN
□	252	.50	.05	285
▱	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK

REDUCED TIP SPEED



ET 42
WT 193

SET 42
RWT 193

Figure A-309

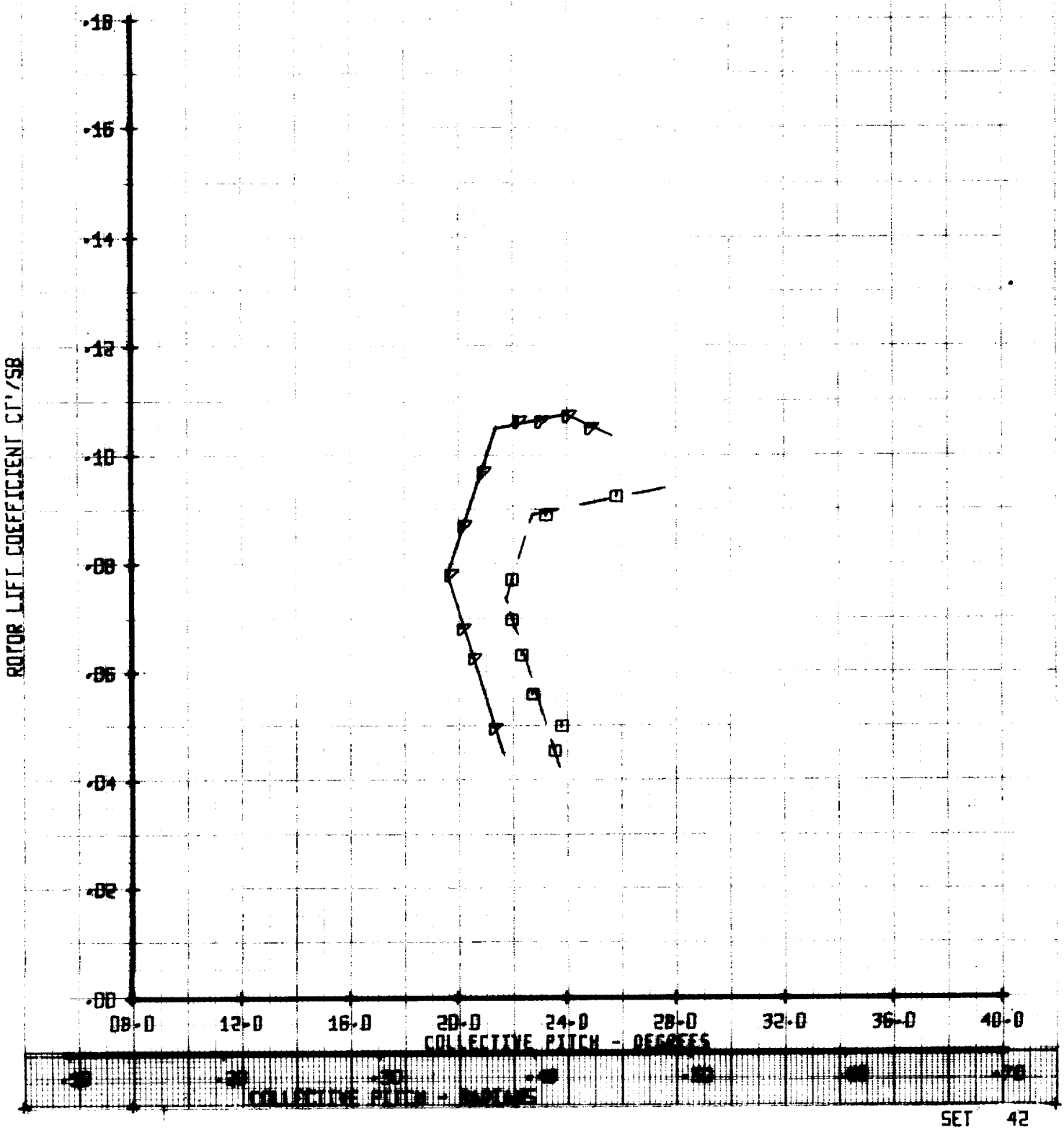
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
⊡	252	.50	.05	285
⊡	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
COLLECTIVE PITCH

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

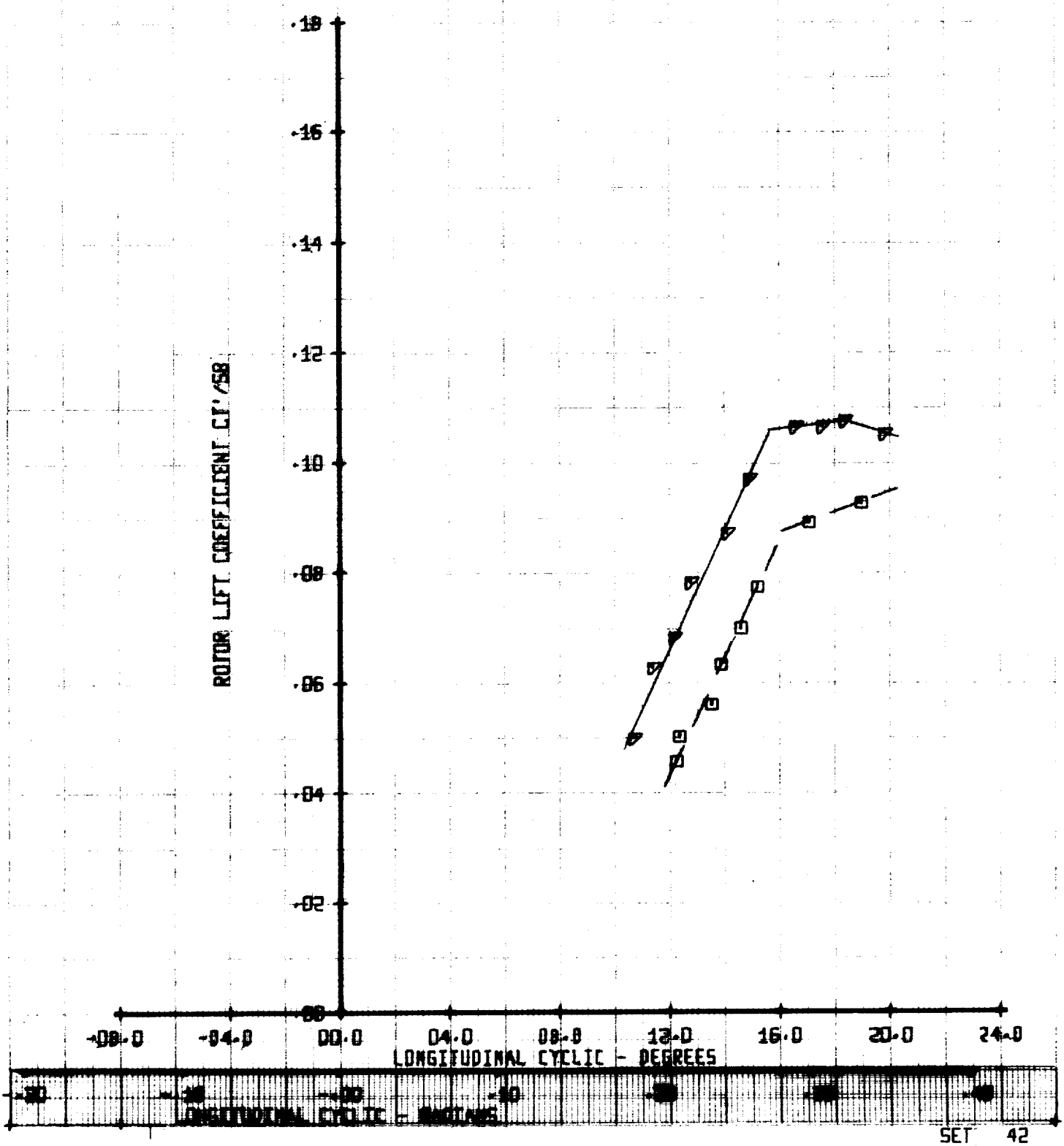
Figure A-310

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	YIUN
⊡	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

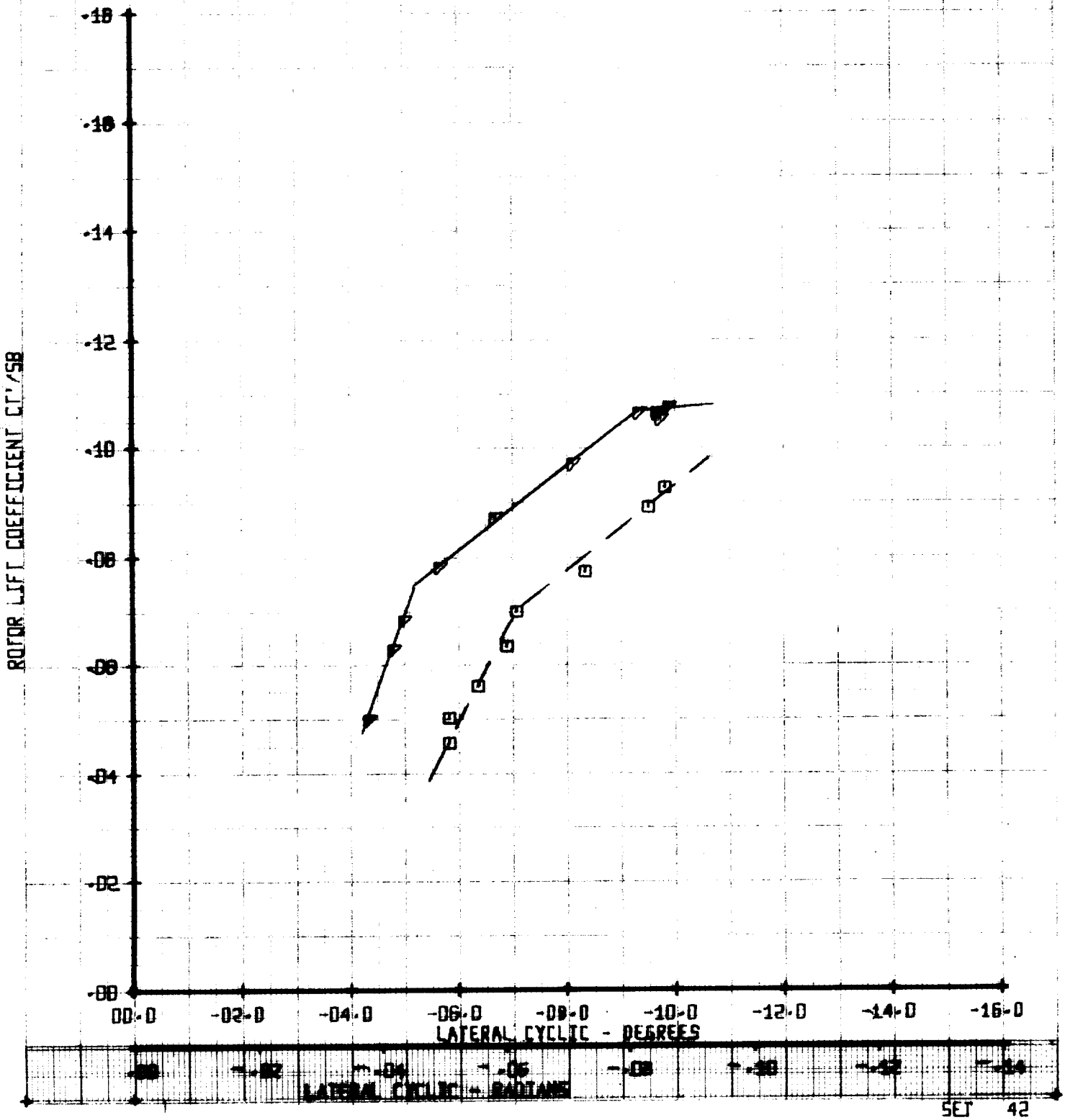
Figure A-311

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND				
SYM	RUN	MU'	X/QD2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
LATERAL CYCLIC

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-312

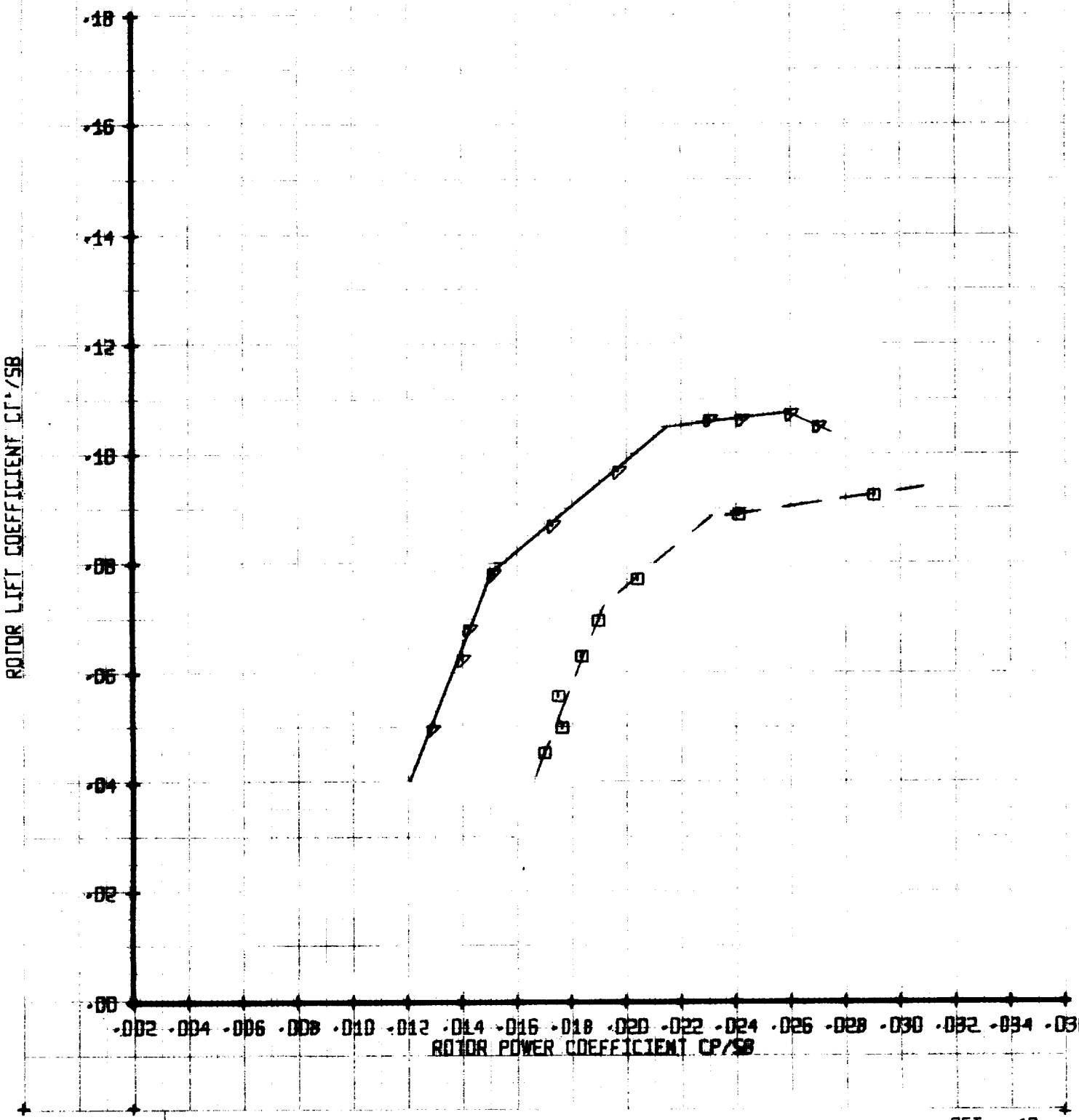
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU	X/QQ25B	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-312A

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

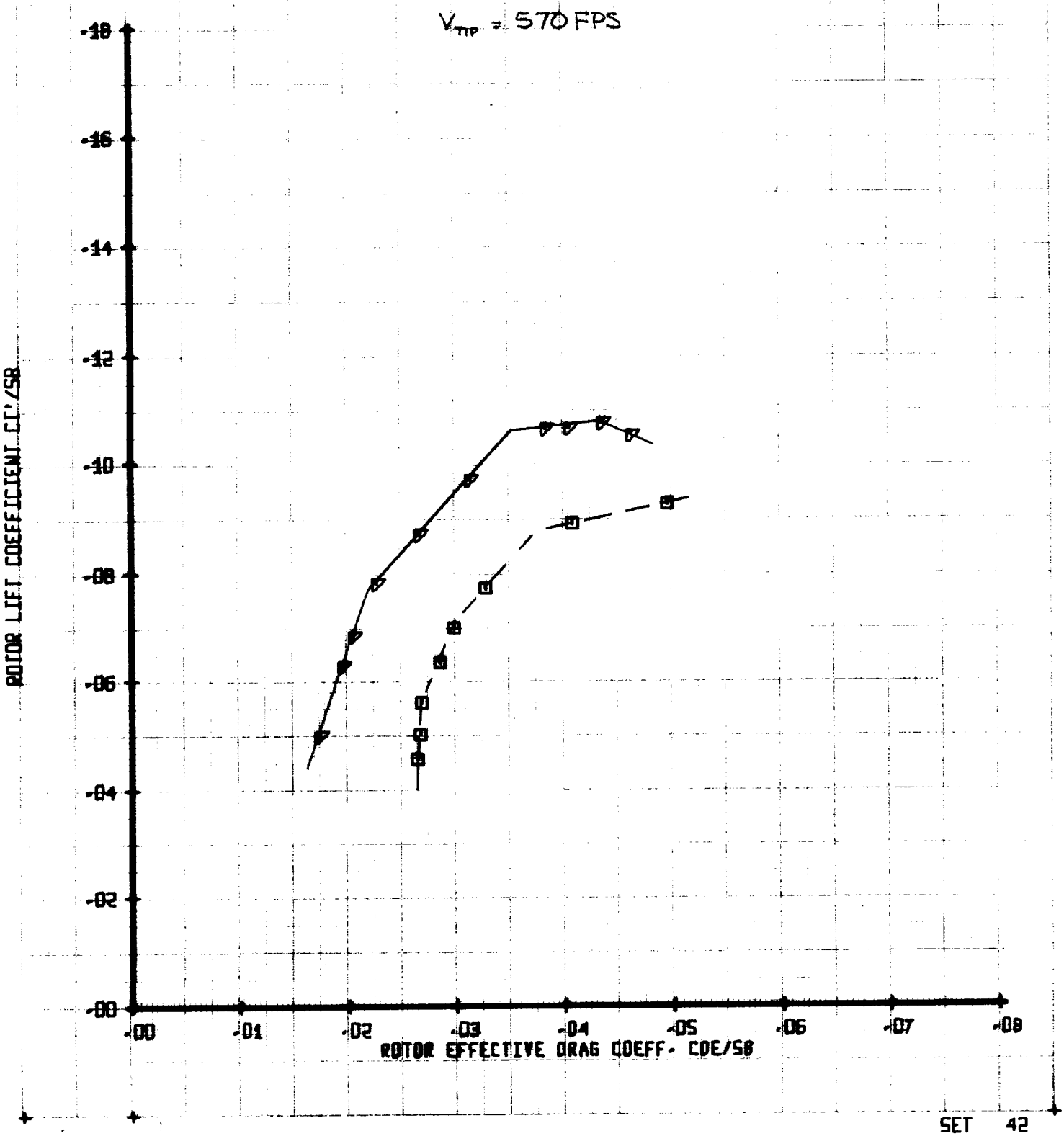
LEGEND

SYM	RUN	MU'	X/QR2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR EFFECTIVE DRAG COEFFICIENT

REDUCED TIP SPEED

V_{TIP} = 570 FPS



SET 42
BVWT 193

Figure A-313

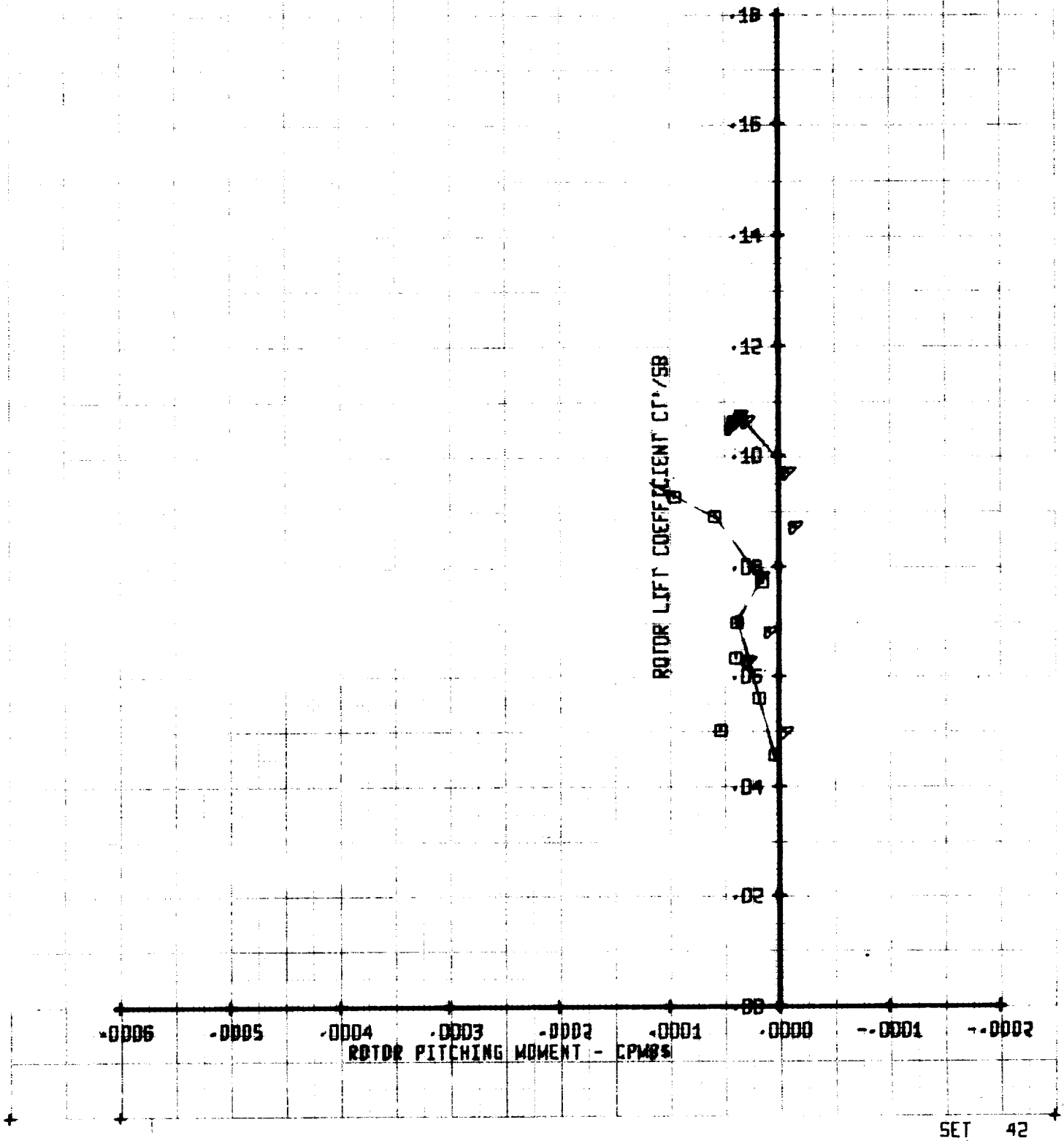
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-314

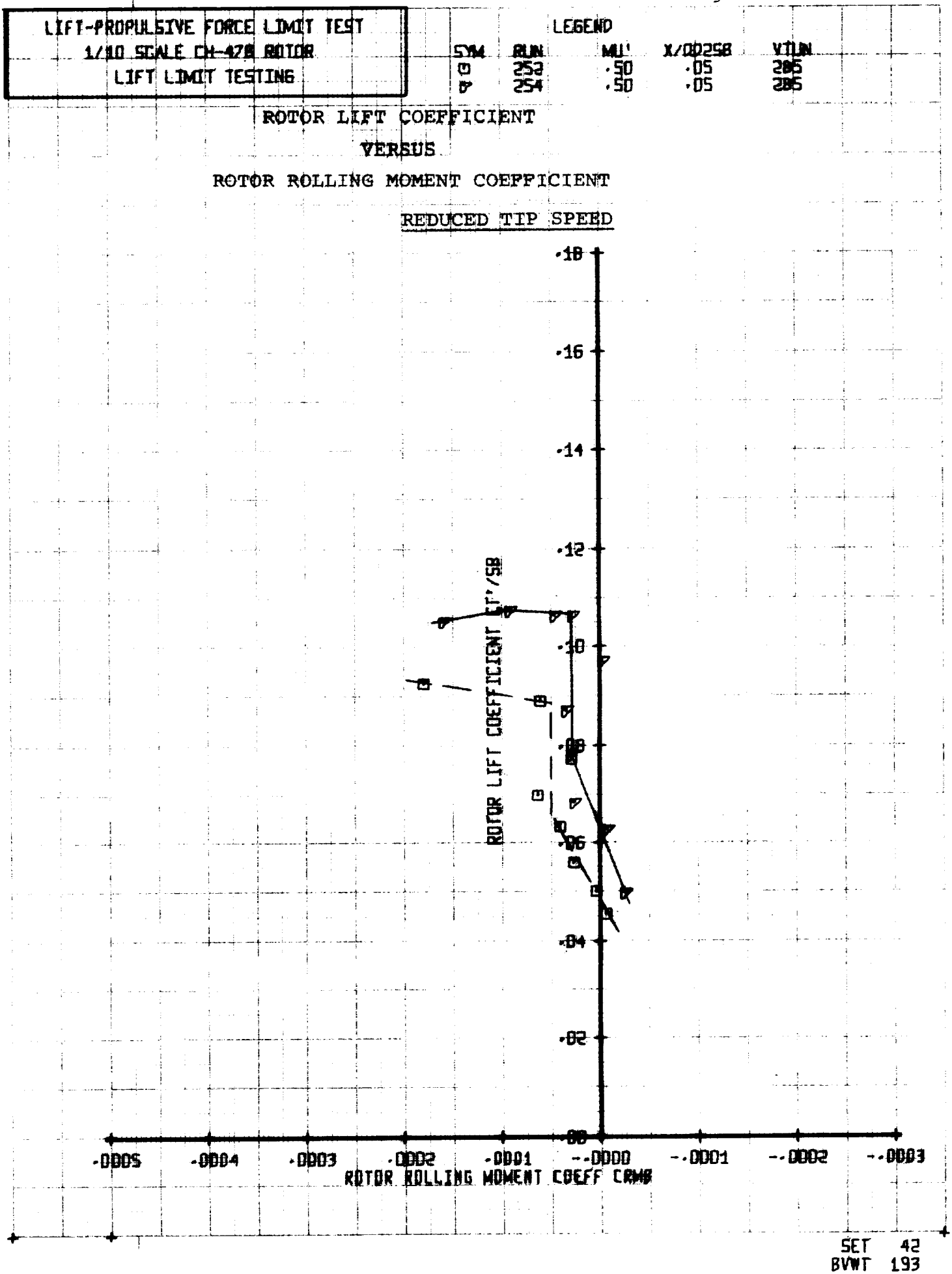

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/DD2SB YTUN
253 .50 .05 285
254 .50 .05 285
ROTOR LIFT COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT
REDUCED TIP SPEED
ROTOR LIFT COEFFICIENT CT'/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
-.0005
-.0004
-.0003
-.0002
-.0001
-.0000
-.0001
-.0002
-.0003
ROTOR ROLLING MOMENT COEFF CRMB
ET 42
WT 193
SET 42
BVWT 193

Figure A-315

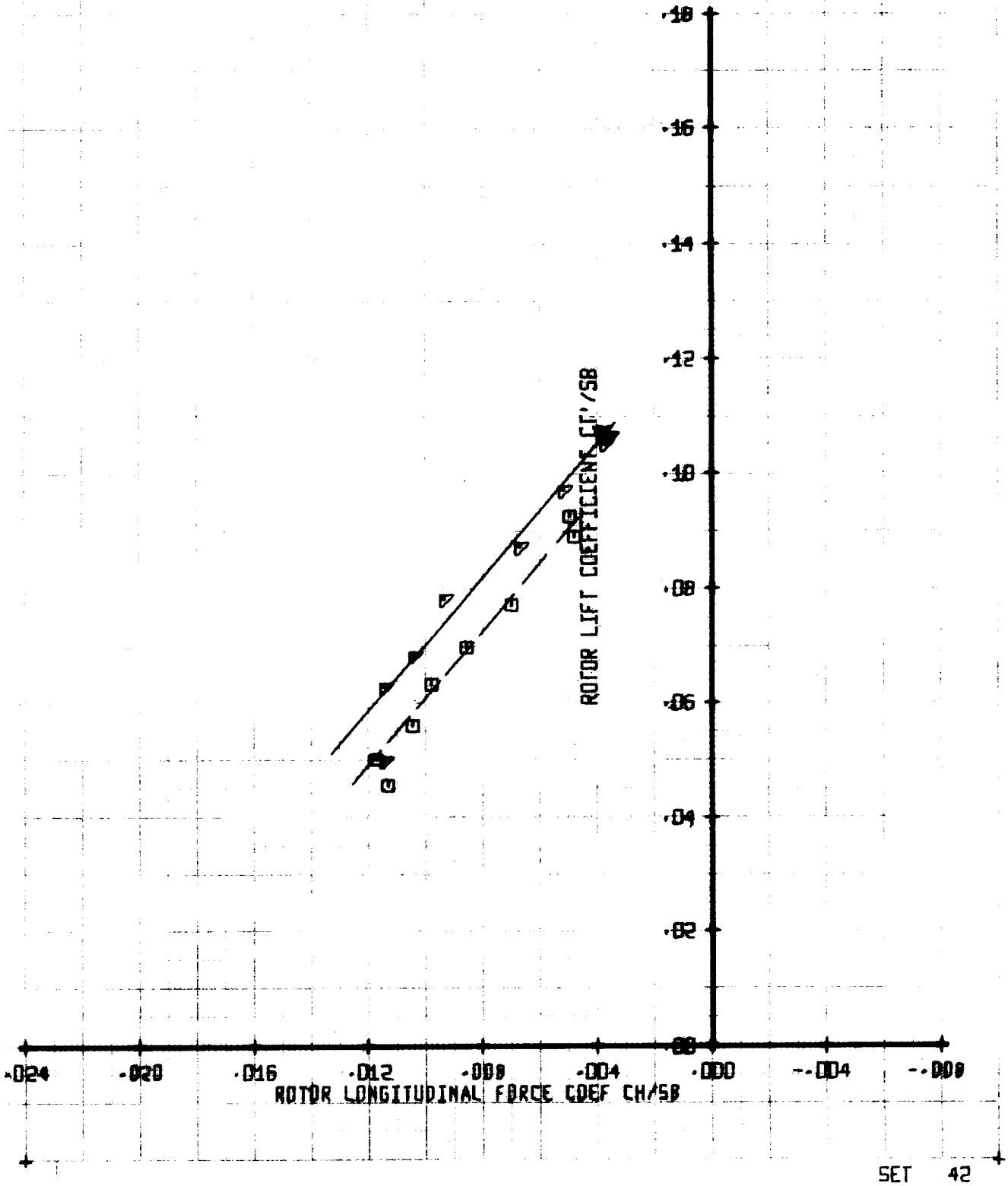
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU*	X/DD2SB	YTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-316

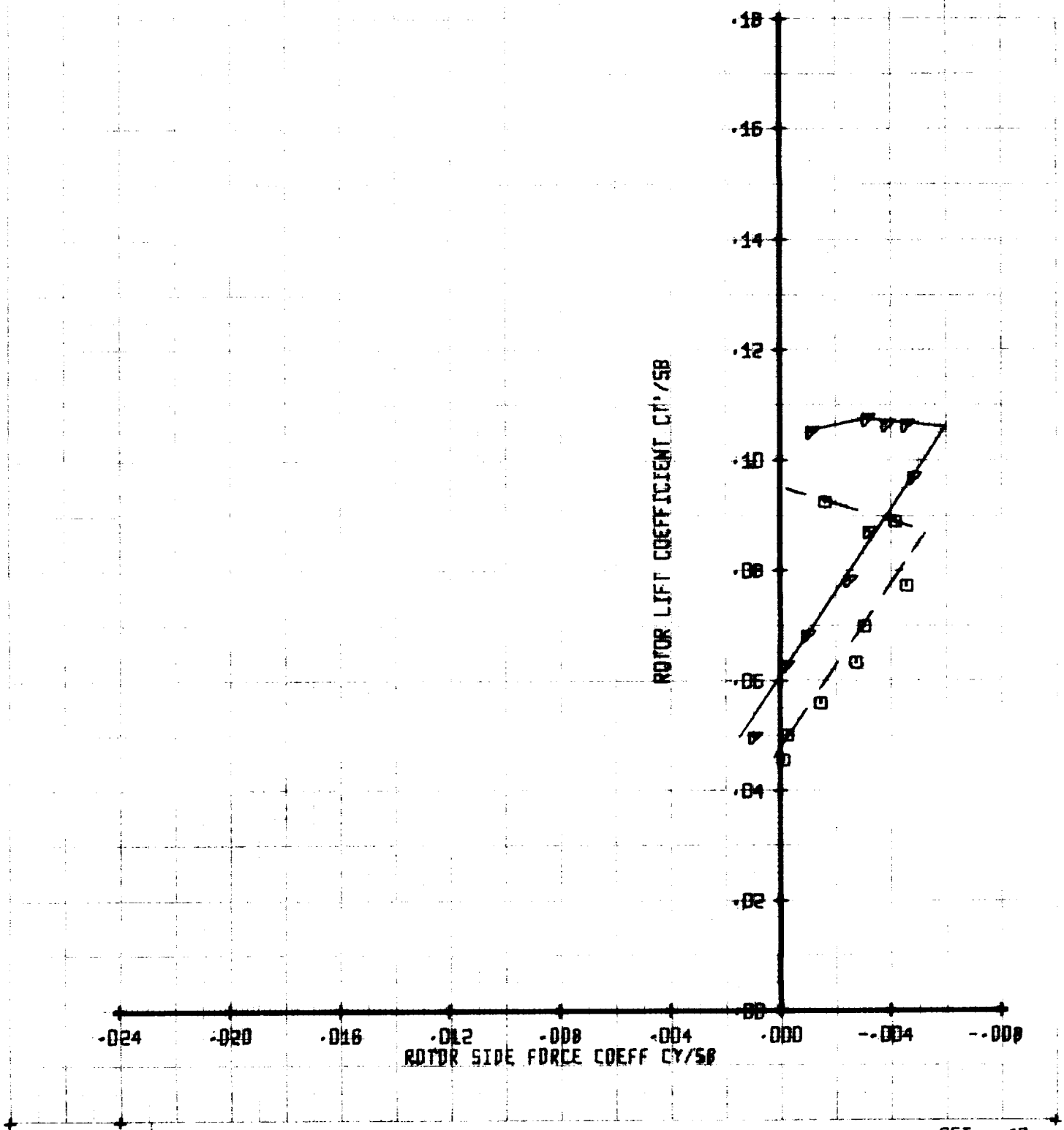
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-317

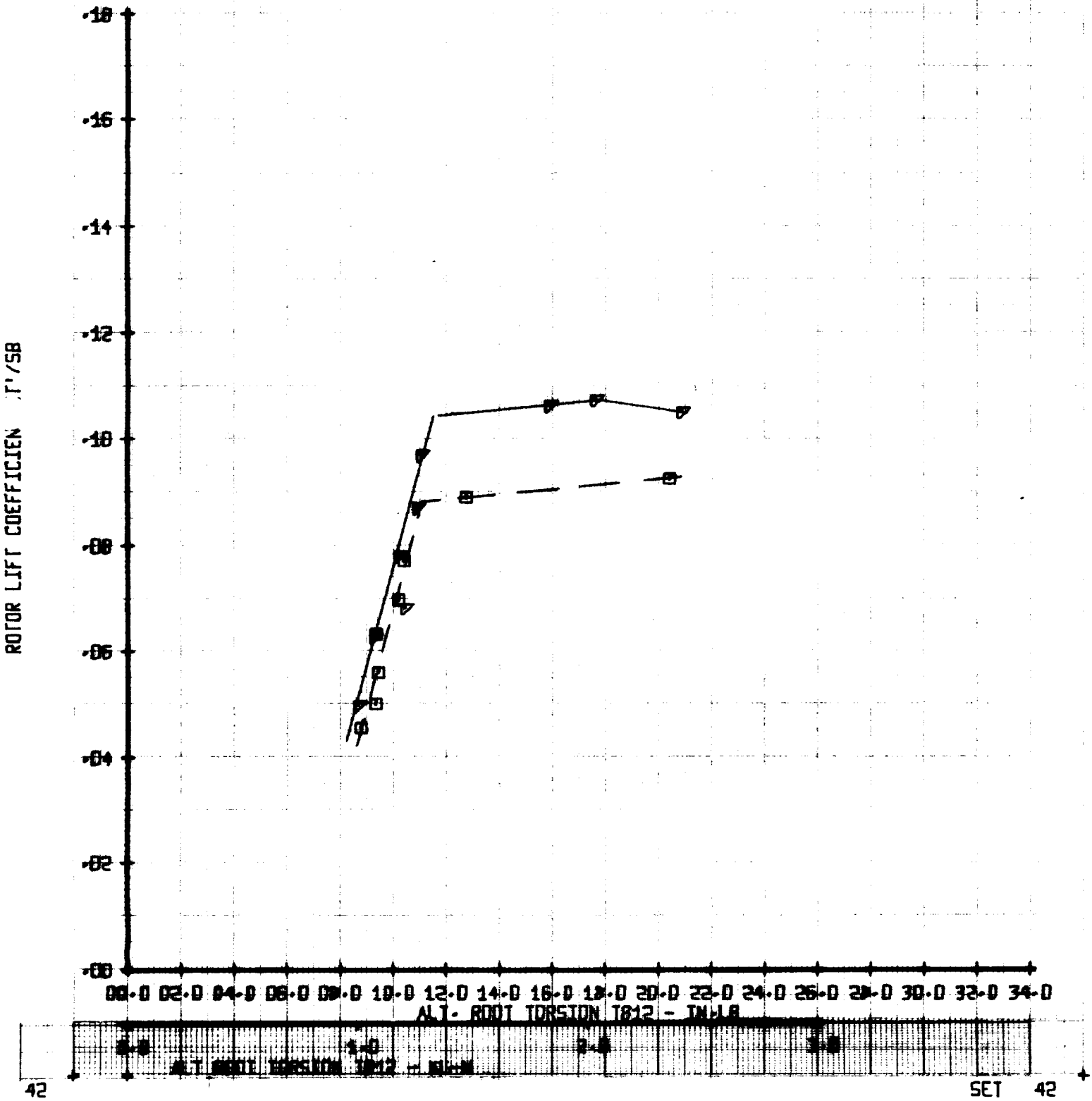
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/DD2SB	VTUN
□	252	.50	.05	285
▽	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-318

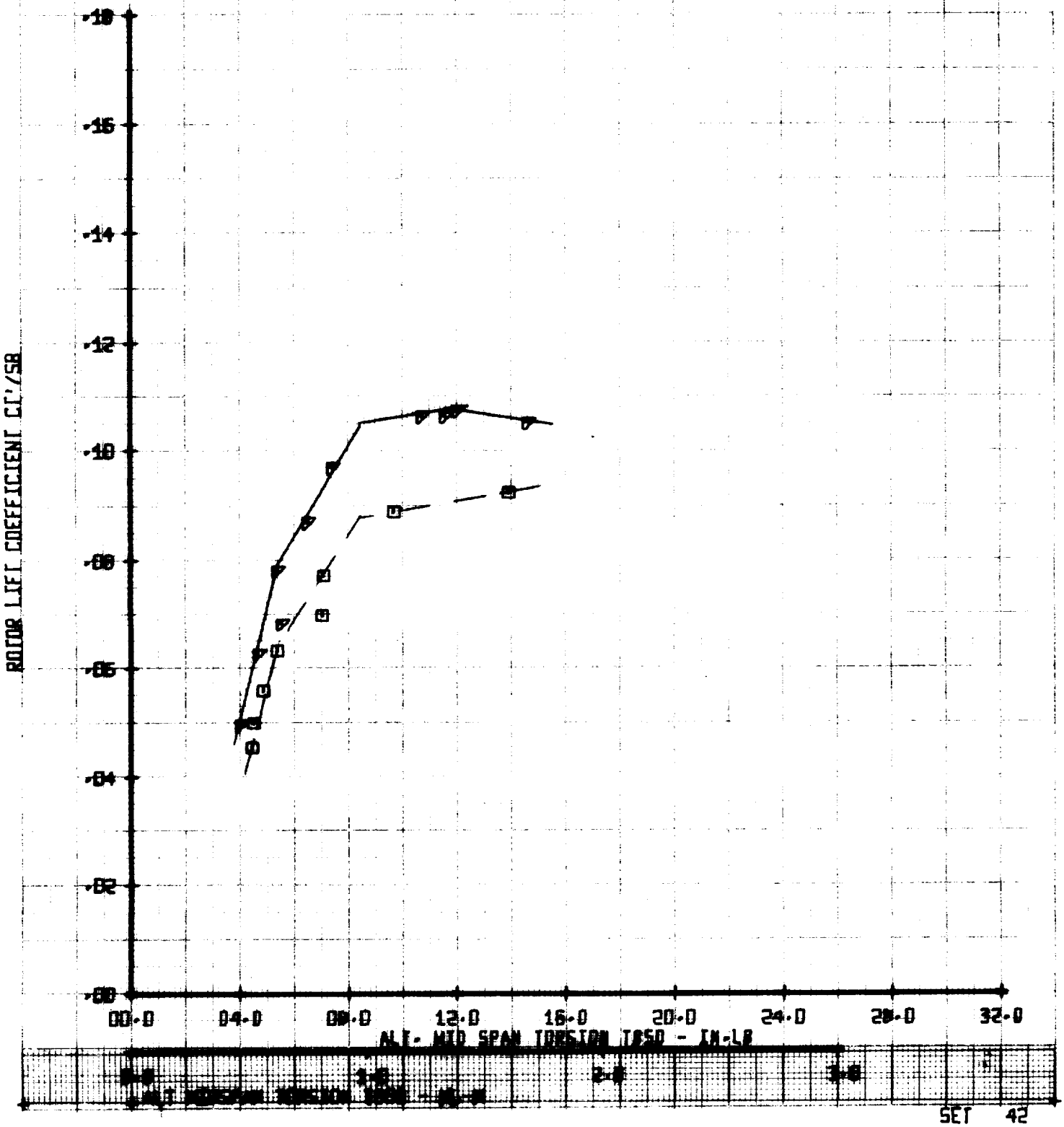
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YIUN
⊕	252	.50	.05	285
⊕	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50

REDUCED TIP SPEED



SET 42
WT 193

SET 42
BVWT 193

Figure A-319

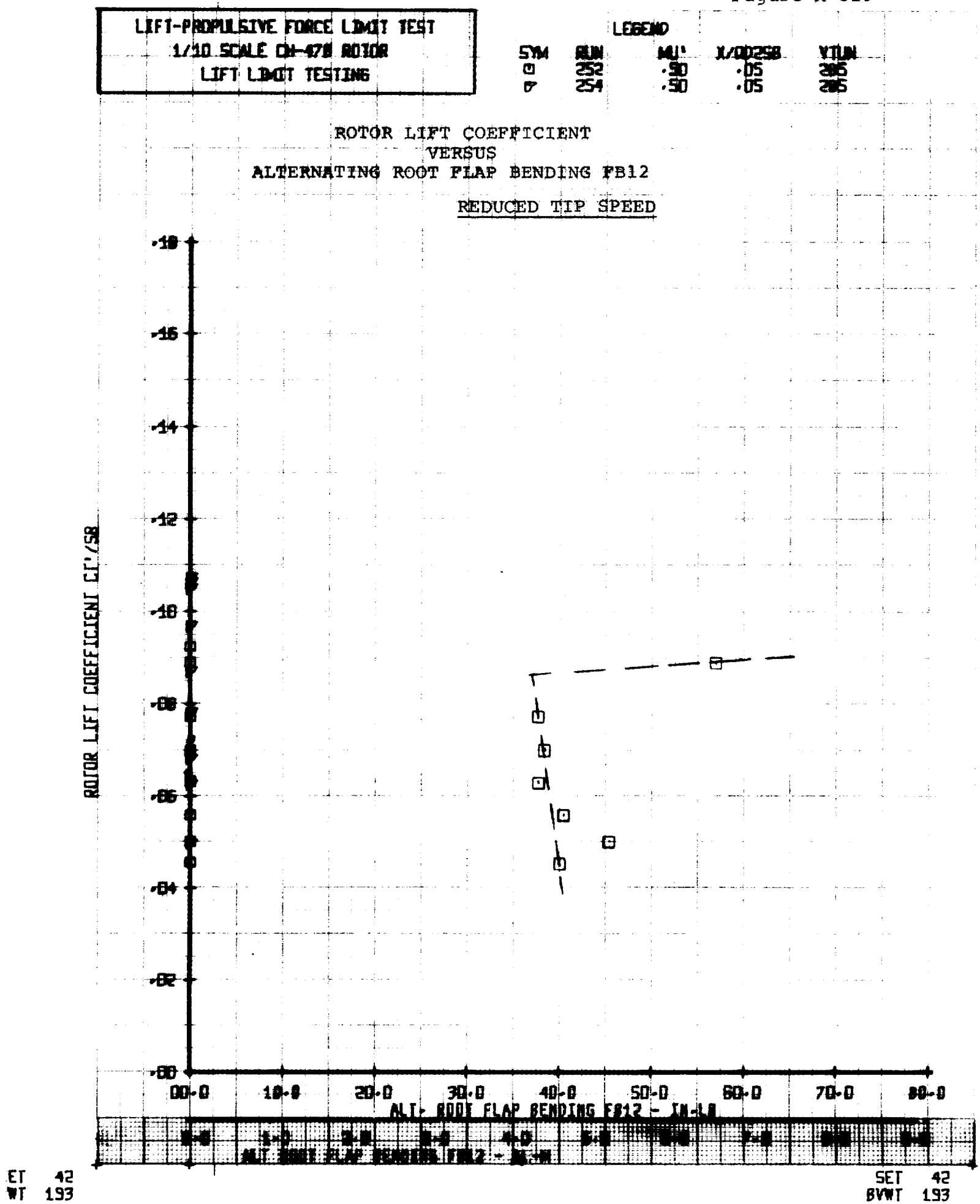

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING
LEGEND
SYM RUN MU' X/QD2SB YTUN
252 .50 .05 285
254 .50 .05 285
ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12
REDUCED TIP SPEED
ROTOR LIFT COEFFICIENT CT/SB
.18
.16
.14
.12
.10
.08
.06
.04
.02
.00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. ROOT FLAP BENDING FB12 - IN-LB
SET 42
BWT 193

Figure A-320

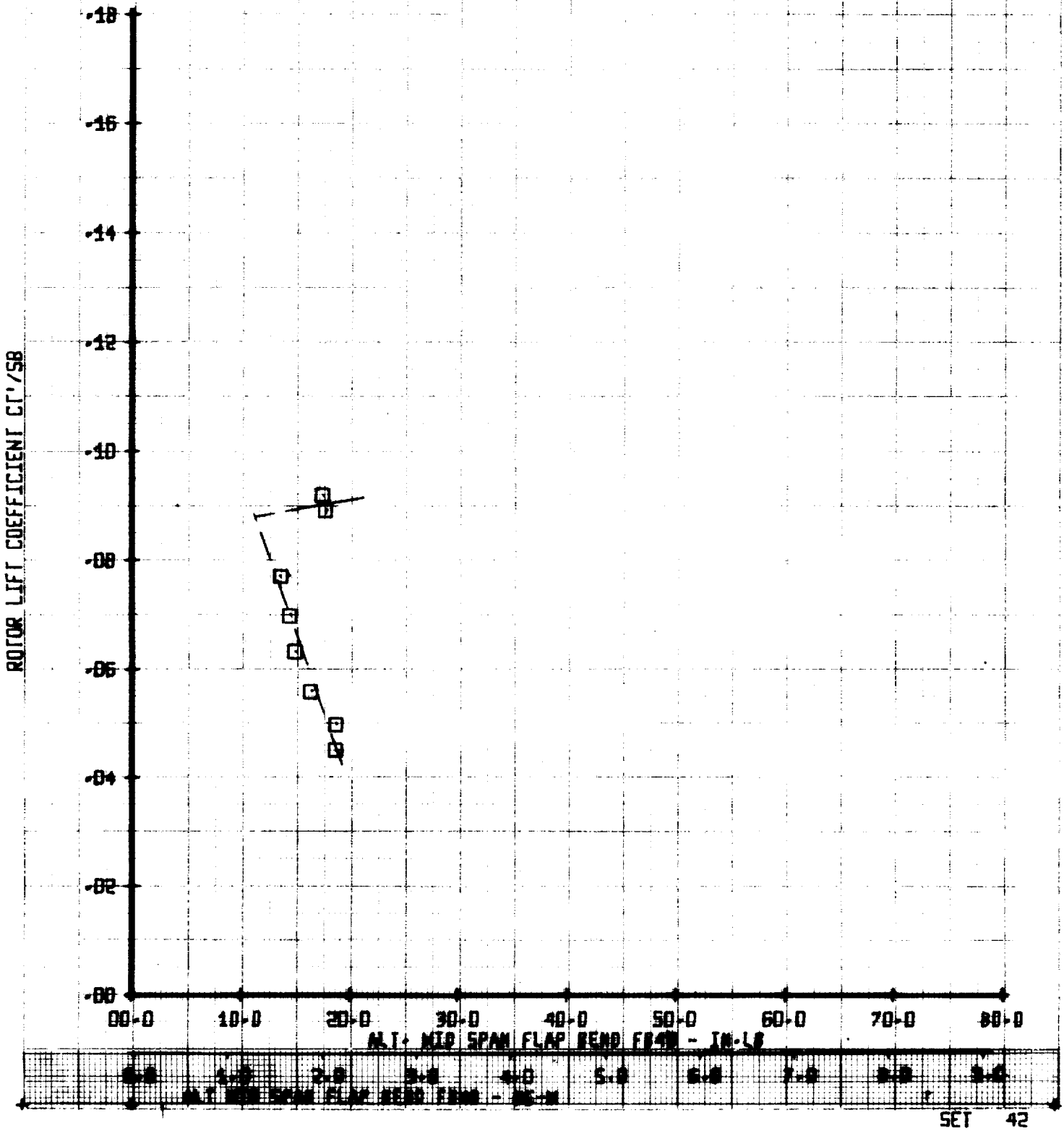
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QQ2SB	VTUN
⊙	252	.50	.05	285
⊙	254	.50	.05	285

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB4⊙

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-321

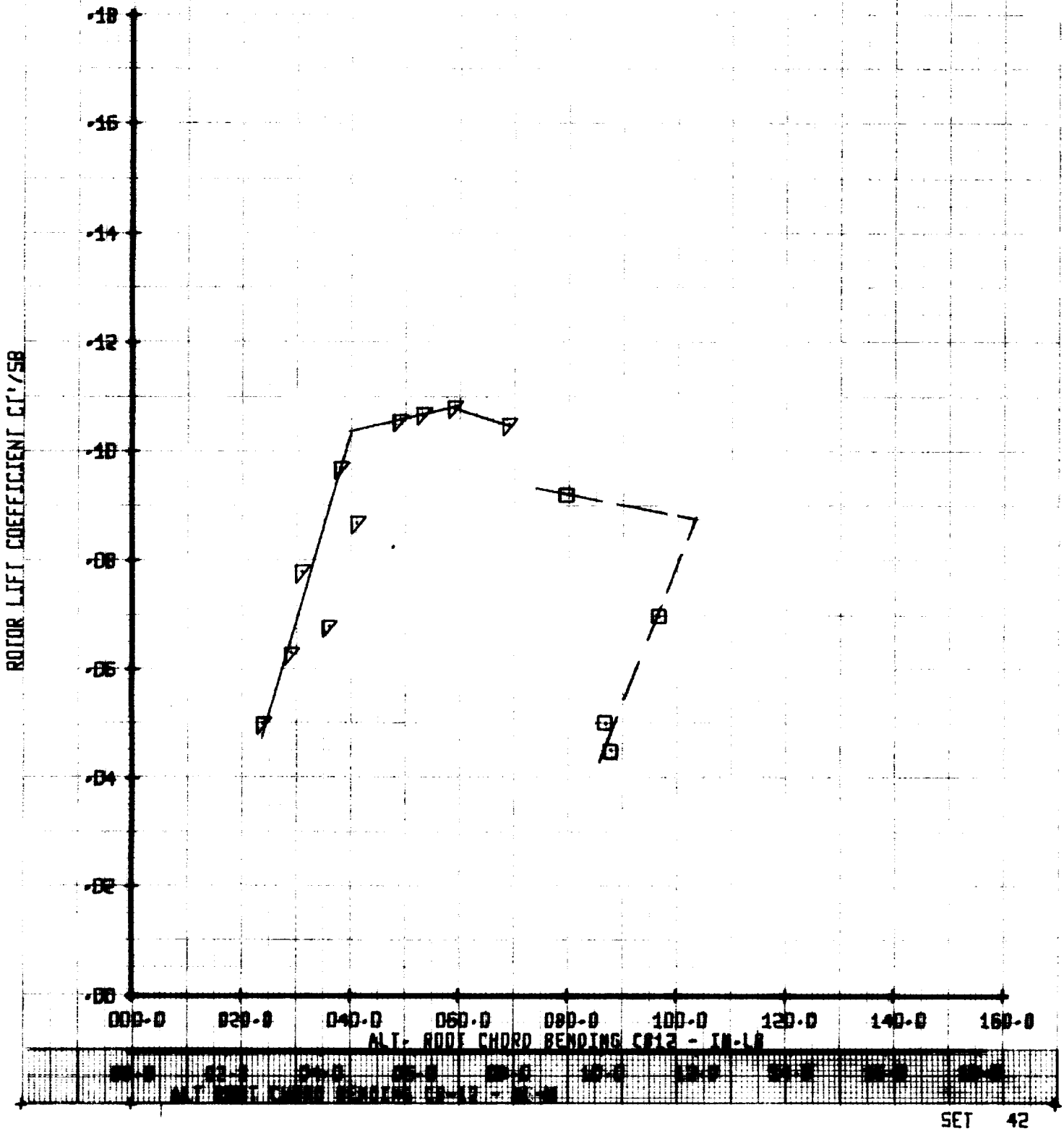
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	252	.50	.05	295
▽	254	.50	.05	295

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12

REDUCED TIP SPEED



ET 42
WT 193

SET 42
BVWT 193

Figure A-322

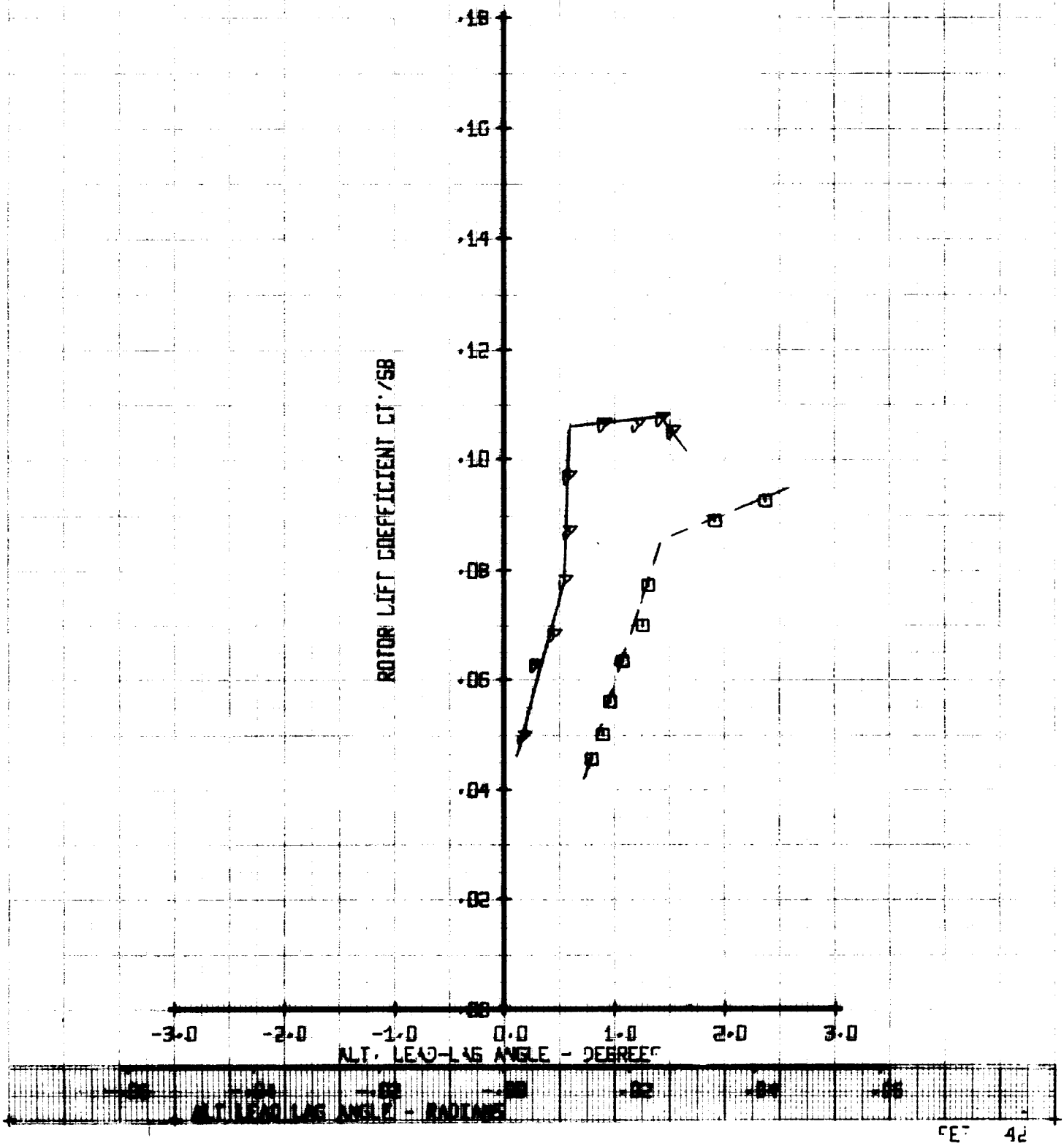
LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE C4-475 ROTOR
LIFT LIMIT TESTING

LEGEND

SYM	RUN	MU'	X/QD2SB	YTUN
□	2052	.50	.05	2865
▽	2054	.50	.05	2865

ROTOR LIFT COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

REDUCED TIP SPEED



ET 42
WT 193

ET 42
BVWT 193

B. Basic Test Data from Propulsive Force Limit Testing

As indicated in Section 5 of the main report, the propulsive for limit testing was conducted at fixed levels of rotor lift by increasing the collective pitch, decreasing the rotor shaft angle of attack and trimming the hub moments to zero with longitudinal and lateral cyclic. This was repeated at each level of rotor lift level and advance ratio for the basic rotor tip speed of 620 ft/sec. A limited amount of testing was also accomplished at a tip speed of 665 ft/sec.

The test data obtained for each of these test runs has been combined to show the impact of rotor lift at a fixed advance ratio. The combinations identified as plot sets, are defined in Table B-1 and are marked on the bottom of each sheet. Within each plot set area series of graphs presenting the variation of each component of measured data with rotor propulsive force coeficient. The sequence of these graphs are as follows:

Propulsive Force Coefficient versus Rotor Propulsive Force Coefficient

Propulsive Force Coefficient versus Shaft Angle of Attack

Propulsive Force Coefficient versus Collective Pitch

Propulsive Force Coefficient versus Longitudinal Cyclic

Propulsive Force Coefficient versus Lateral Cyclic

Propulsive Force Coefficient versus Rotor Power Coefficient

Propulsive Force Coefficient versus Rotor Pitching Moment

Propulsive Force Coefficient versus Rotor Rolling Moment Coefficient

Propulsive Force Coefficient versus Rotor Longitudinal Force Coefficient

Propulsive Force Coefficient versus Rotor Side Force Coefficient

Propulsive Force Coefficient versus Alternating Root Torsion TB12

Propulsive Force Coefficient versus Alternating Mid Span Torsion TB50

Propulsive Force Coefficient versus Alternating Outboard Torsion TB80

Propulsive Force Coefficient versus Alternating Root Flap Bending FB12

Propulsive Force Coefficient versus Alternating Mid Span Flap Bending FB47

Propulsive Force Coefficient versus Alternating Outboard Flap Bending FB78

Propulsive Force Coefficient versus Alternating Root Chord Bending CB12

Propulsive Force Coefficient versus Coning Angle

Propulsive Force Coefficient versus 1st Harmonic Longitudinal Flapping A1

Propulsive Force Coefficient versus 1st Harmonic Lateral Flapping B1

Propulsive Force Coefficient versus Alternating Lead-Lag Angle

Rotor Pitching Moment Coefficient versus 1st Harmonic Longitudinal Flapping A1

Rotor Rolling Moment Coefficient versus 1st Harmonic Lateral Flapping B1

TABLE B-1 DATA PLOTTING SUMMARY FOR PROPULSIVE FORCE LIMIT TESTING

PLOT SET	RUN NO.	ROTOR TIP SPEED V_T	ADVANCE RATIO μ	ROTOR LIFT COEFF. C_T/σ	ROTOR PROPULSIVE FORCE COEFF. $X/qd^2\sigma$	TUNNEL SPEED V	COMMENTS
47	230	620FPS	.40	.06	Range	248FPS	Cruise performance and propulsive force limit.
	231	620FPS	.40	.09	Range	248FPS	
48	243	620FPS	.45	.06	Range	279FPS	
	244	620FPS	.45	.076	Range	279FPS	
49	232	620FPS	.50	.06	Range	311FPS	
	233	620FPS	.50	.06	Range	311FPS	
	234	620FPS	.50	.08	Range	311FPS	
	235	620FPS	.50	.08	Range	311FPS	
50	269	620FPS	.50	.06	Range	311FPS	
	270	620FPS	.50	.07	Range	311FPS	
	271	620FPS	.50	.09	Range	311FPS	
	272	620FPS	.50	.10	Range	311FPS	
51	268	620FPS	.53	.05	Range	328FPS	
	240	620FPS	.53	.06	Range	328FPS	
	266	620FPS	.53	.08	Range	328FPS	
	241	620FPS	.53	.09	Range	328FPS	
	242	620FPS	.53	.09	Range	328FPS	
	267	620FPS	.53	.10	Range	328FPS	
52	264	620FPS	.53	.05	Range	328FPS	
	265	620FPS	.53	.07	Range	328FPS	

TABLE B-1 DATA PLOTTING SUMMARY FOR PROPULSIVE FORCE LIMIT TESTING
(Continued)

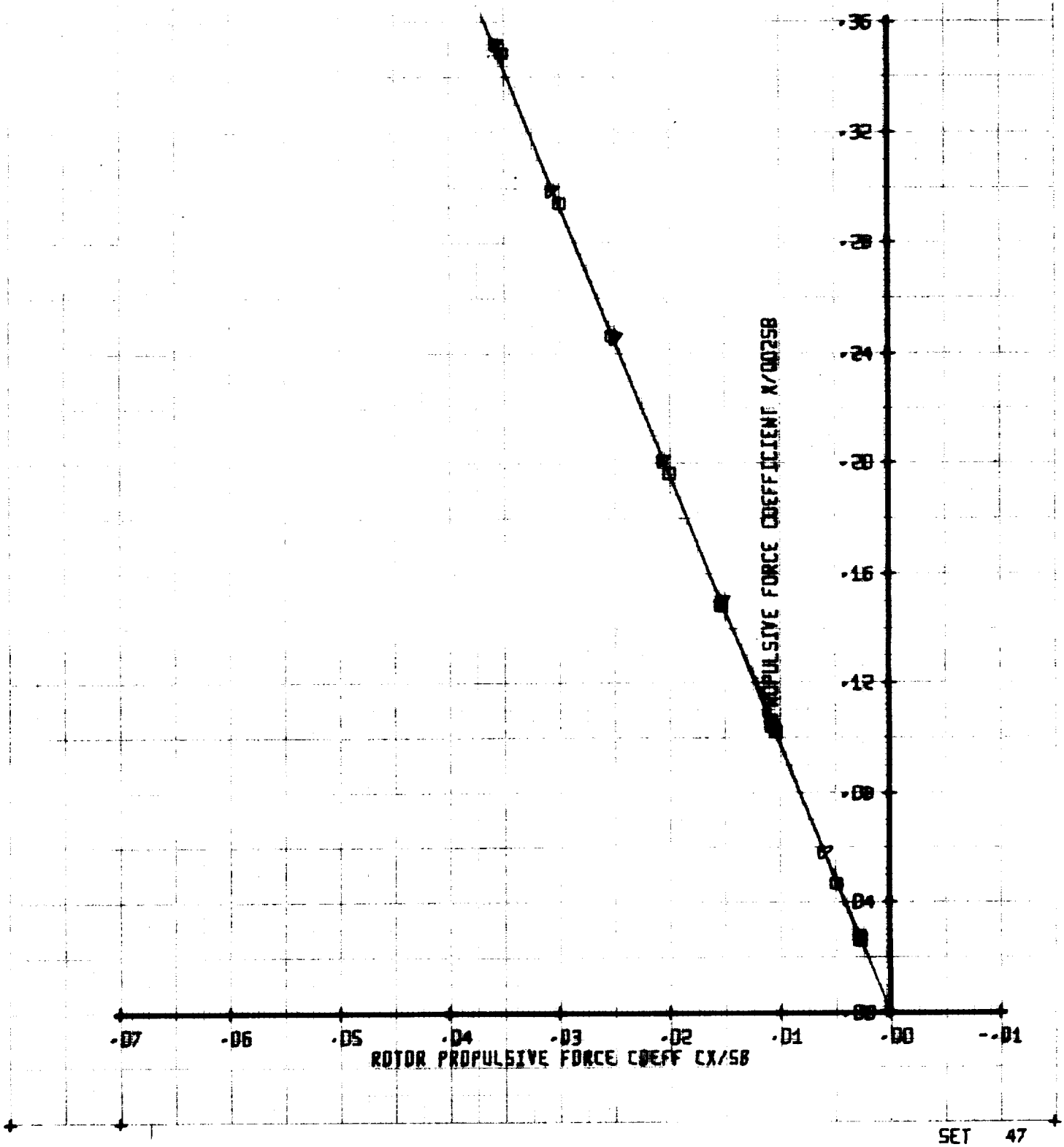
PLOT SET	RUN NO.	ROTOR TIP SPEED V_T	ADVANCE RATIO μ	ROTOR LIFT COEFF. C_T/σ	ROTOR PROPULSIVE FORCE COEFF. $X/qd^2\sigma$	TUNNEL SPEED V	COMMENTS
53	236	620FPS	.57	.06	Range	353FPS	Cruise performance and propulsive force limit.
	237	620FPS	.57	.076	Range	353FPS	
54	239	620FPS	.61	.04	Range	378FPS	
	238	620FPS	.61	.055	Range	378FPS	
55	276	665FPS	.53	.06	Range	352FPS	Cruise performance and force limit at increased tip speed.
	277	665FPS	.53	.08	Range	352FPS	

Figure B-1

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



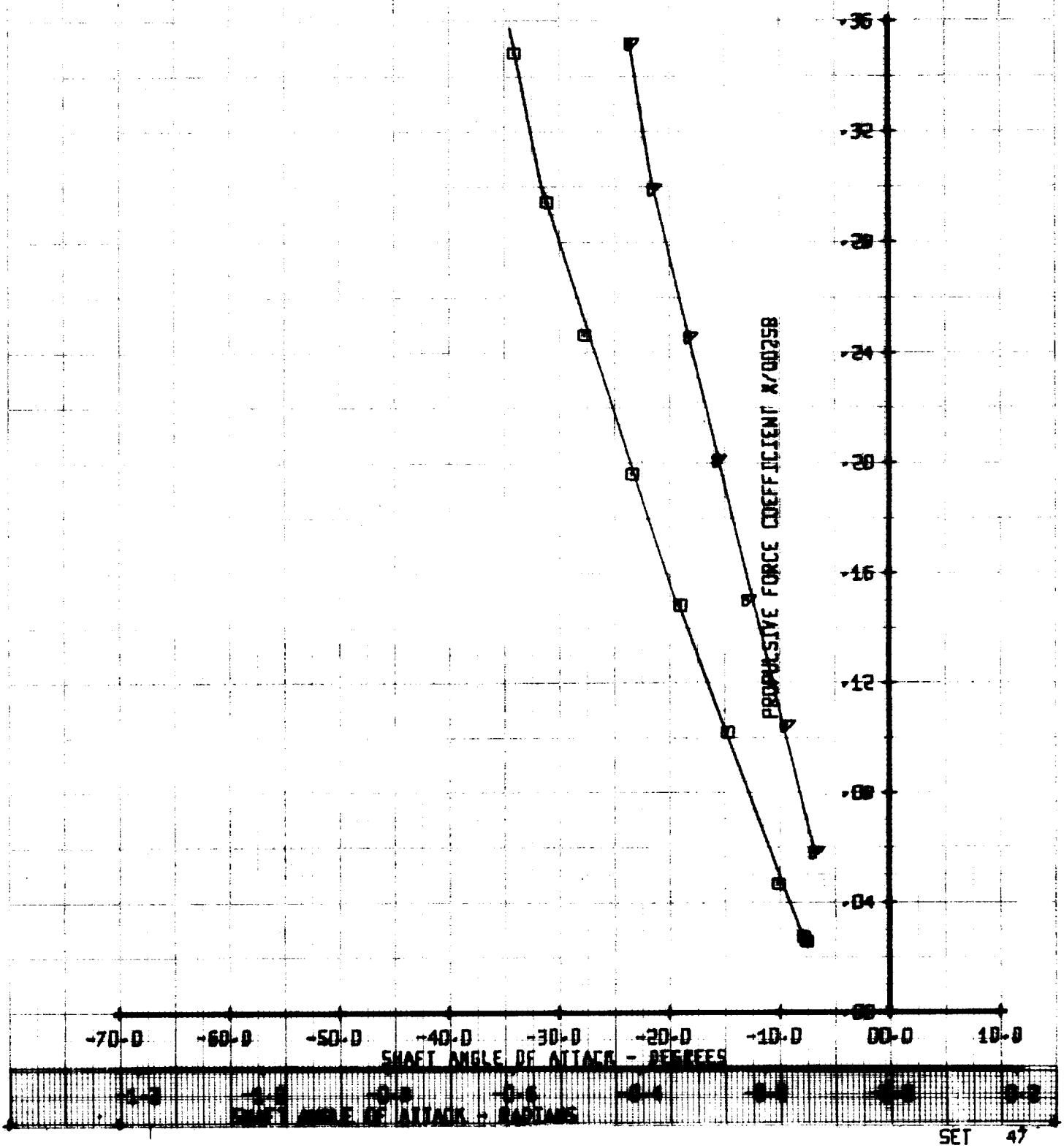
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 47
WT 193

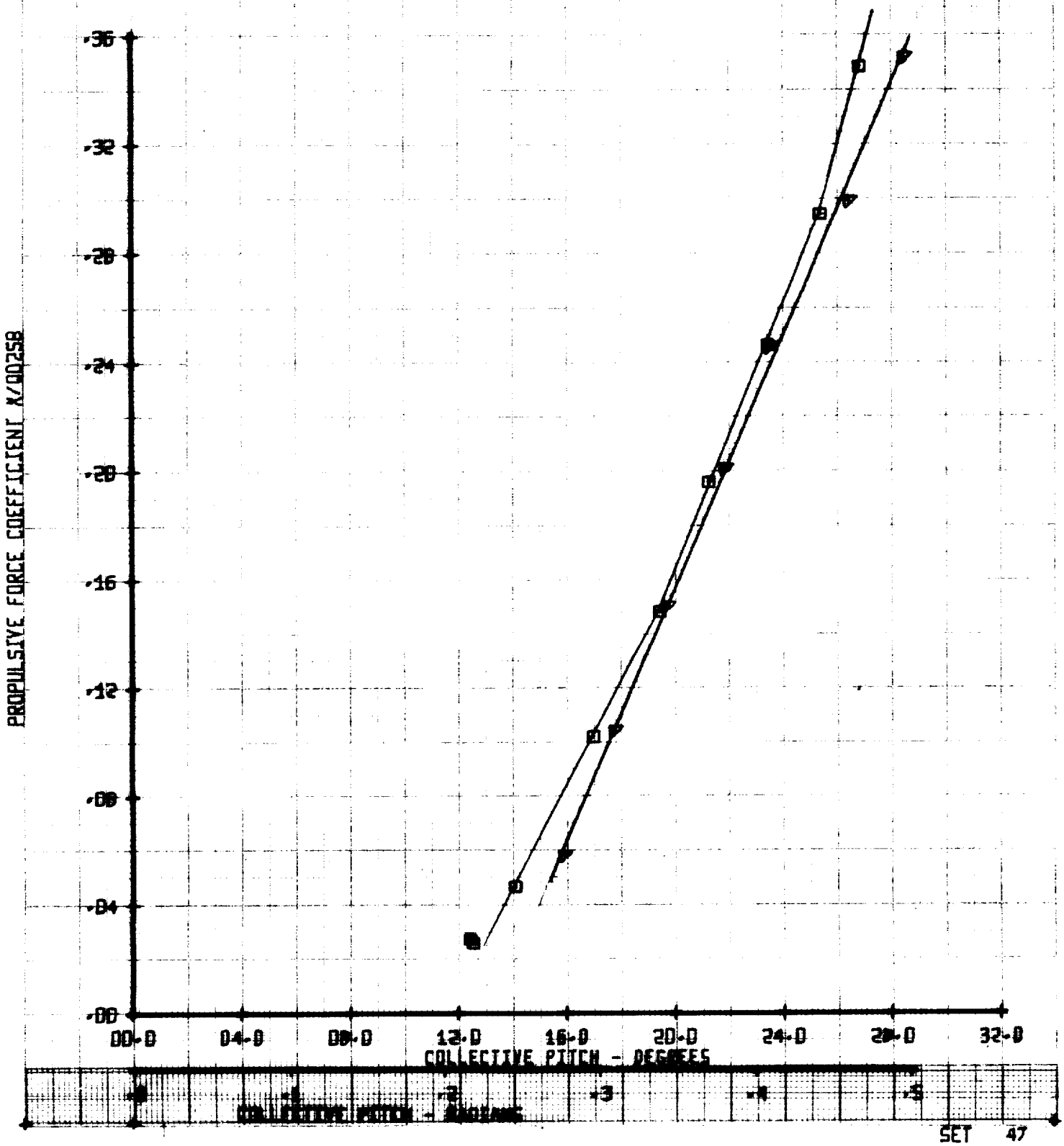
SET 47
BVWT 193

Figure B-3

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



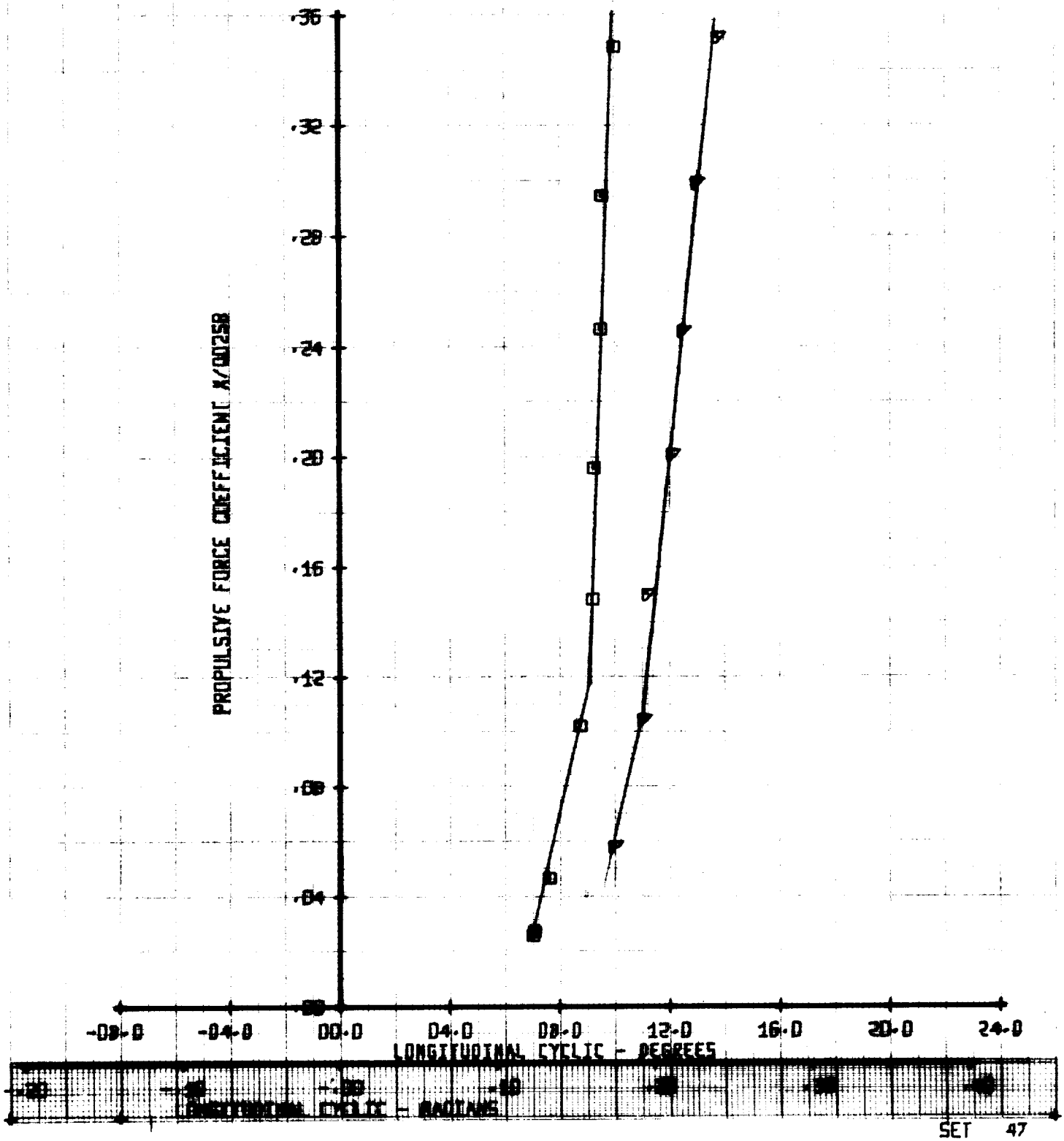
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 47
WT 193

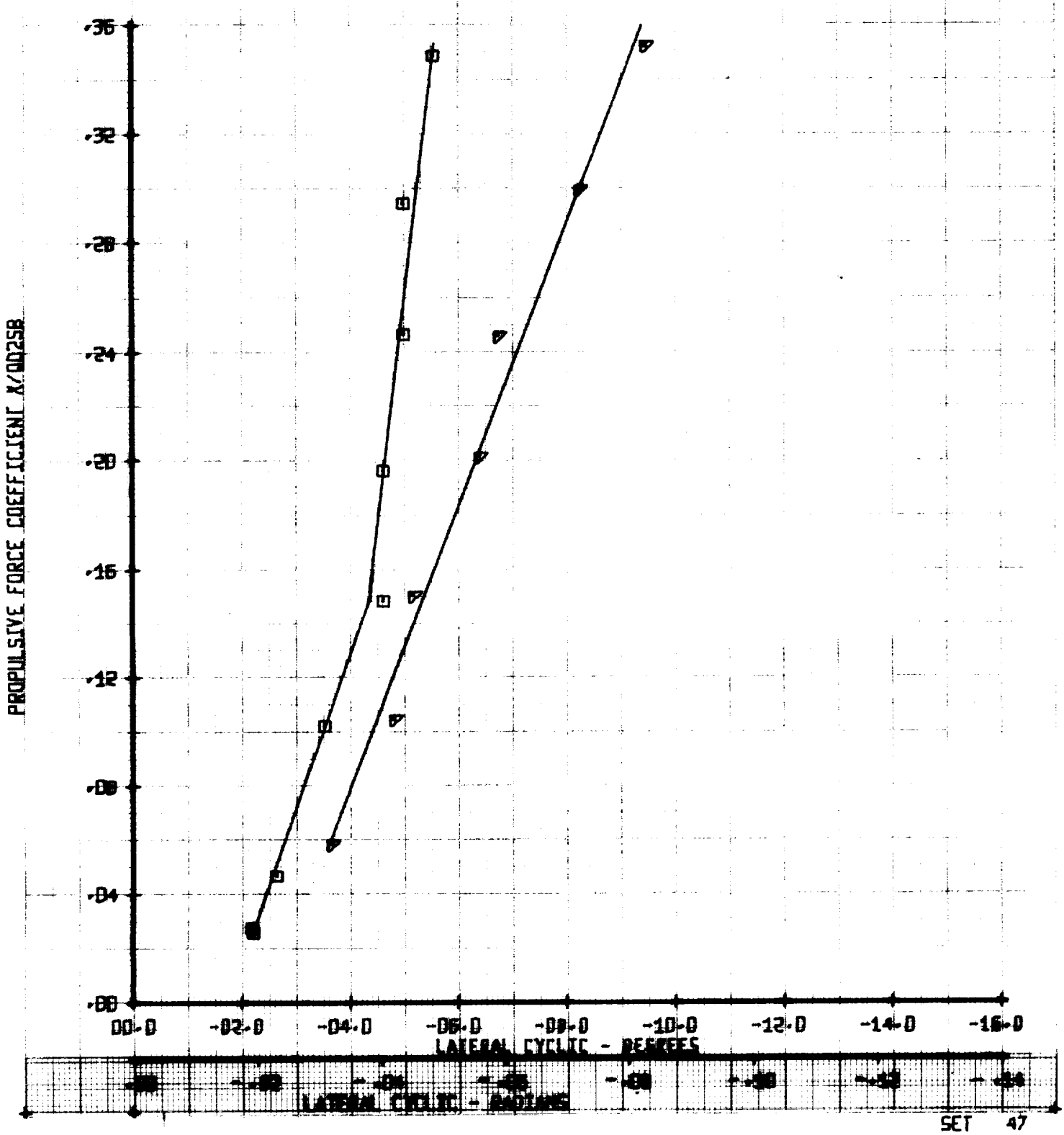
SET 47
BVWT 193

Figure B-5

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 47
WT 193

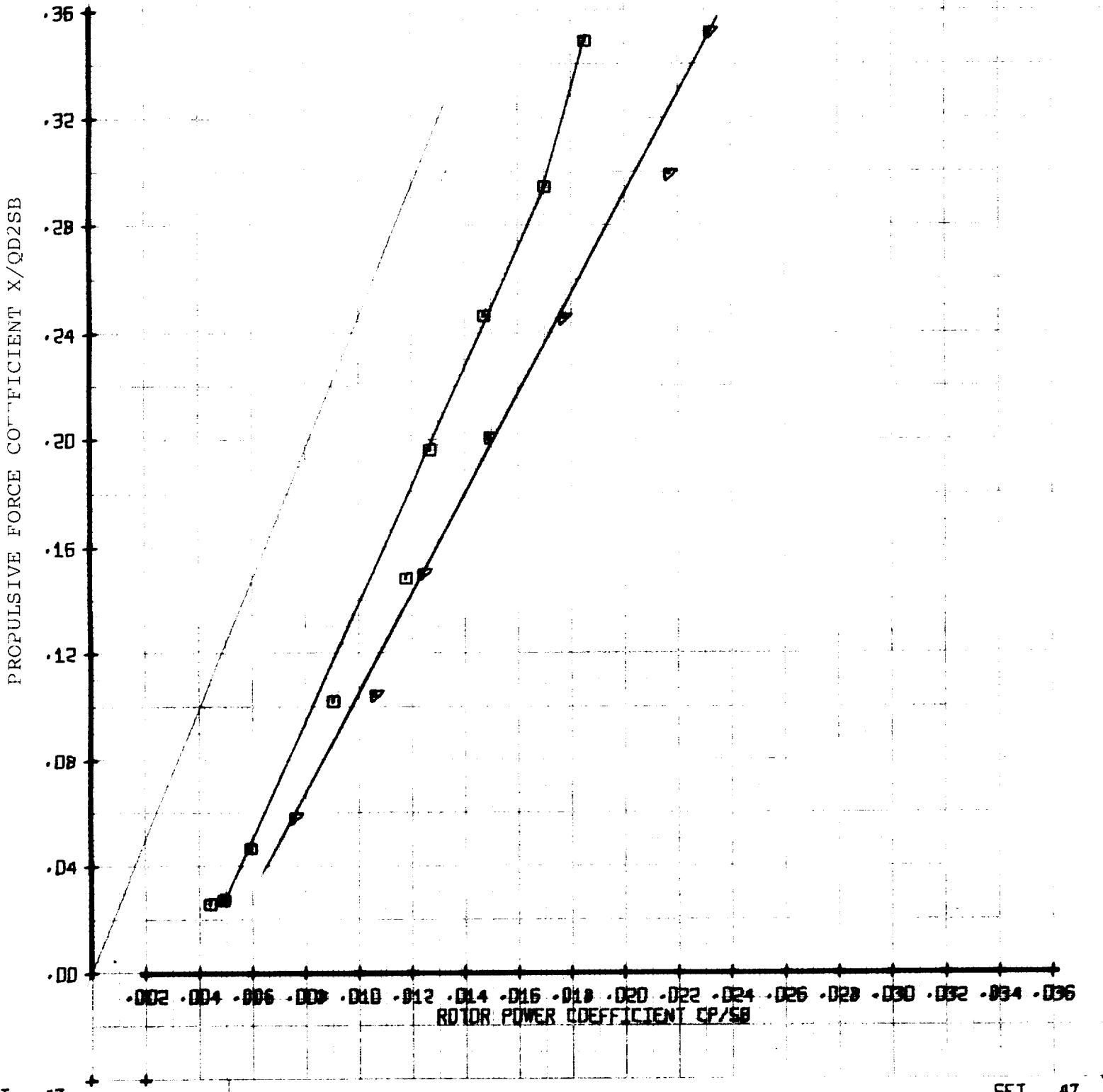
SET 47
BVWT 193

Figure B-6

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 47
WT 193

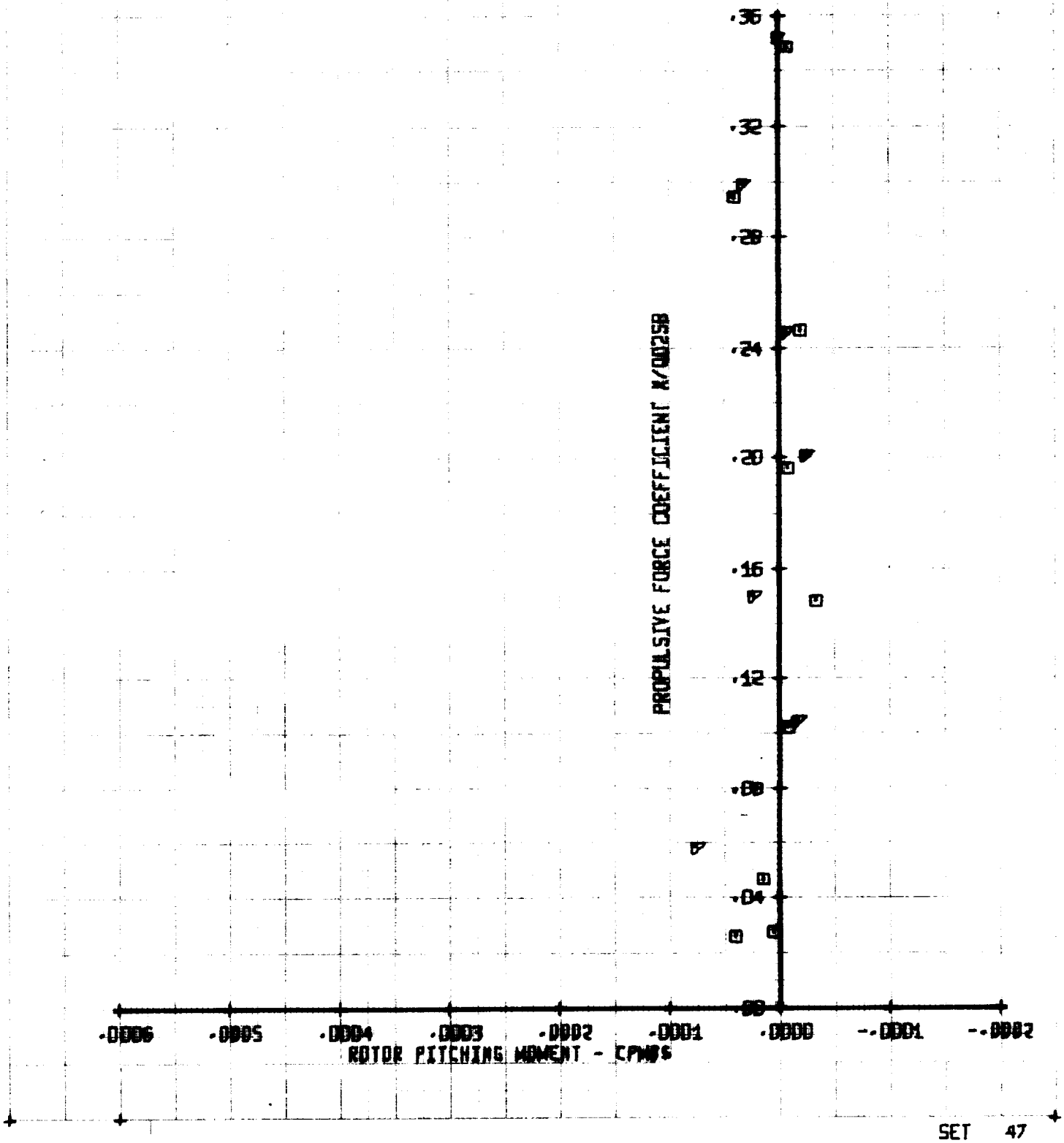
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 47
WT 193

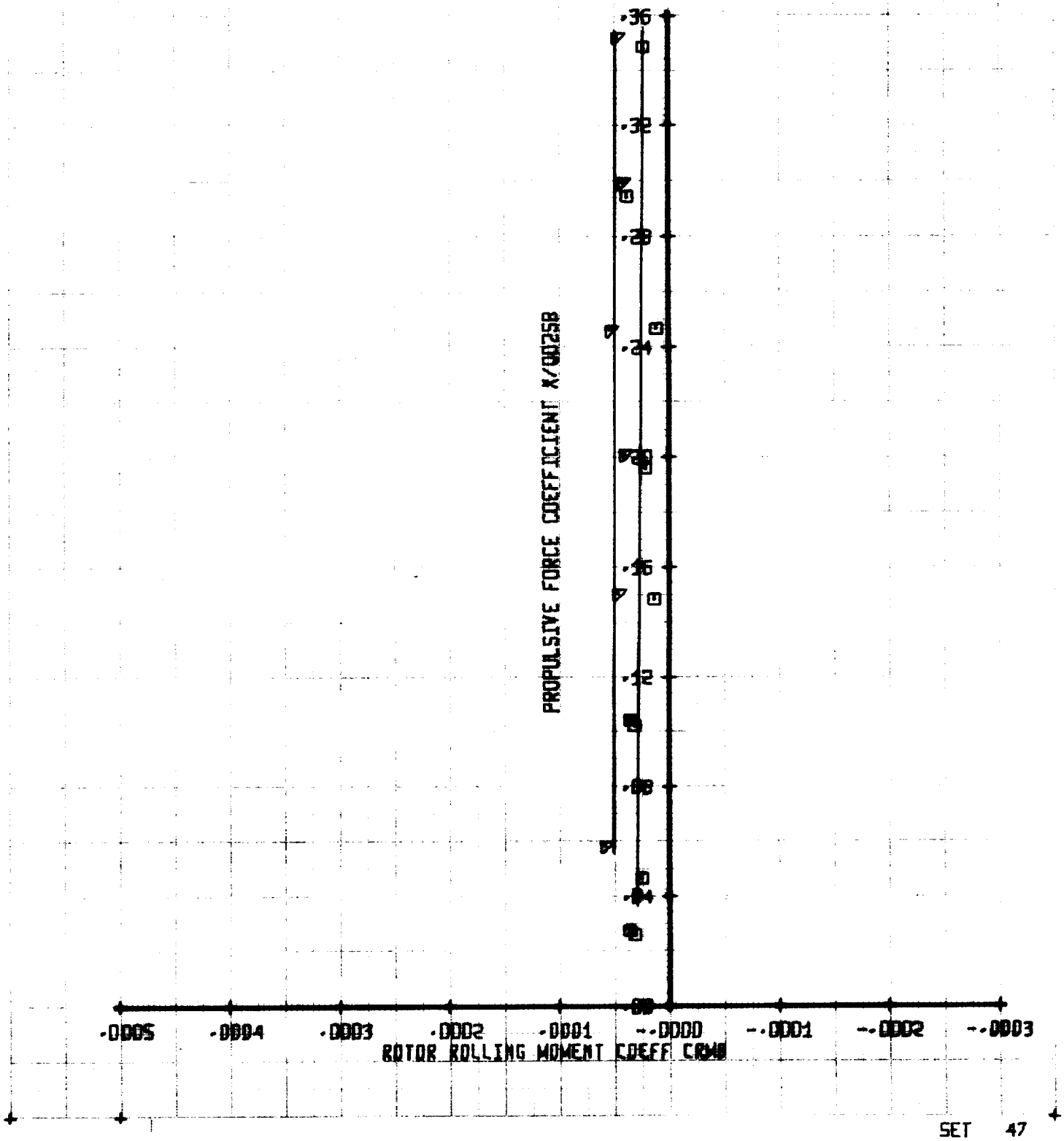
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET 47
WT 193

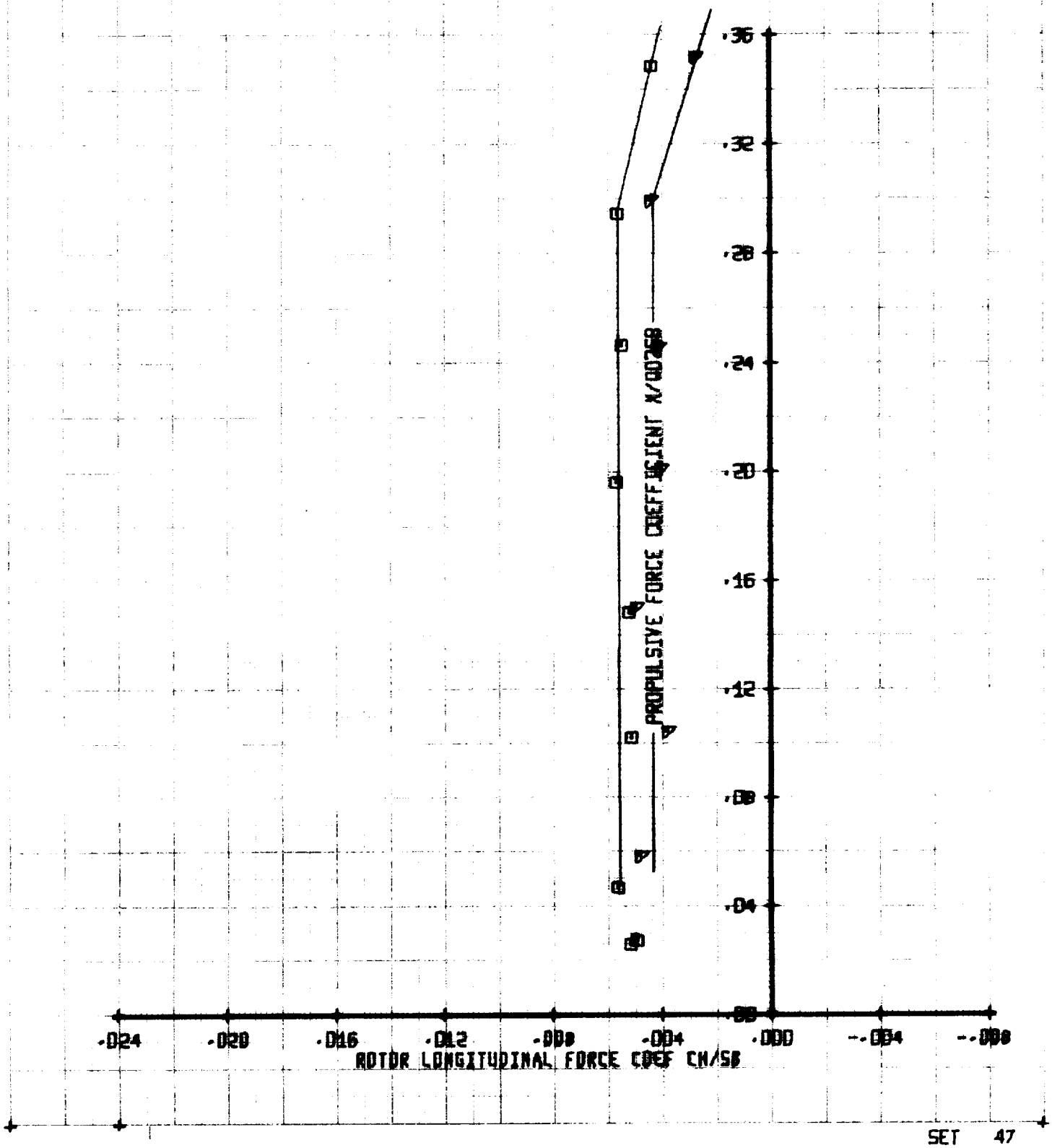
SET 47
BVWT 193

Figure B-9

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



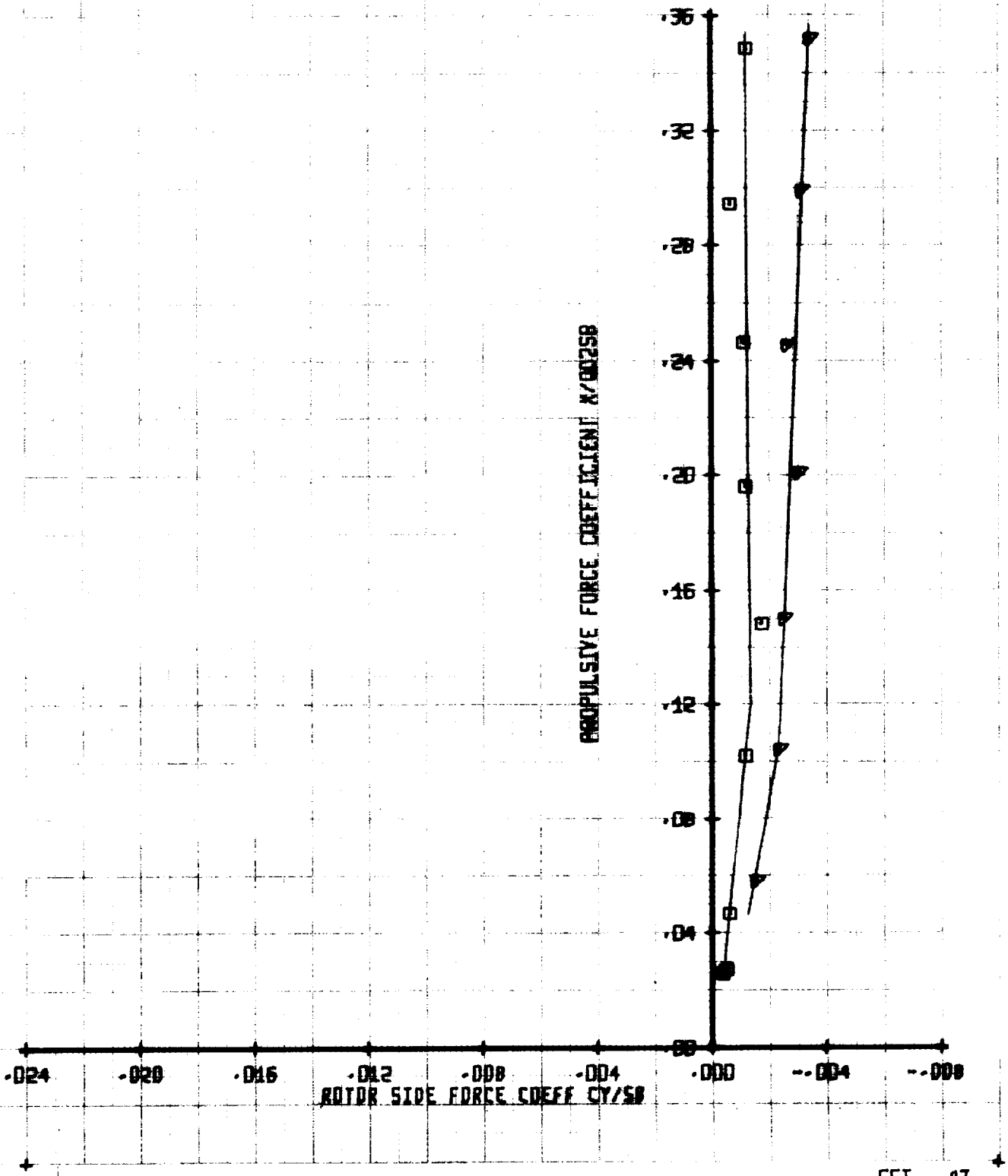
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
◇	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 47
WT 193

SET 47
BVWT 193

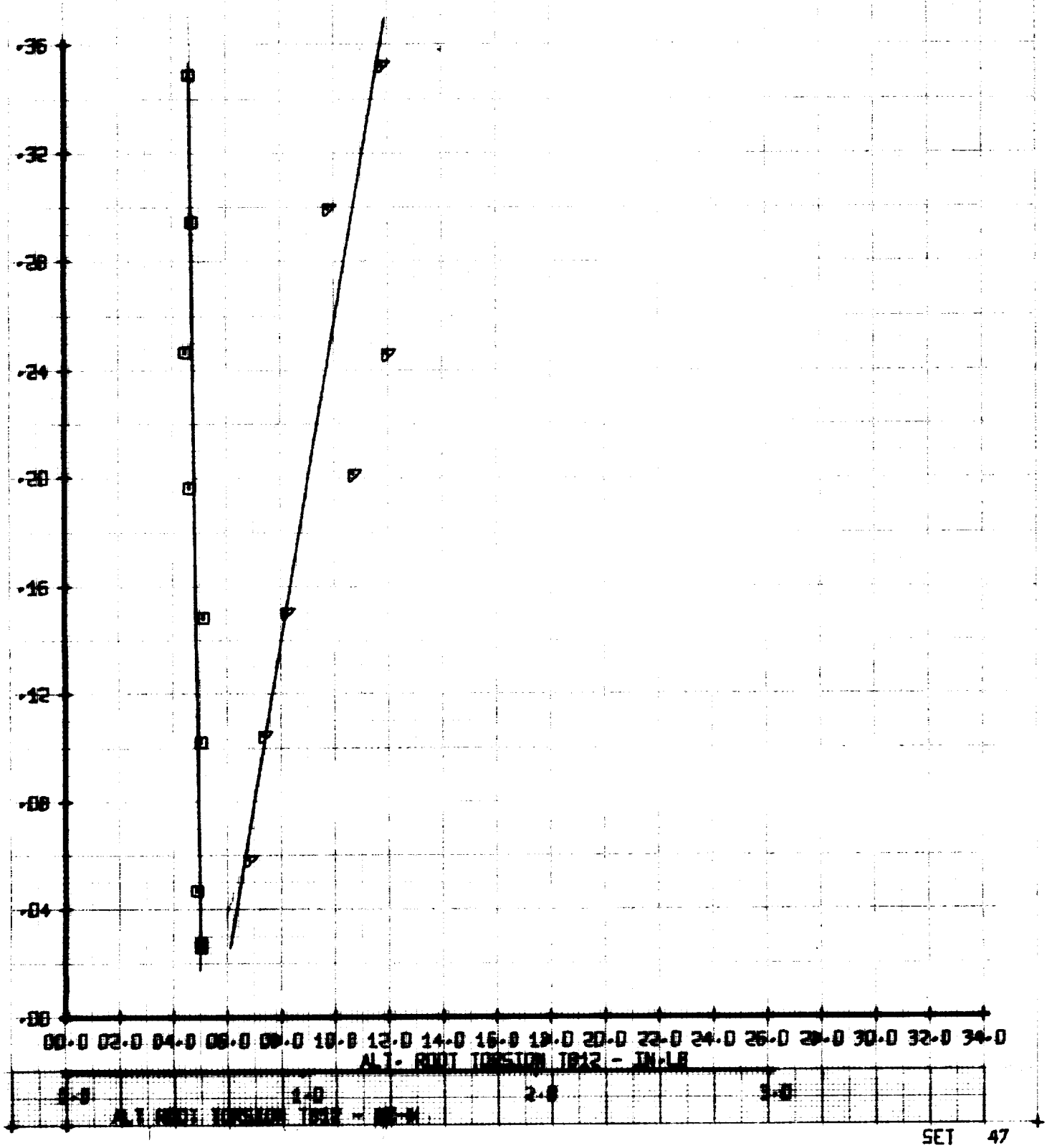
Figure B-11

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YILN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATENG ROOT TORSION TB12



ET 47
WT 193

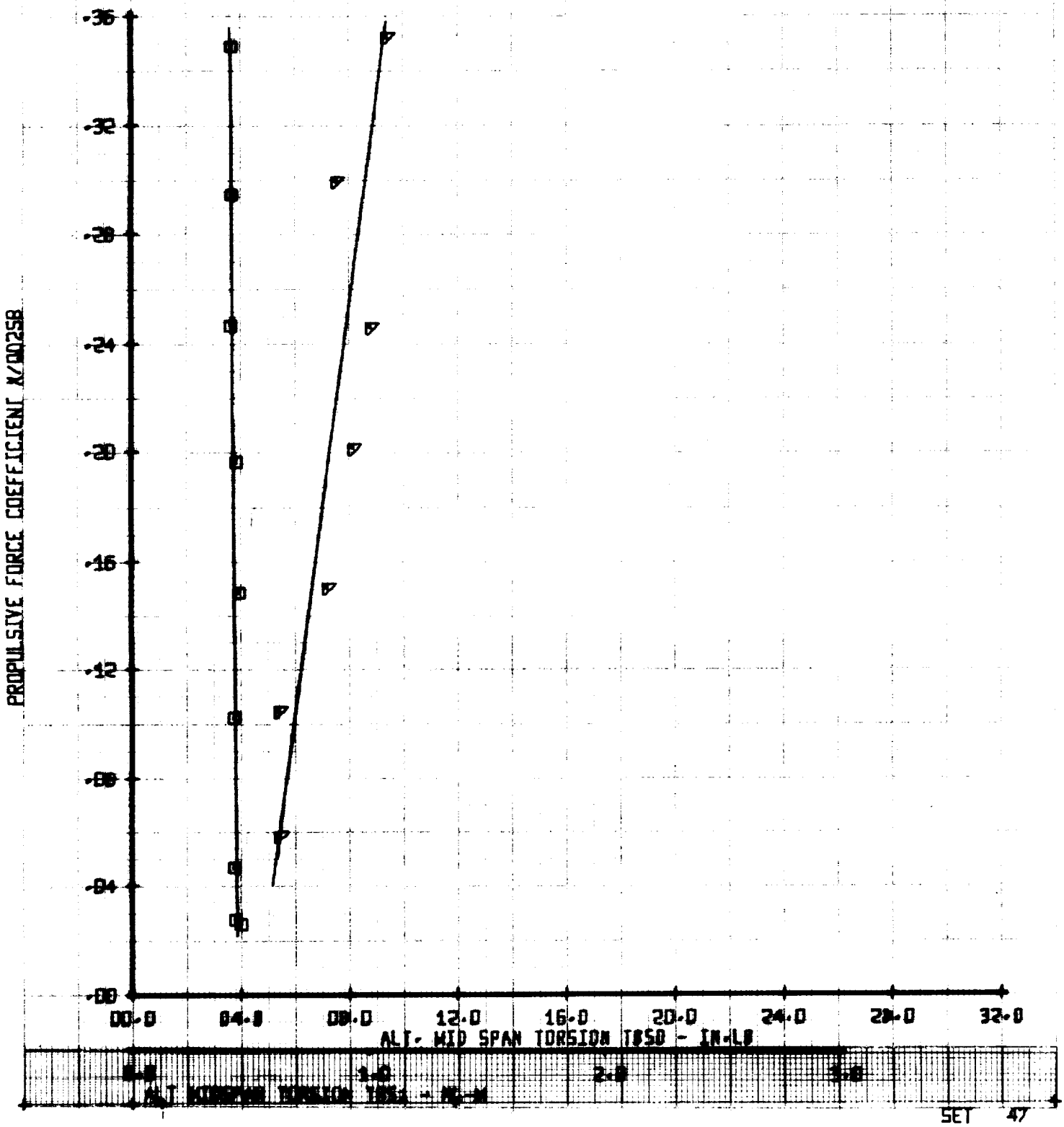
SET 47
BVWT 193

Figure B-12

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
◻	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION T850



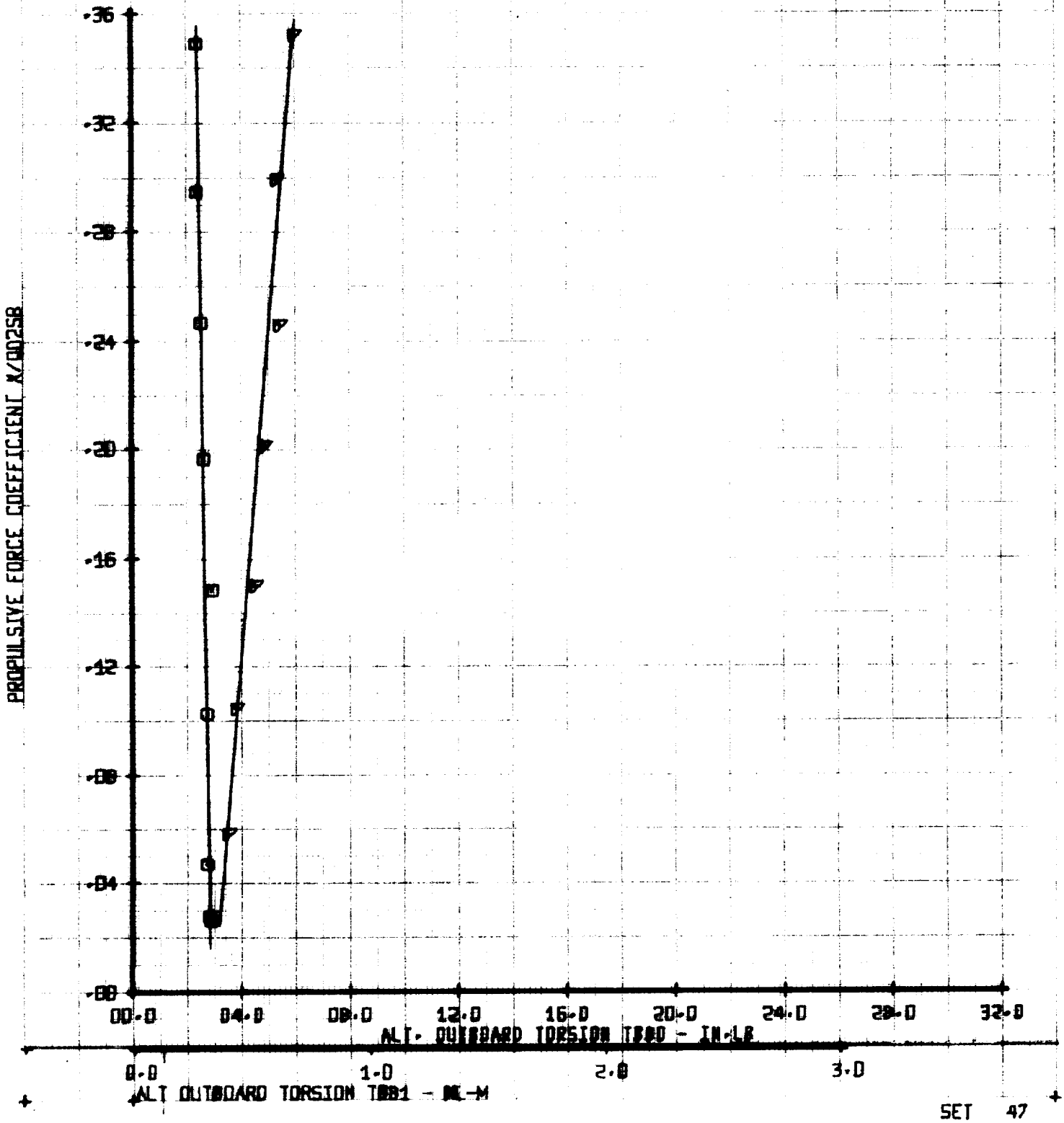
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 47
WT 193

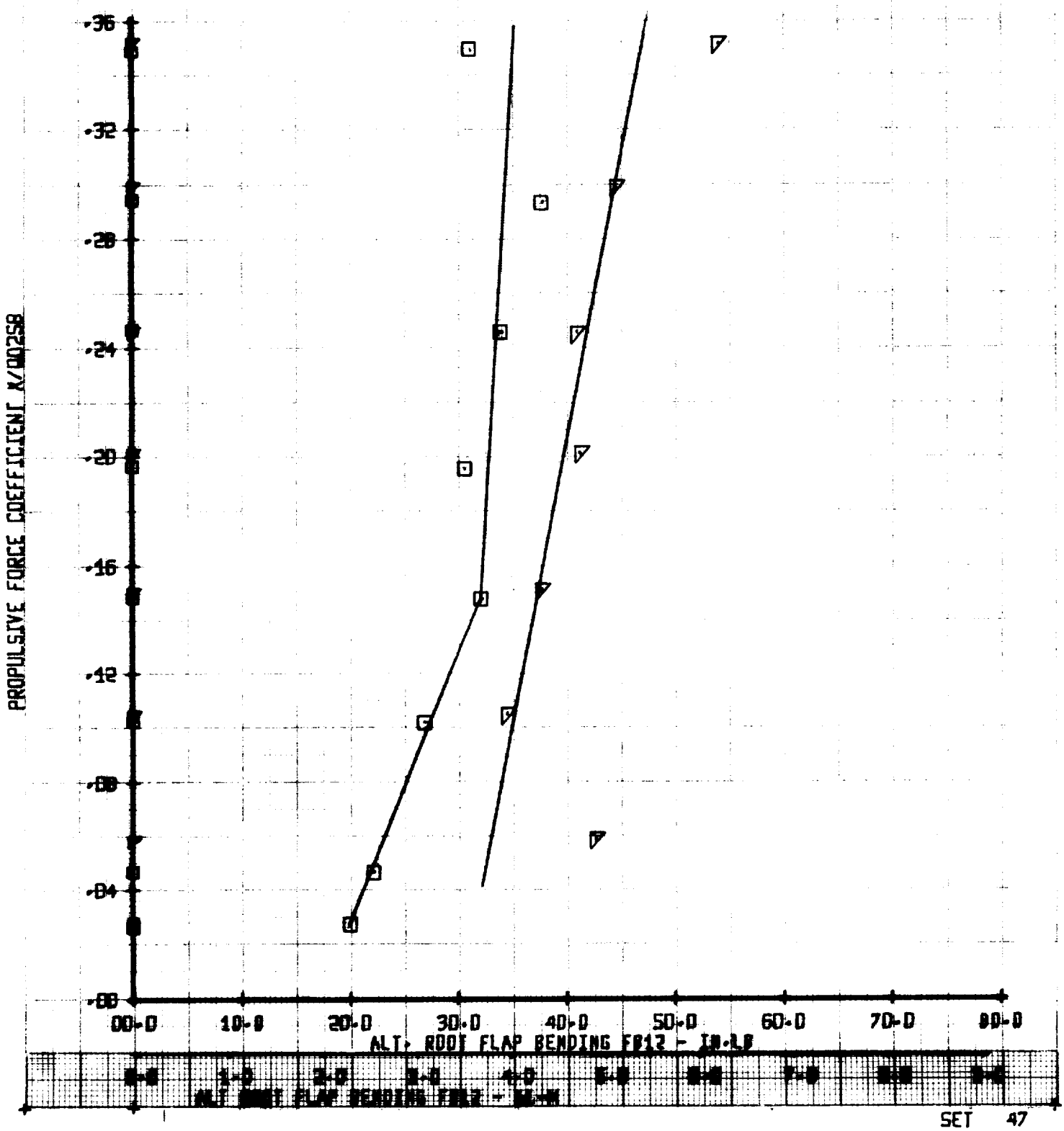
SET 47
BVWT 193

Figure B-14

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 47
WT 193

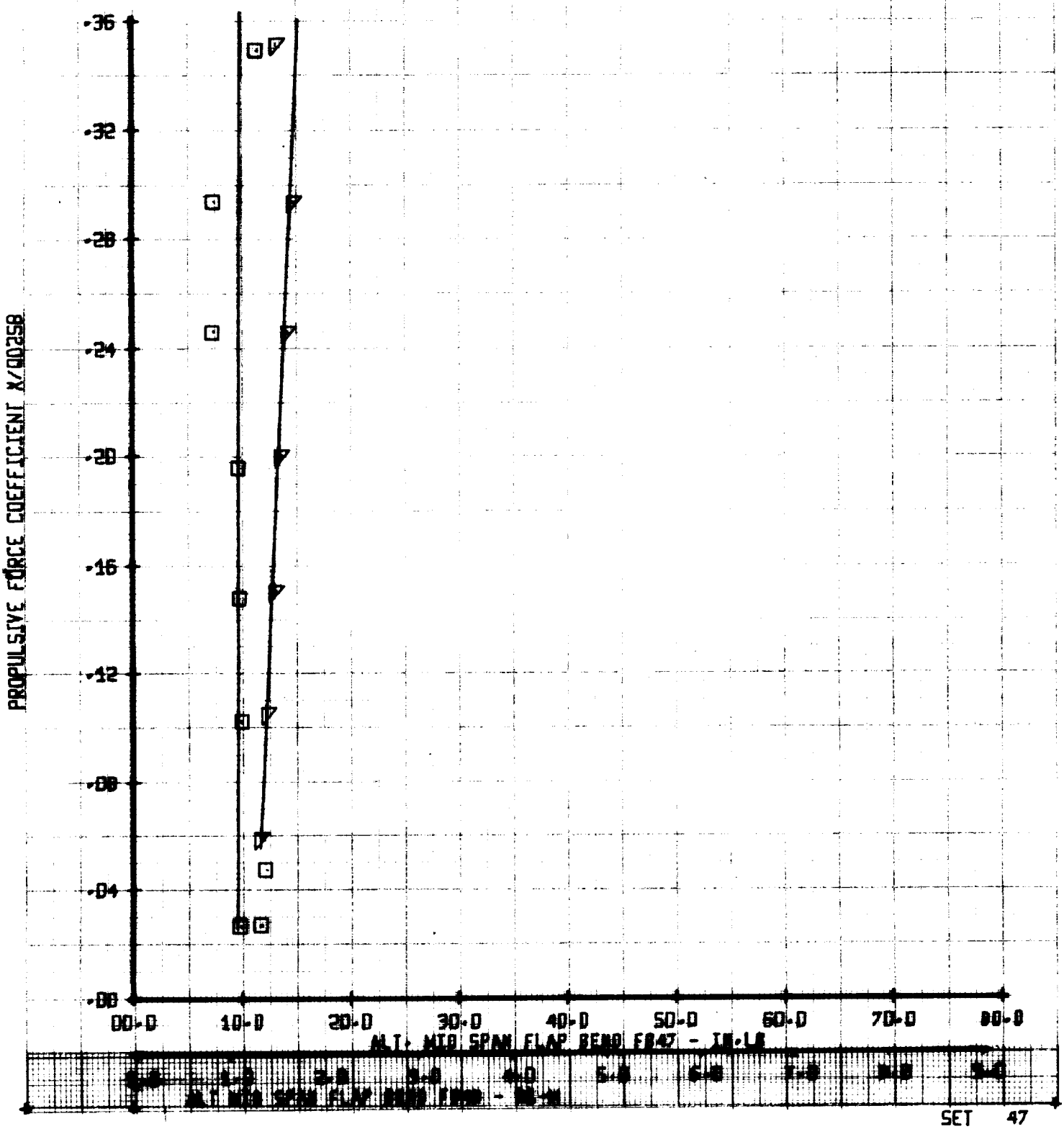
SET 47
BVWT 193

Figure B-15

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB47



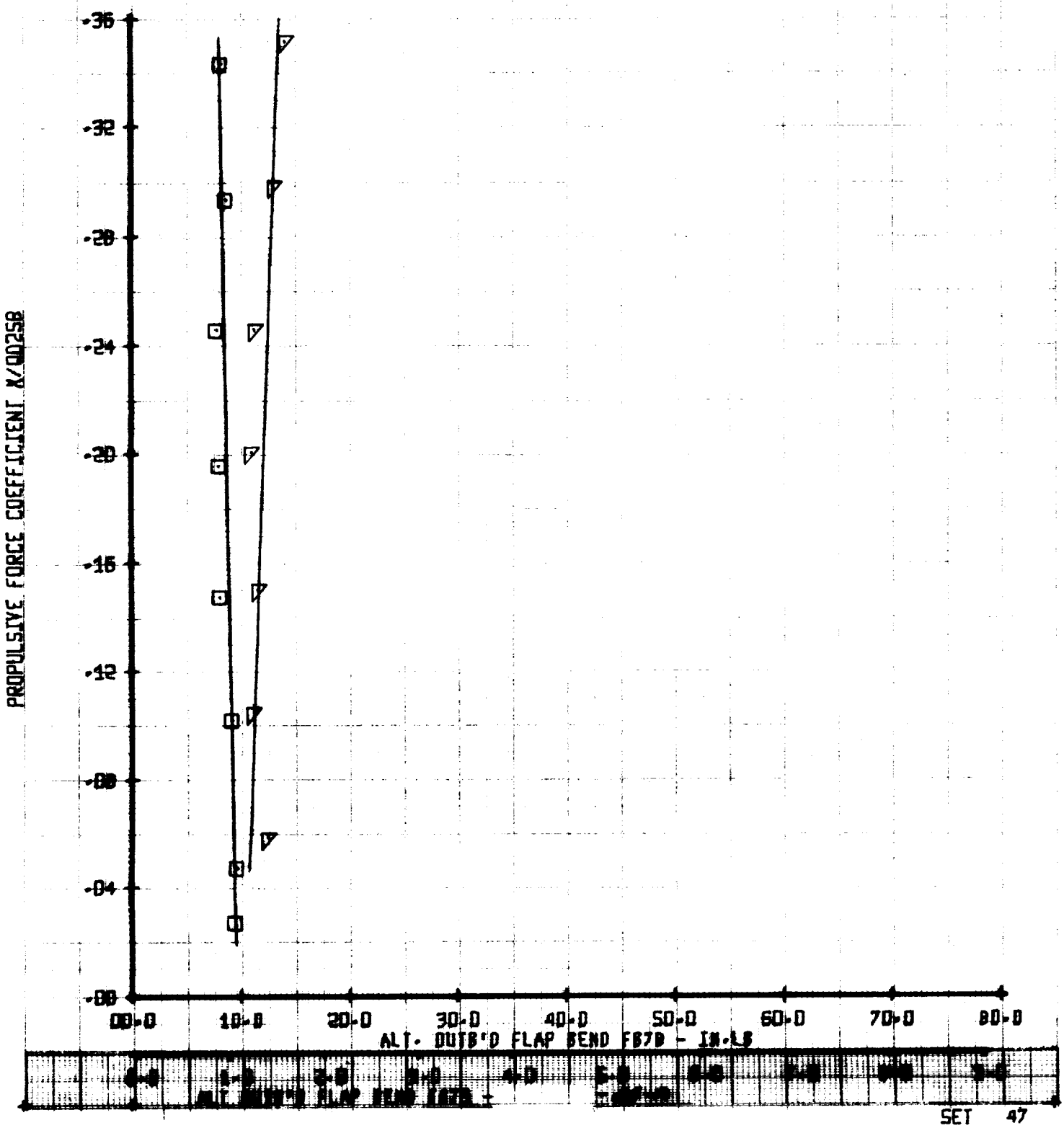
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47D ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



ET 47
WT 193

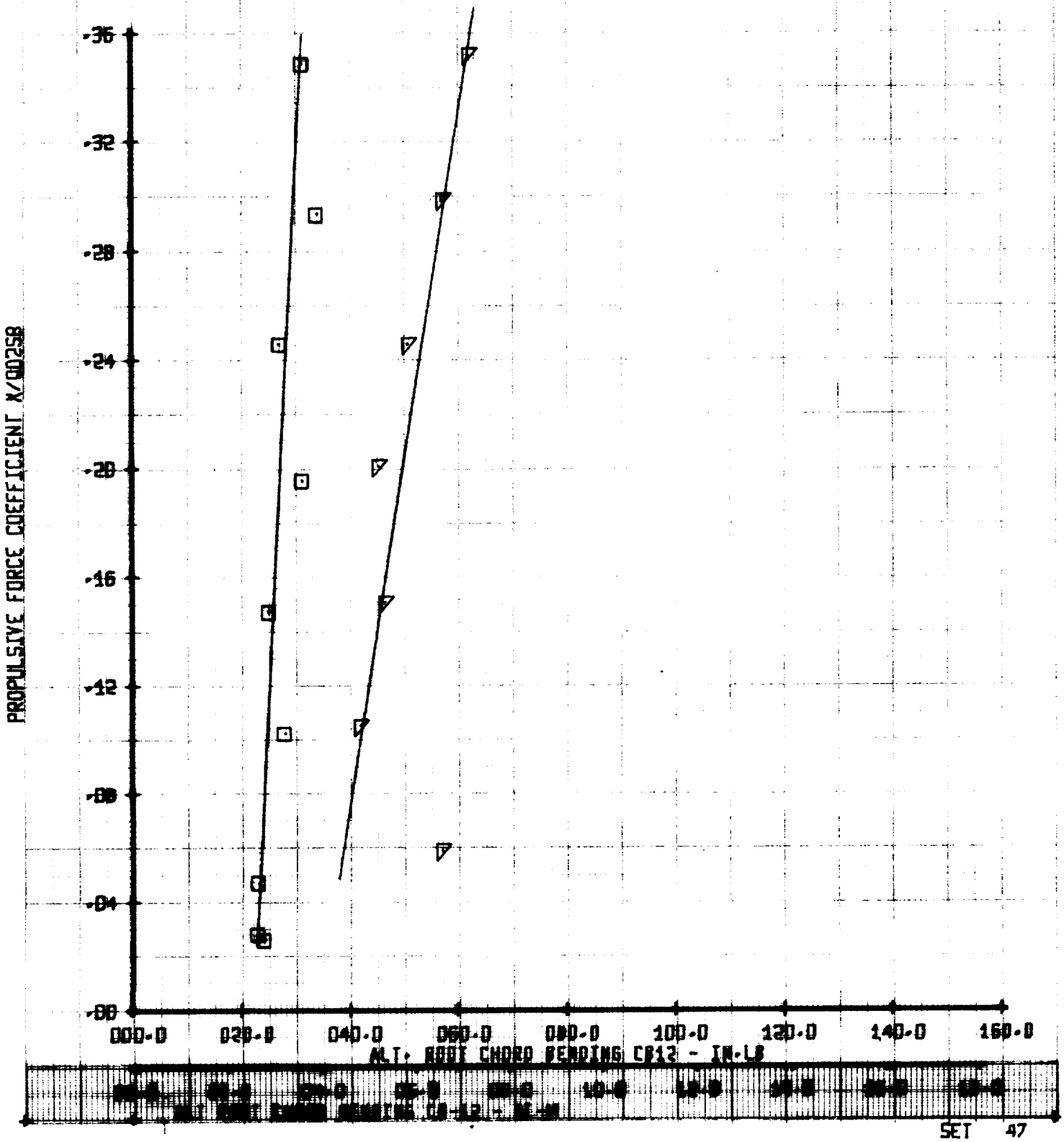
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 47
WT 193

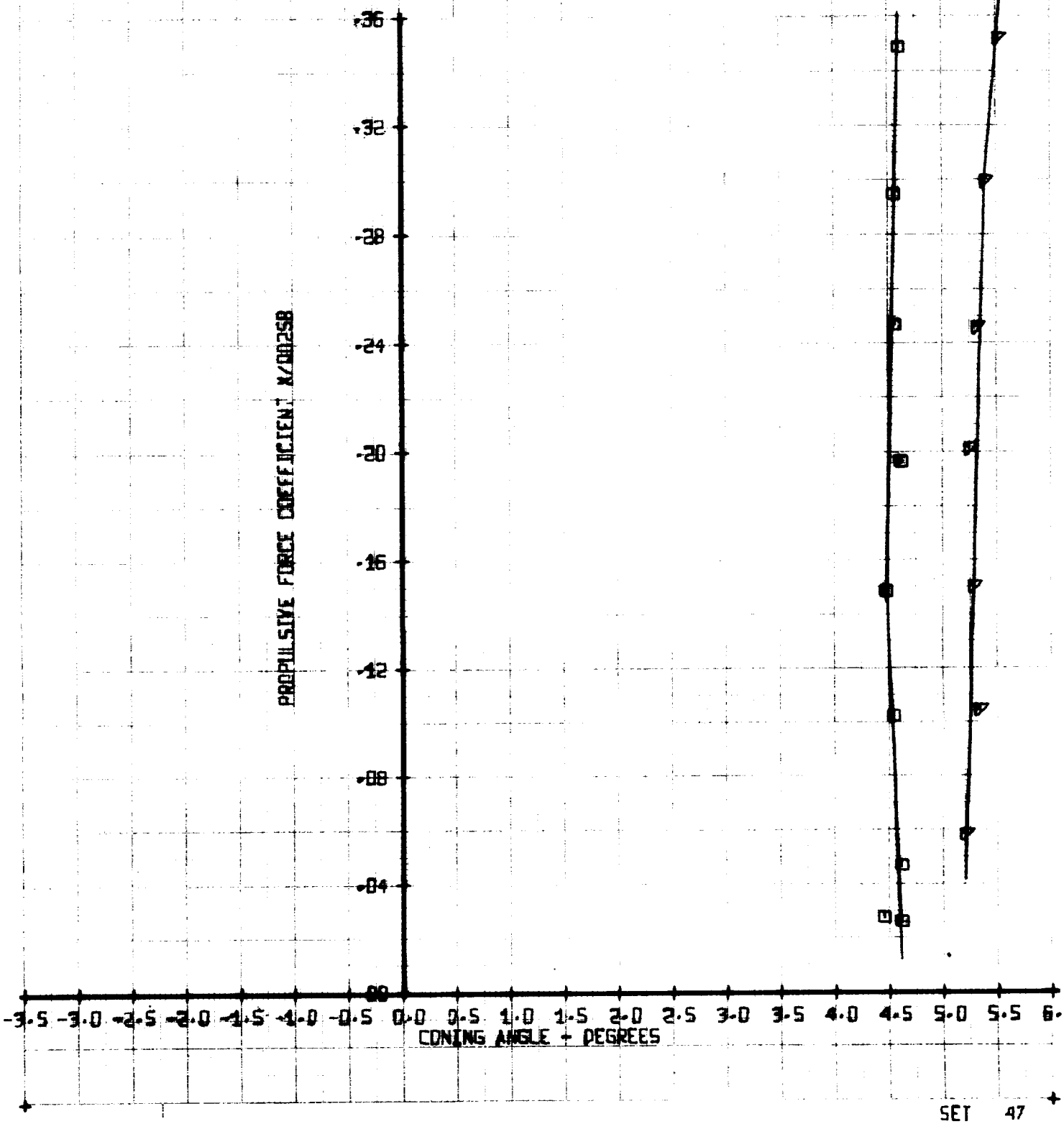
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YAW
□	230	.40	.06	24B
▽	231	.40	.09	24B

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE

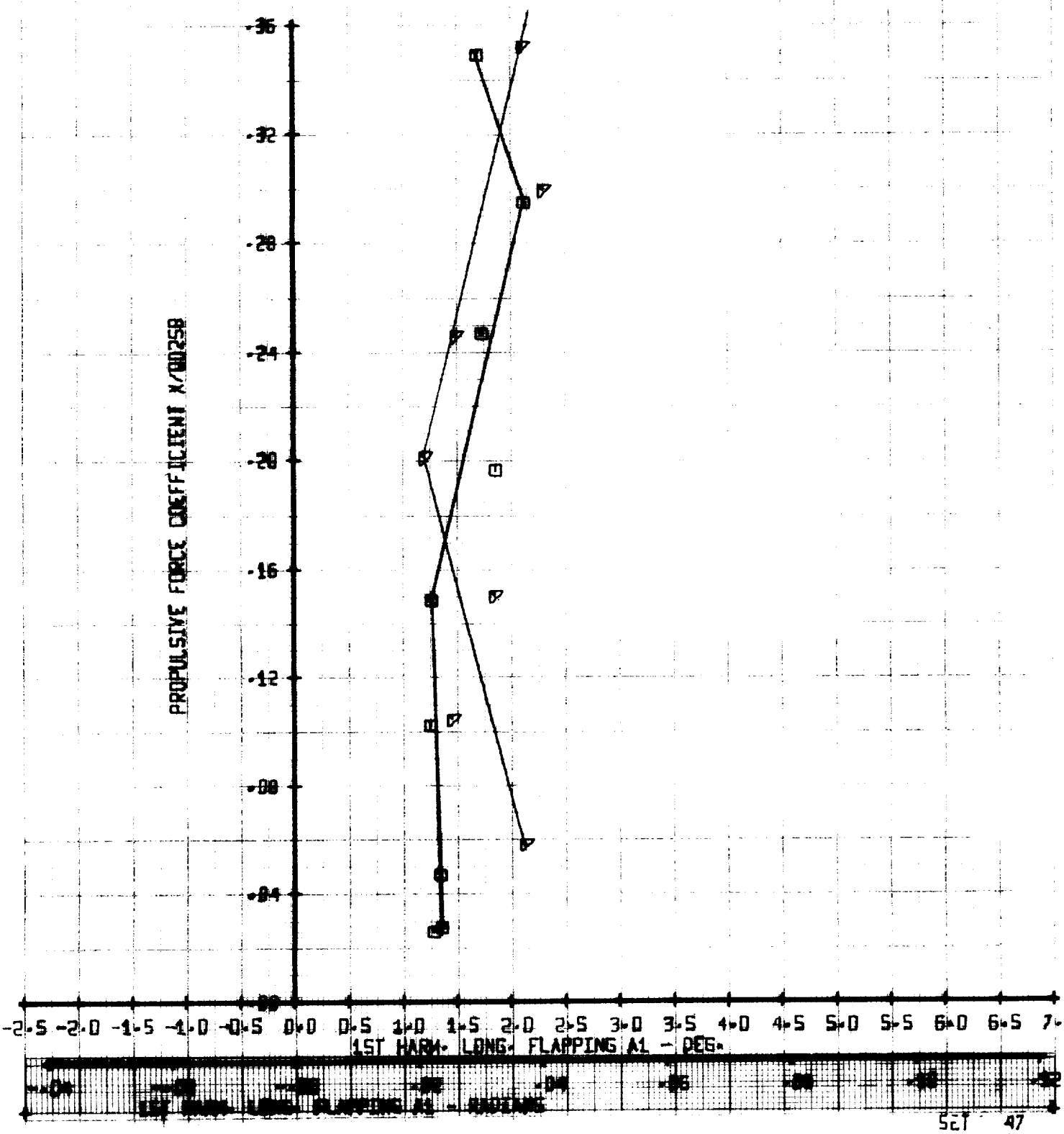


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 47
WT 193

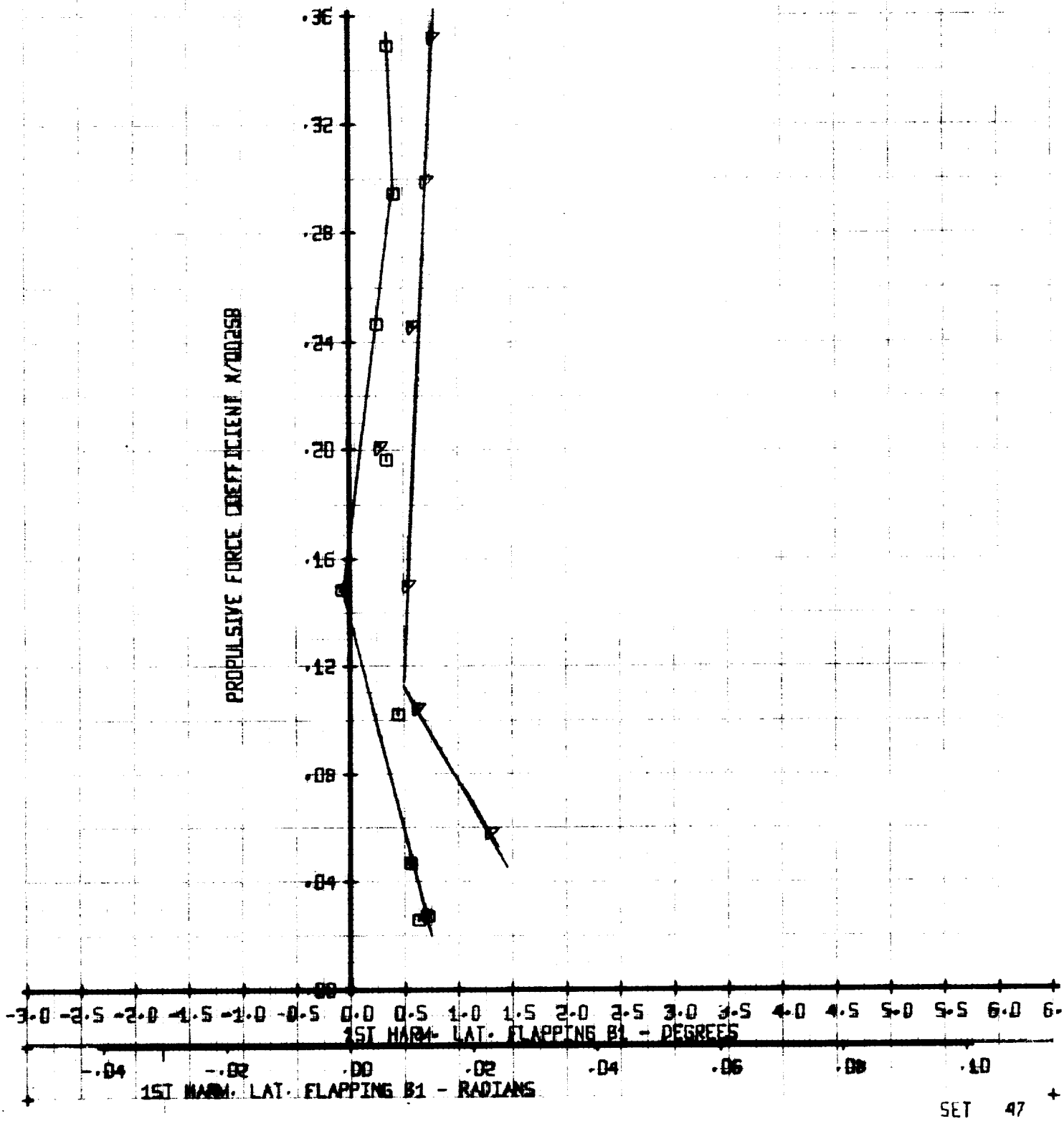
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



CT 47
WT 193

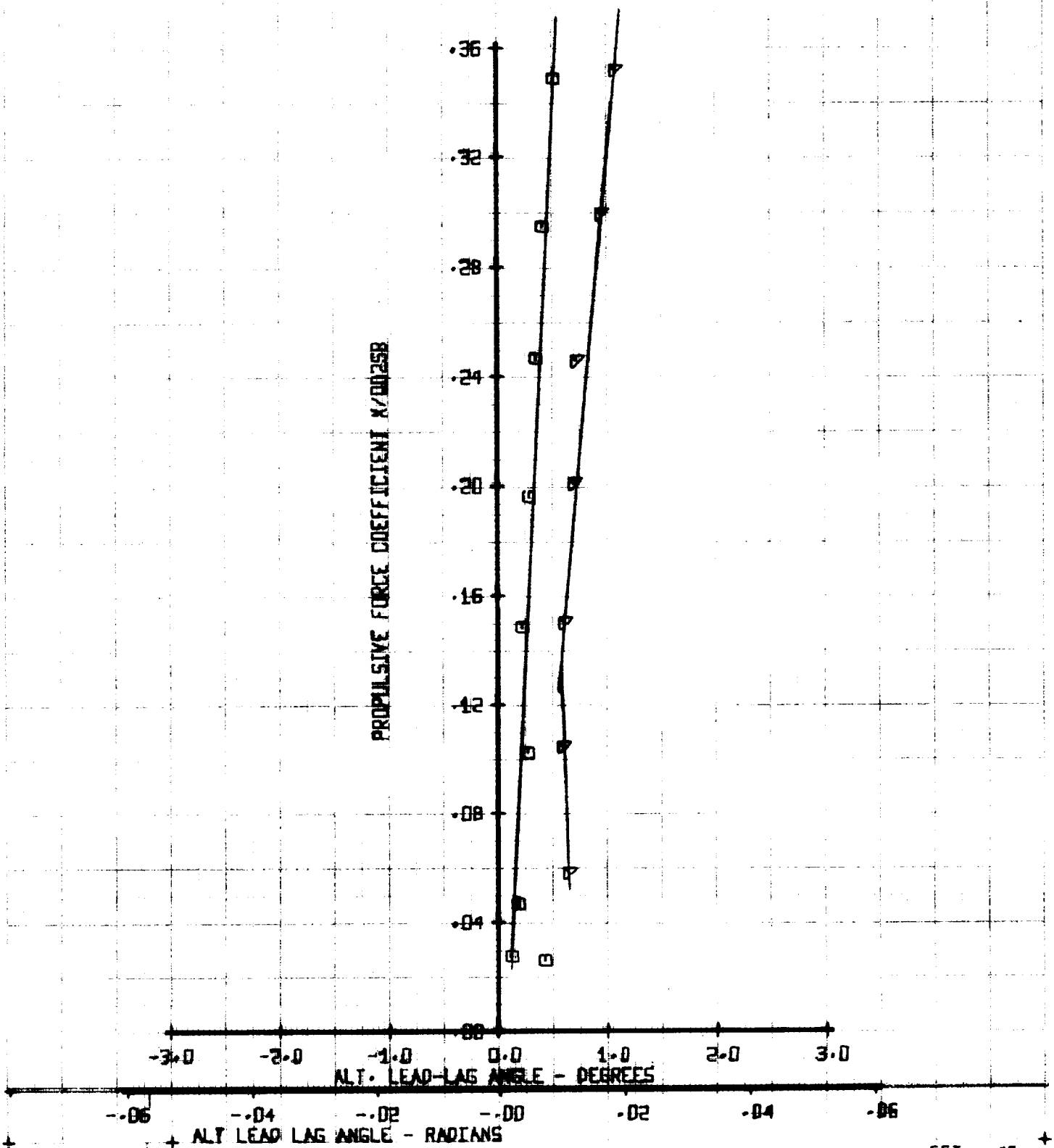
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



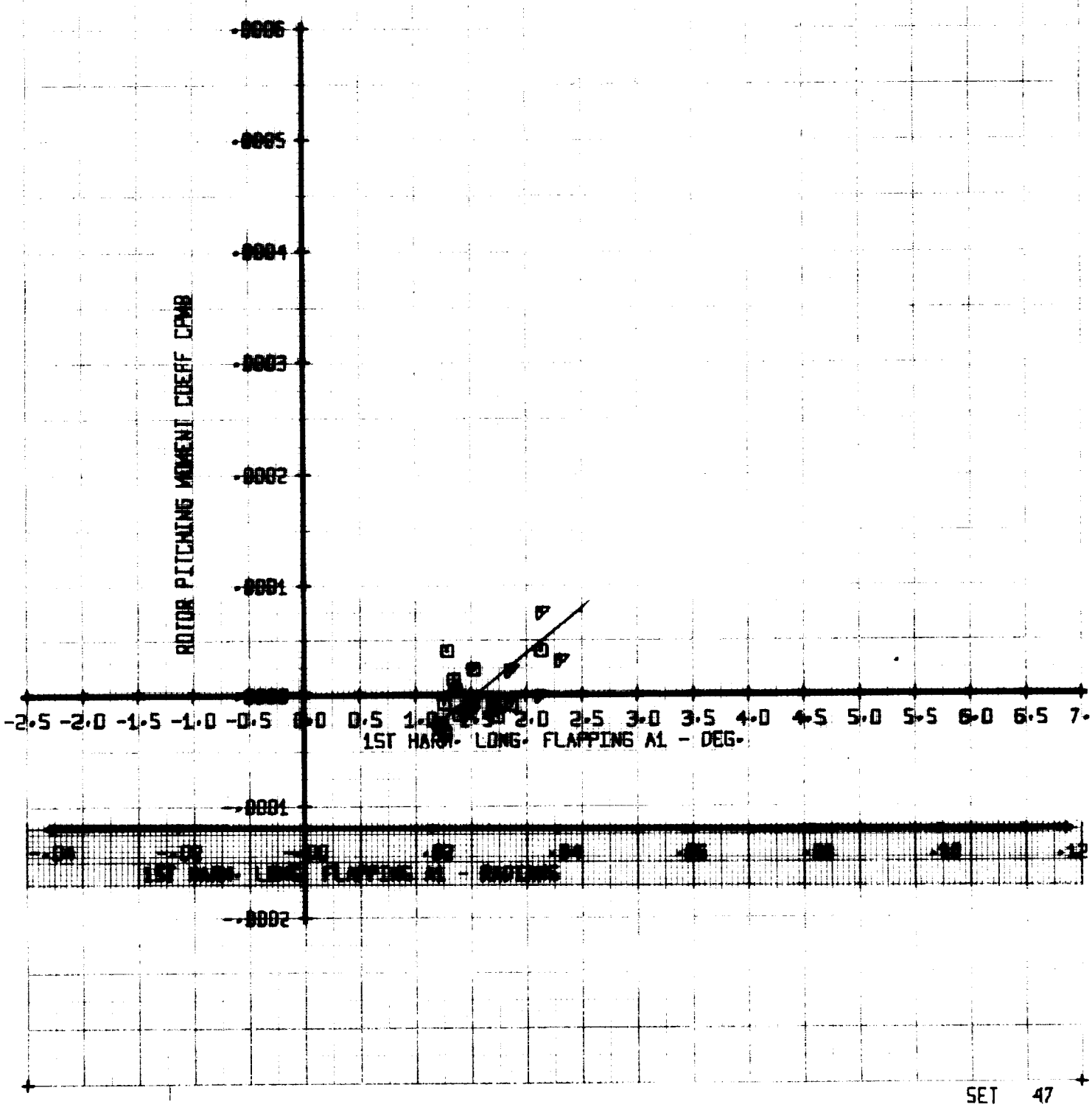
SET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	240
▽	231	.40	.09	240

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 47
WT 193

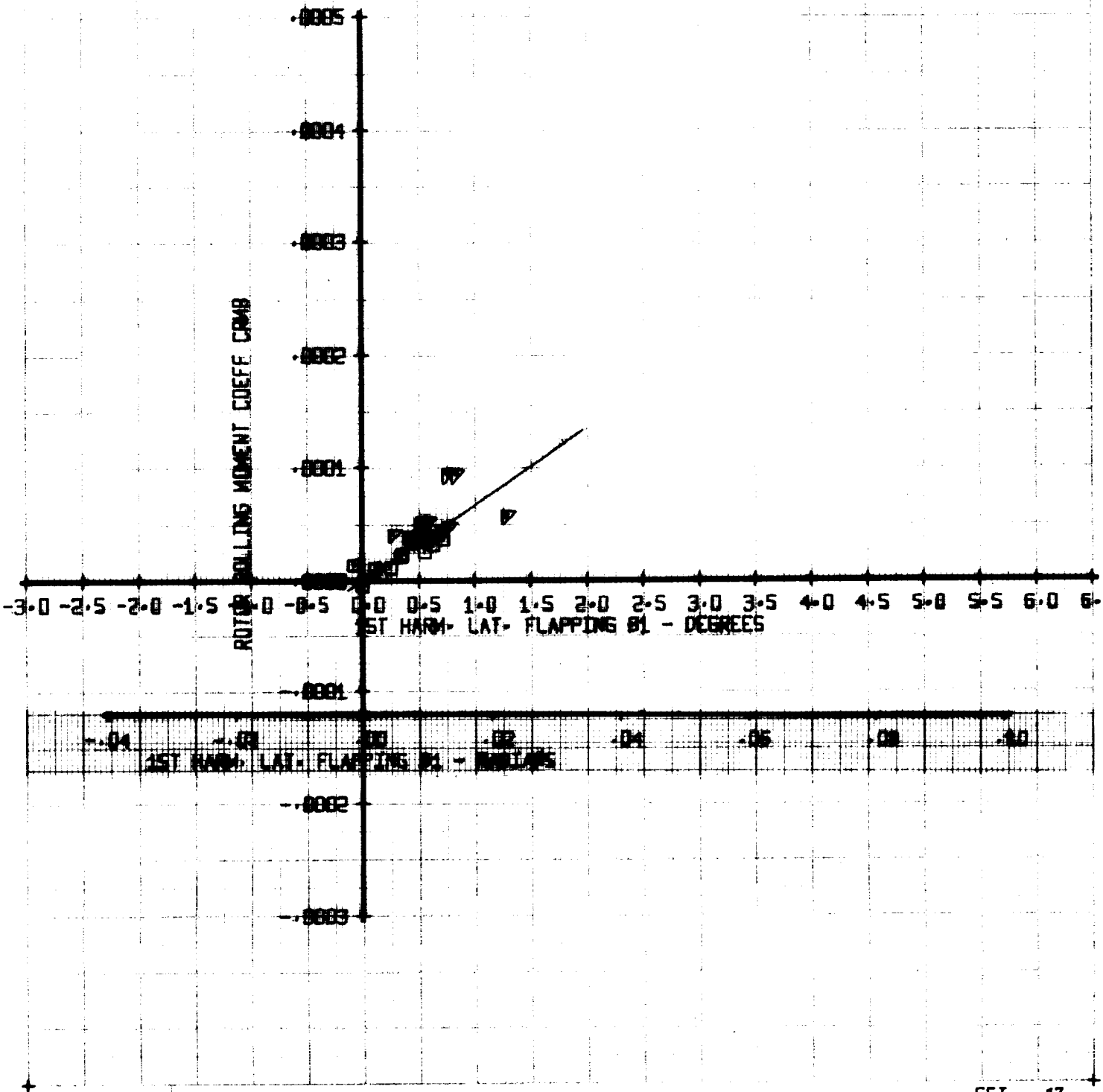
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

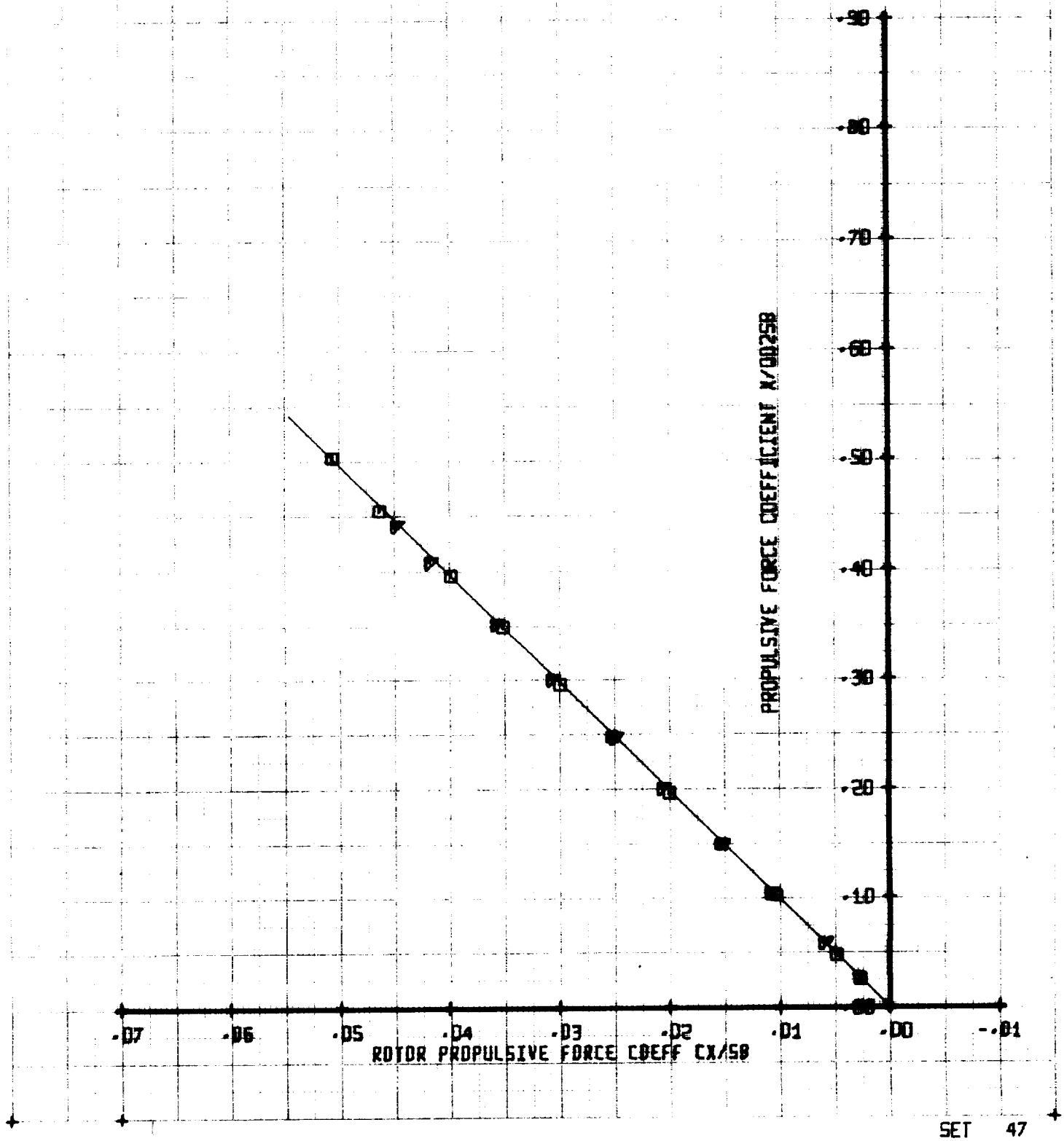
ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
◻	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 47
WT 193

SET 47
BVWT 193

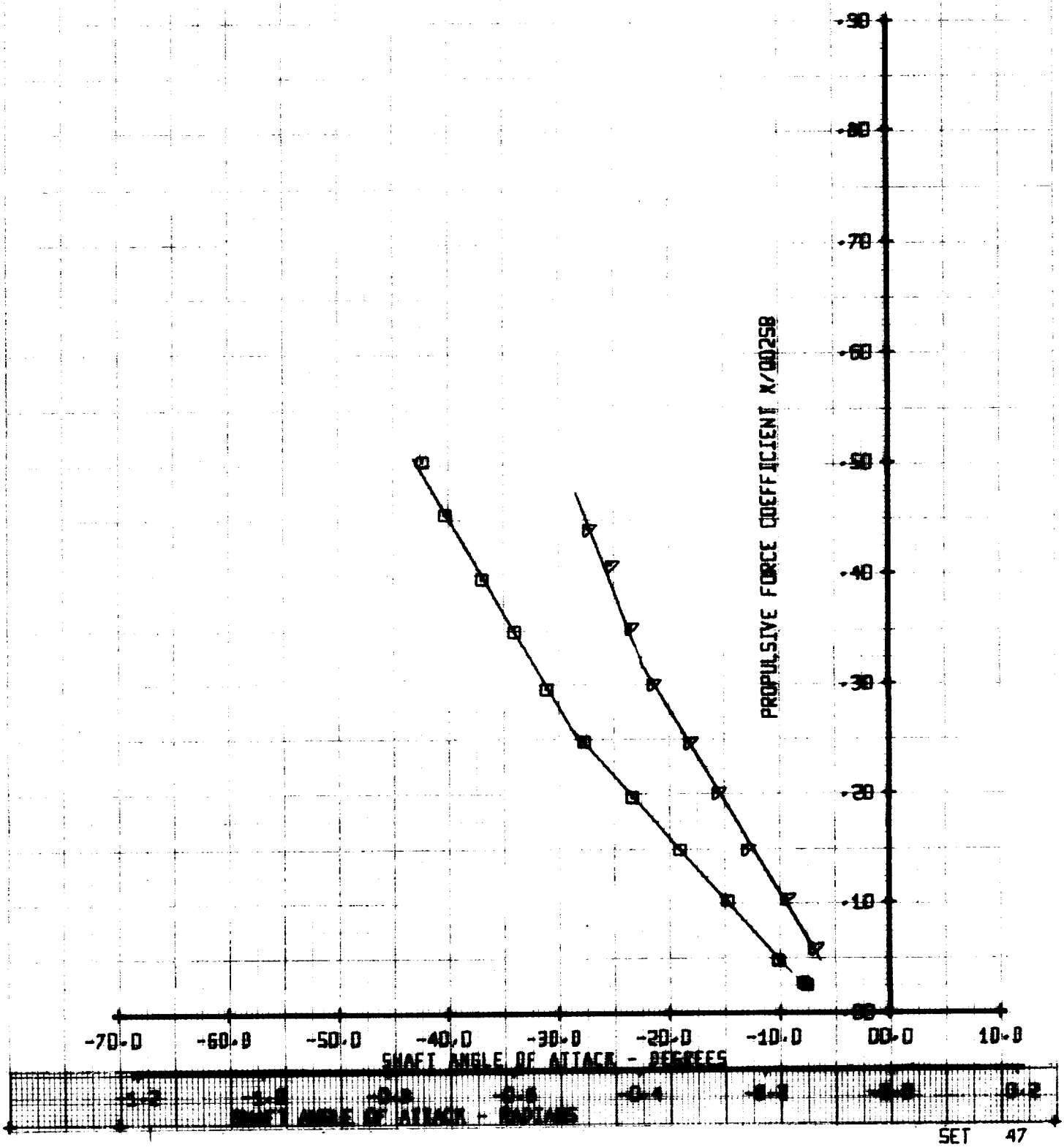
Figure B-25

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 47
WT 193

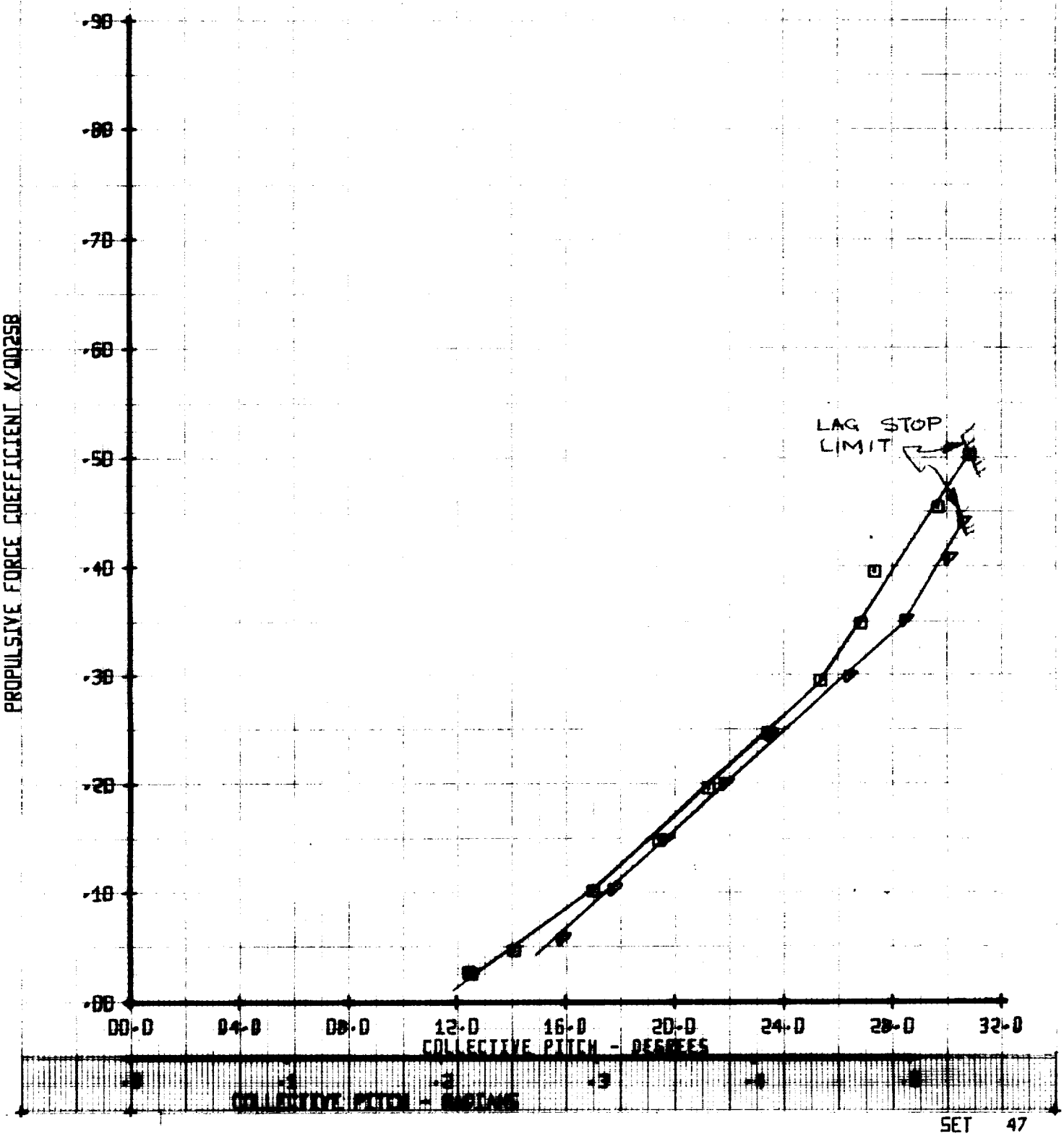
SET 47
BVWT 193

Figure B-26

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 47
WT 193

SET 47
BVWT 193

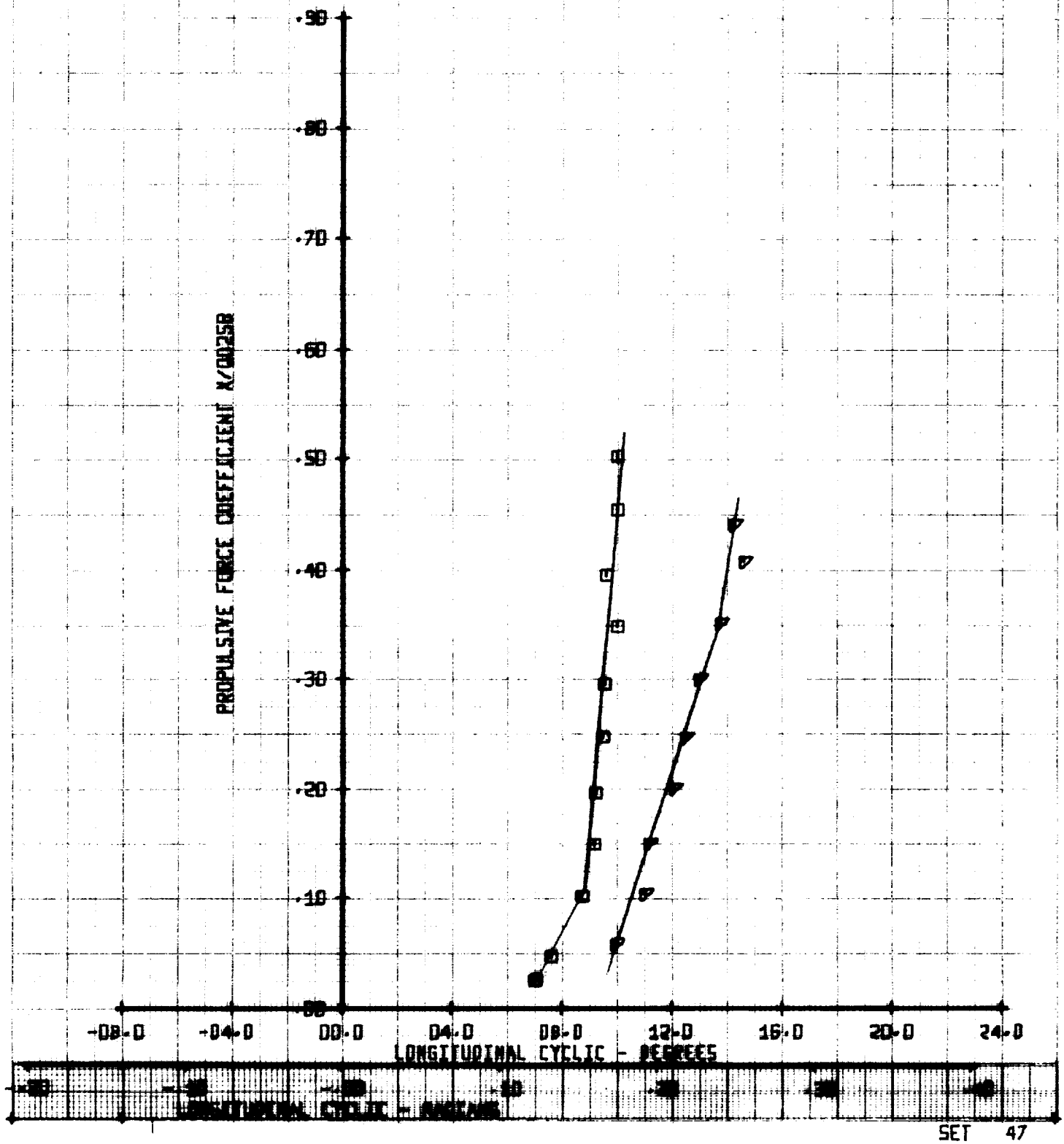
Figure B-27

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
◎	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC

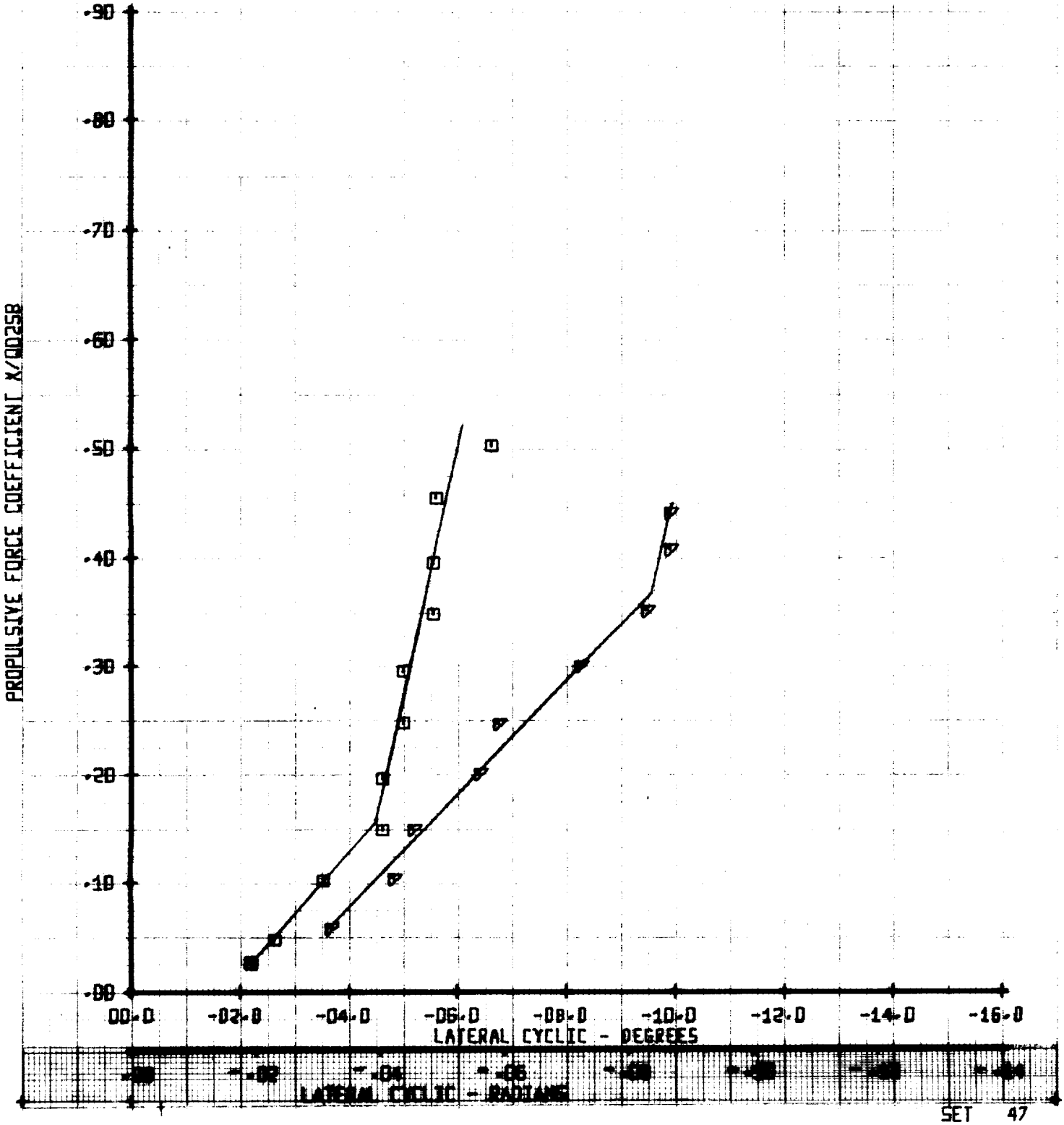


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 47
WT 193

SET 47
BVWT 193

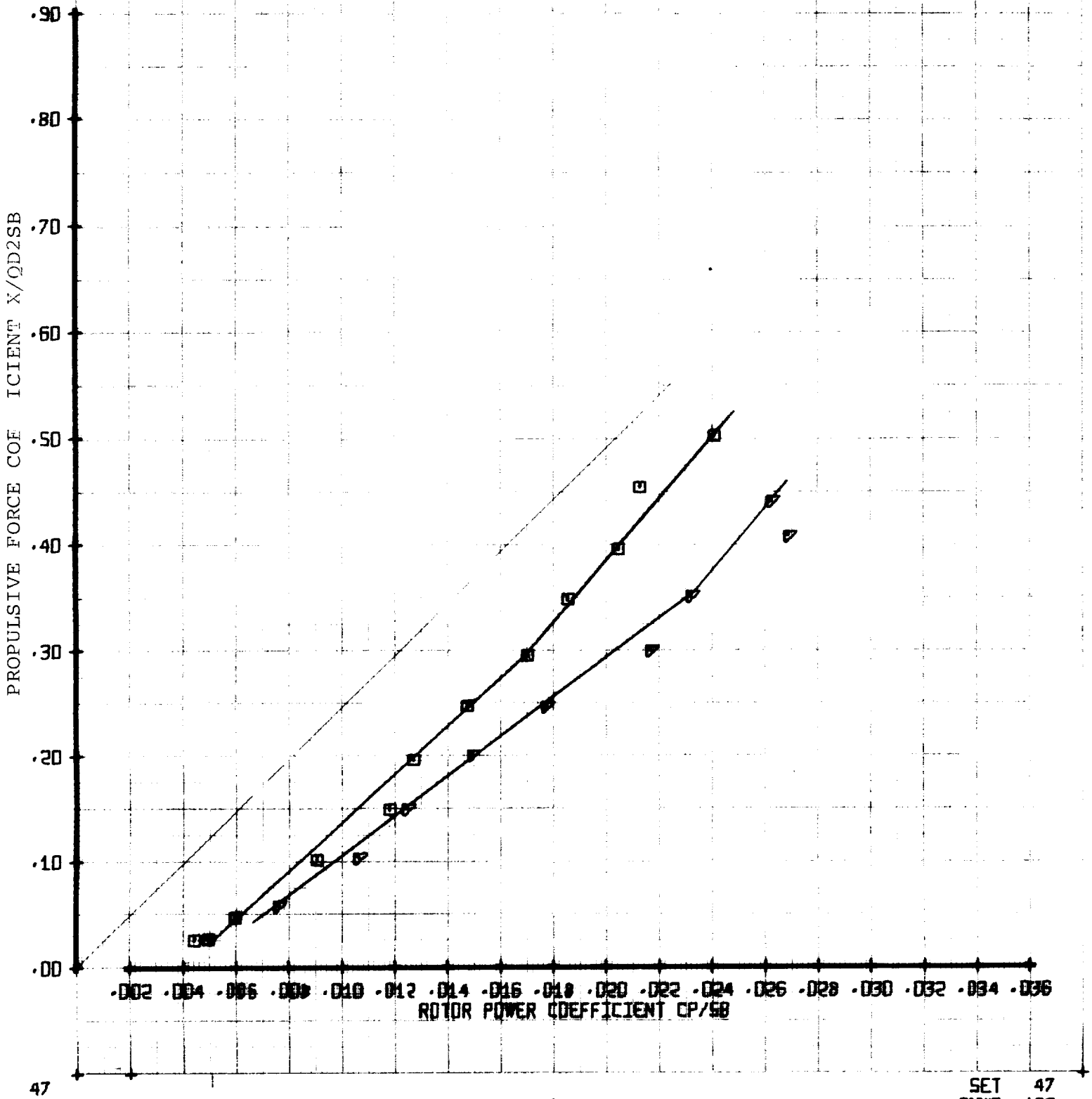
Figure B-29

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 47
WT 193

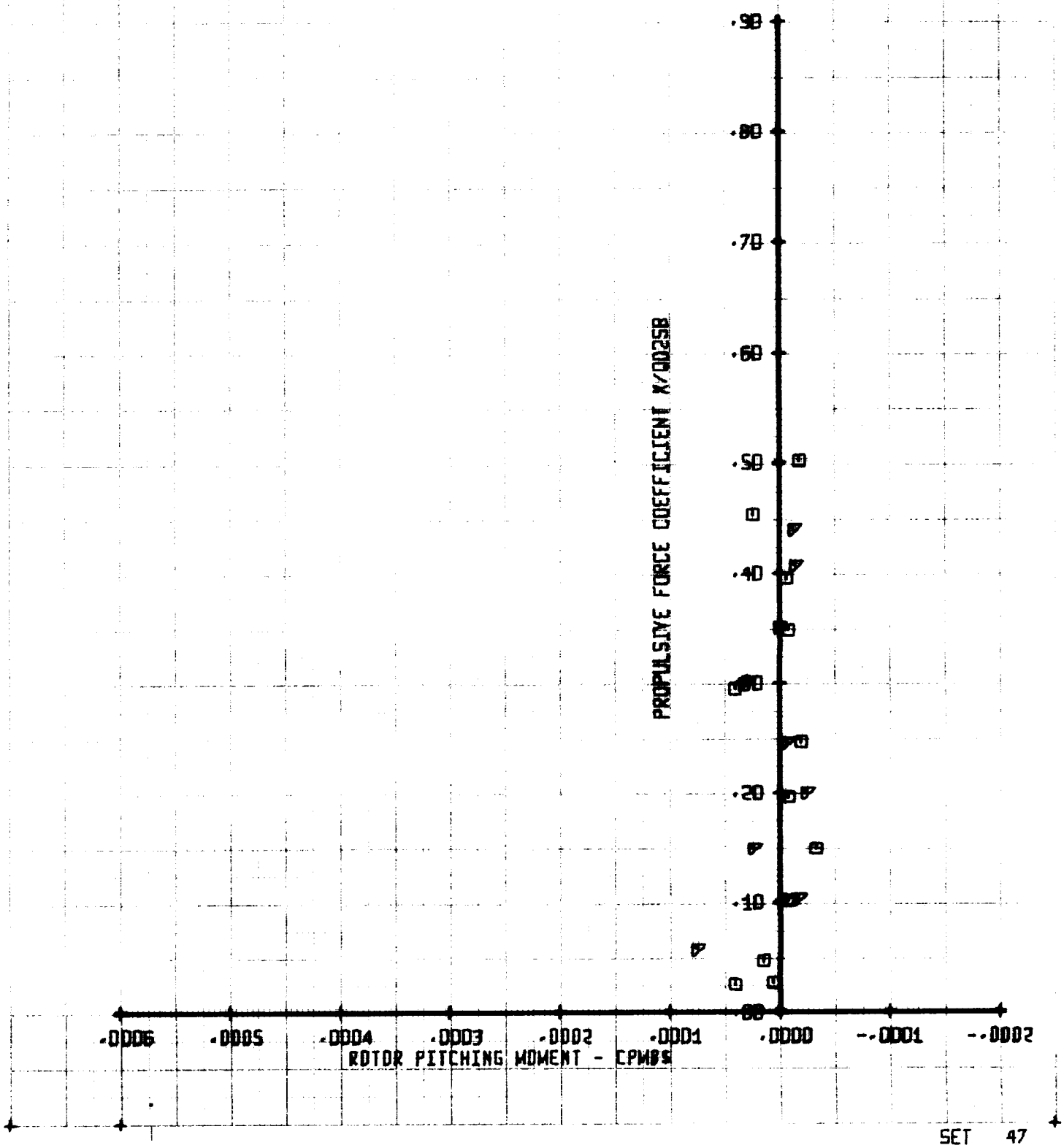
SET 47
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	24B
▽	231	.40	.09	24B

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 47
WT 193

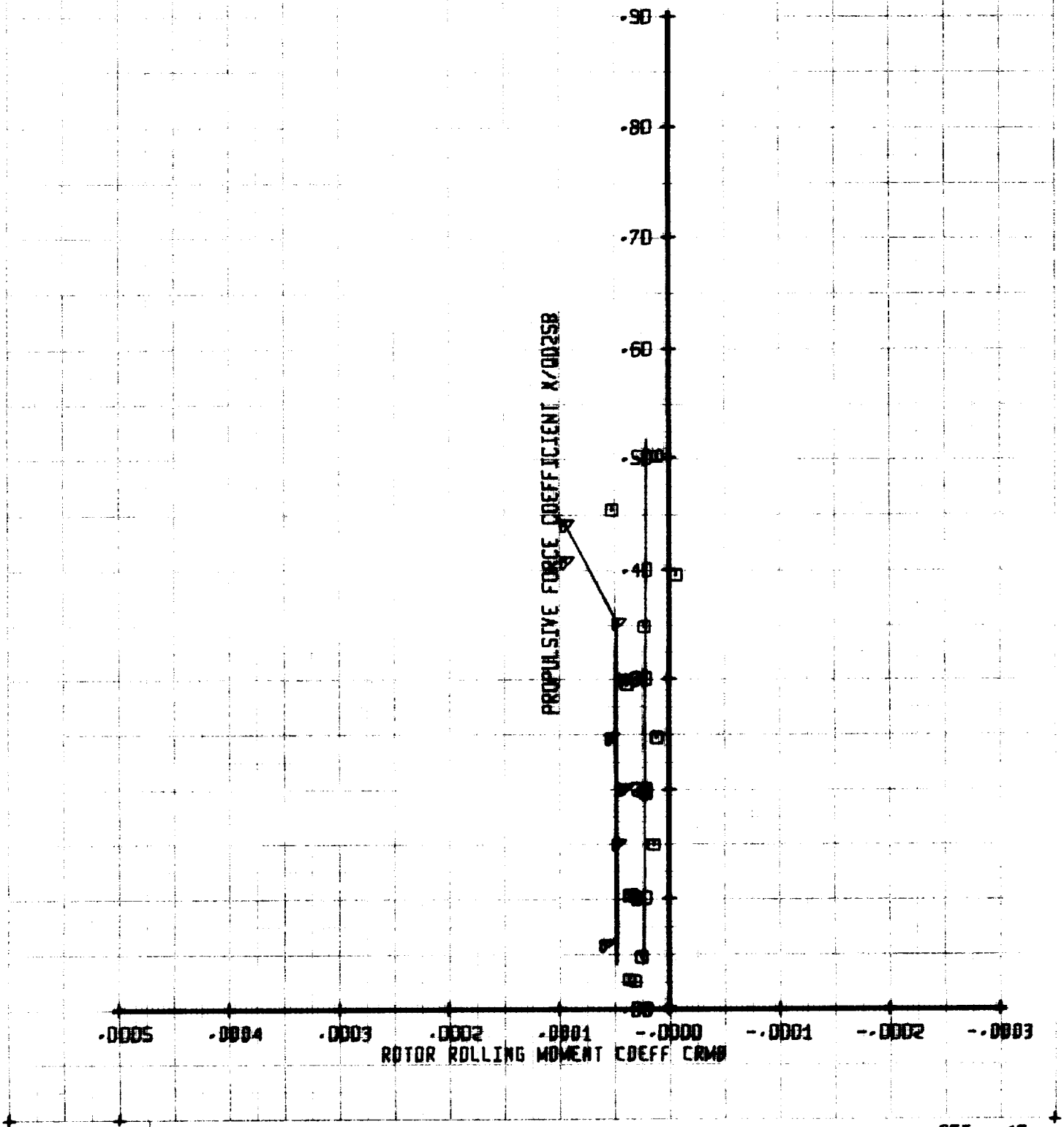
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT

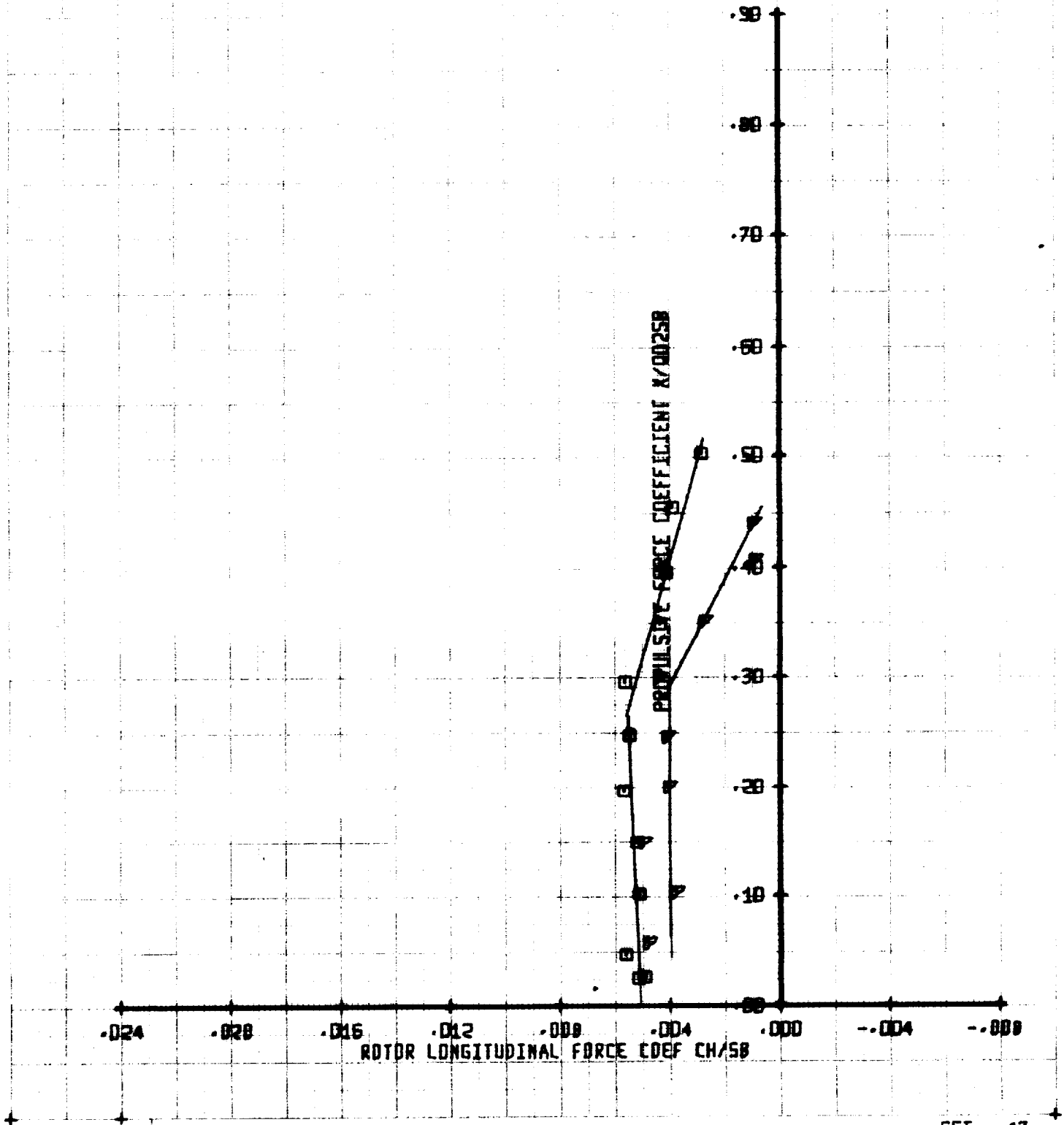


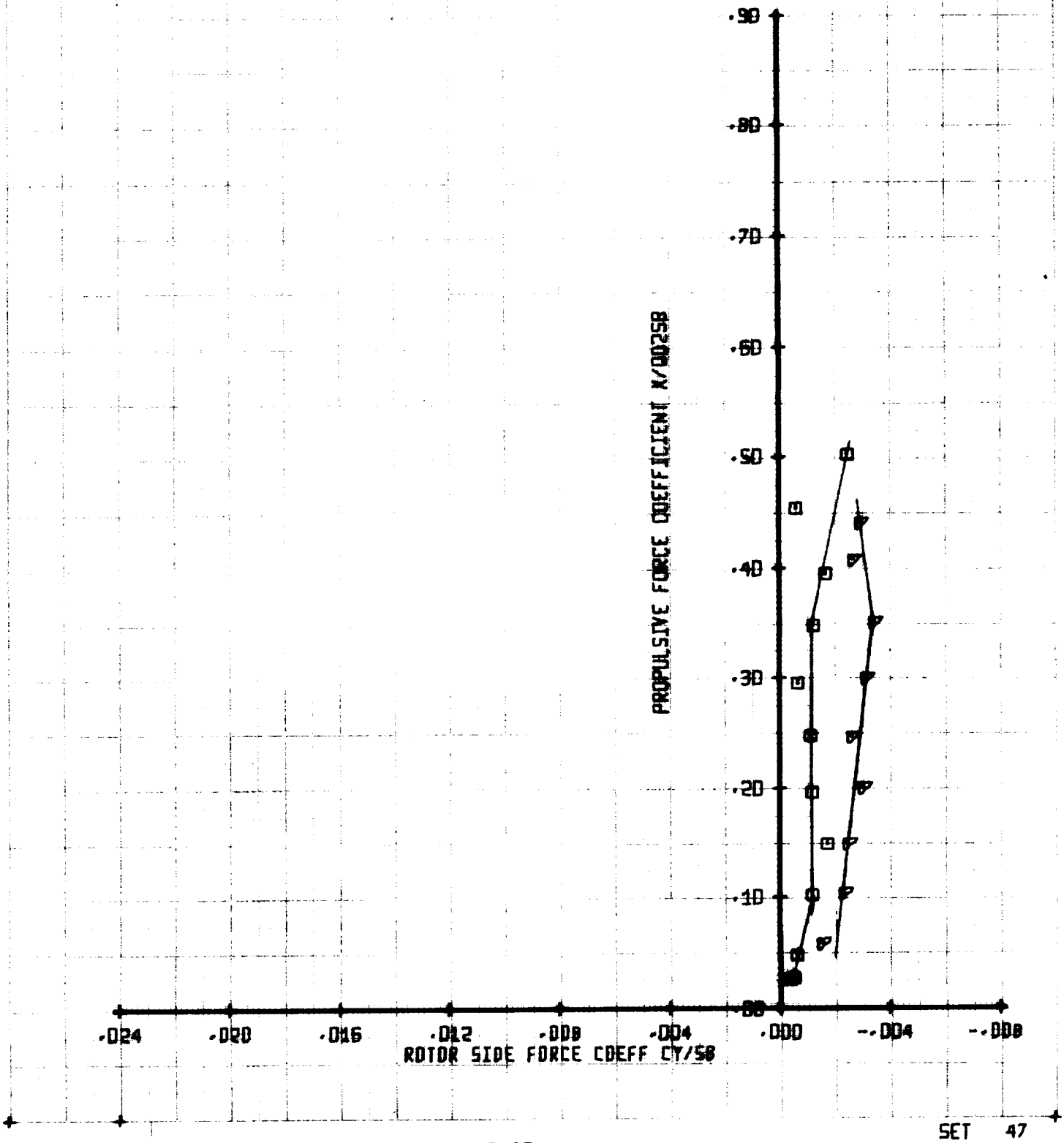
Figure B-33

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 47
NT 193

SET 47
BVWT 193

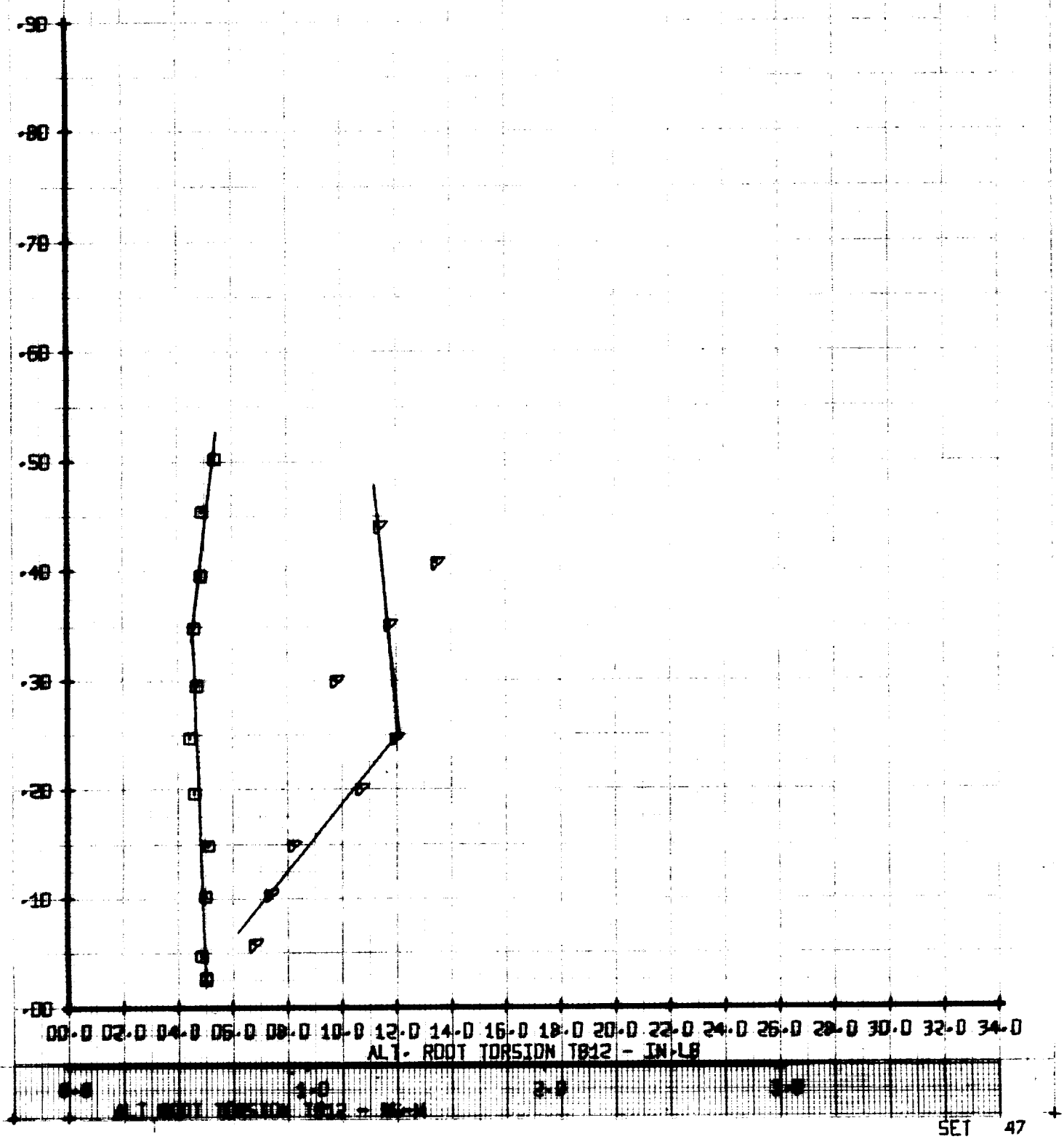
Figure B-34

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



SET 47
WT 193

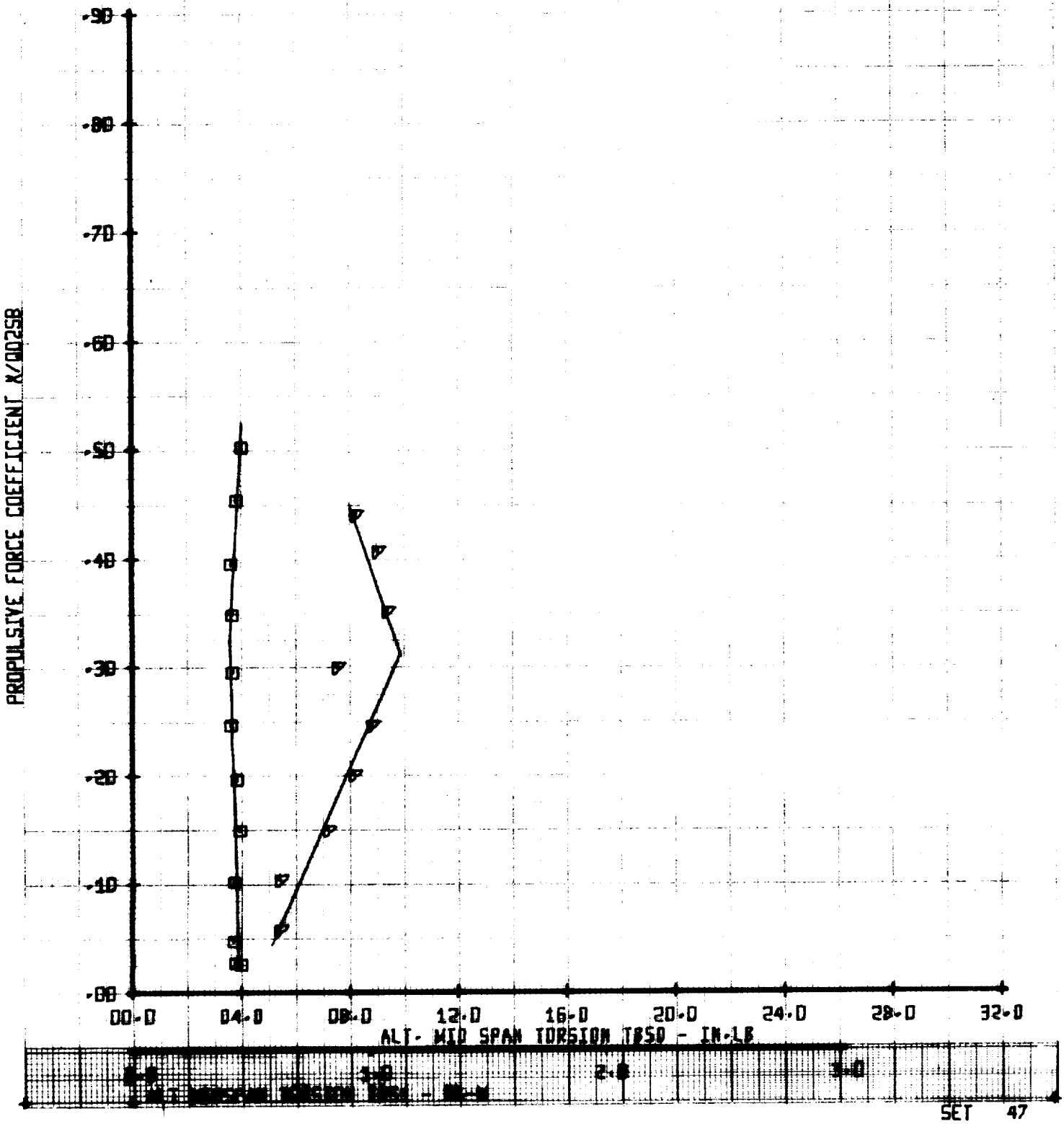
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



SET 47
BWT 193

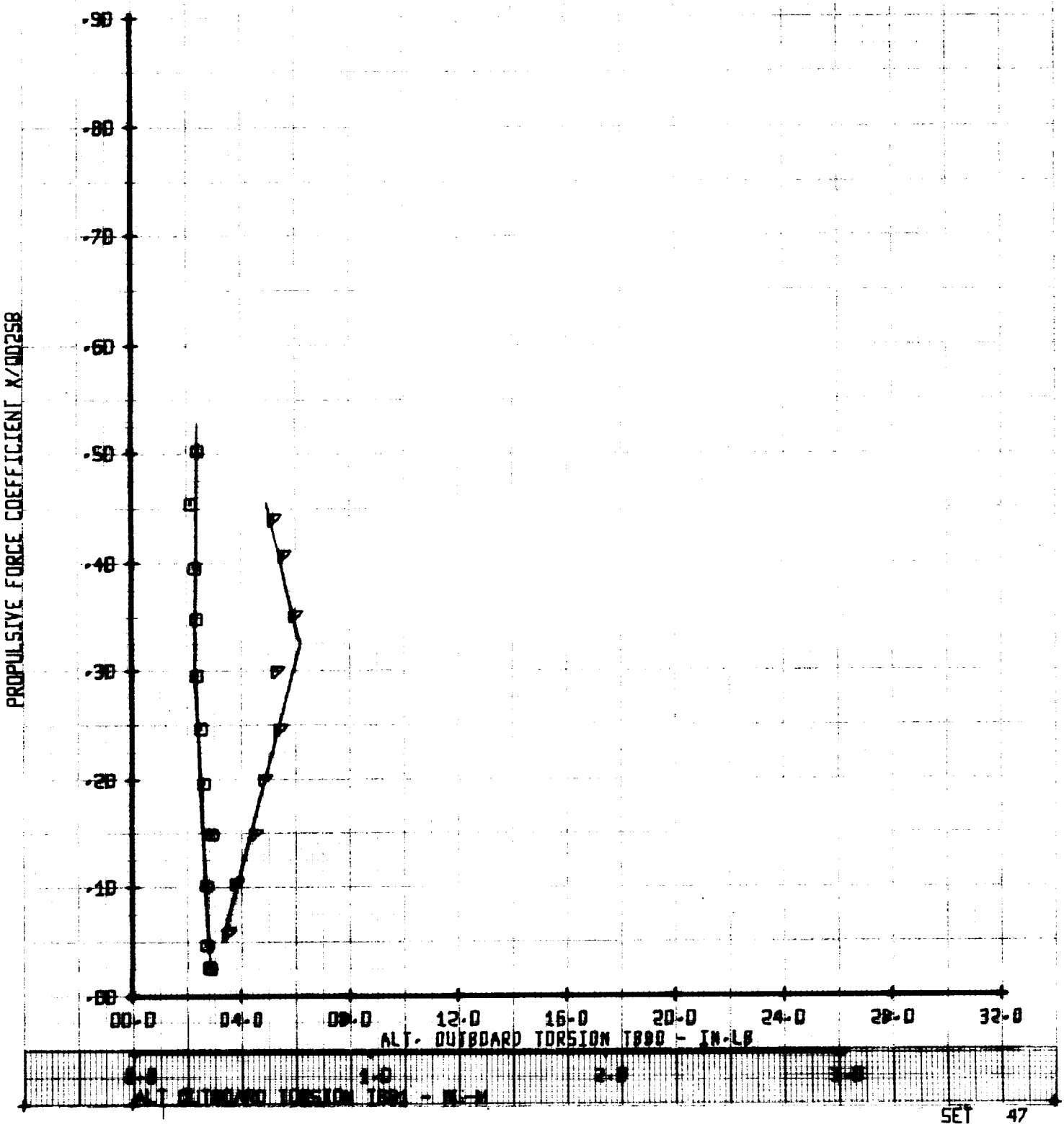
SET 47
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



SET 47
BVWT 193

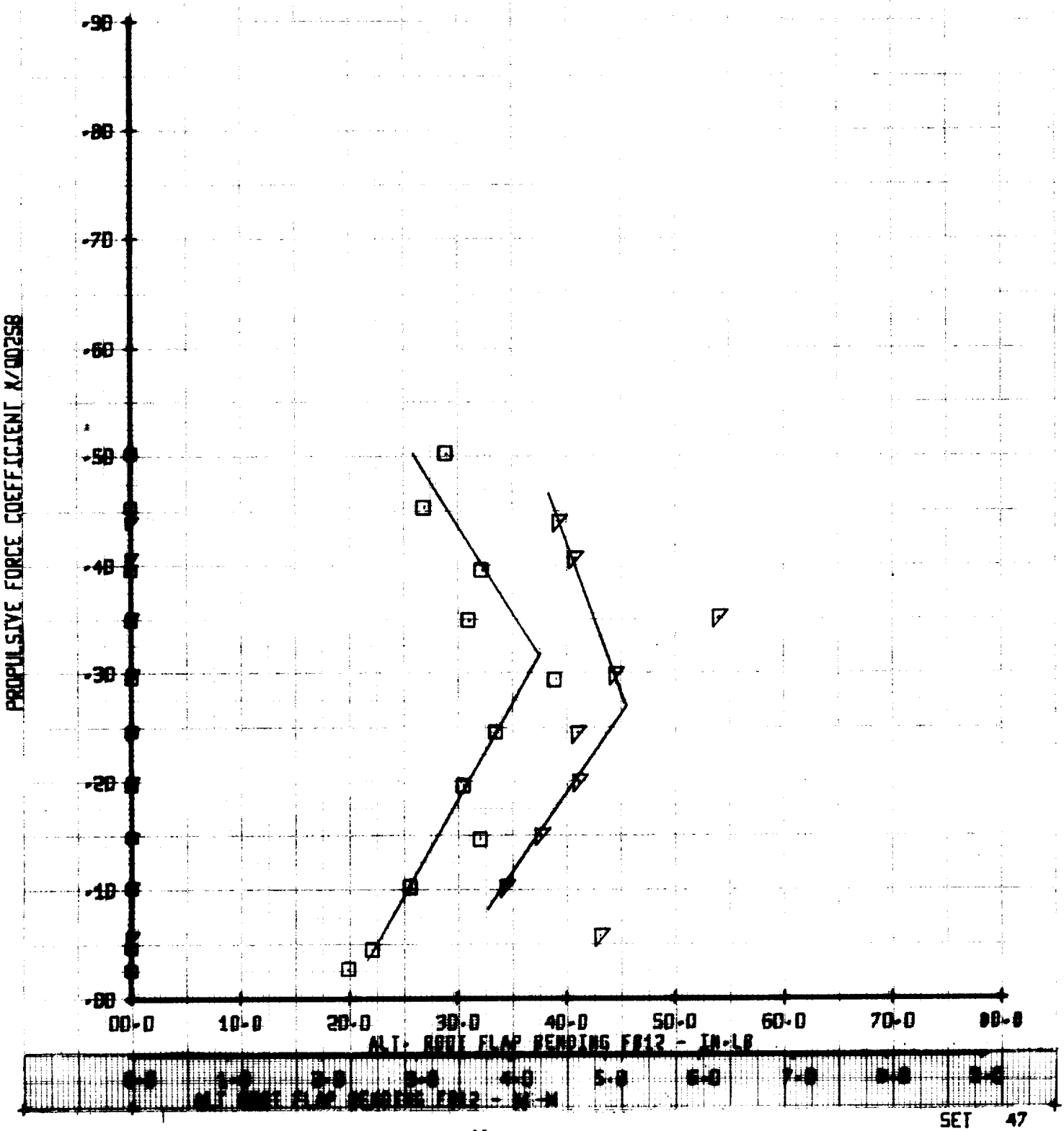
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 47
WT 193

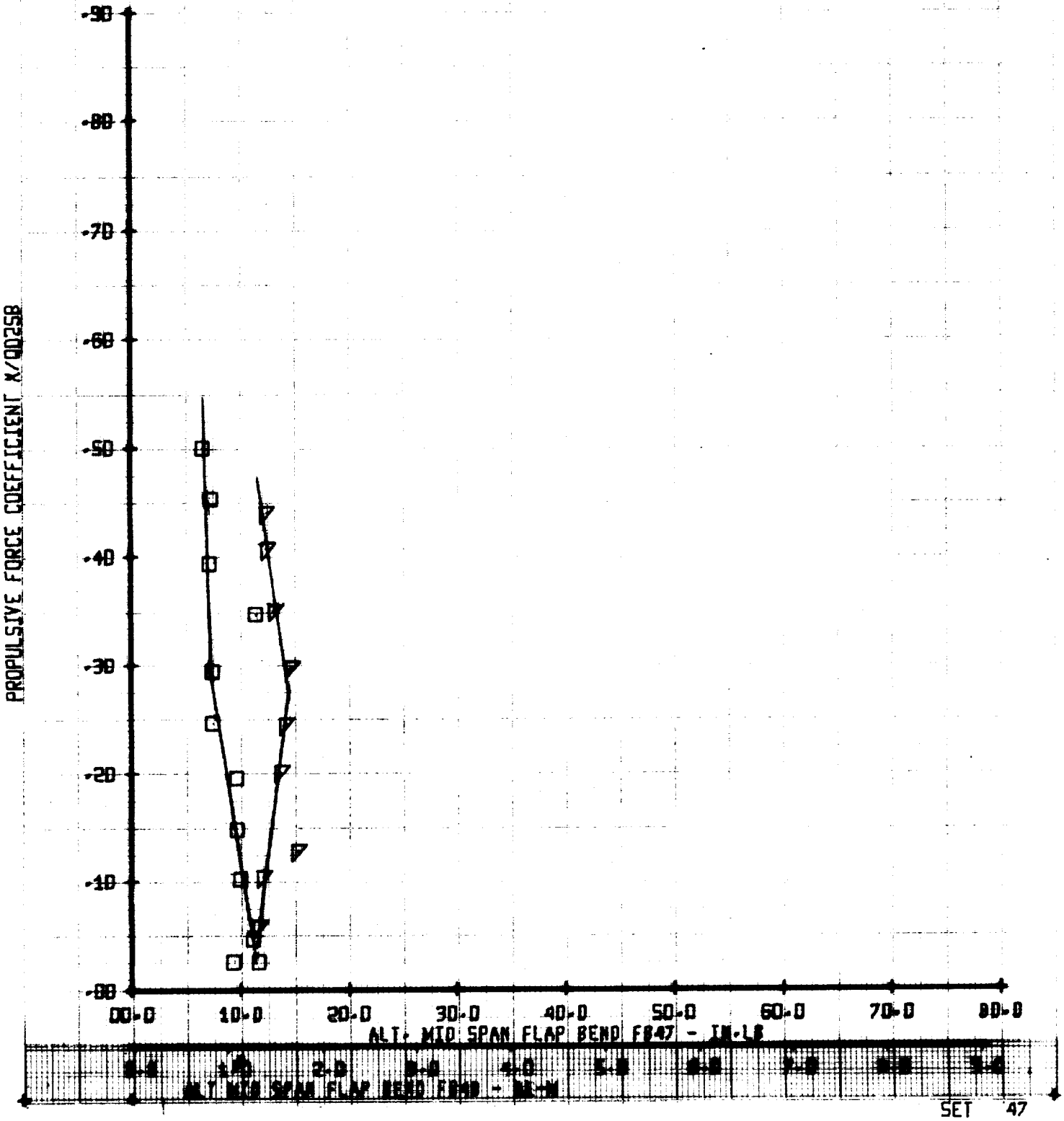
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB47



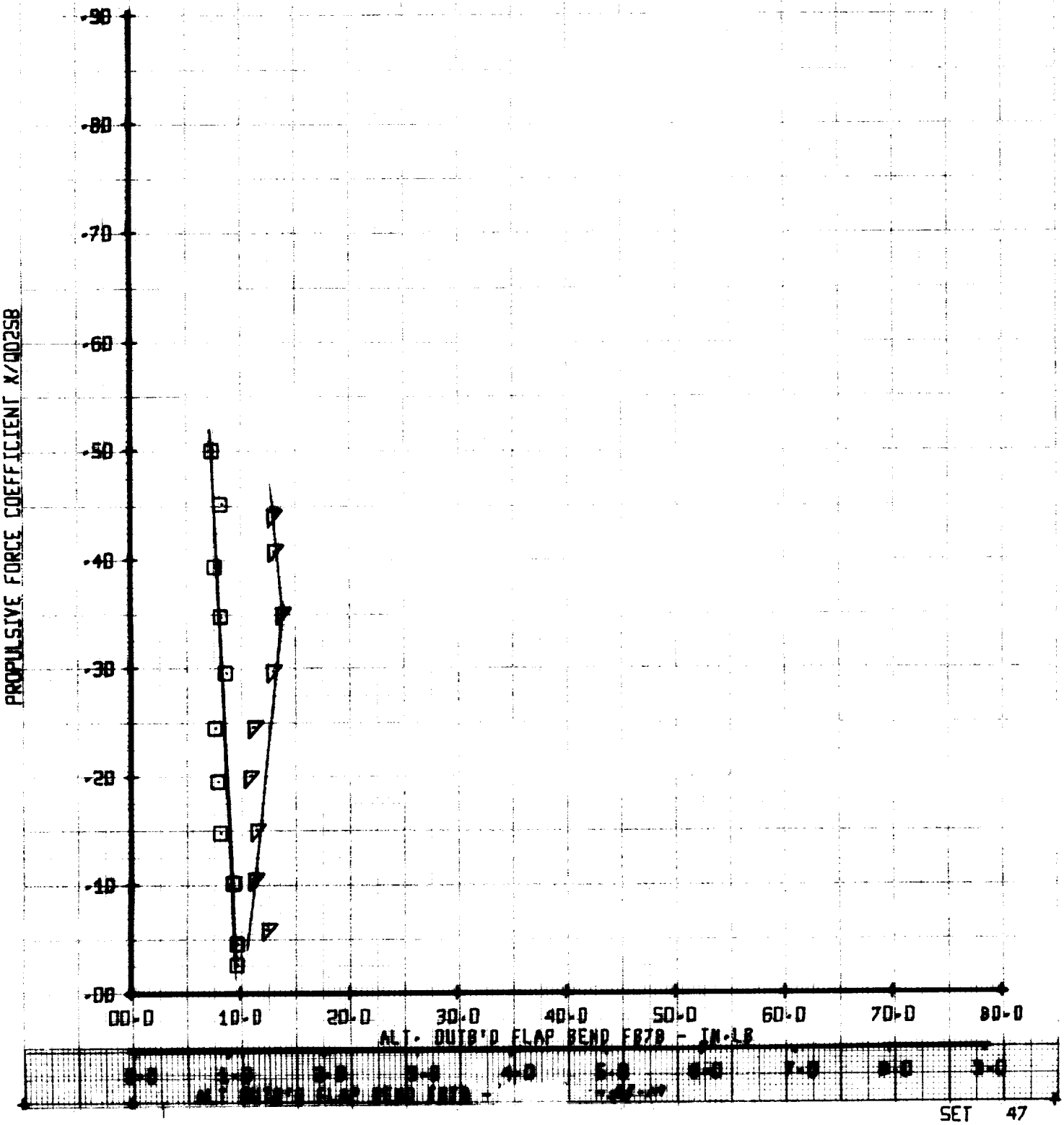
ET 47
WT 193

SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
⊡	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



ET 47
WT 193

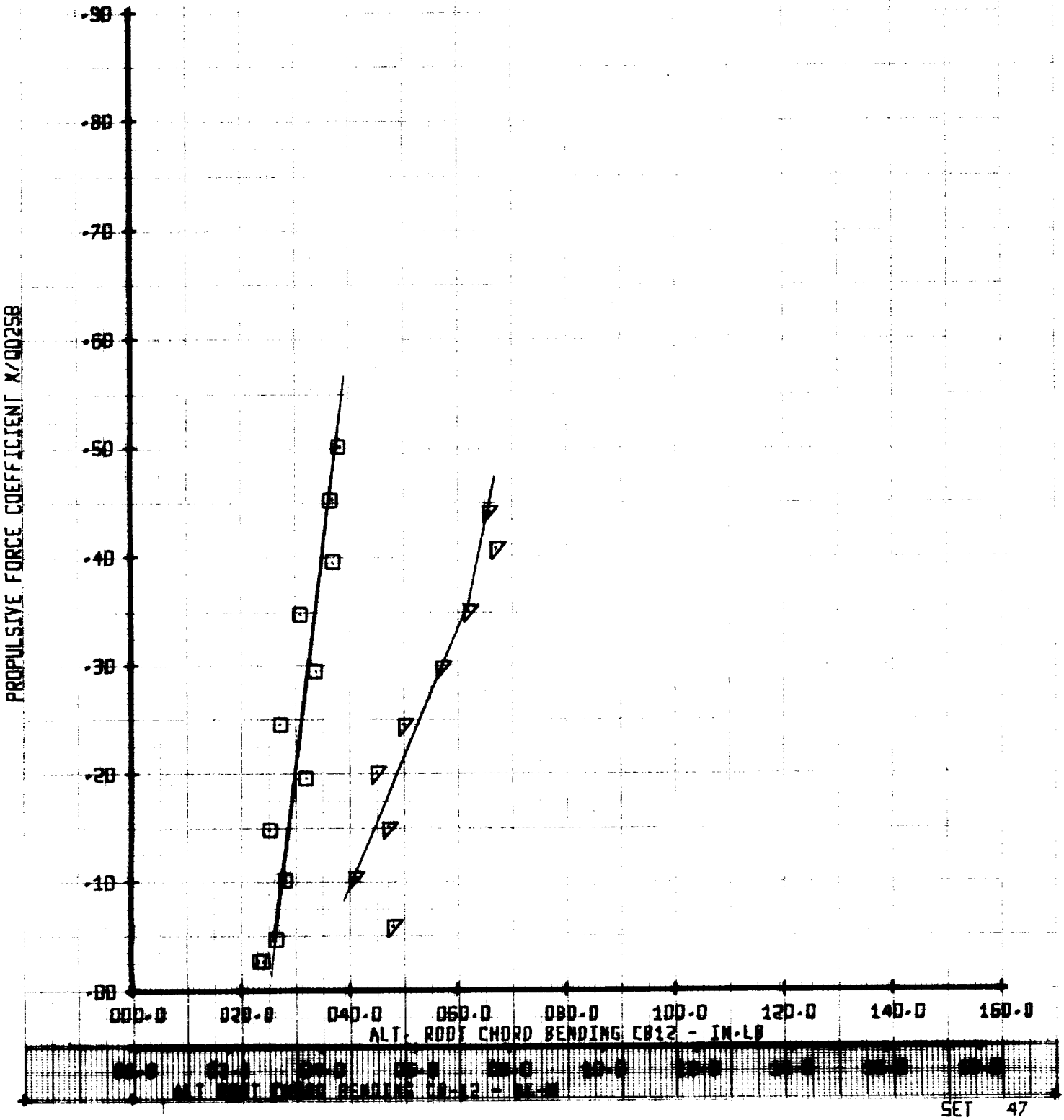
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 47
WT 193

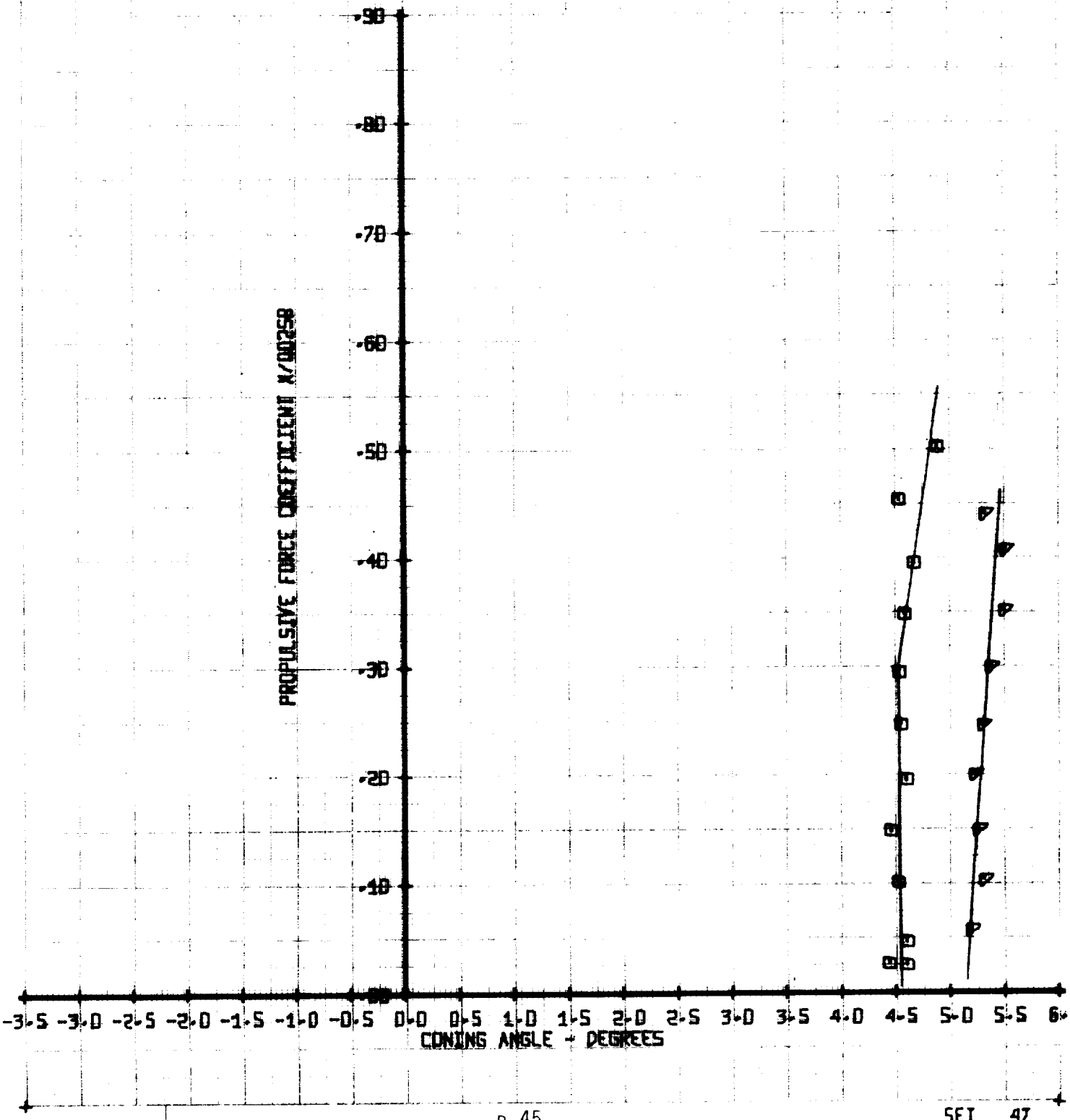
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊙	230	.40	.06	248
▽	231	.40	.09	248

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



ET 47
WT 193

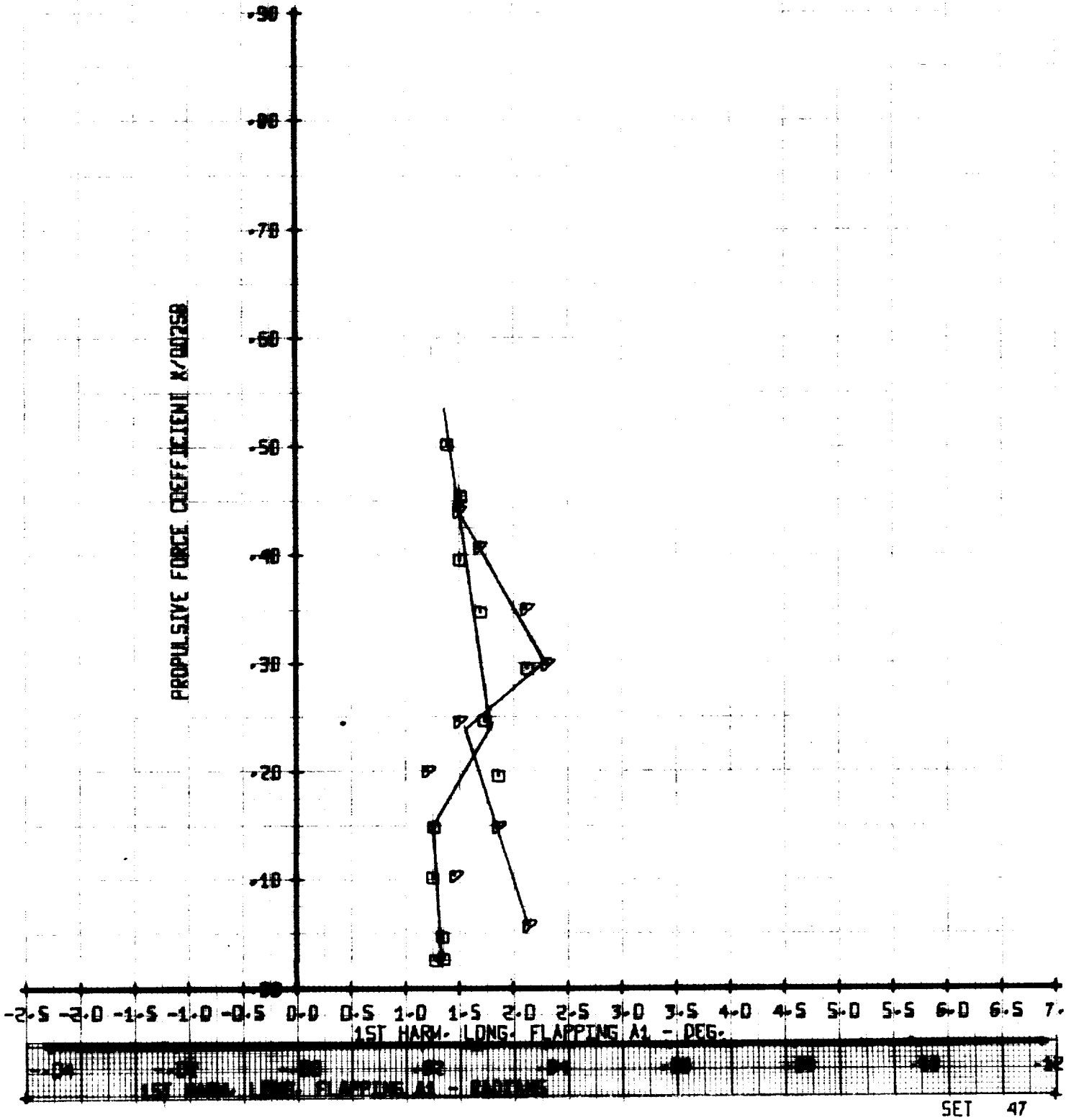
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 47
WT 193

SET 47
BVWT 193

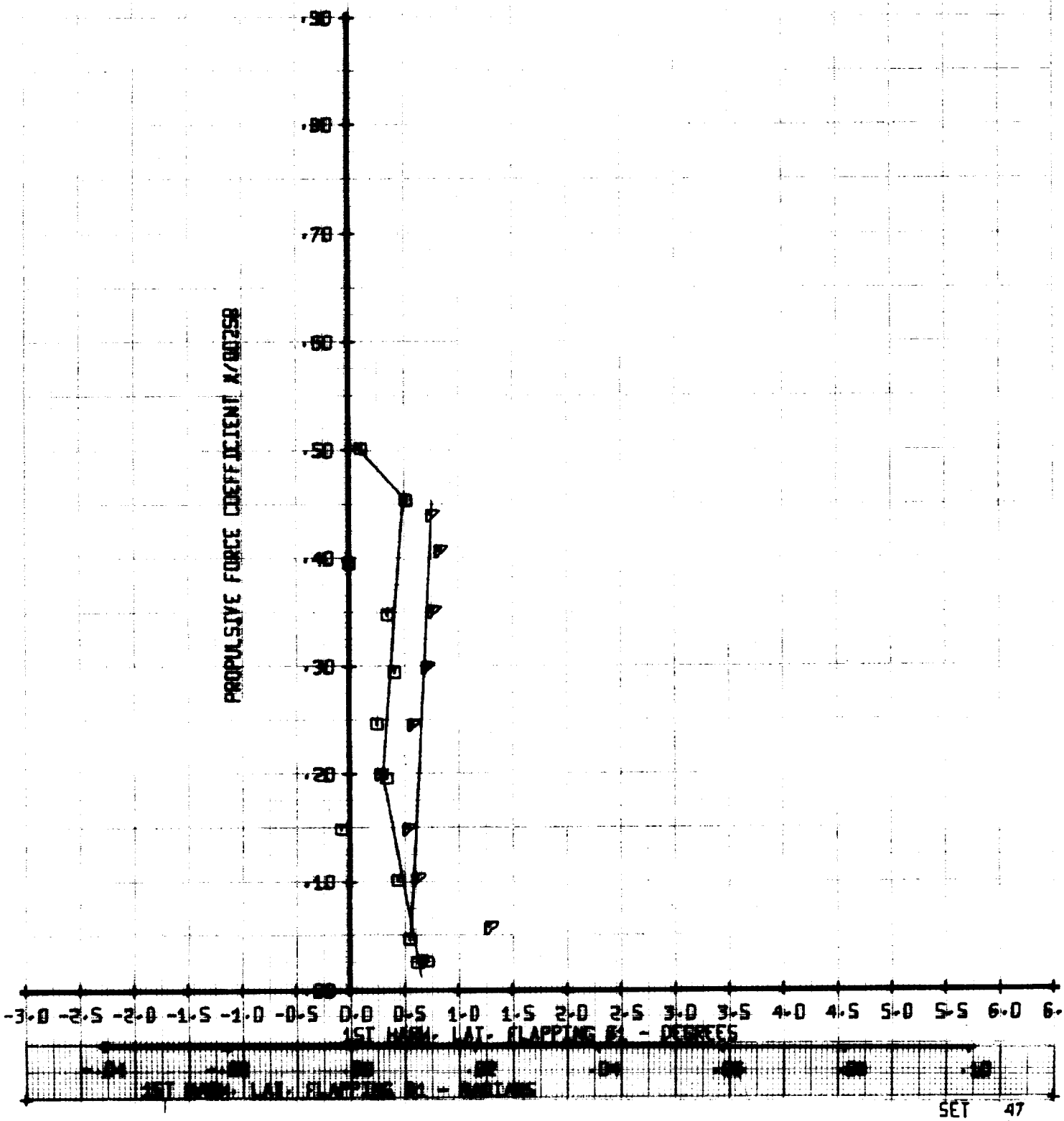
Figure B-43

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 47
WT 193

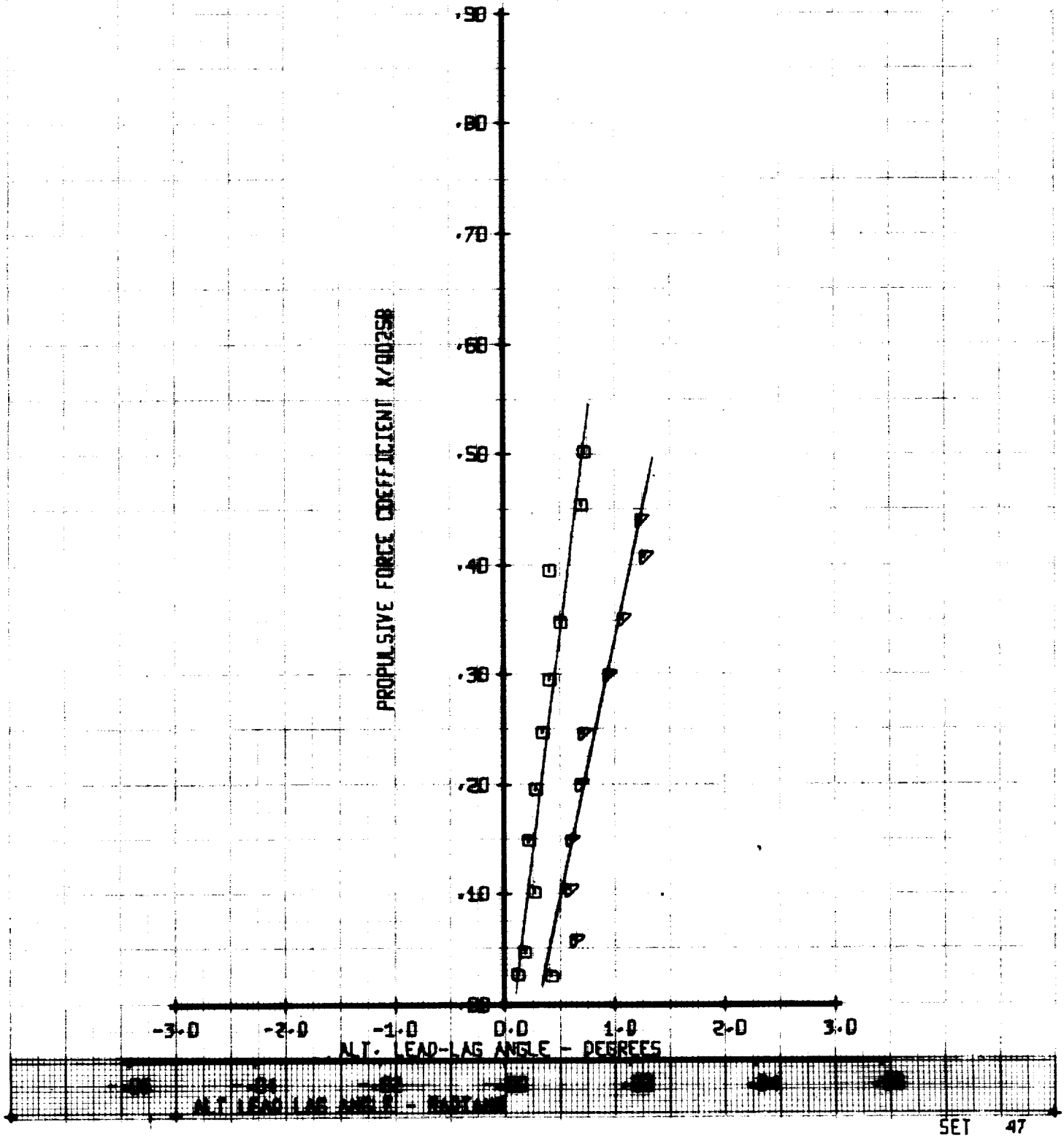
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	240
▽	231	.40	.09	240

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 47
WT 193

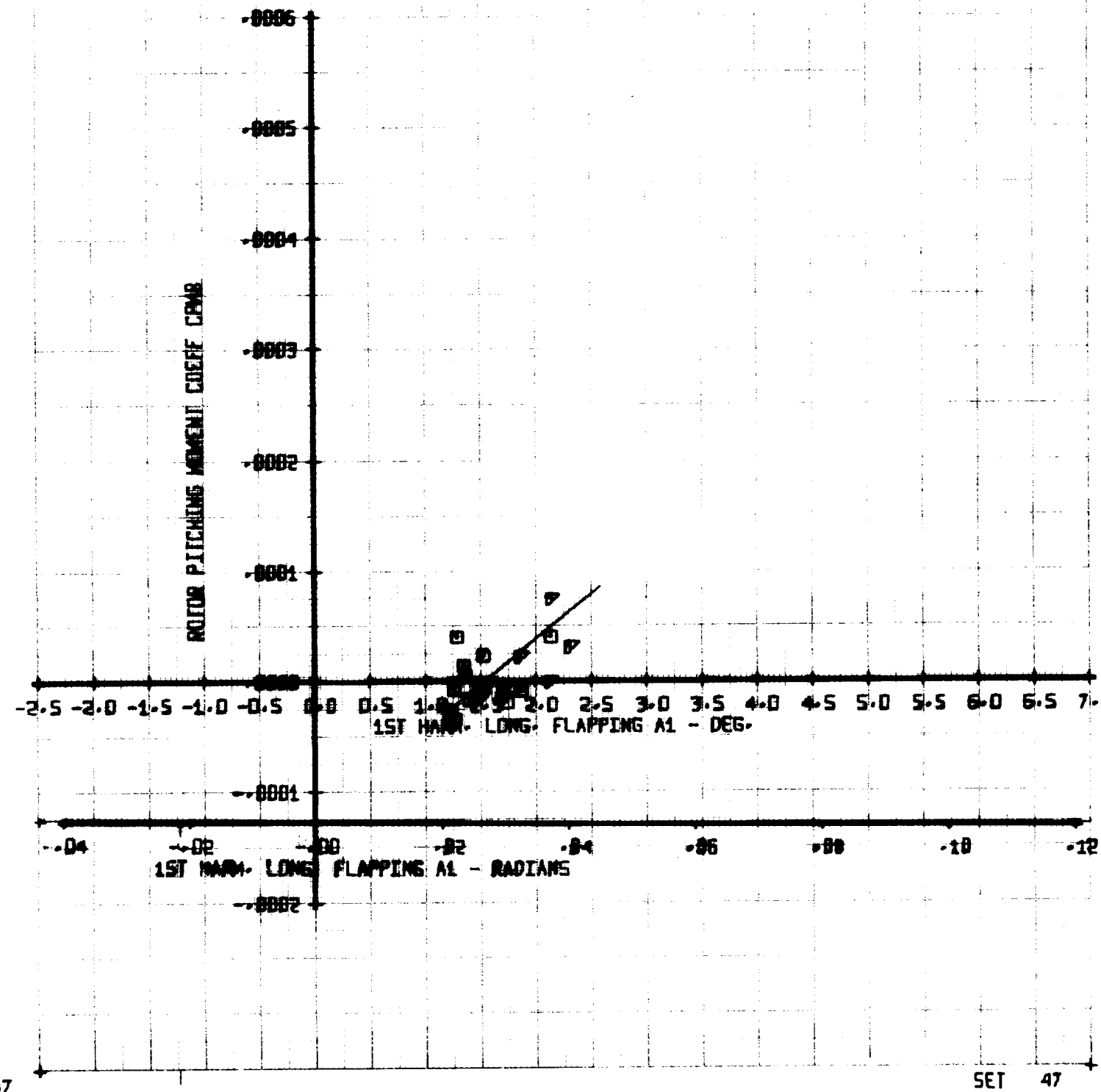
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	230	.40	.06	240
▽	231	.40	.09	240

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 47
WT 193

SET 47
BVWT 193

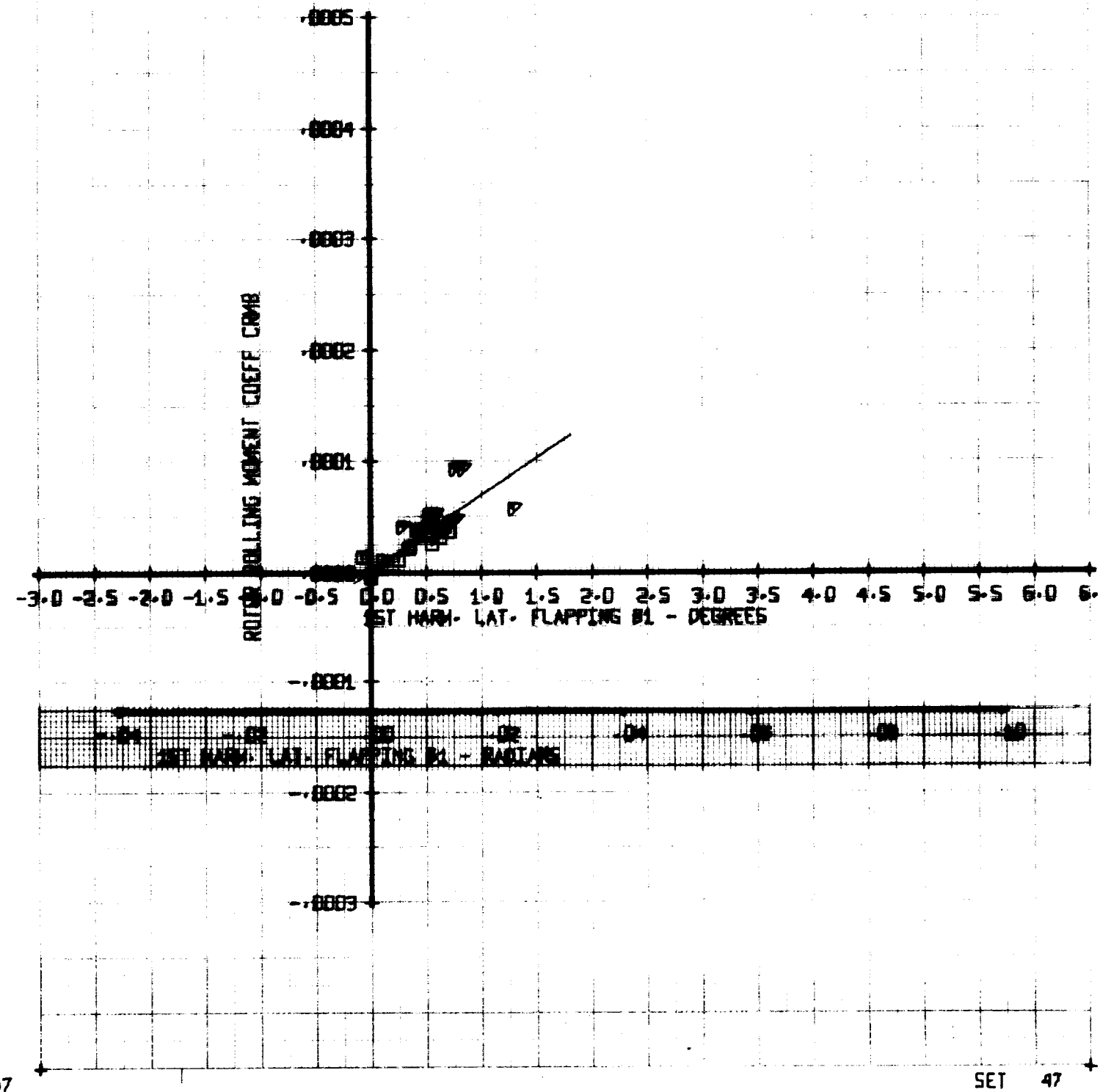
Figure B-46

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
⊡	230	.40	.06	24B
▽	231	.40	.09	24B

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 47
WT 193

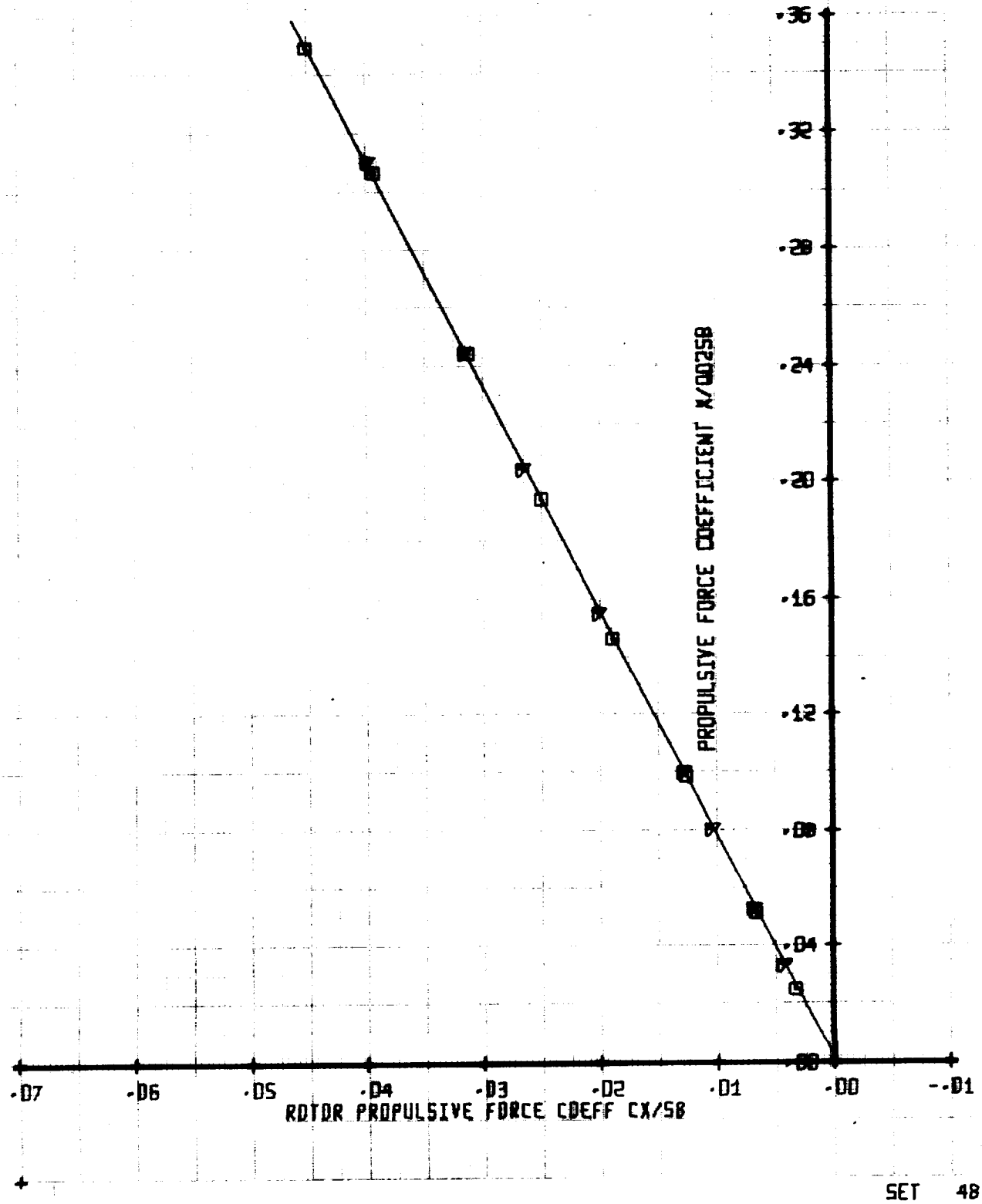
SET 47
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 48
WT 193

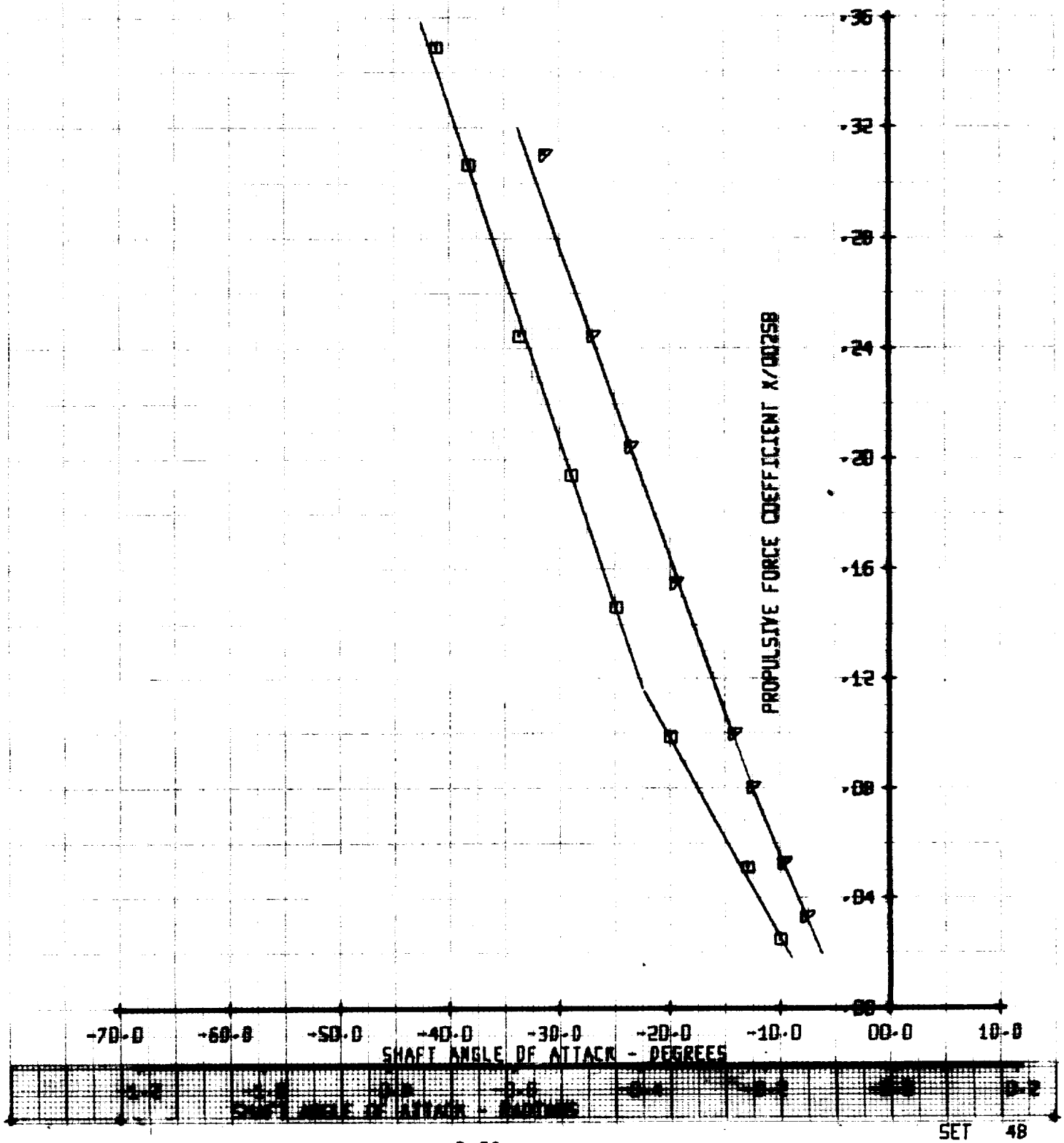
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 48
WT 193

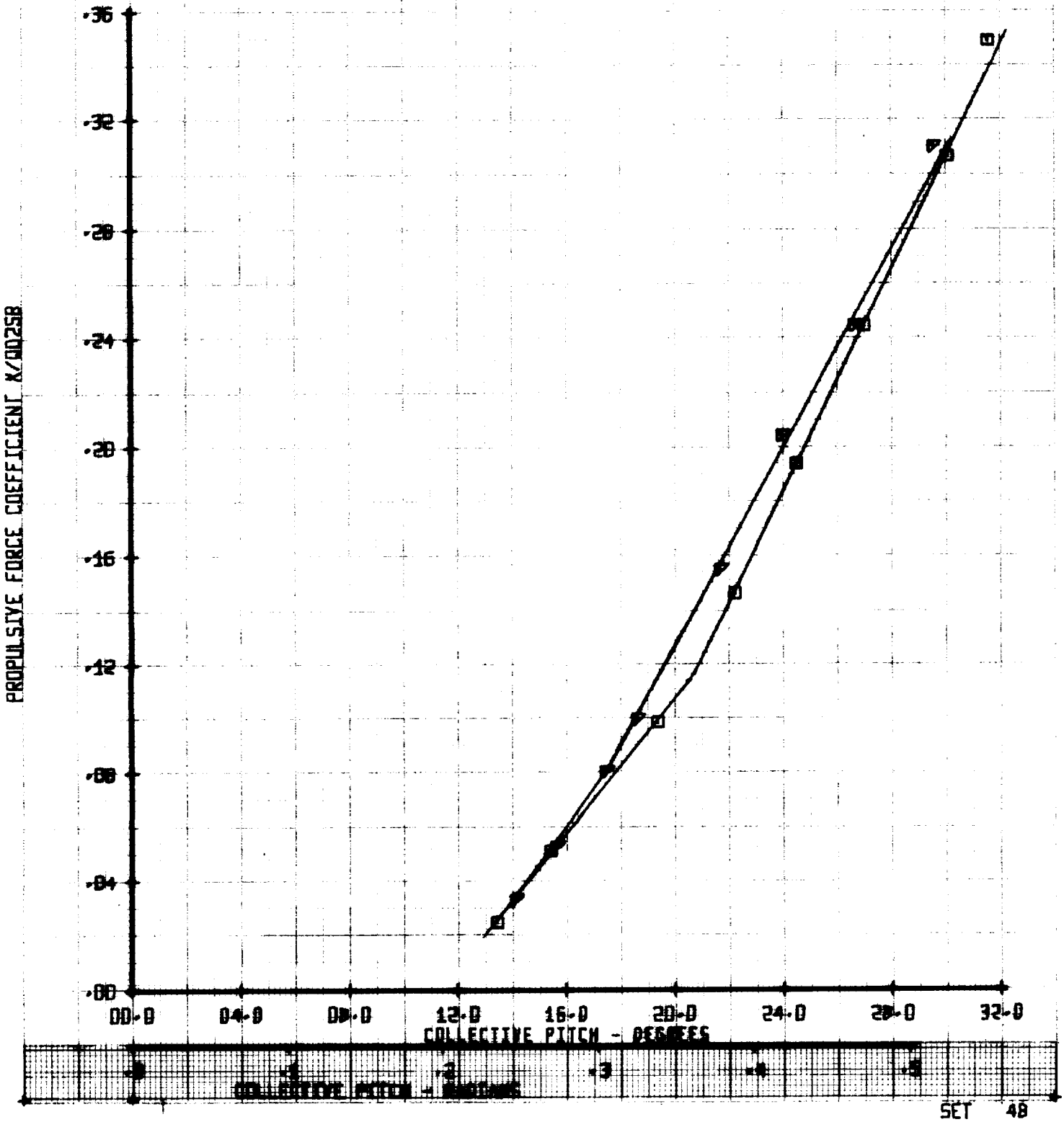
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
◇	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



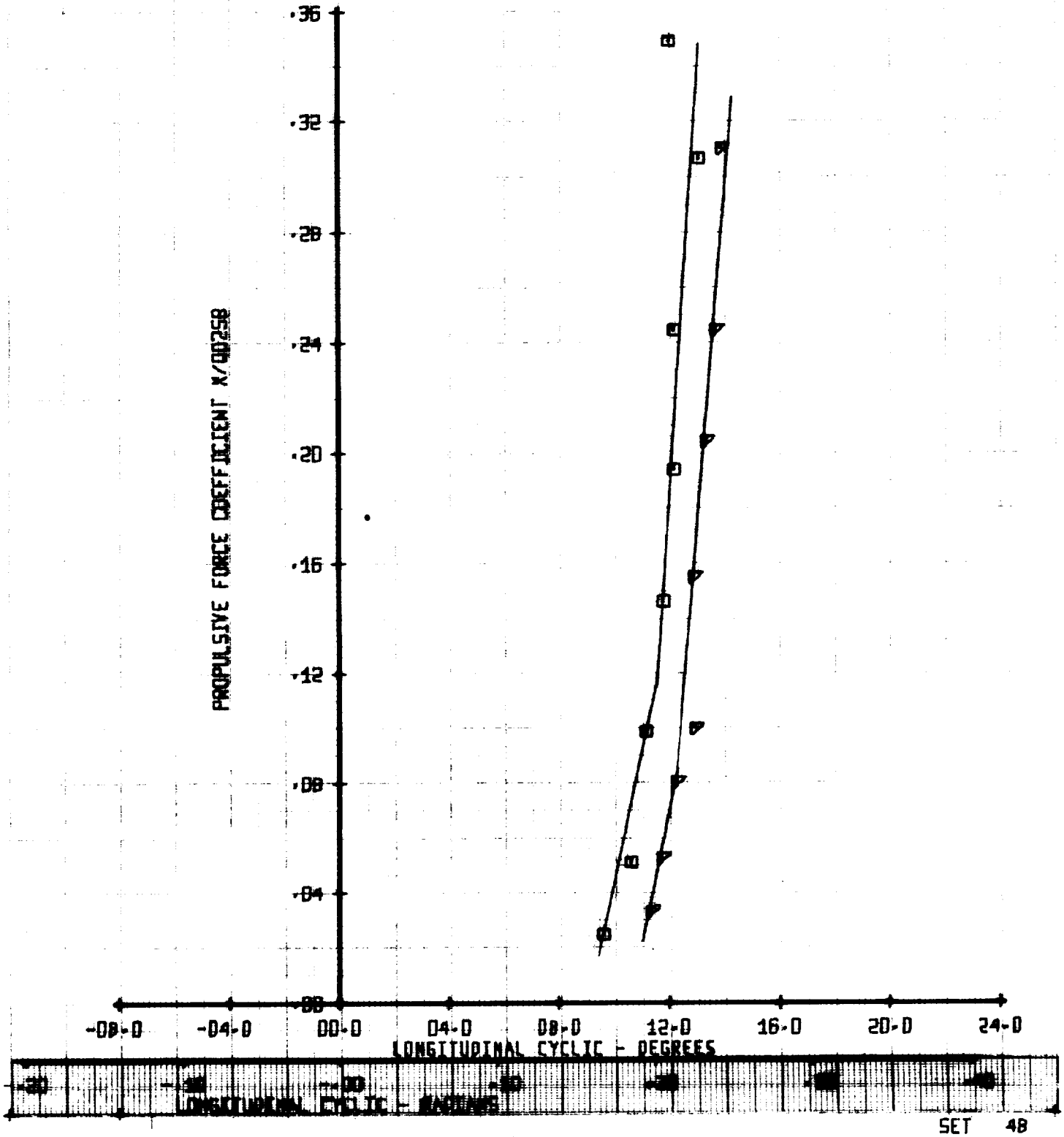
ET 48
WT 193

SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 48
WT 193

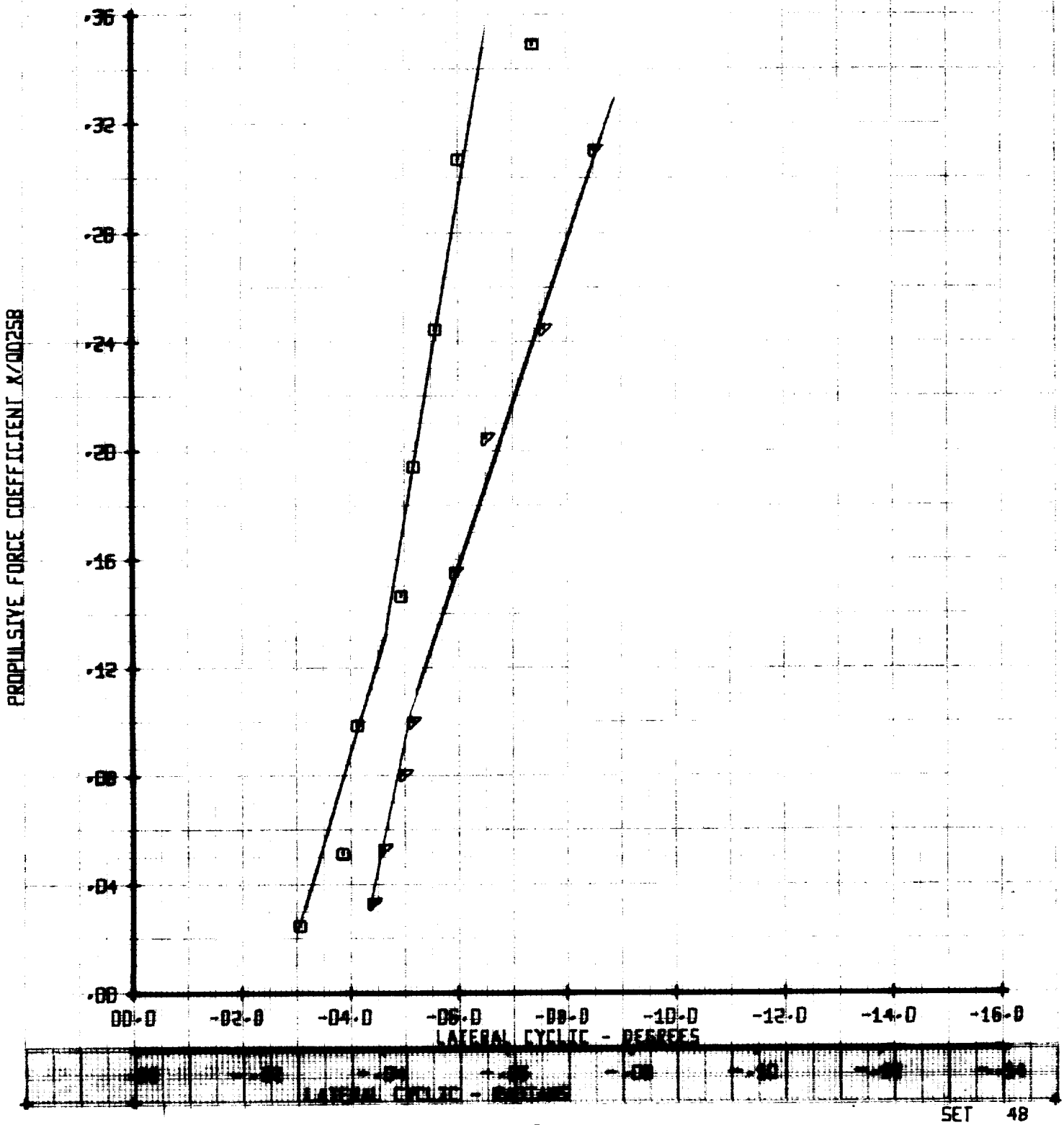
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 48
WT 193

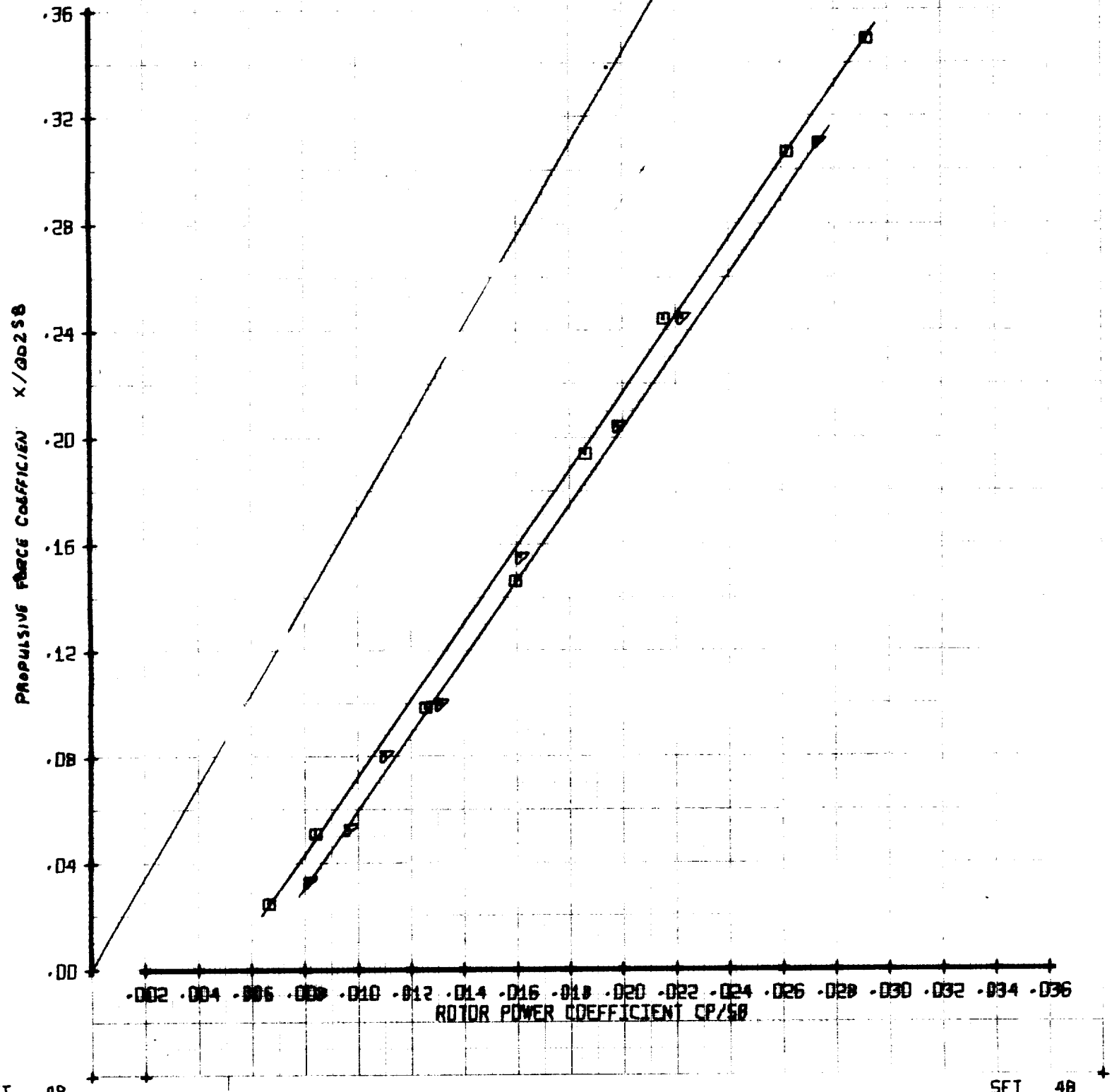
SET 48
BVWT 193

Figure B-52

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 48
WT 193

SET 48
BVWT 193

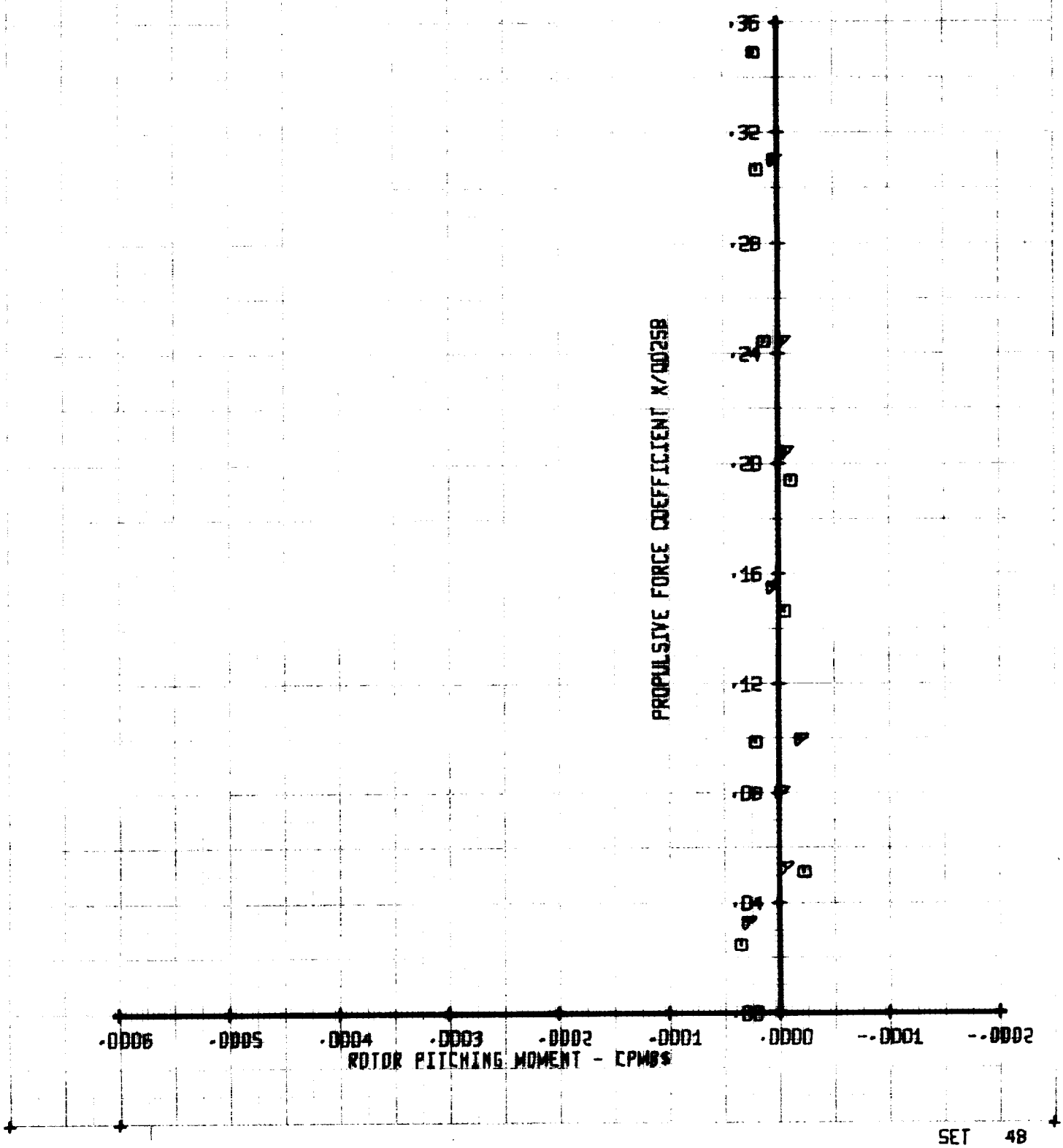
Figure B-53

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 48
WT 193

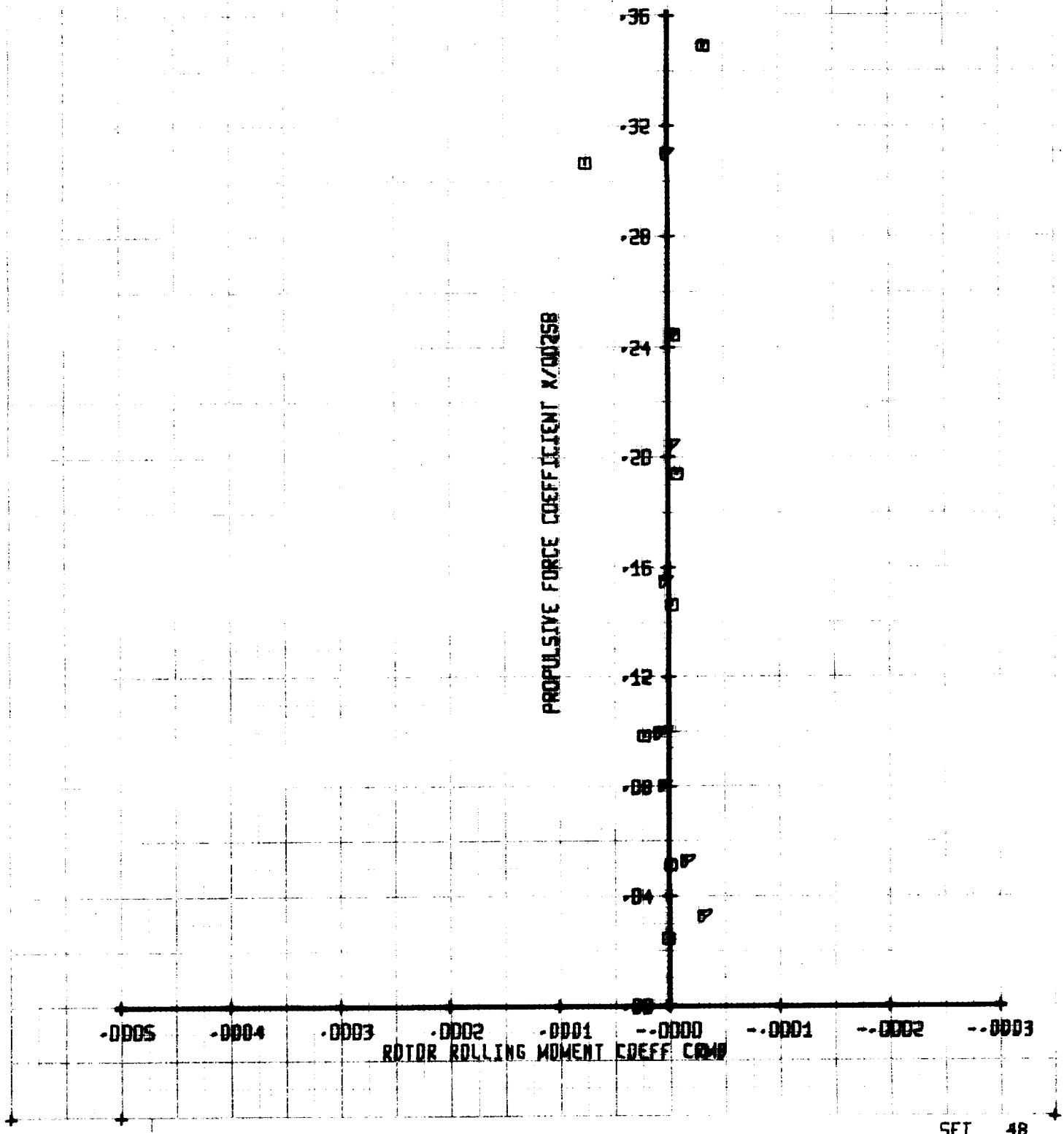
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

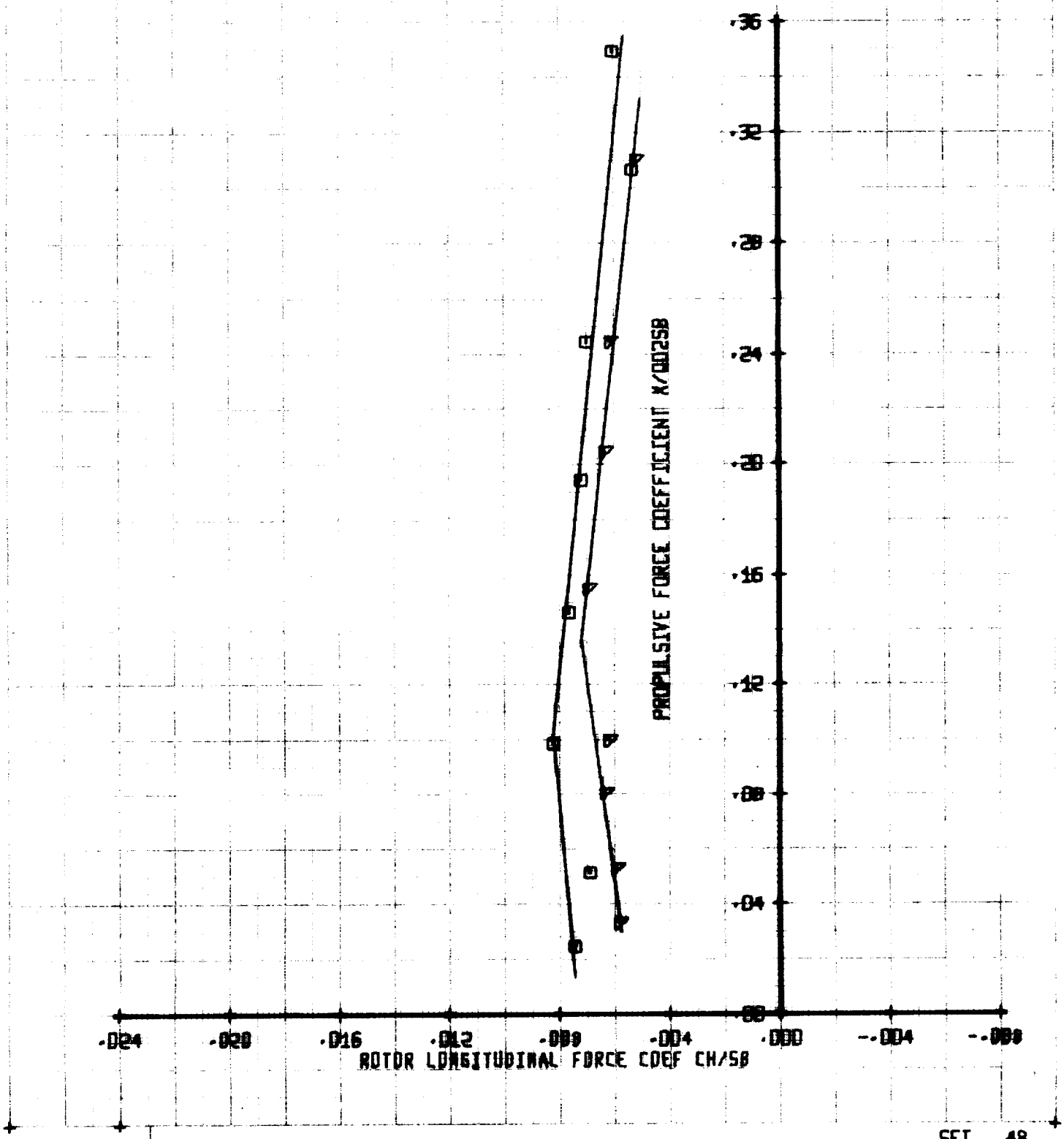


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 48
WT 193

SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VILN
◻	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

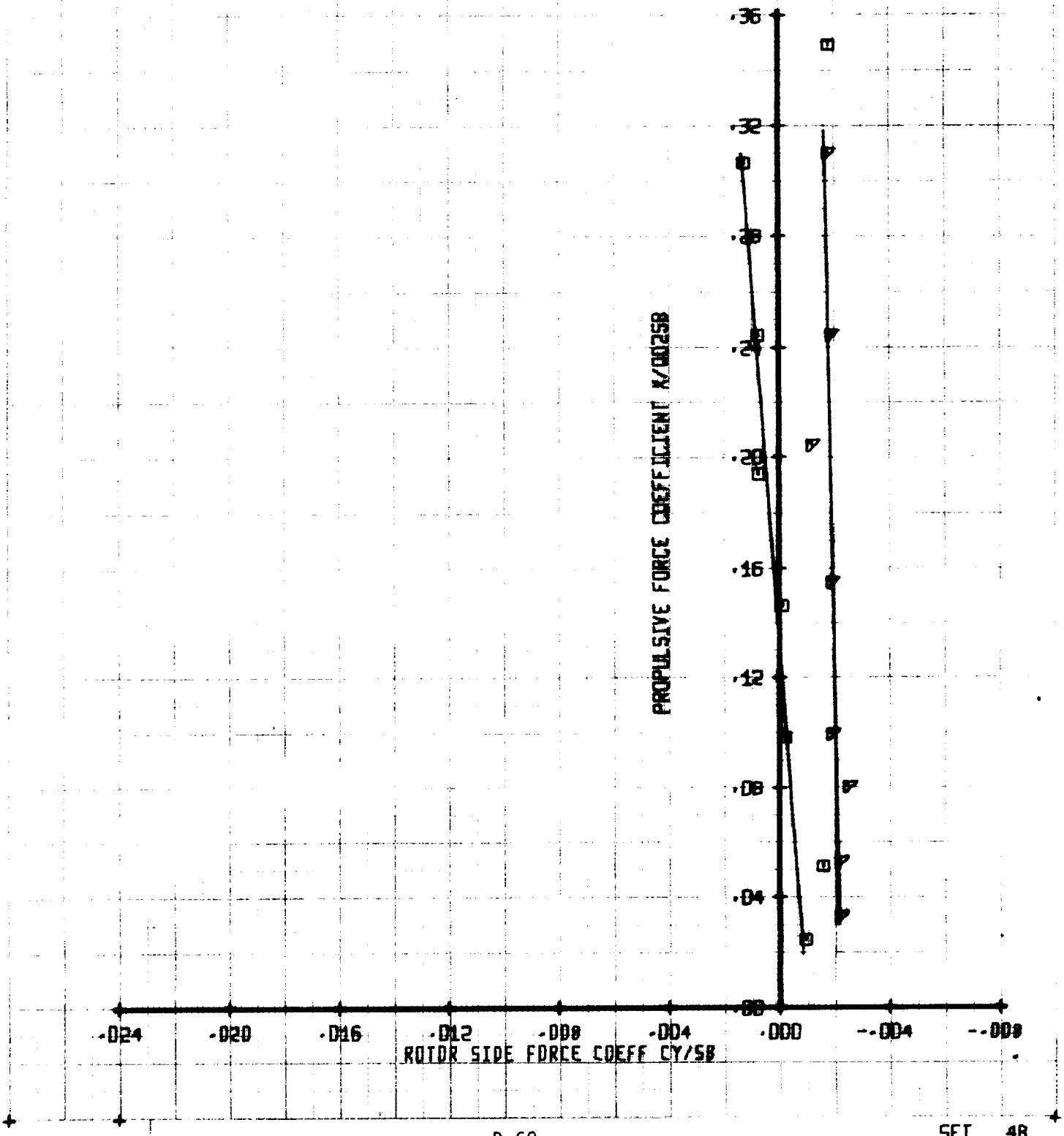
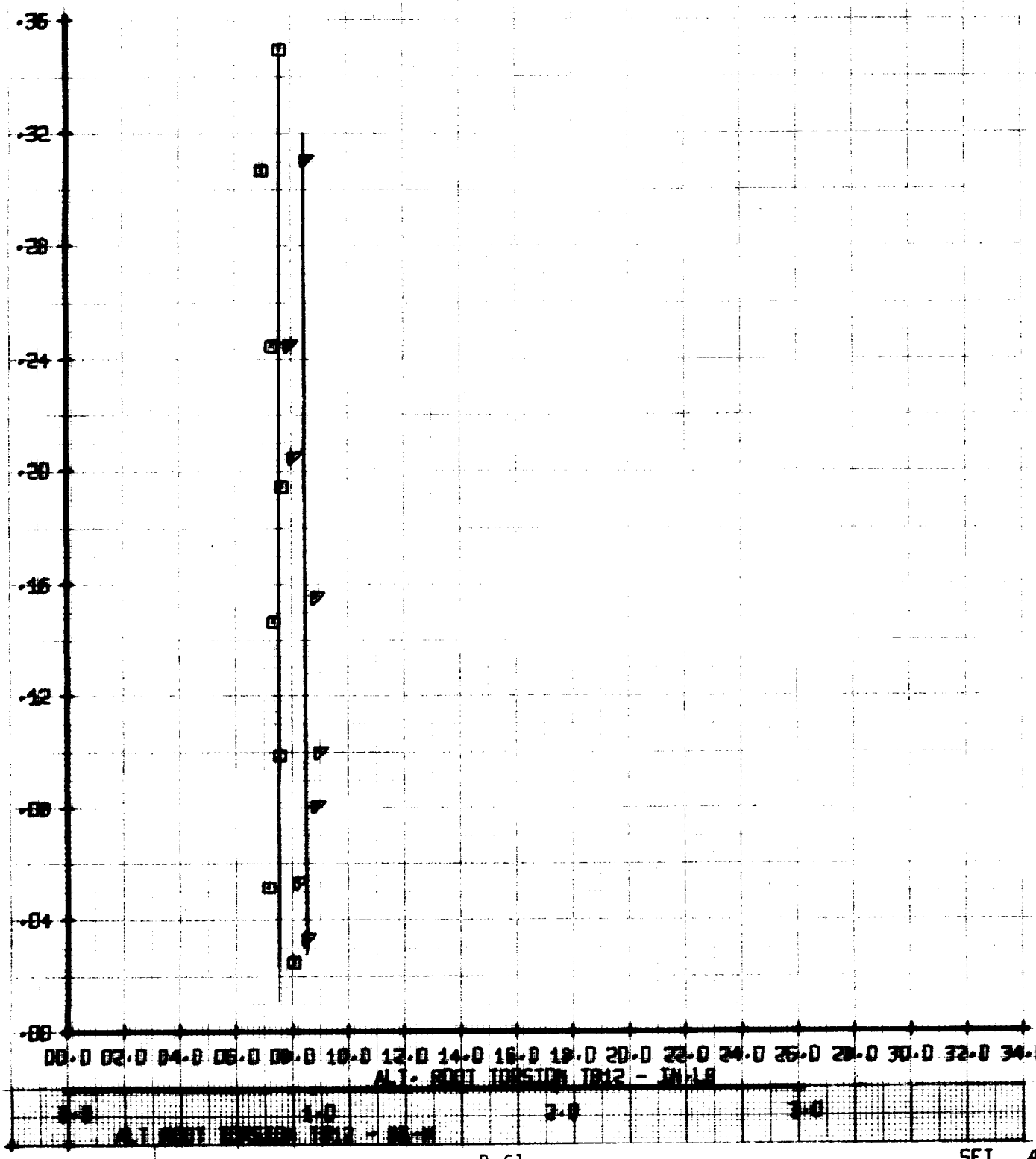


Figure B-57

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
⊡	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



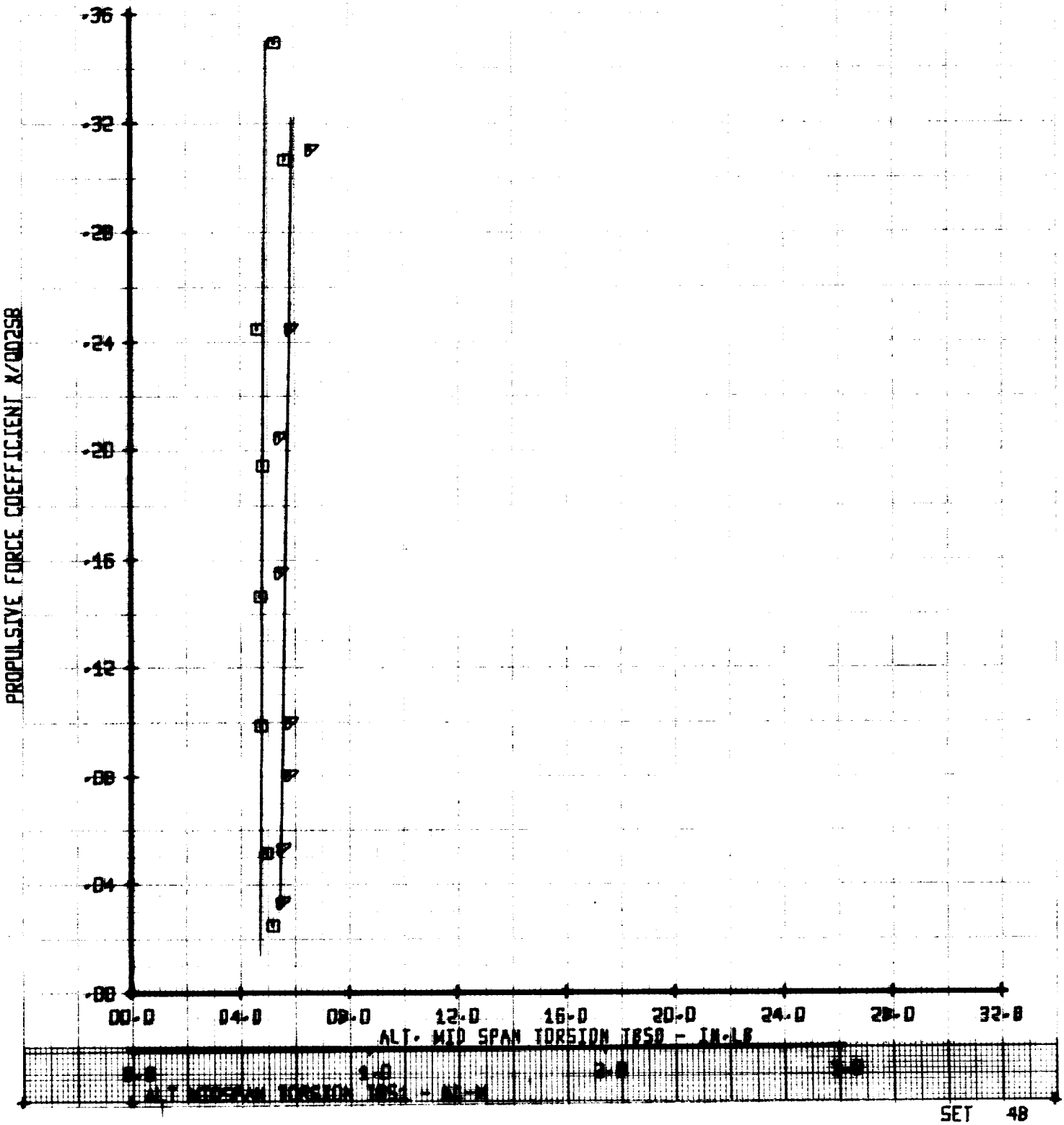
ET 48
WT 193

SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
◻	243	.45	.06	279
◻	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 48
WT 193

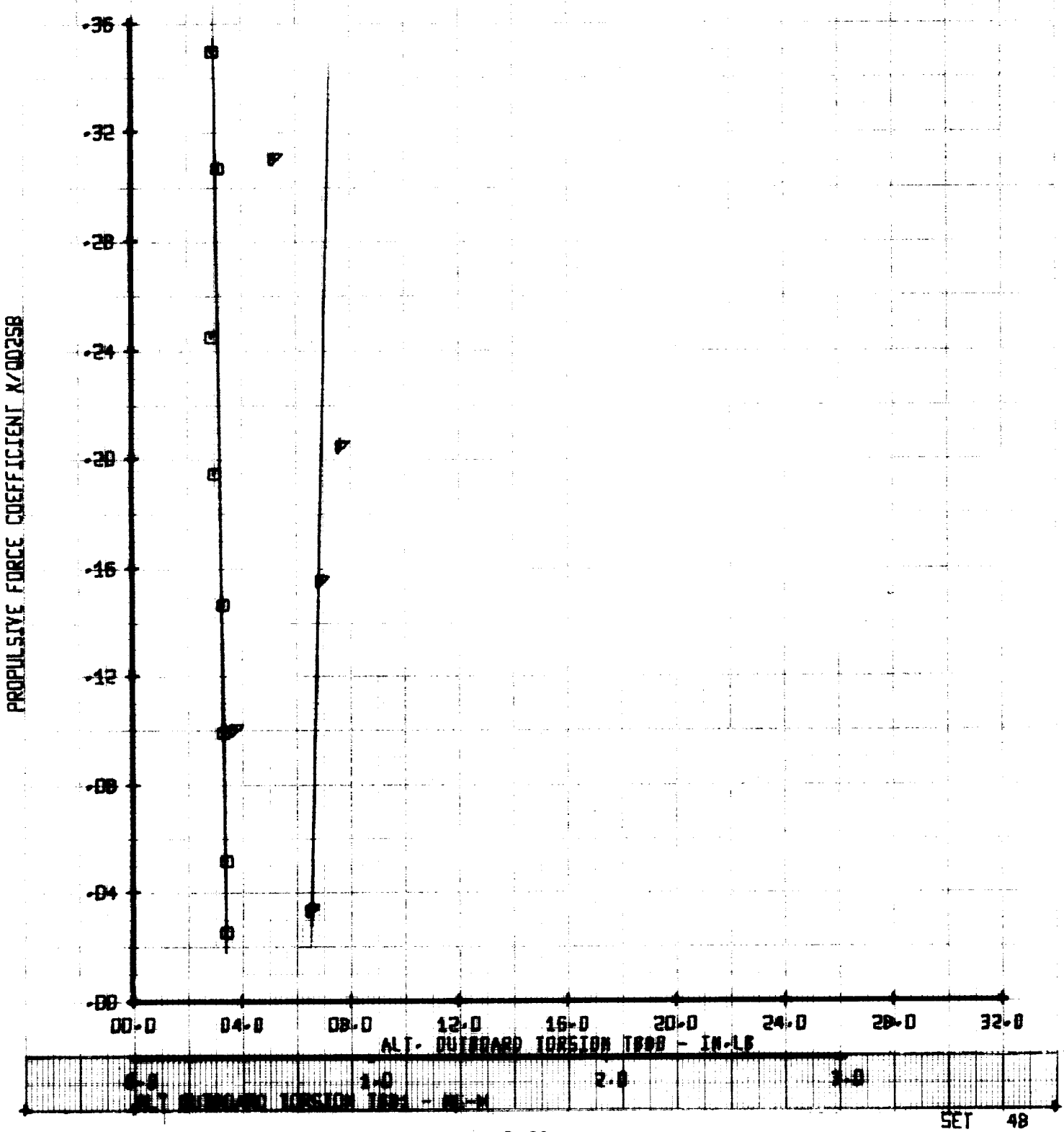
SET 48
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	243	.45	.06	279
⊡	244	.45	.076	279

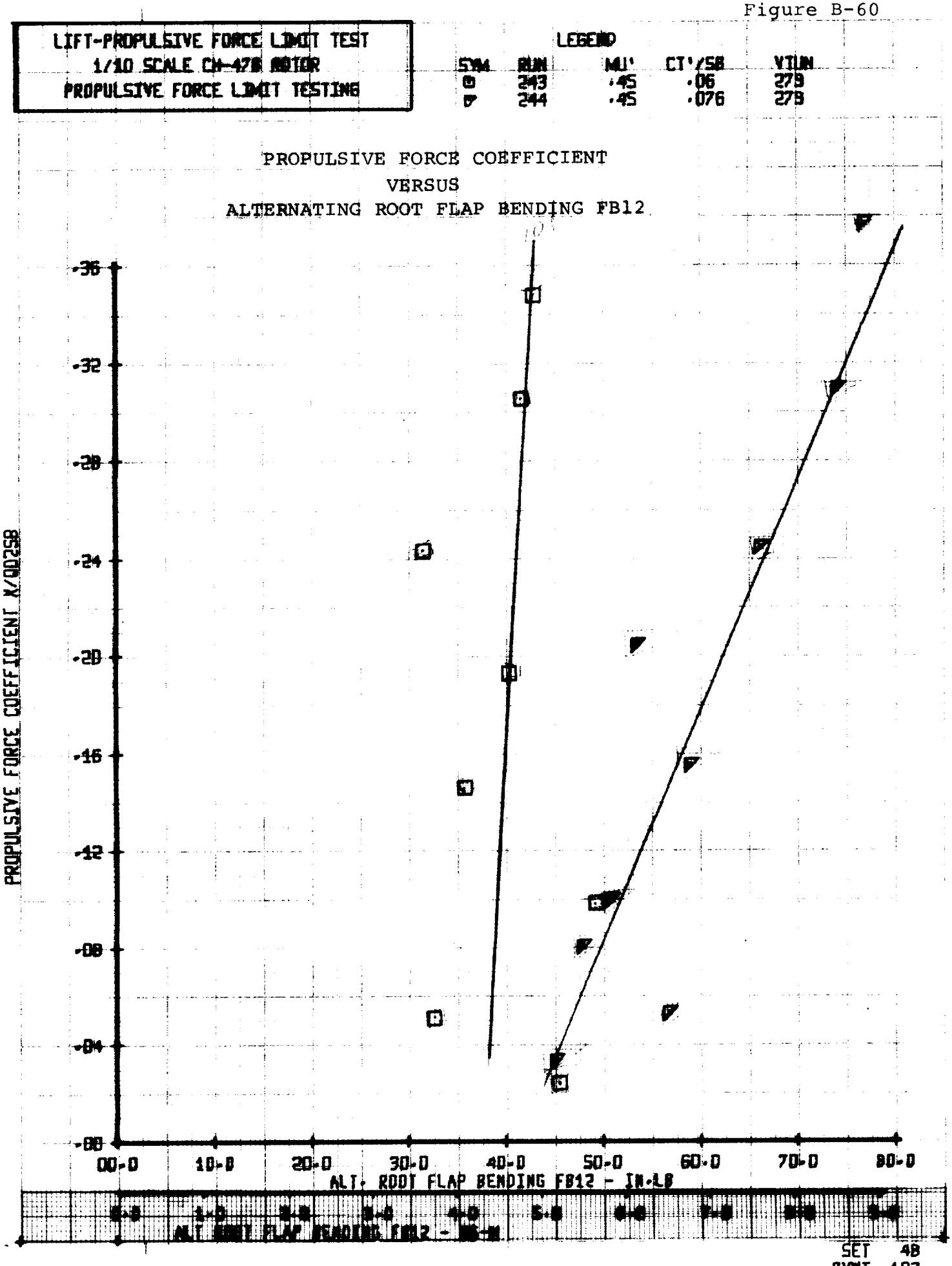
PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80

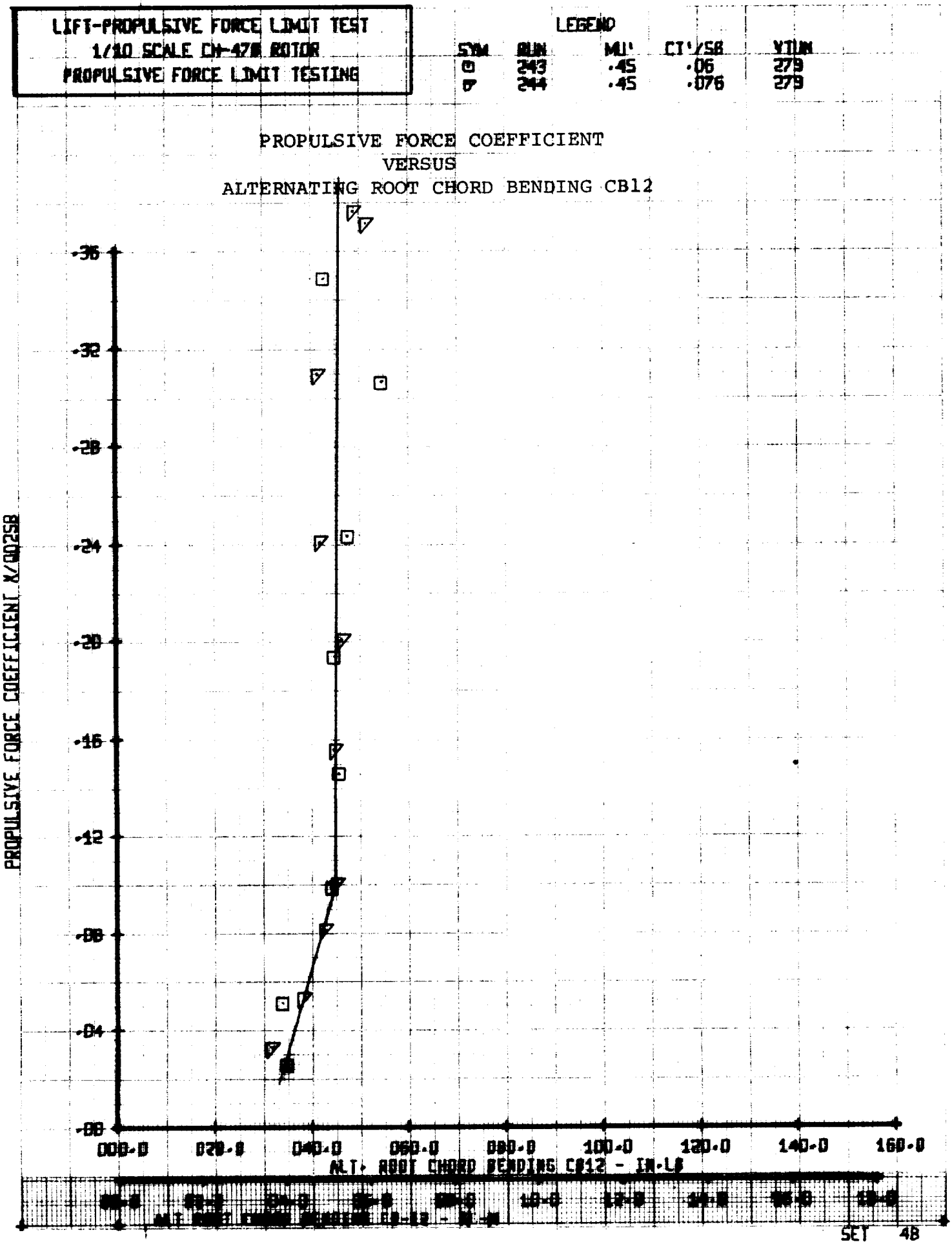


ET 48
WT 193

SET 48
BVWT 193

Figure B-60


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING
LEGEND
SYM RUN MU' CT'/SB VTUN
243 .45 .06 279
244 .45 .076 279
PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12
PROPULSIVE FORCE COEFFICIENT N/QBSB
-36
-32
-28
-24
-20
-16
-12
-08
-04
-00
00.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
ALT. ROOT FLAP BENDING FB12 - IN-LB
ALT ROOT FLAP BENDING FB12 - IN-LB
ET 48
WT 193
SET 48
BVWT 193

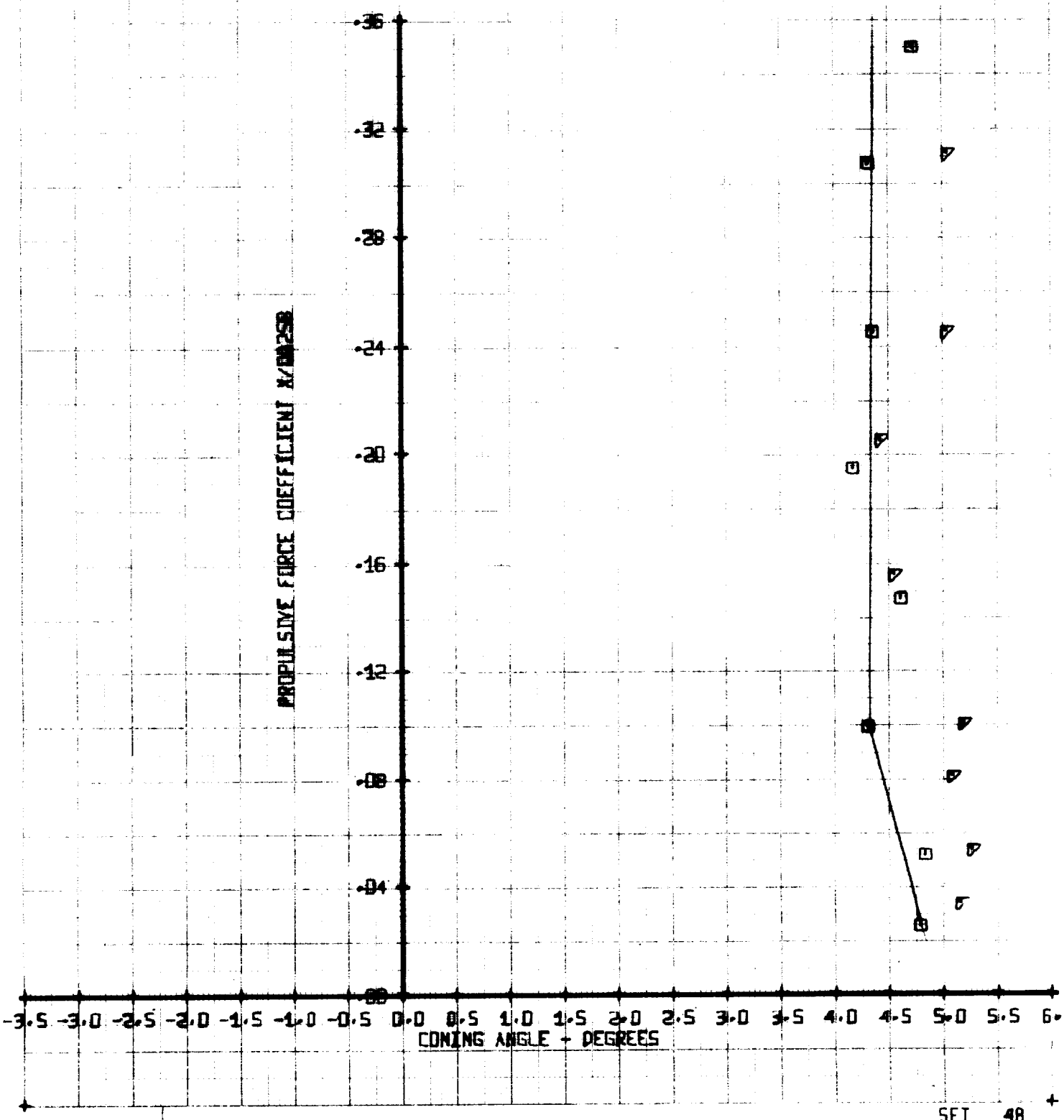

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING
LEGEND
SYM RUN MU' CT'/SB YTUN
243 .45 .06 279
244 .45 .076 279
PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12
PROPULSIVE FORCE COEFFICIENT X/QQ2SB
-36
-32
-28
-24
-20
-16
-12
-08
-04
-00
000.0
020.0
040.0
060.0
080.0
100.0
120.0
140.0
160.0
ALT. ROOT CHORD BENDING CB12 - IN-LB
ET 48
WT 193
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE

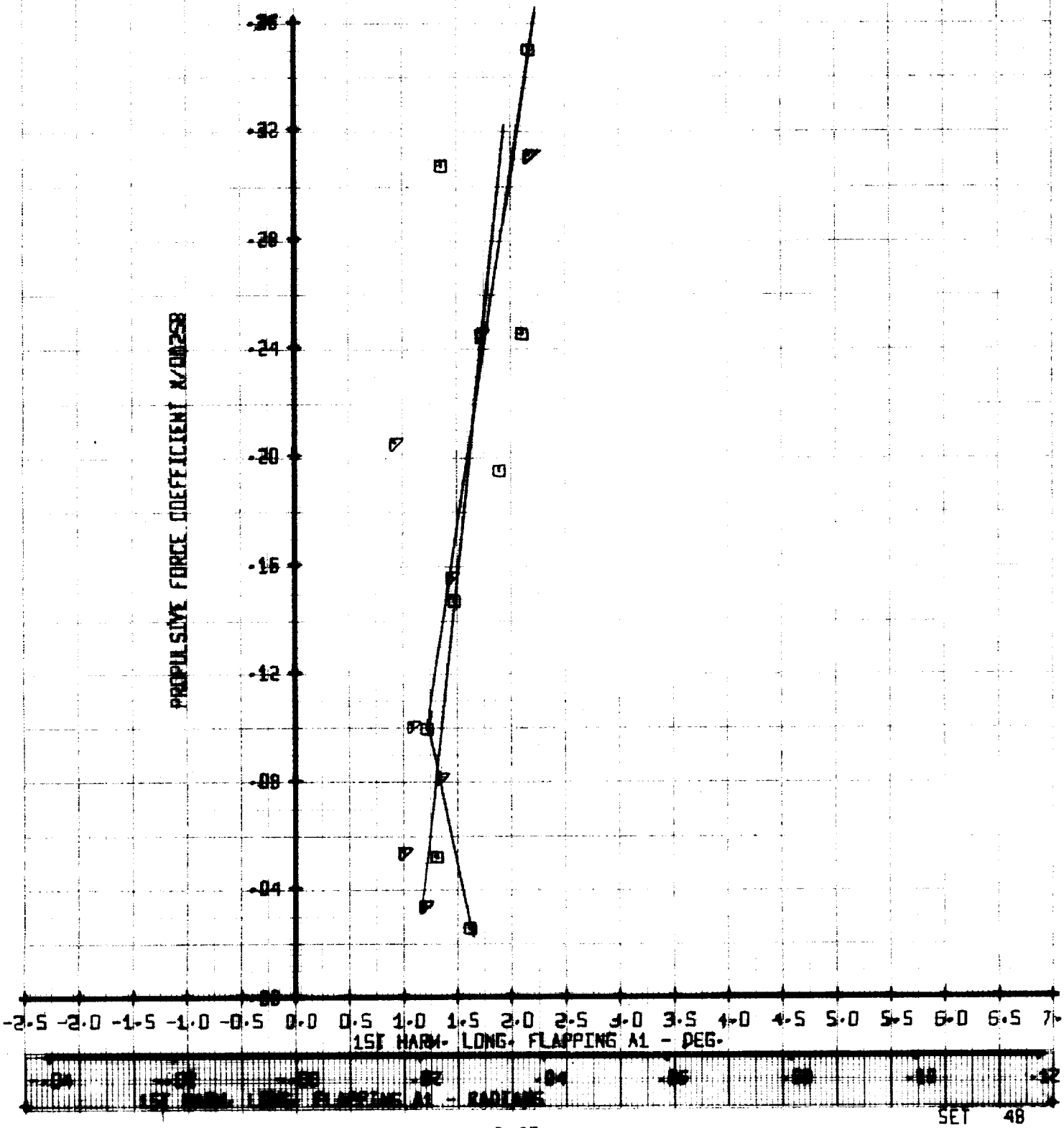


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

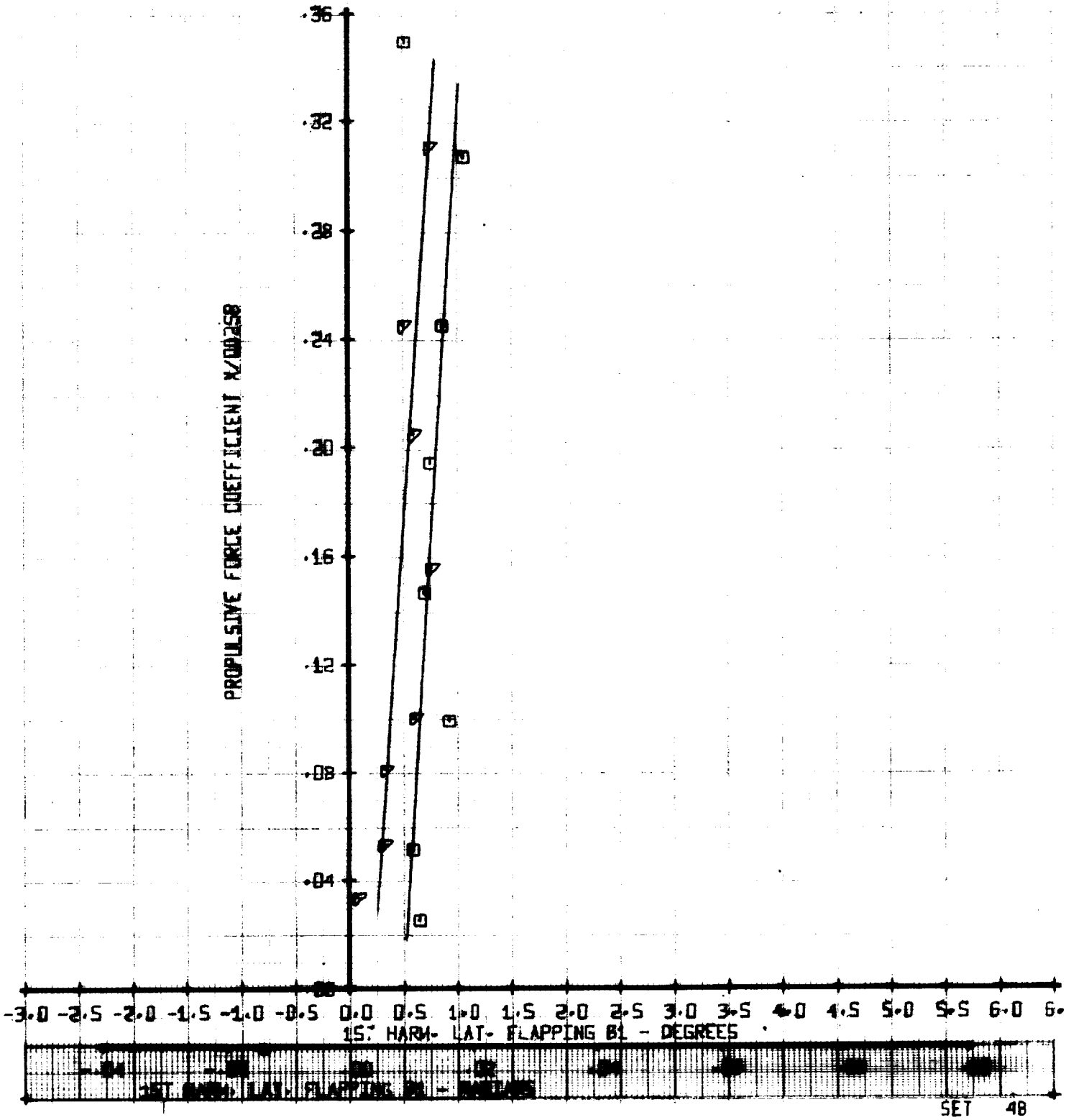


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SG	YTUN
□	243	.45	.06	279
▽	244	.45	.075	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 48
WT 193

SET 48
BVWT 193

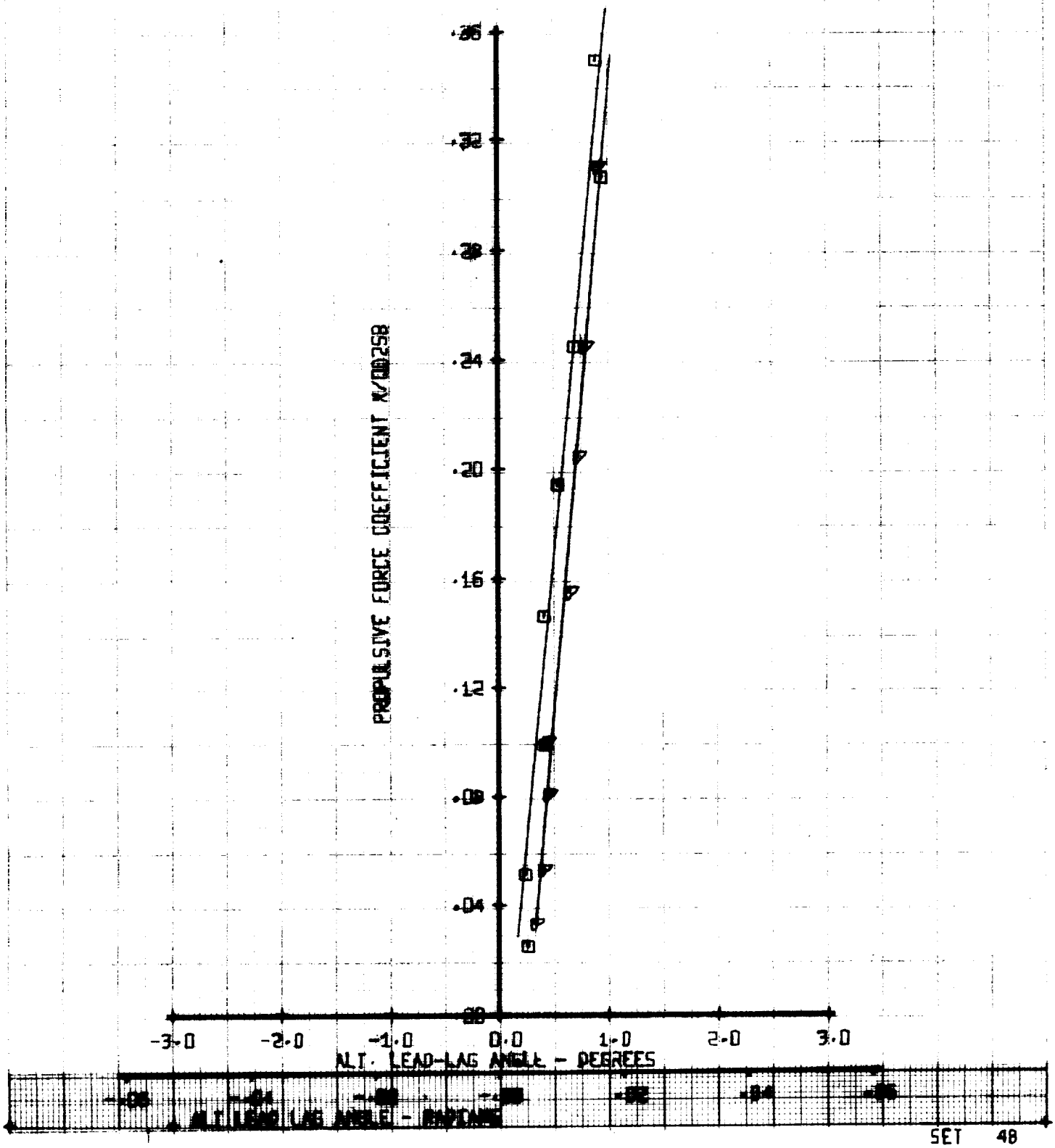
Figure B-65

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YIRUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



SET 48
WT 193

B-69

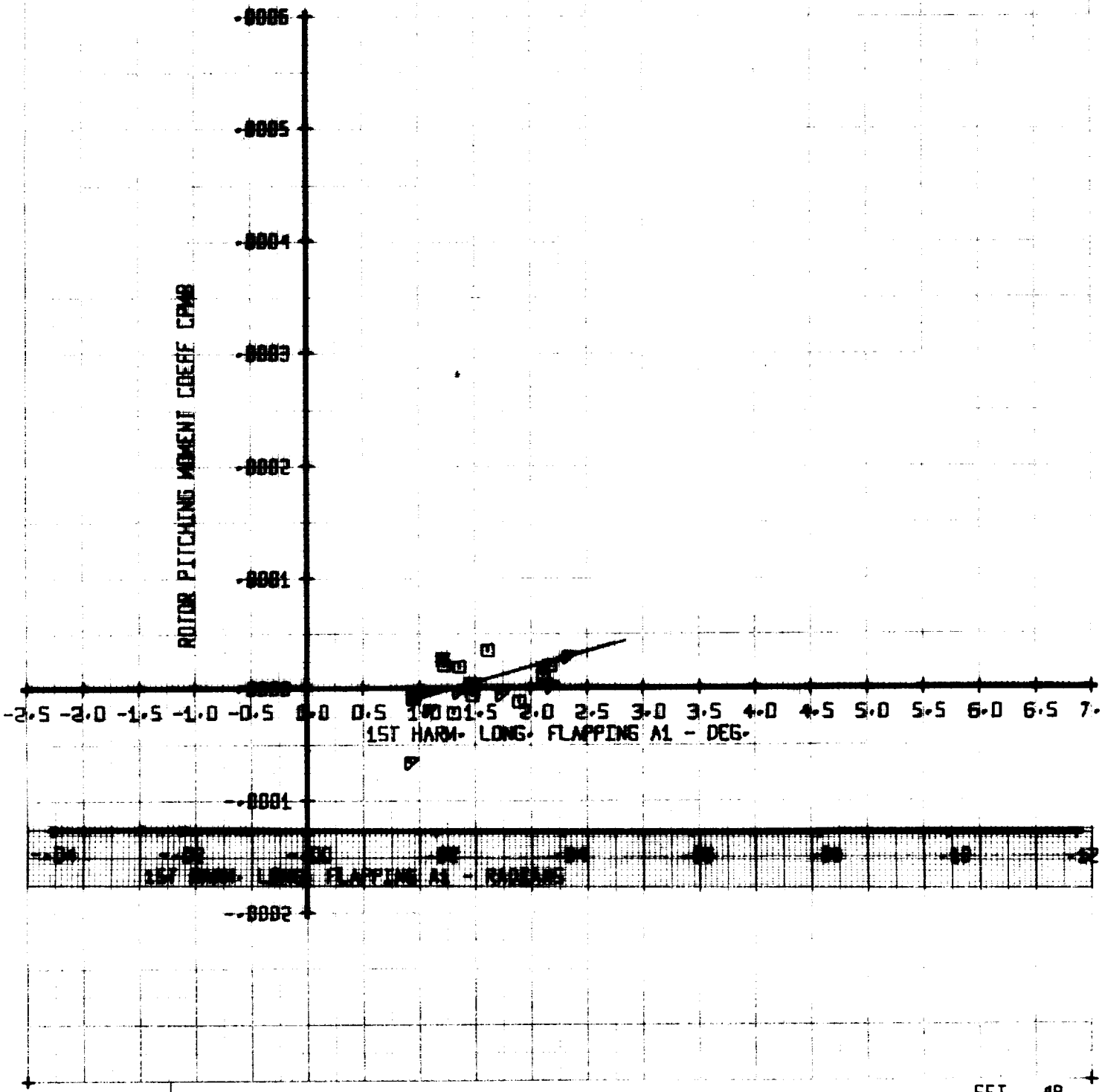
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

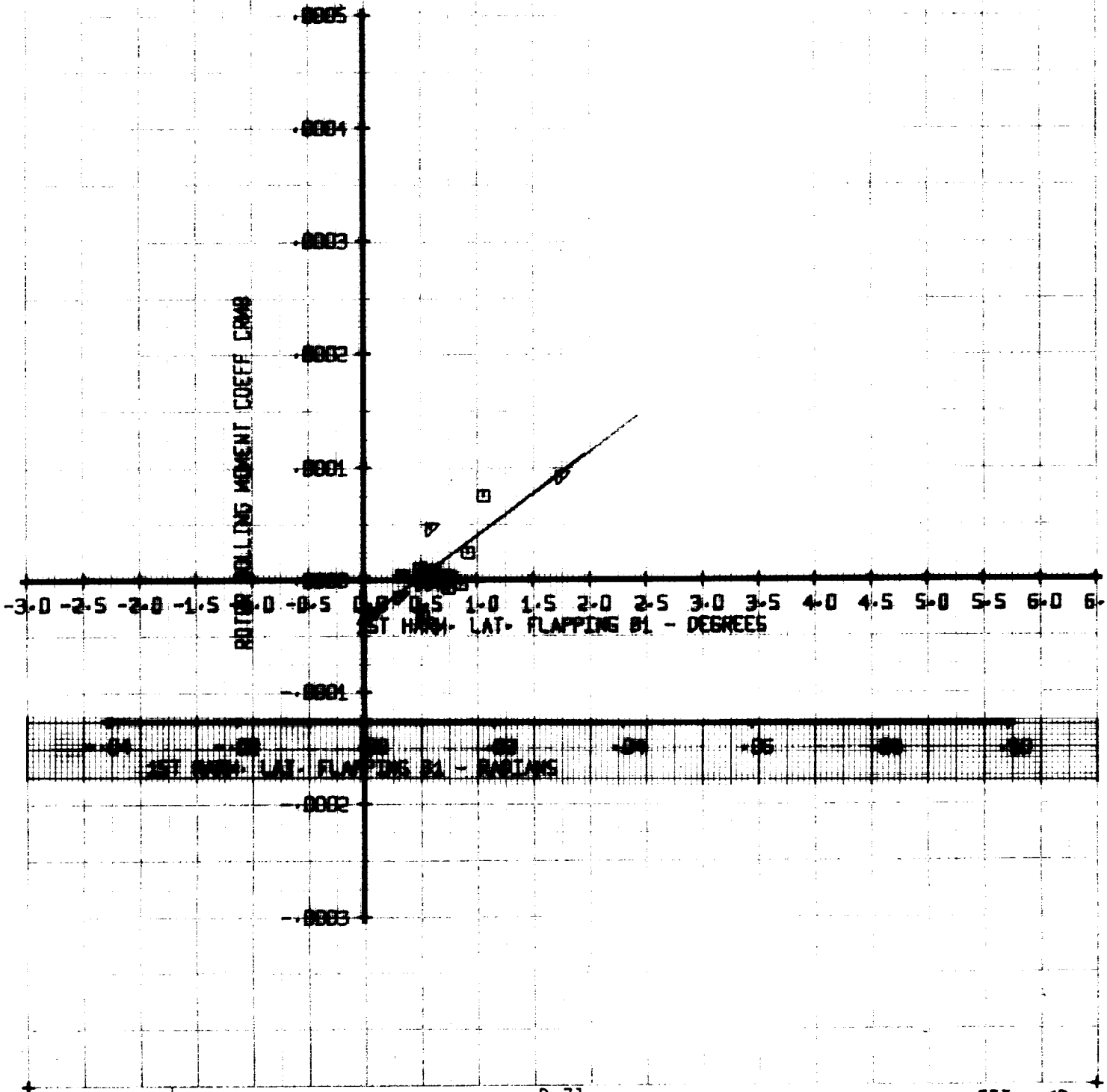
ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 48
WT 193

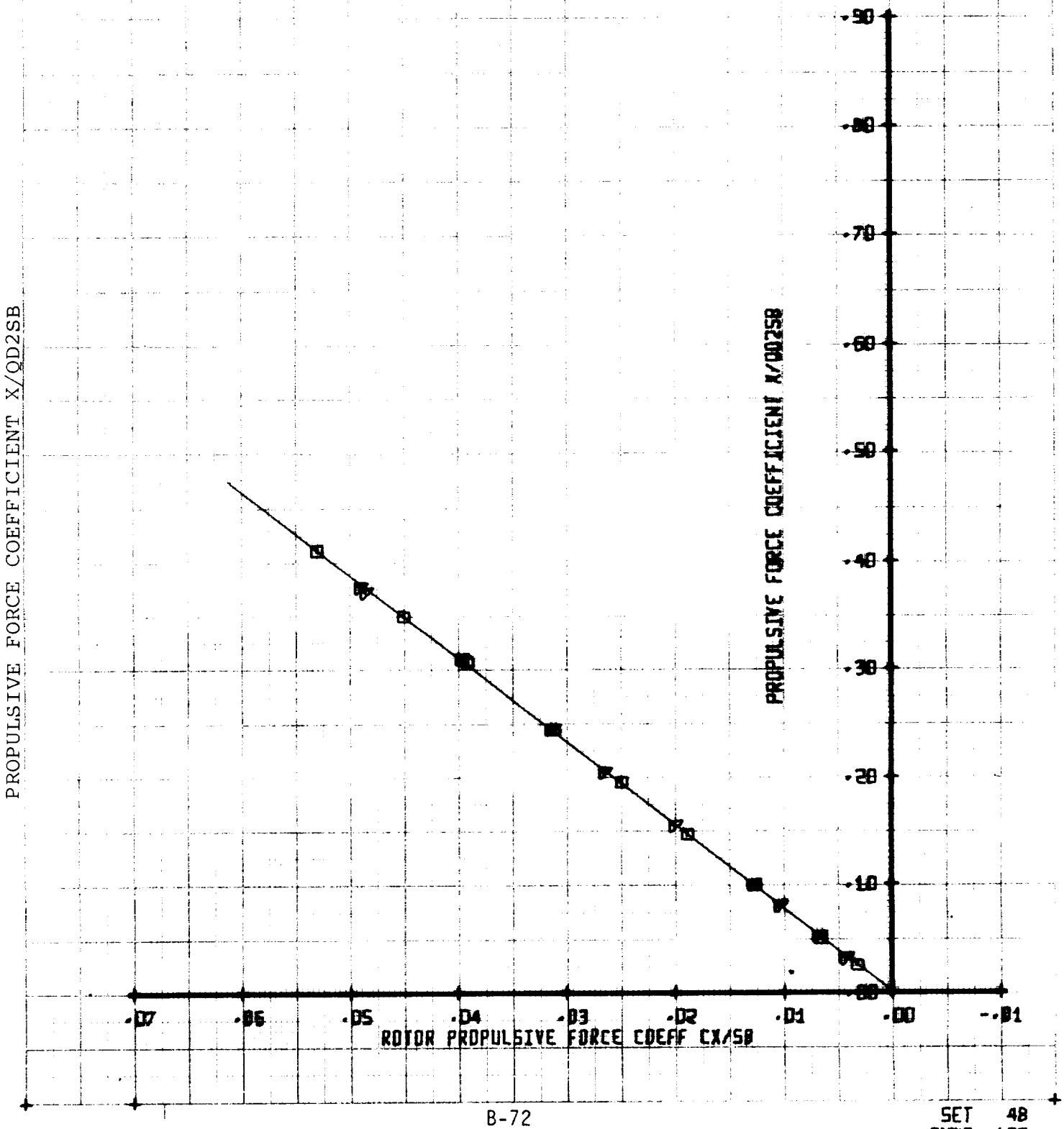
SET 48
BVWT 193

Figure B-68

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND SYM	RUN	MU'	CT'/SB	YTUN
⊡	243	.45	.06	279
⊞	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT

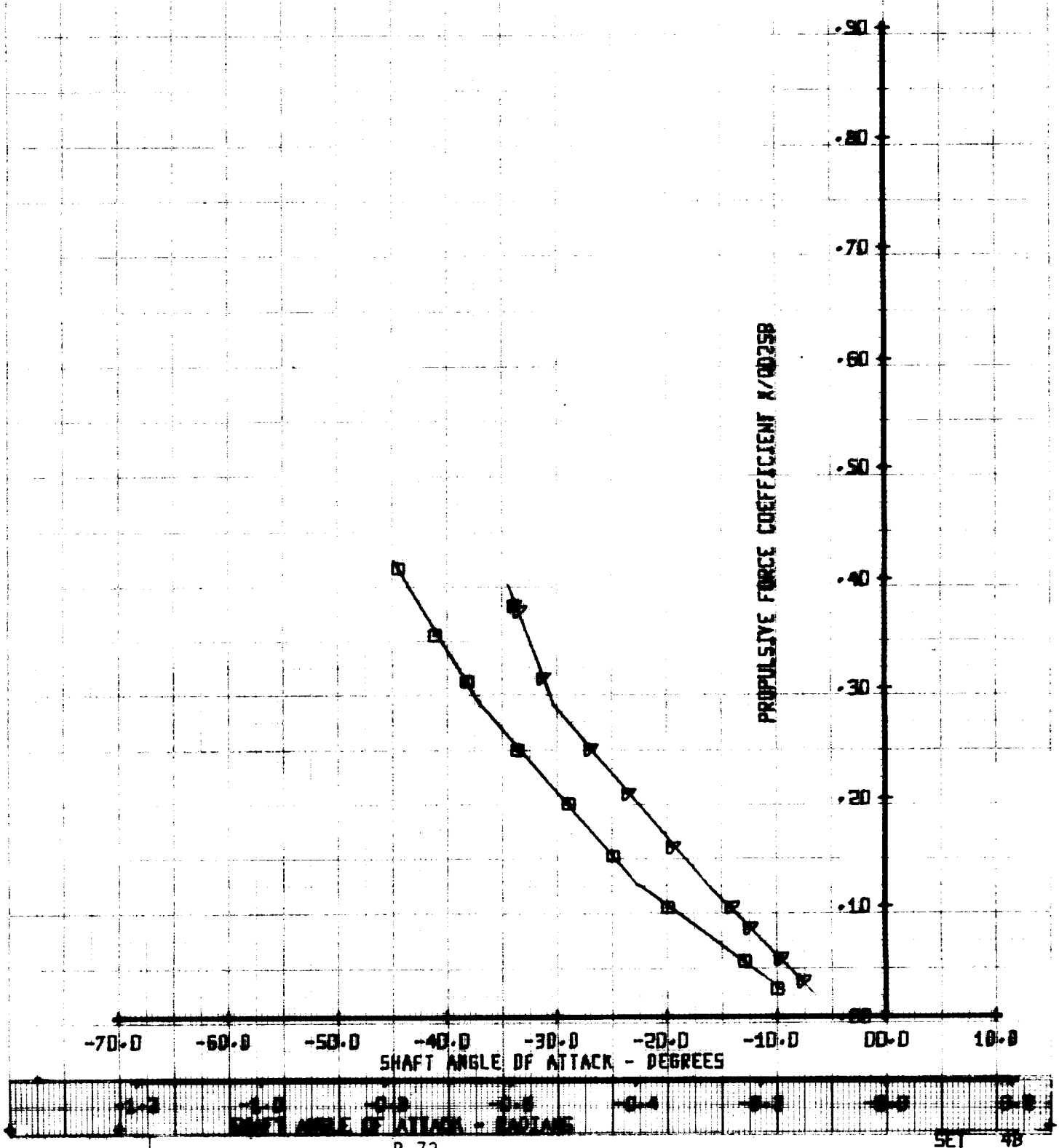


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 48
WT 193

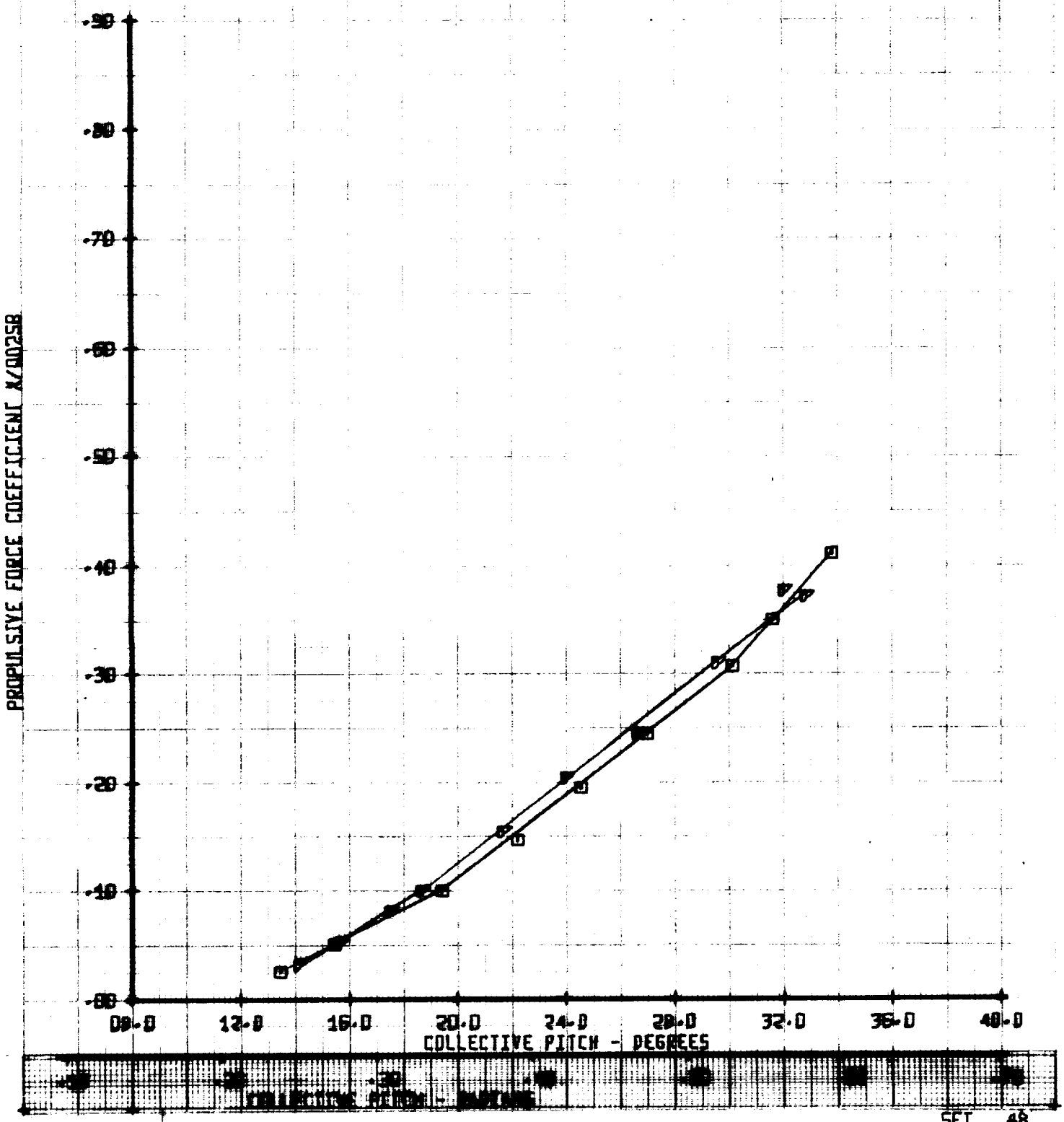
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 48
WT 193

SET 48
BVWT 193

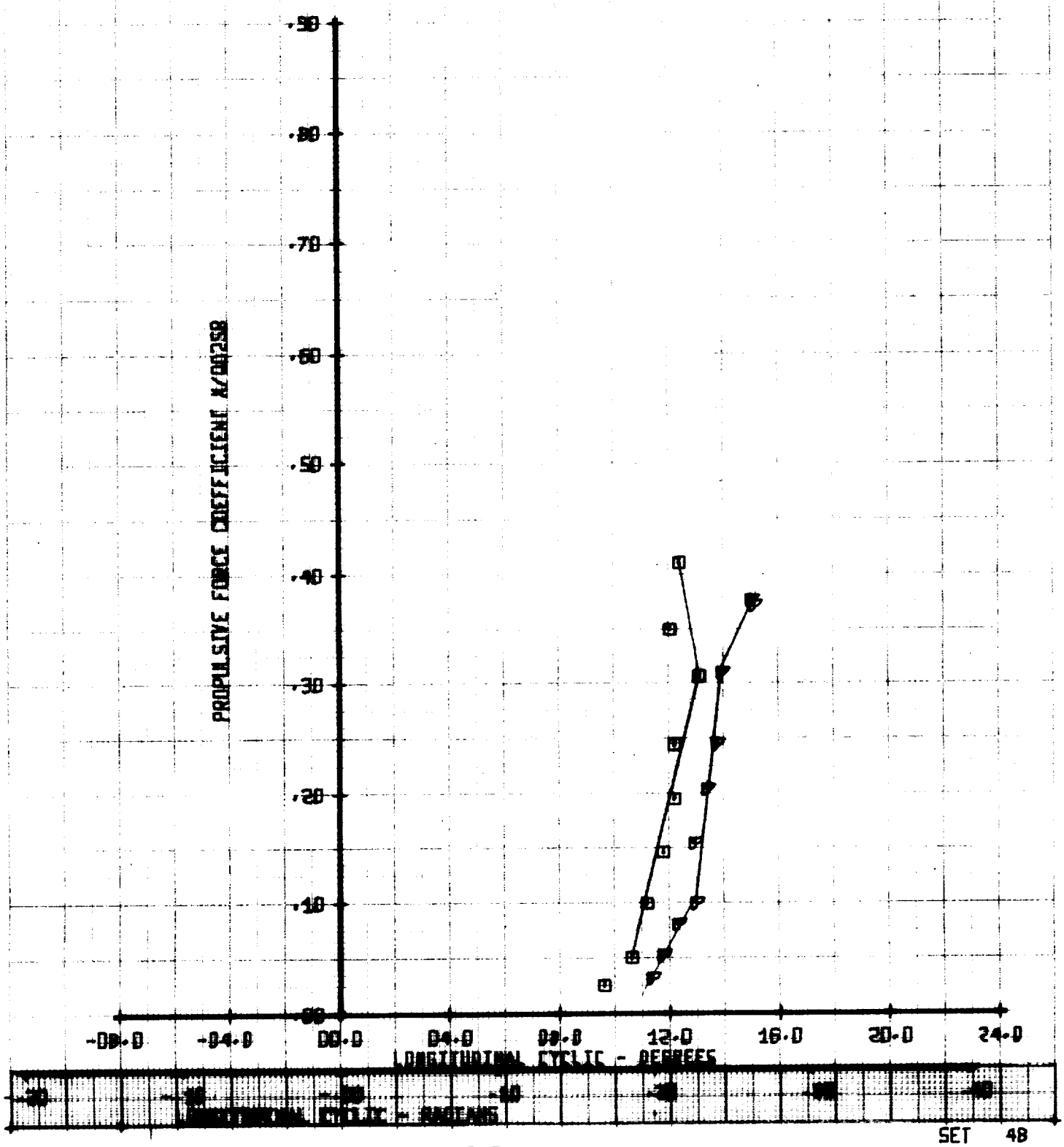
Figure B-71

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 48
WT 193

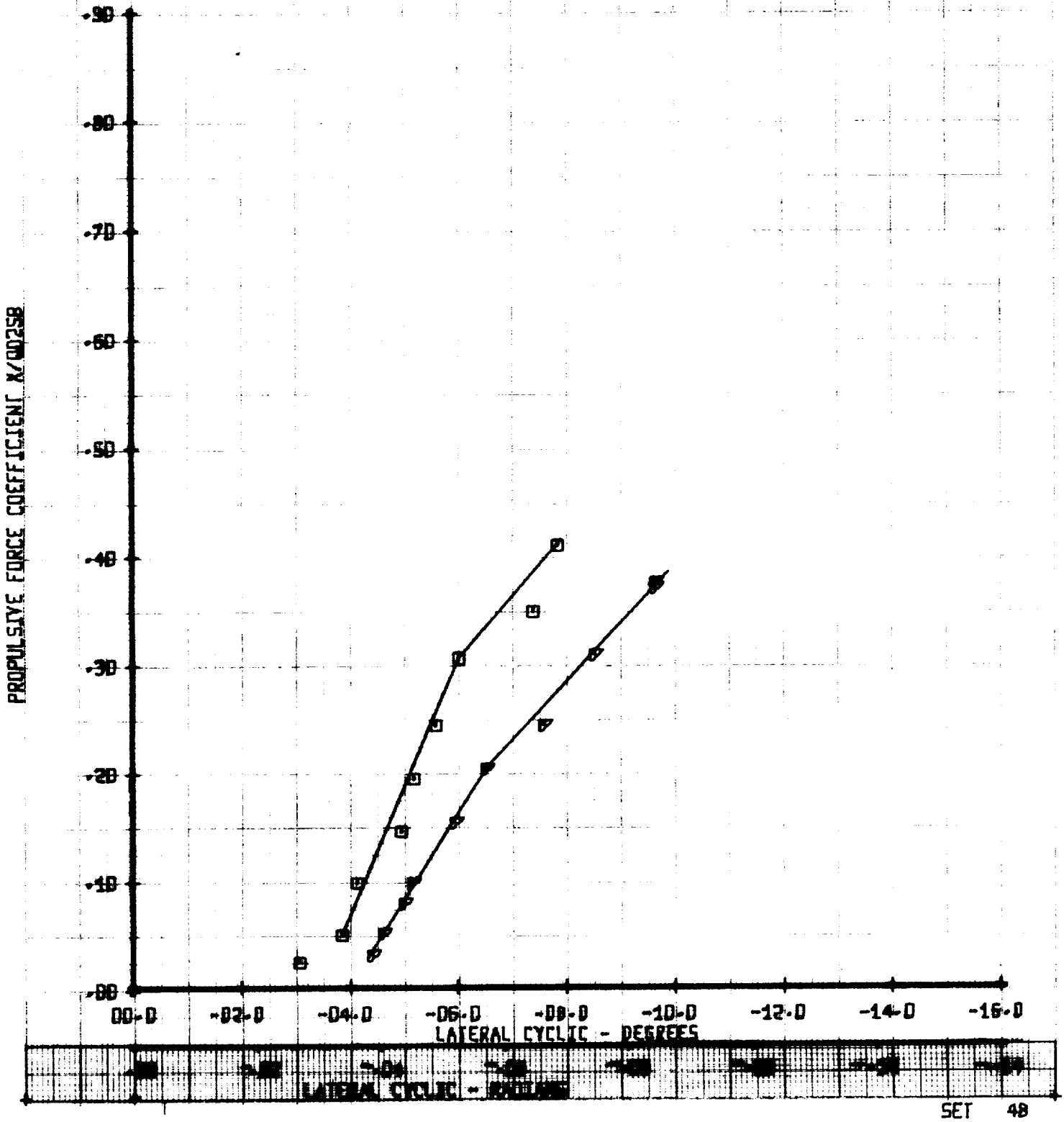
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 48
WT 193

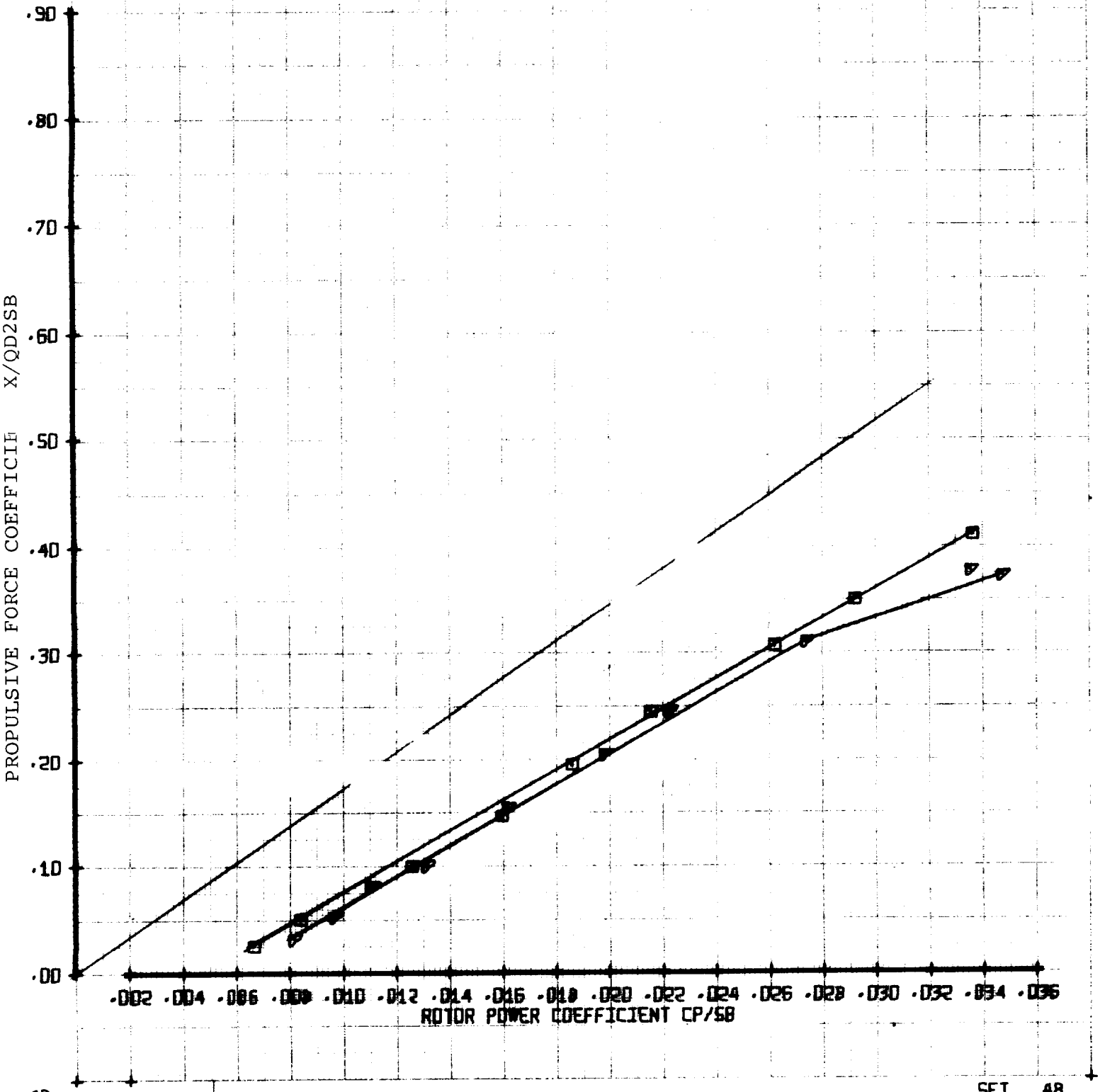
SET 48
BVWT 193

Figure B-73

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 48
WT 193

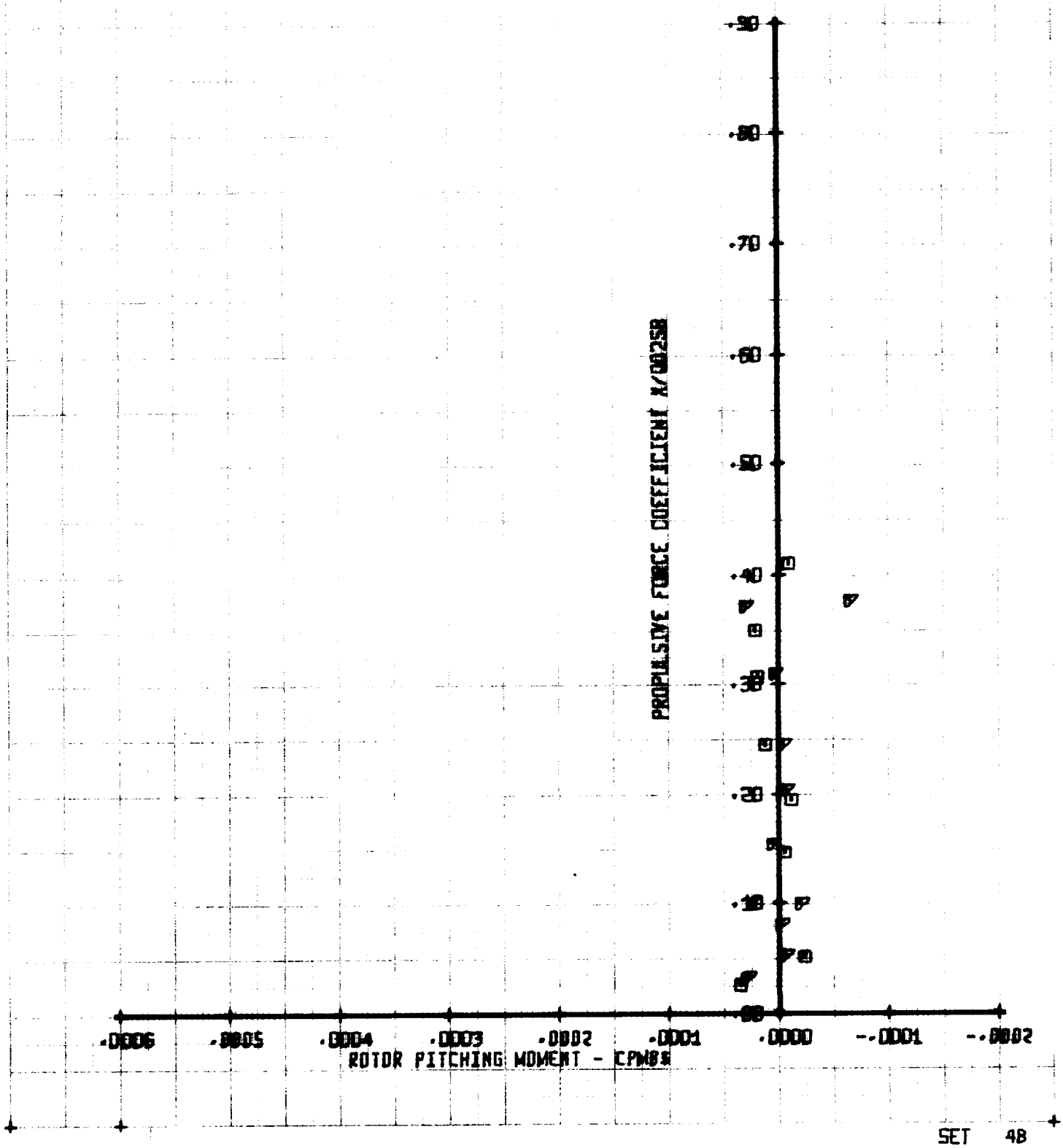
SET 48
BVWT 193

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 48
WT 193

SET 48
BVWT 193

Figure B-75

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VRUN
⊡	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

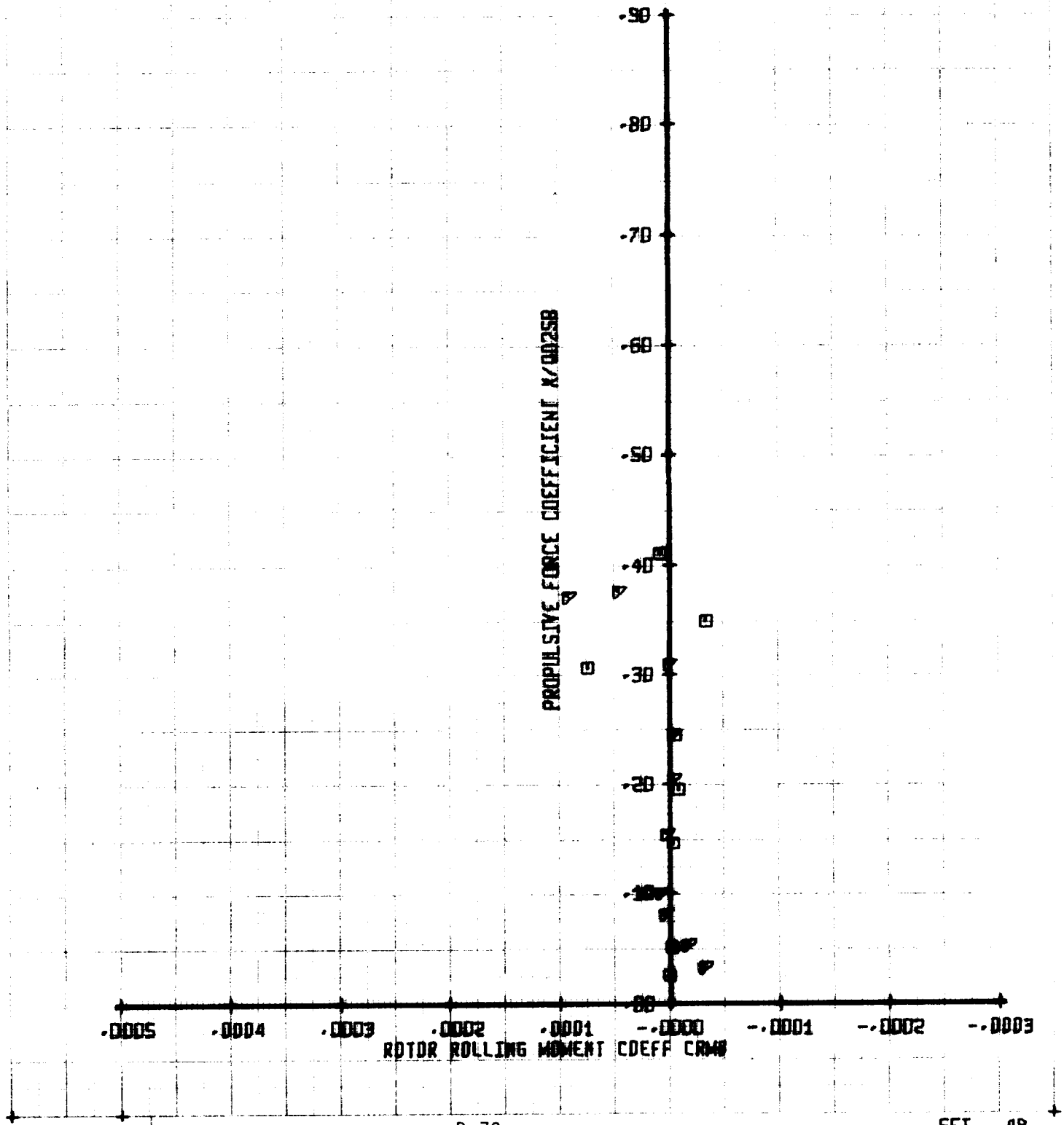


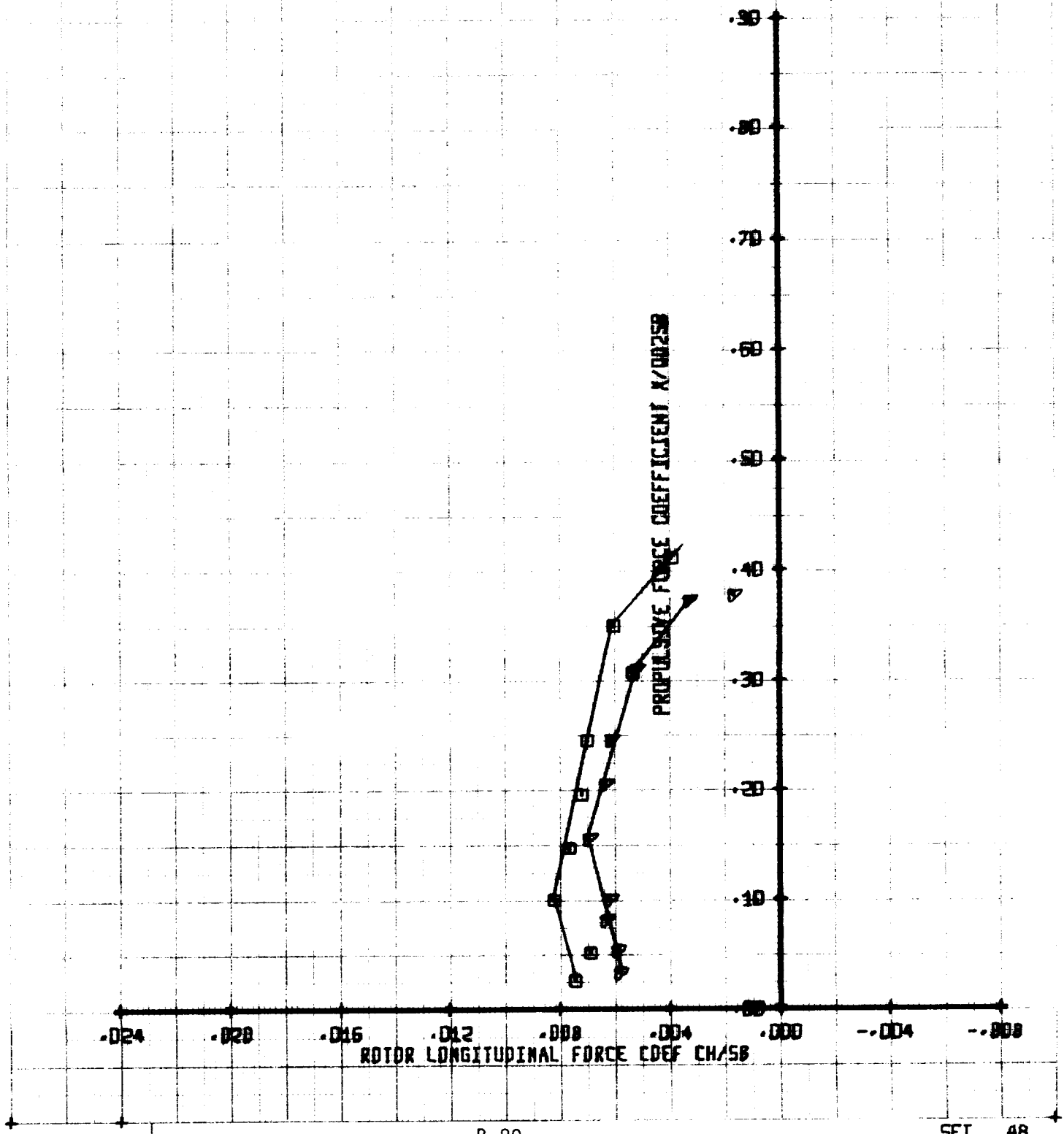
Figure B-76

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

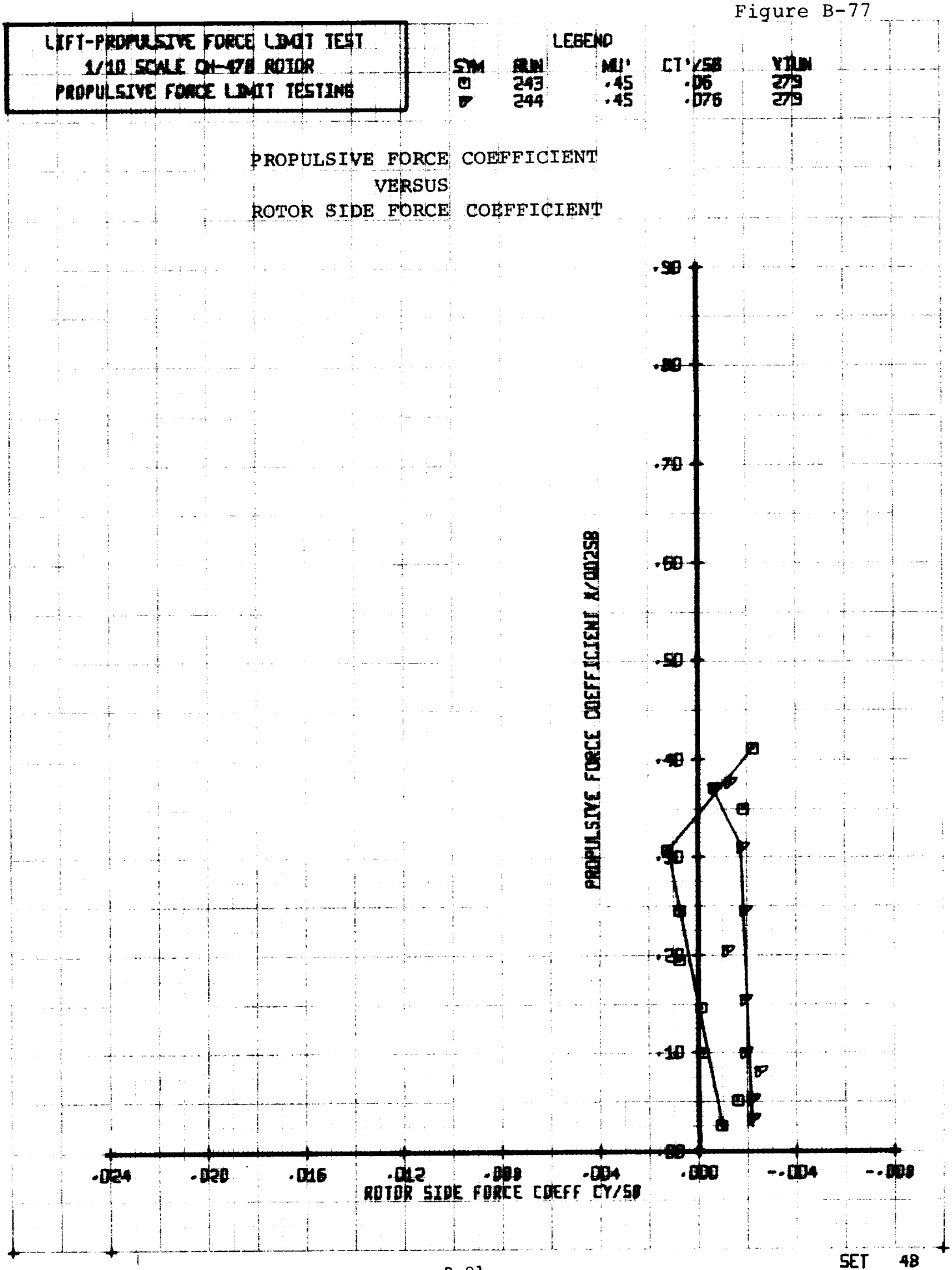
PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 48
WT 1.93

SET 48
BVWT 1.93

Figure B-77



ET 48
WT 193

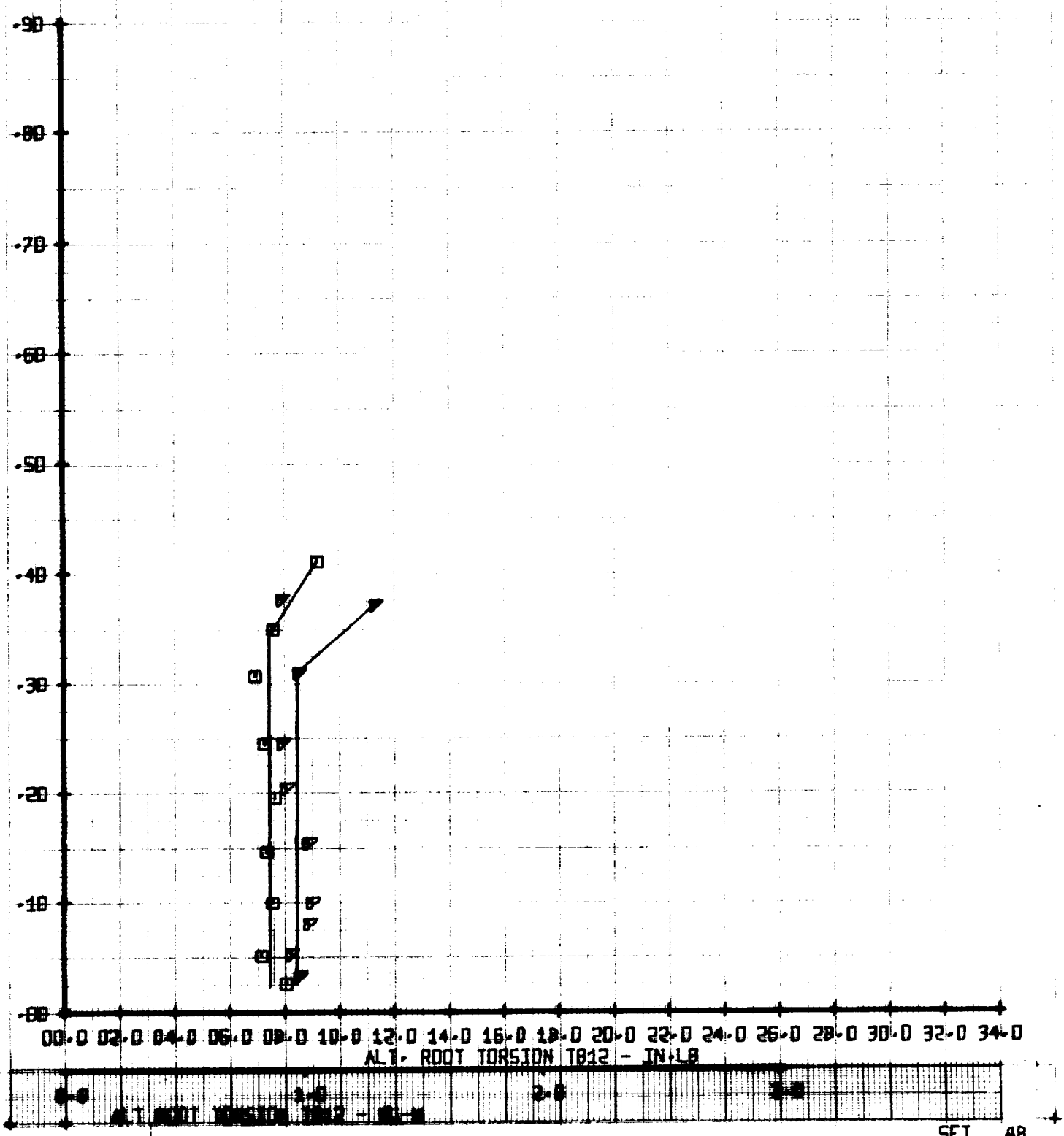
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 48
WT 193

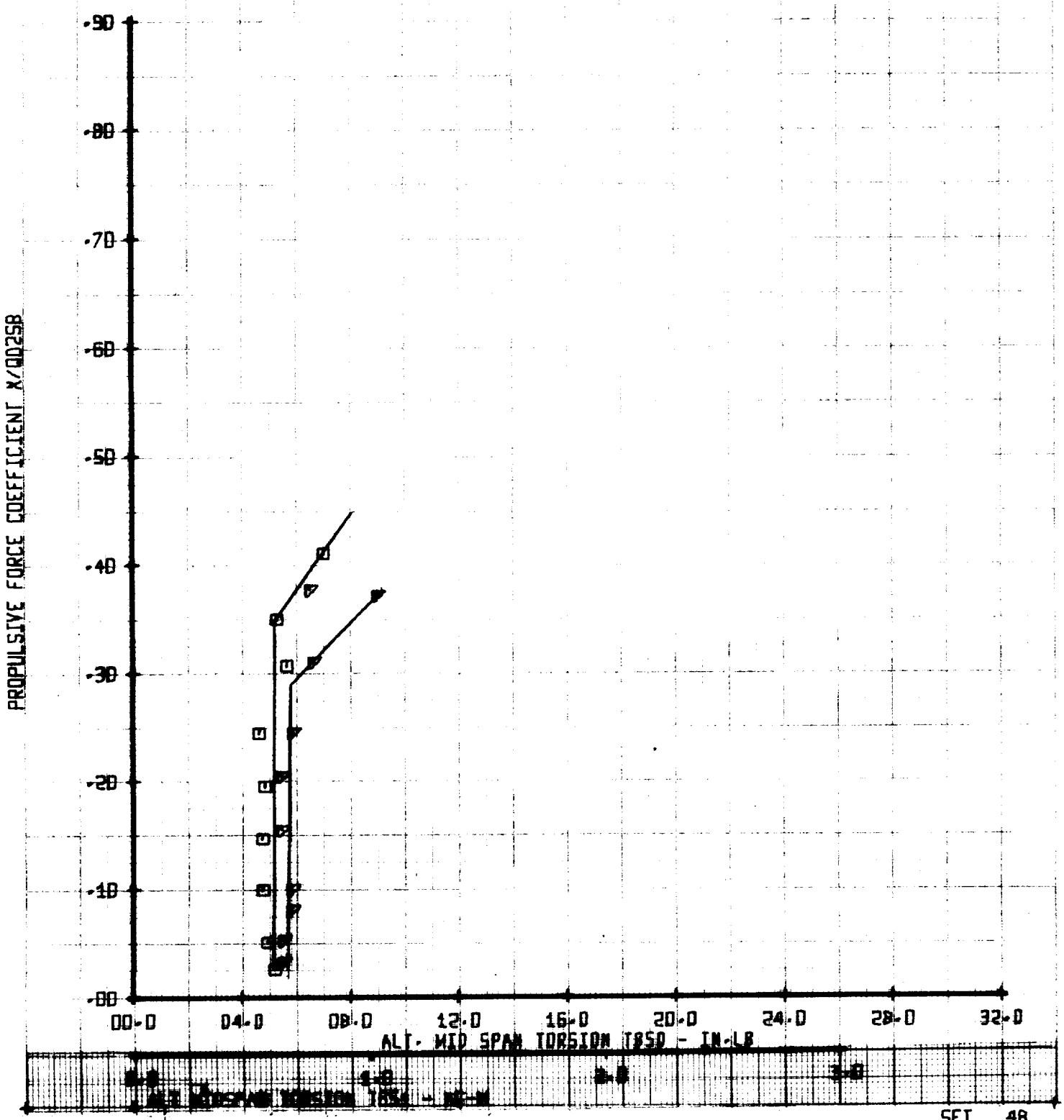
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 48
WT 193

SET 48
BVWT 193

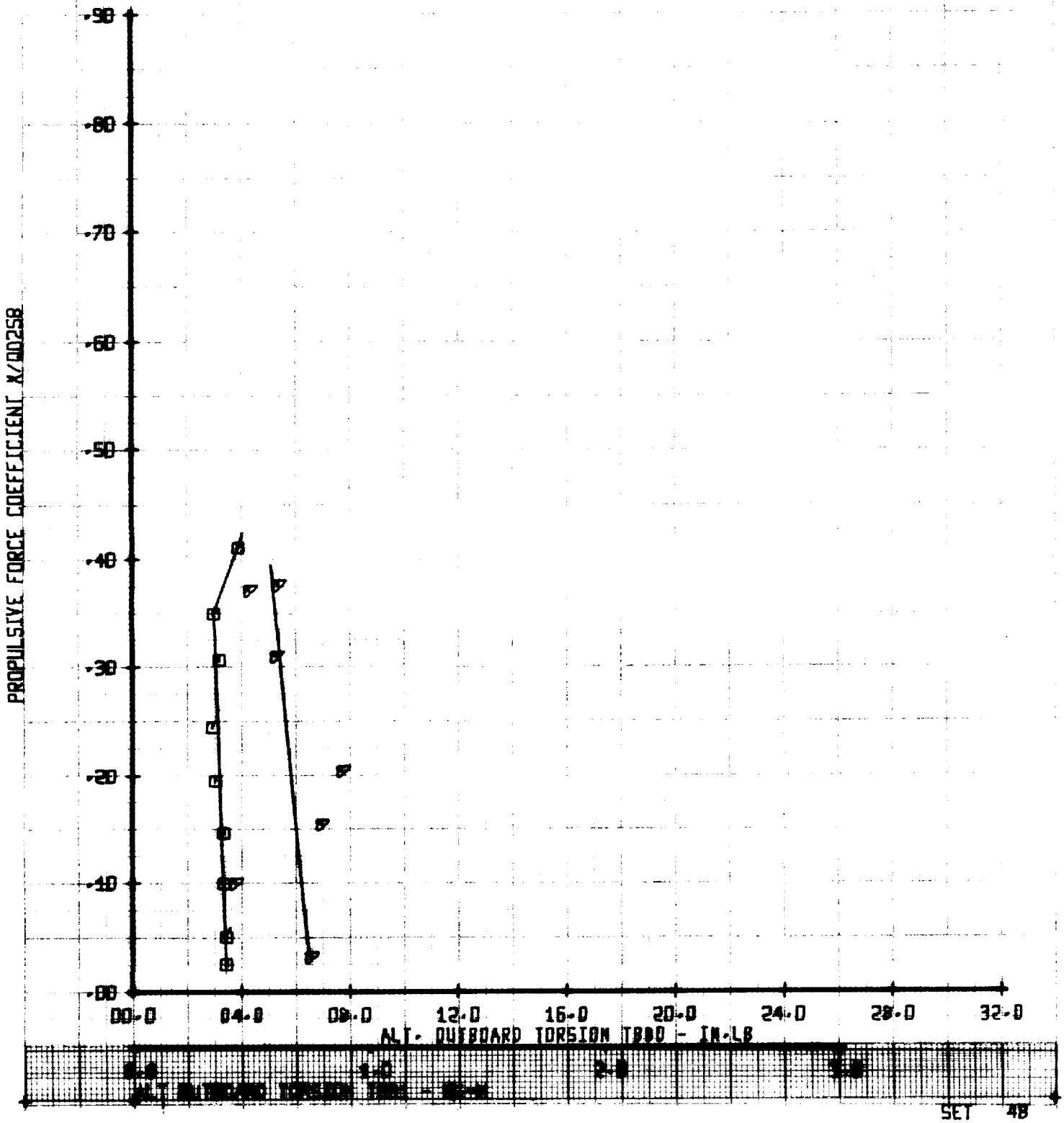
Figure B-80

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 48
WT 193

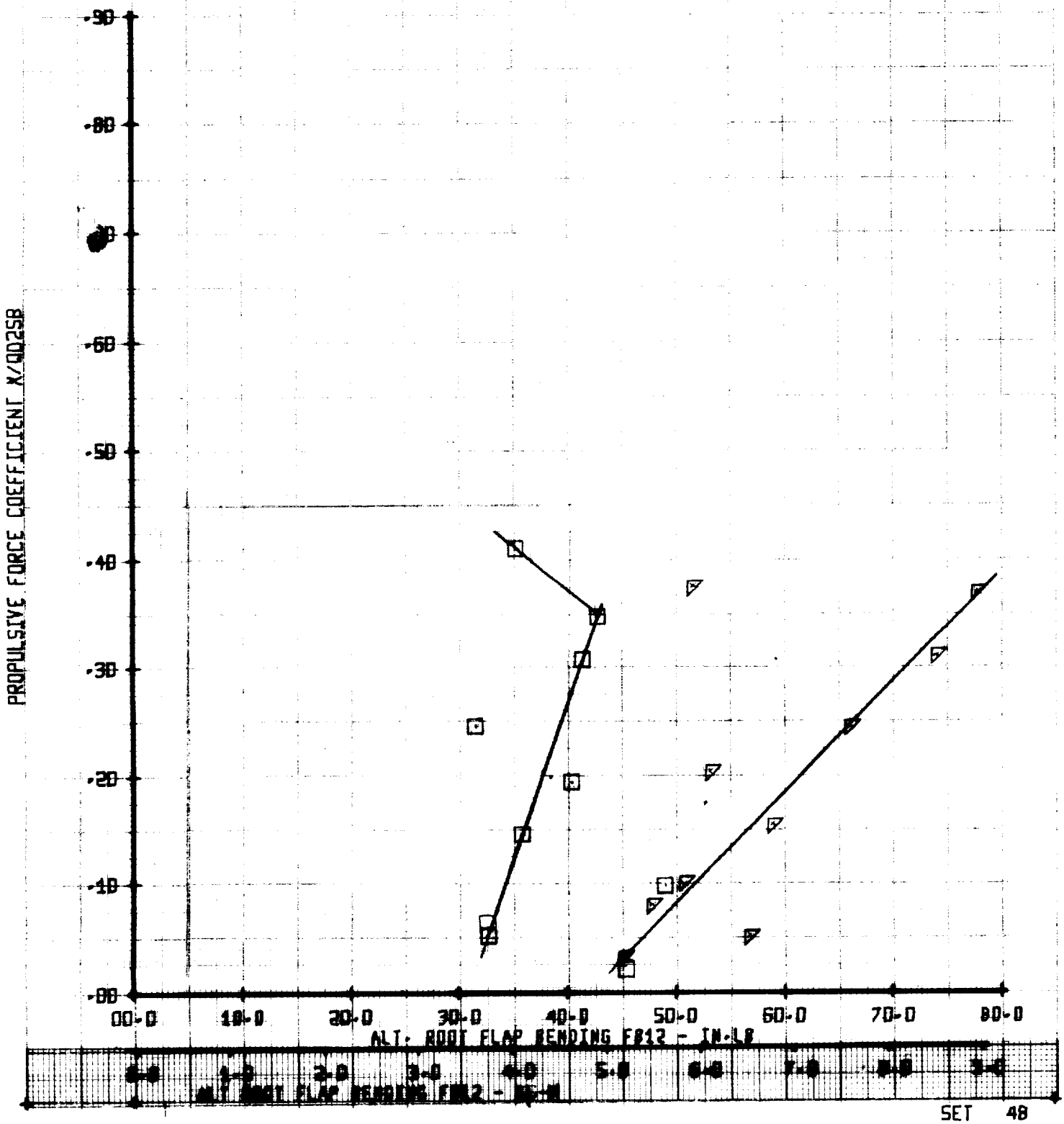
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 48
WT 193

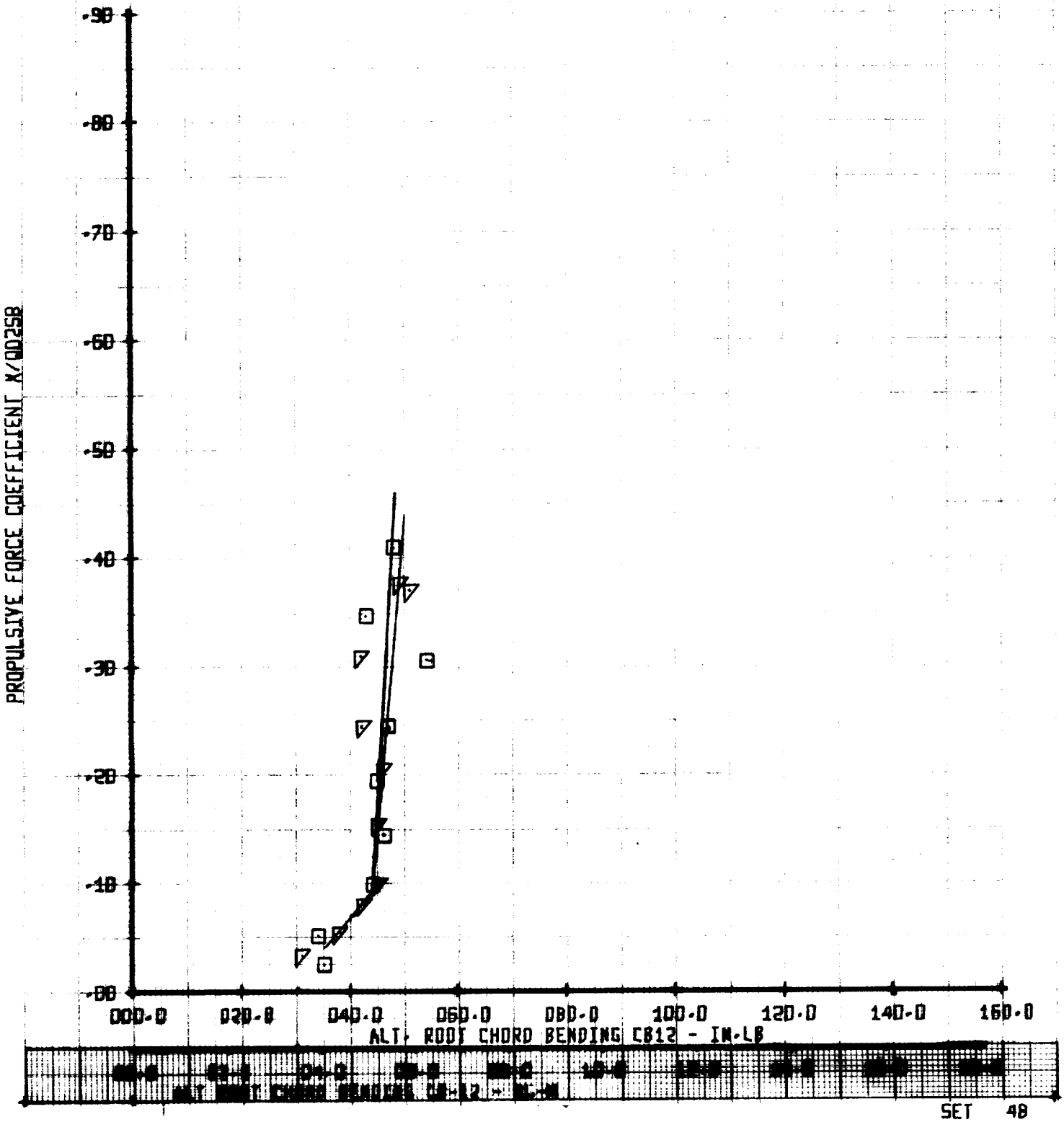
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



ET 48
WT 193

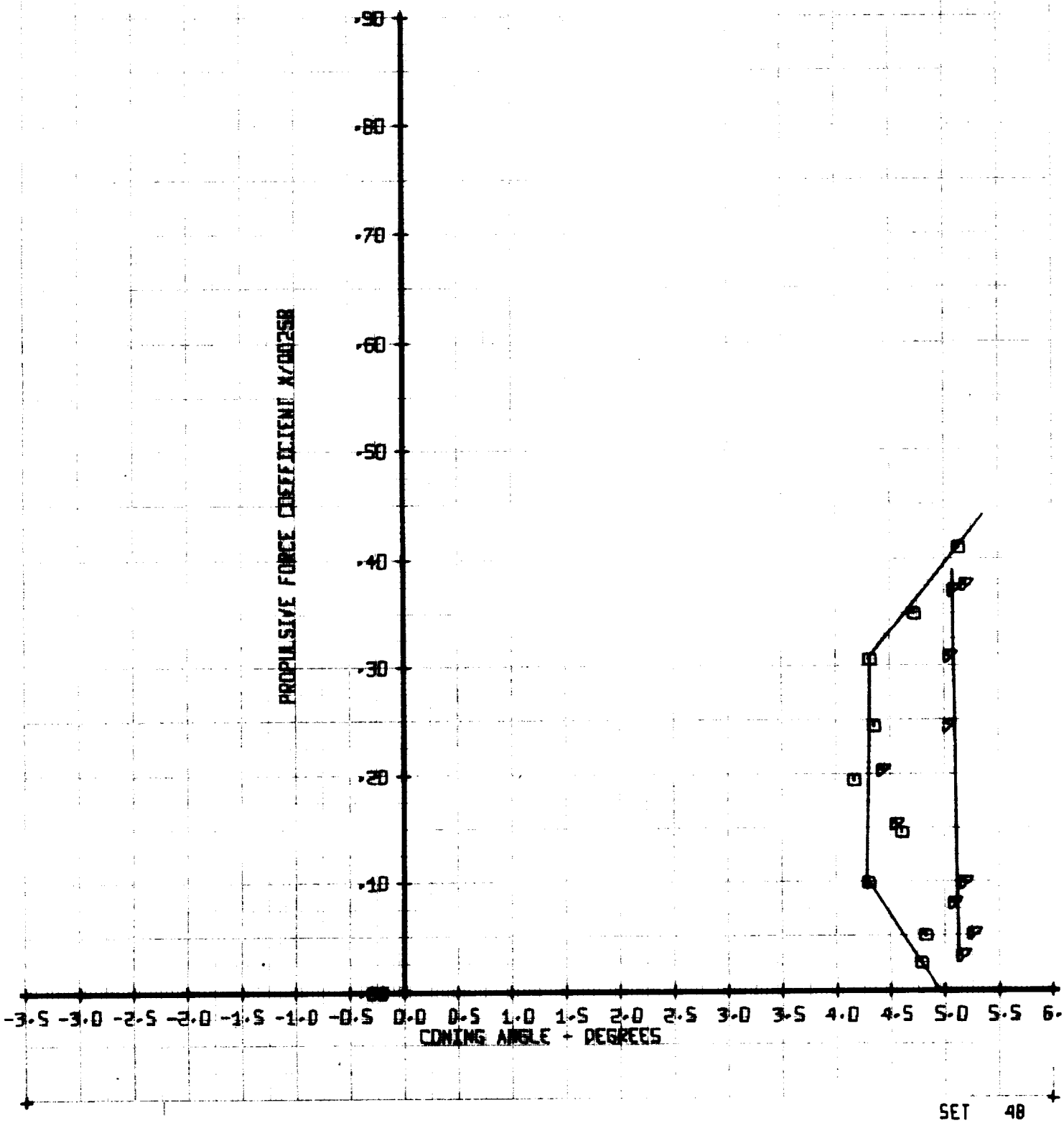
SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
◇	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



ET 48
WT 193

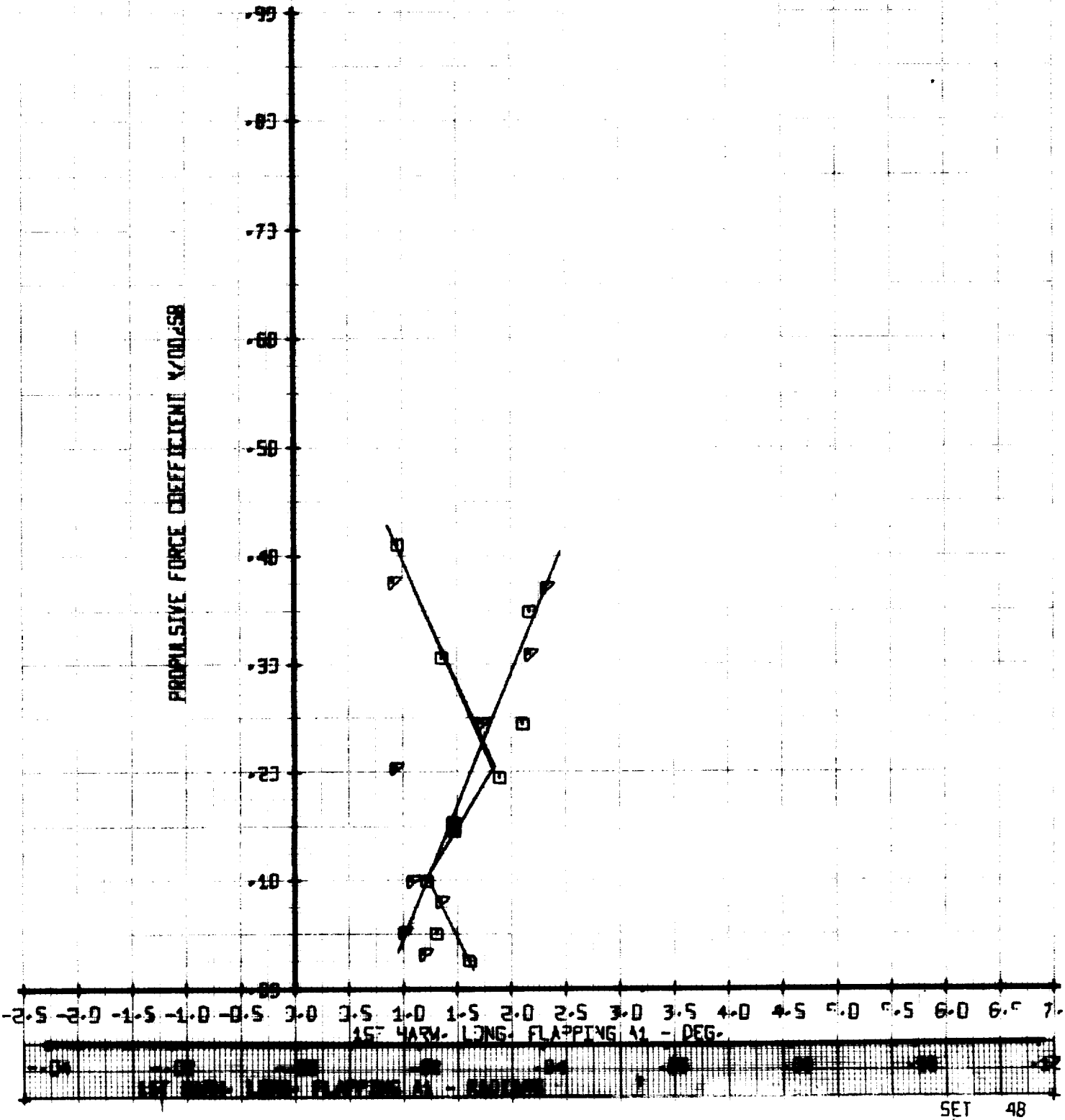
SET 48
BVWT 193

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	LT/SB	YTUN
□	243	.45	.06	279
▽	214	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



ET 48
WT 193

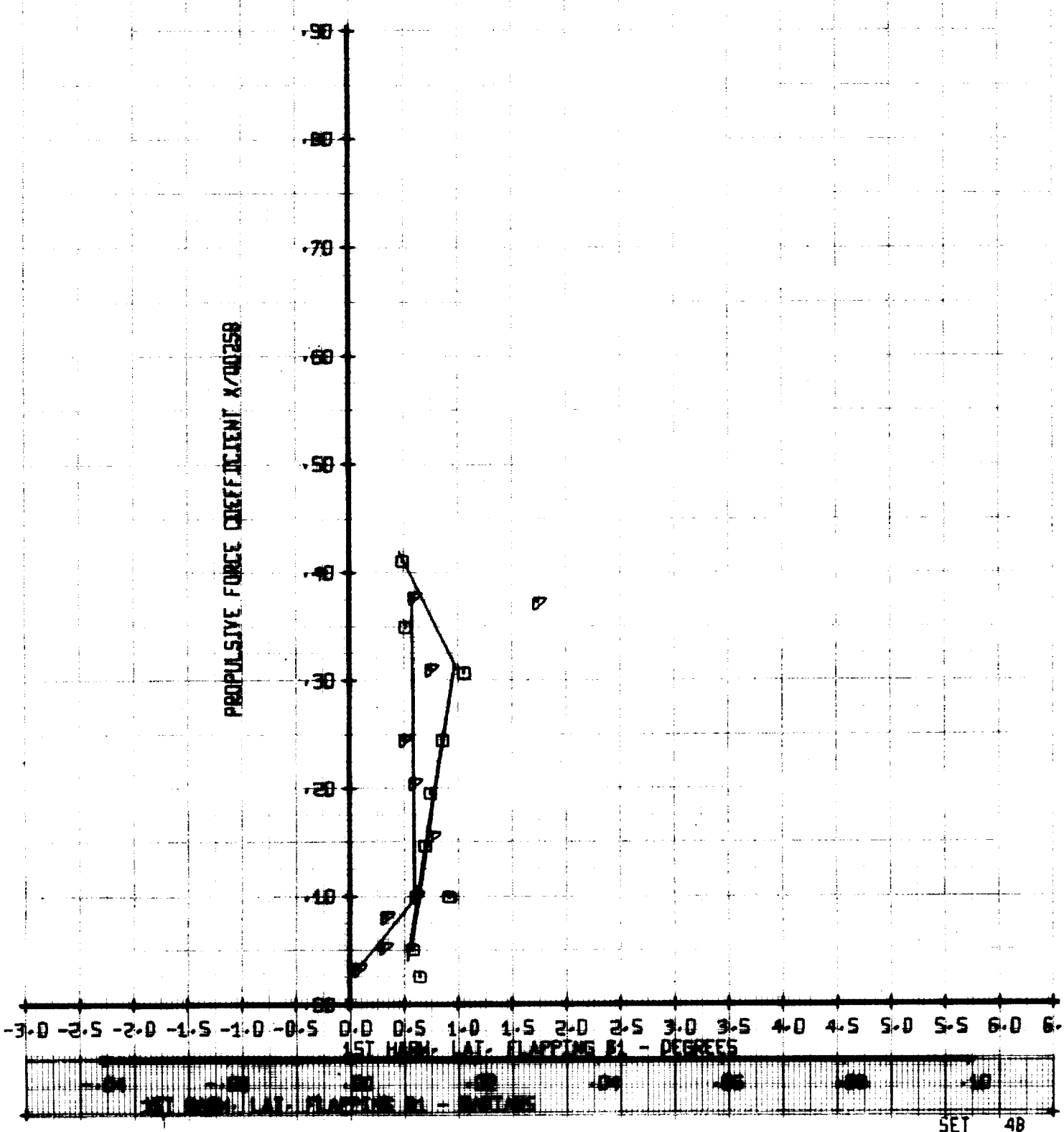
SET 48
WT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

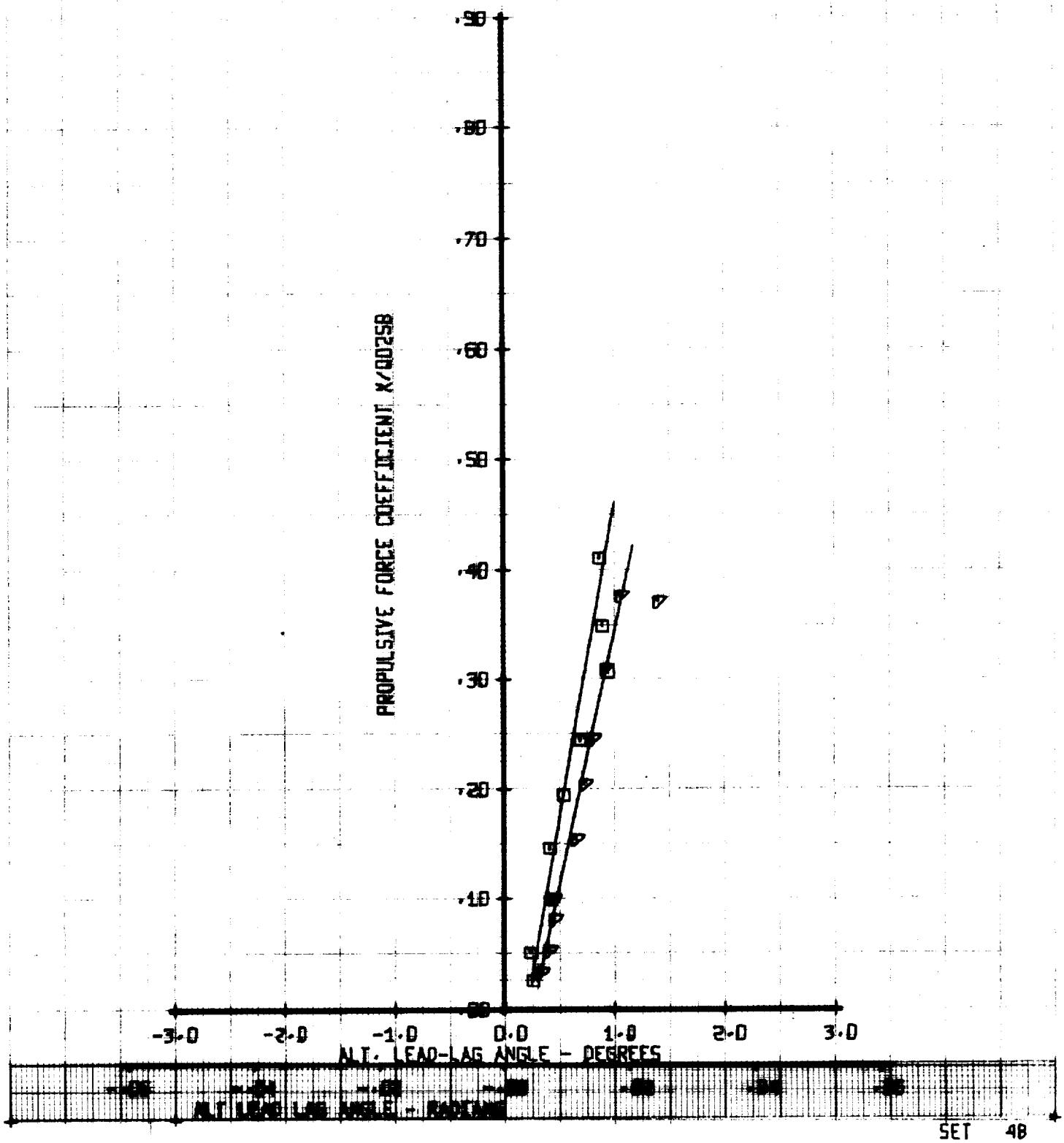


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 48
WT 193

SET 48
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

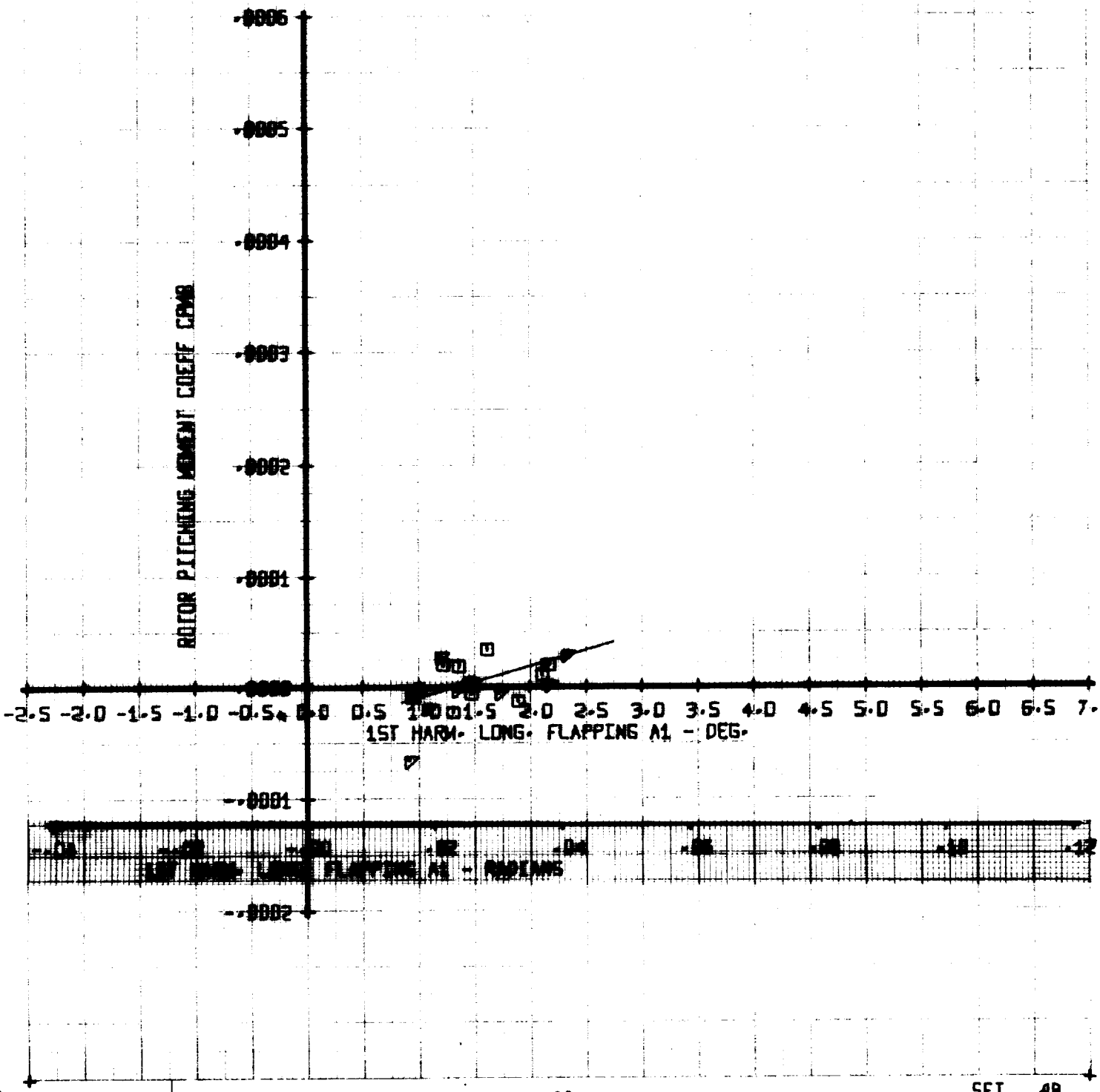


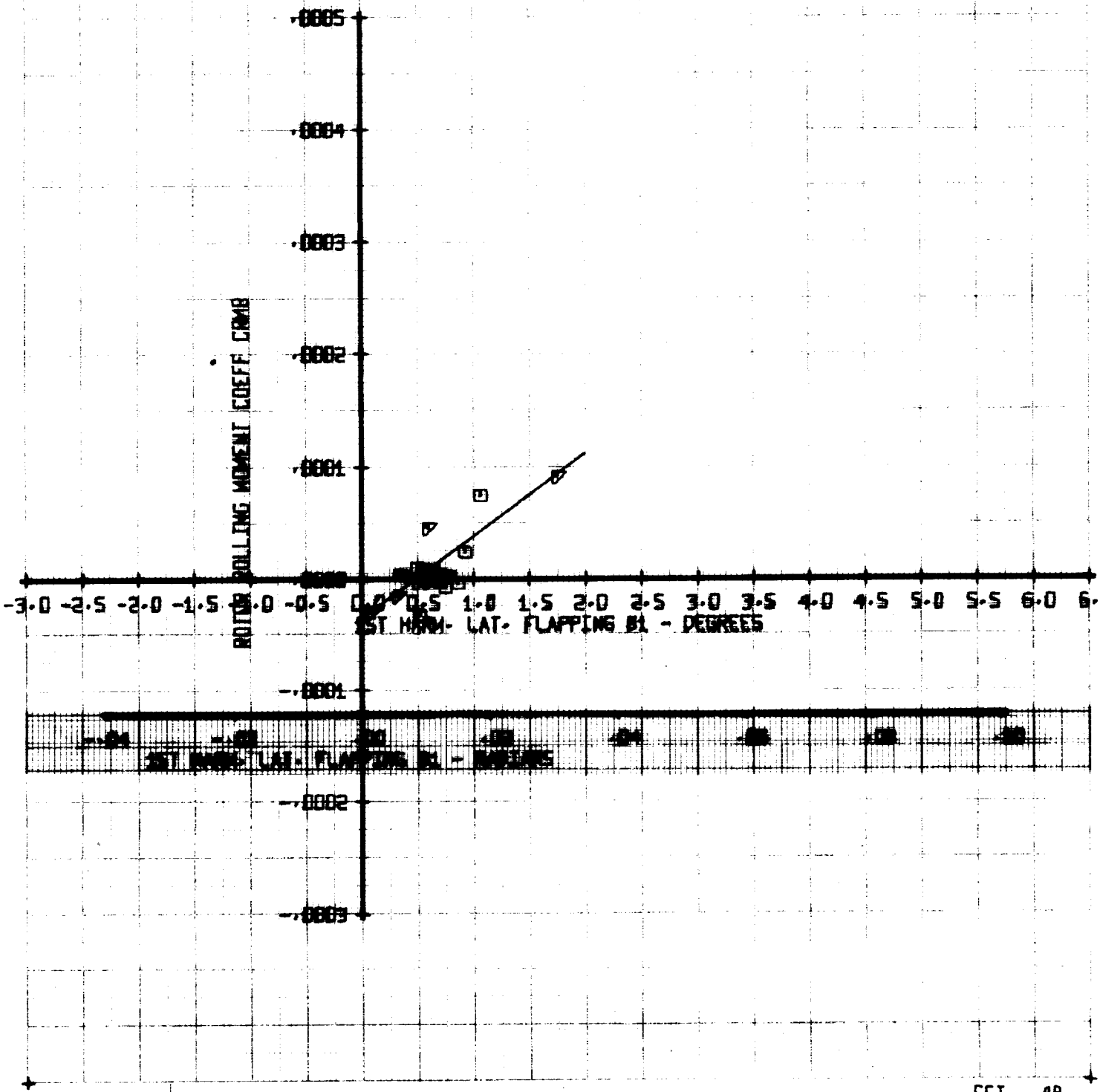
Figure B-88

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	243	.45	.06	279
▽	244	.45	.076	279

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

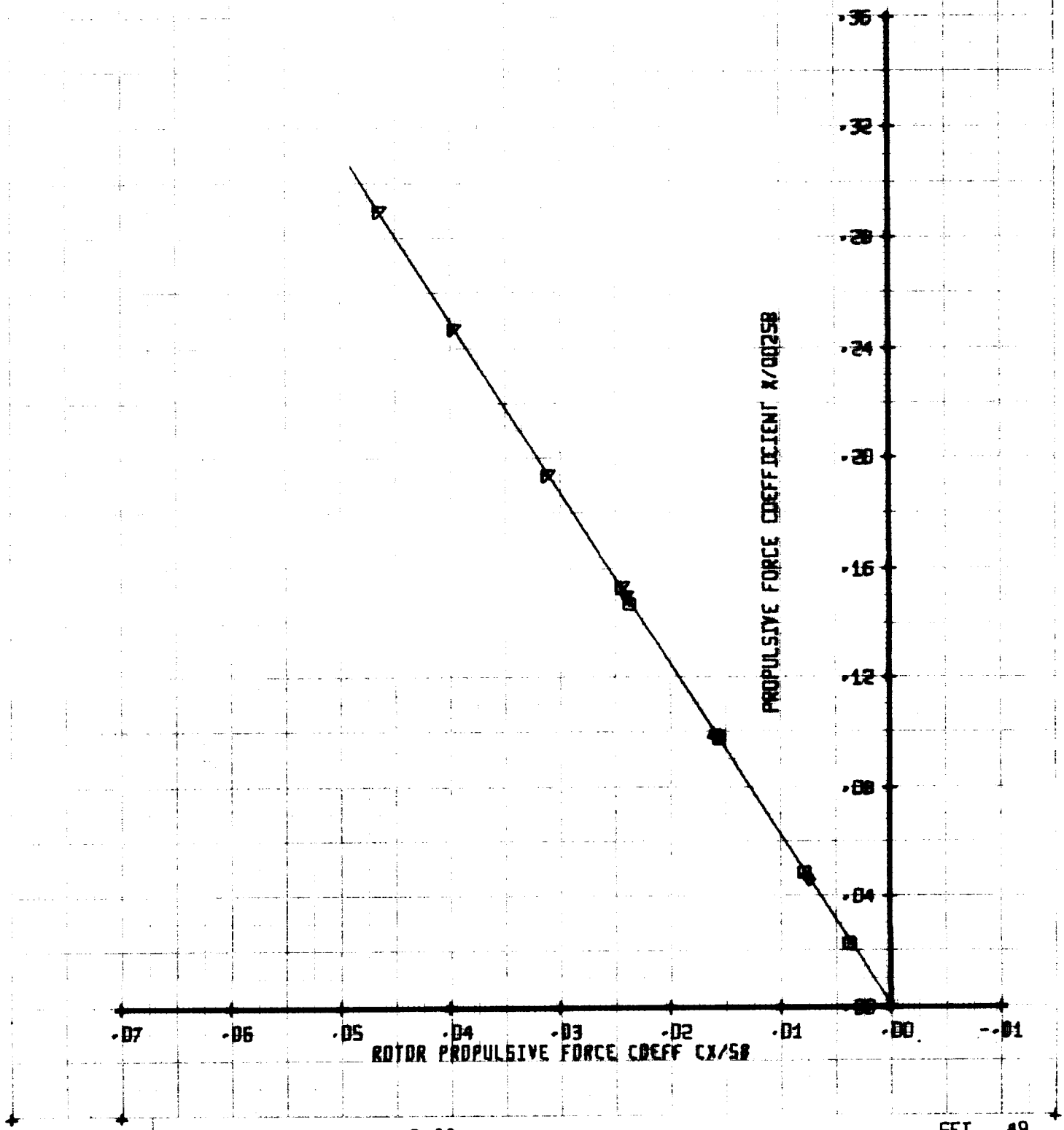


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▼	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 49
WT 193

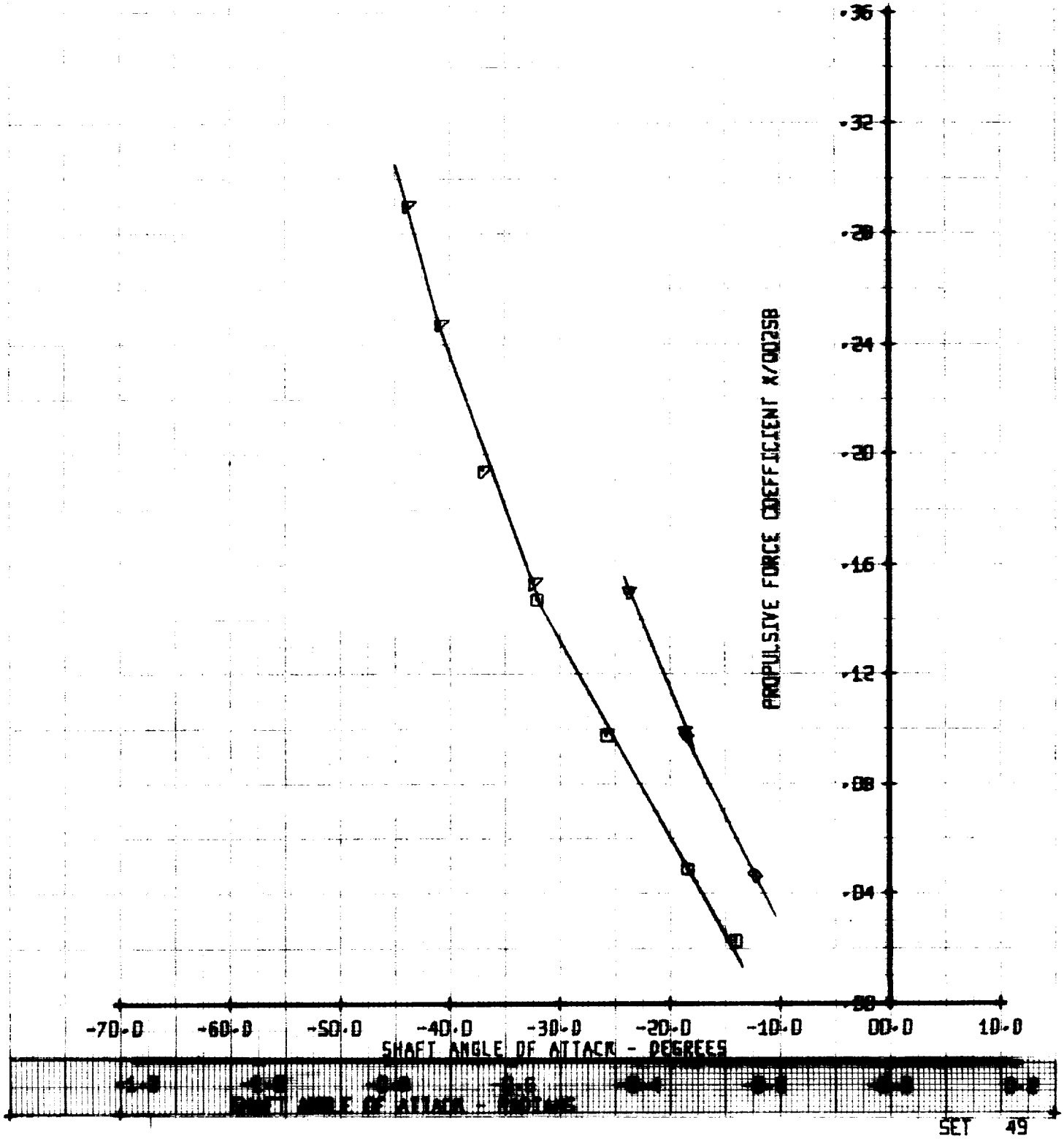
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK

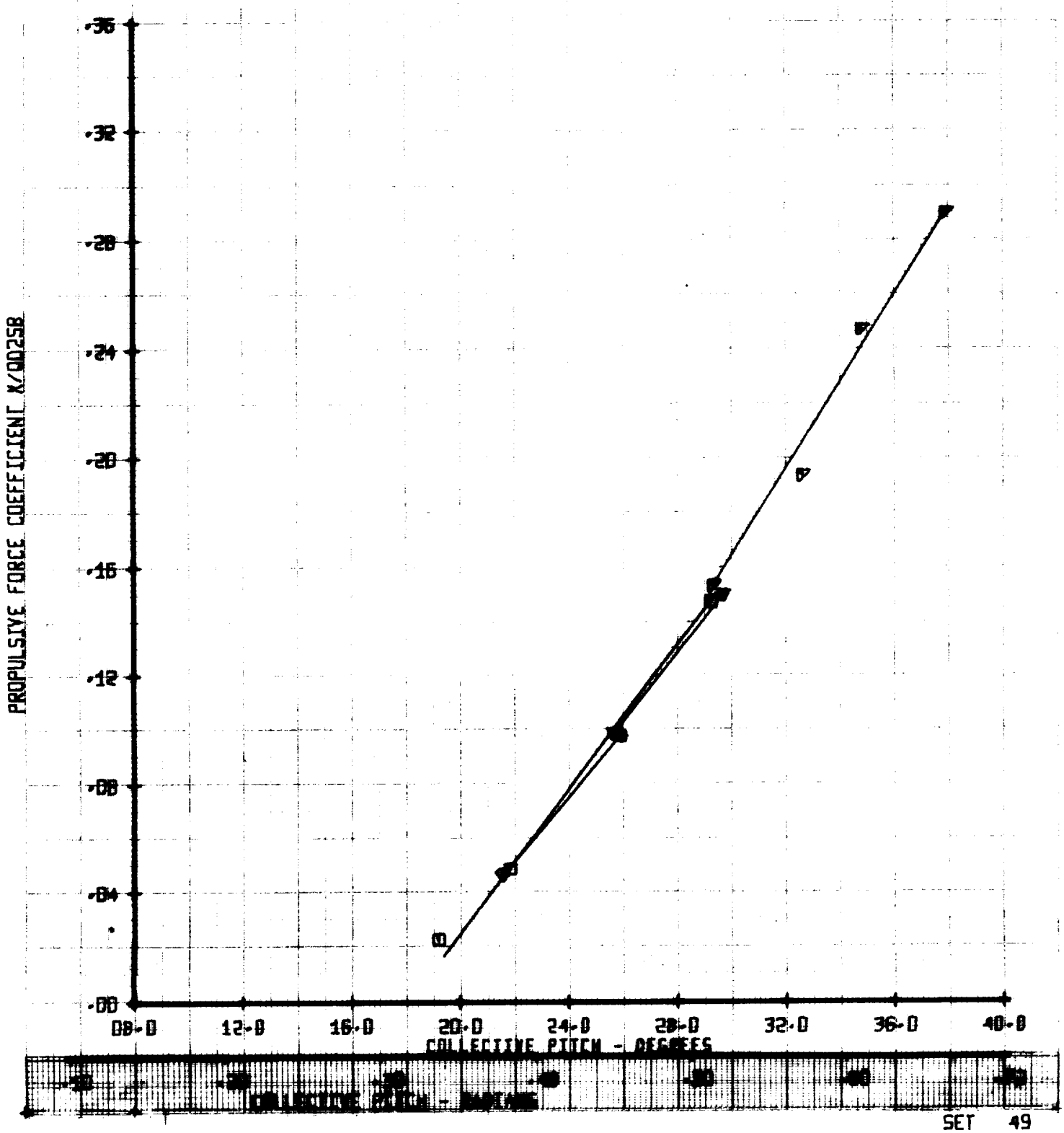


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
◇	233	.50	.06	311
◆	234	.50	.08	311
▼	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 49
WT 193

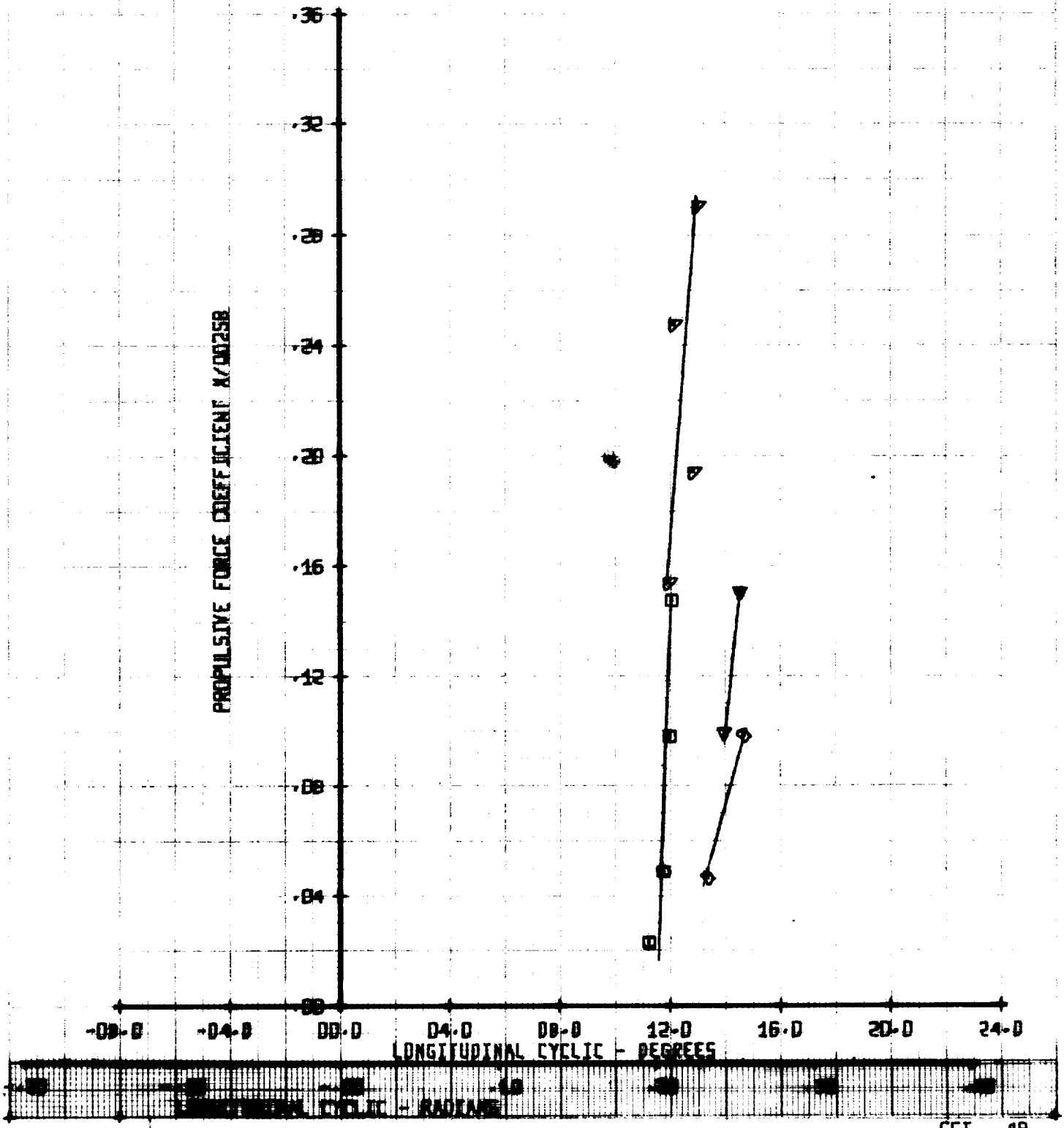
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▼	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC

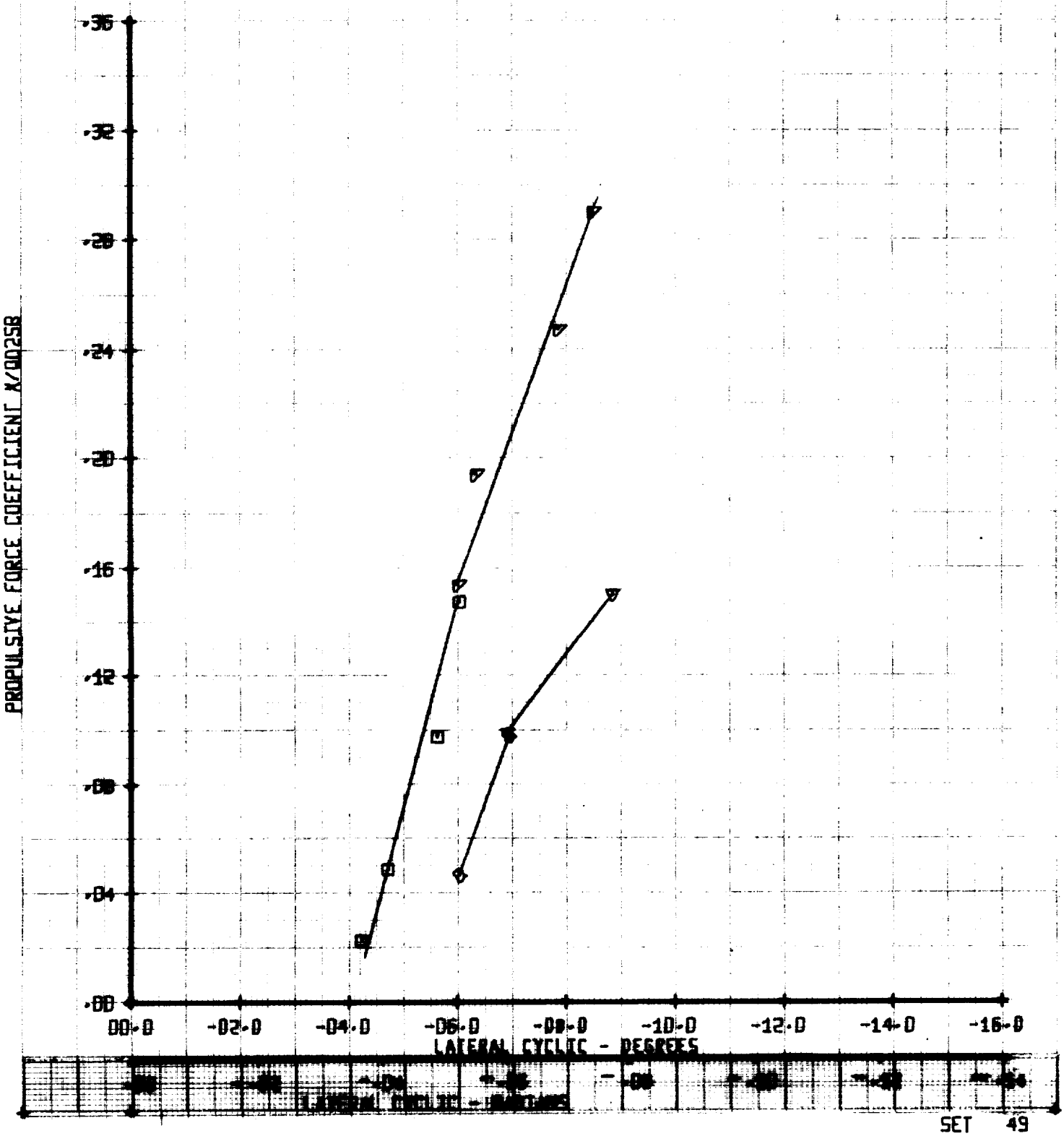


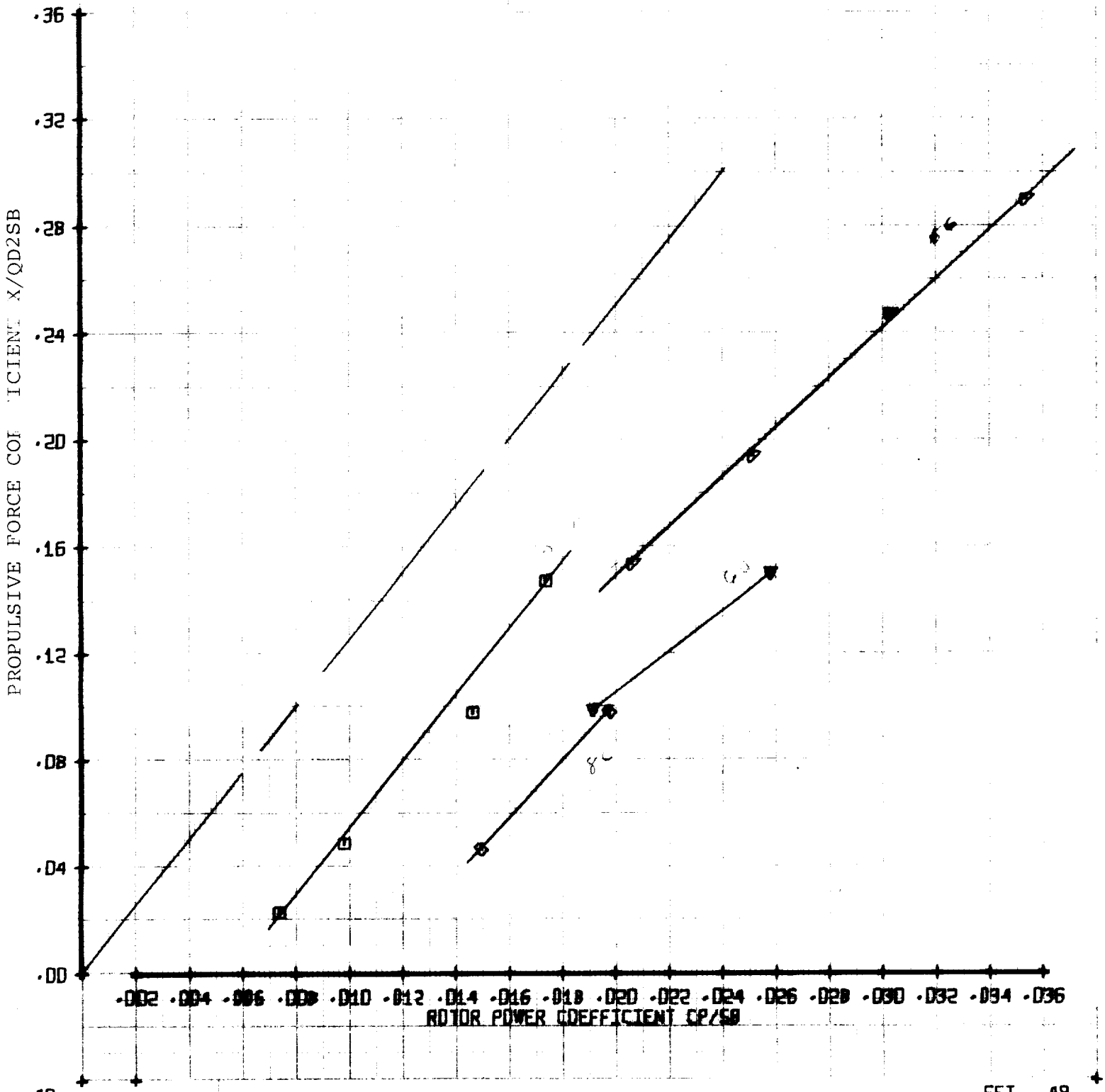
Figure B-94

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 49
WT 193

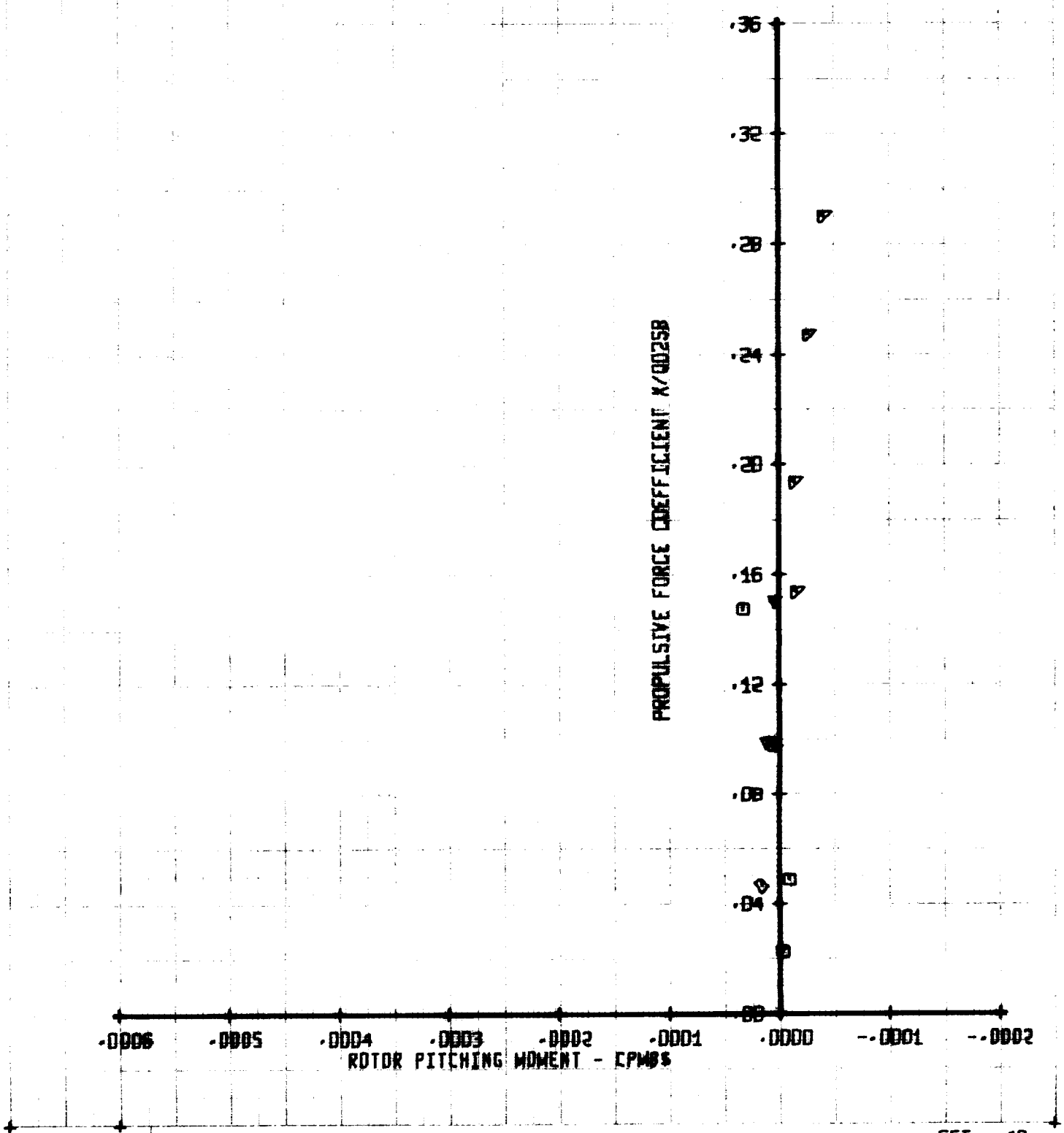
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▼	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

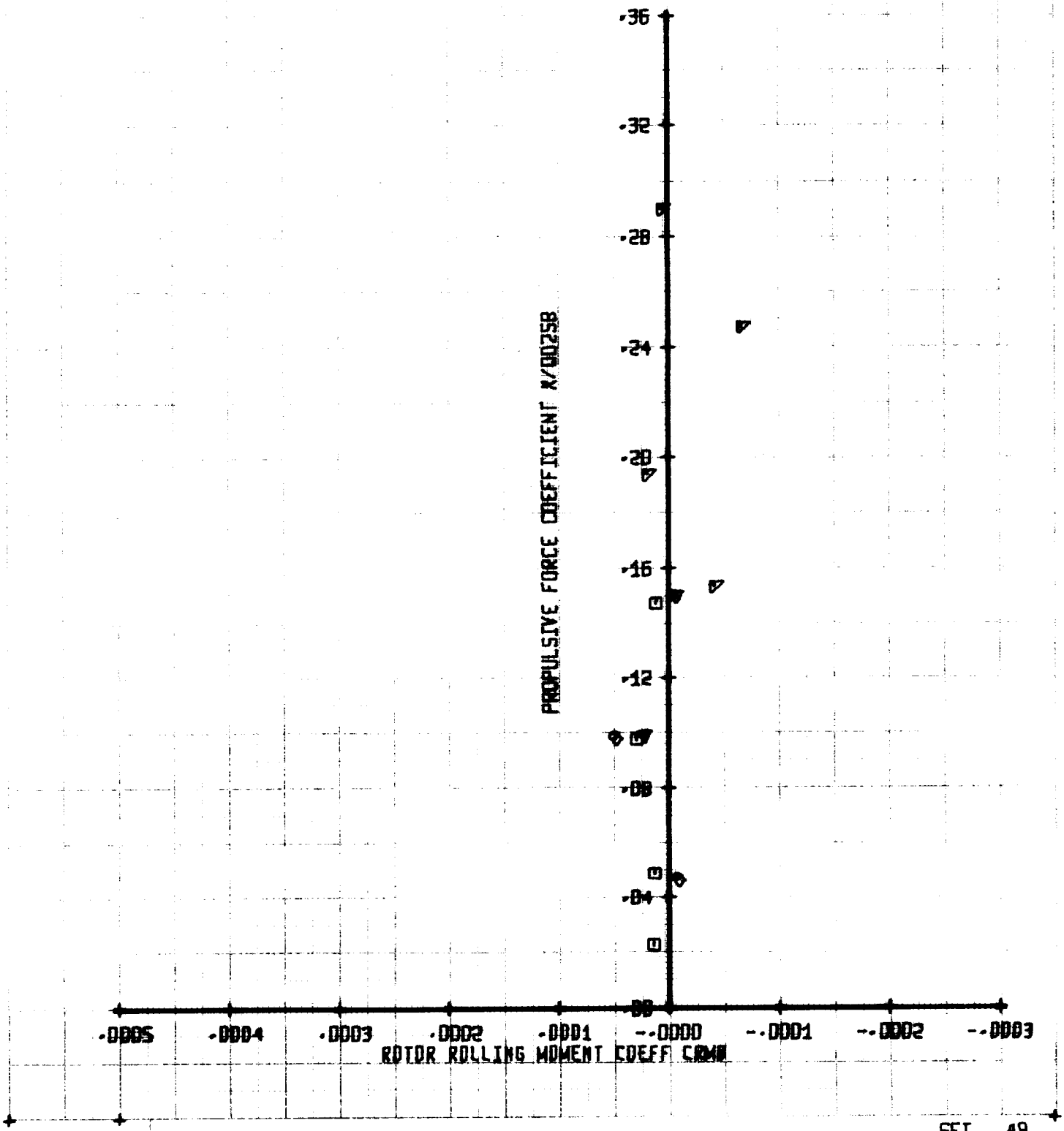


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

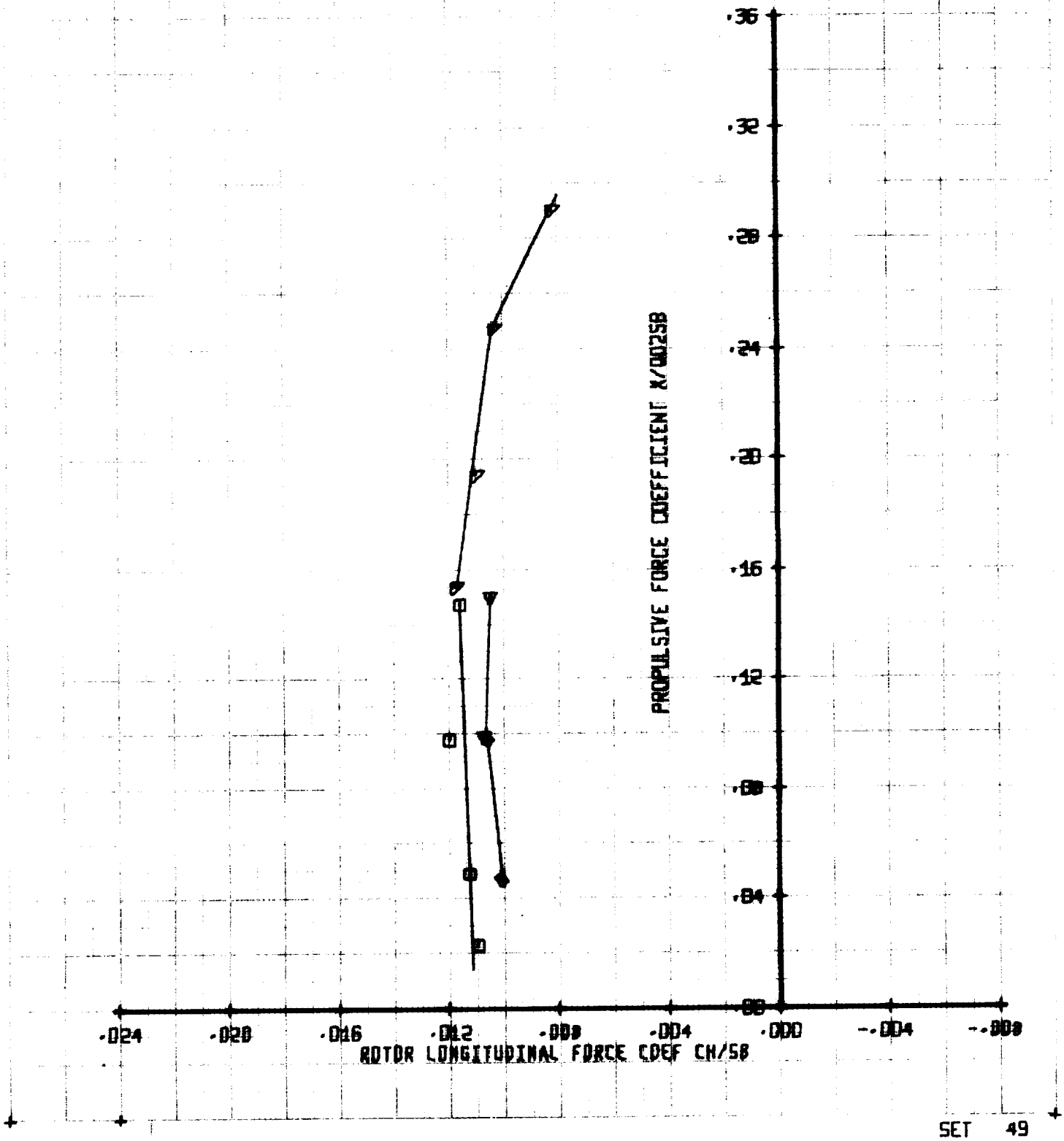


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 49
WT 193

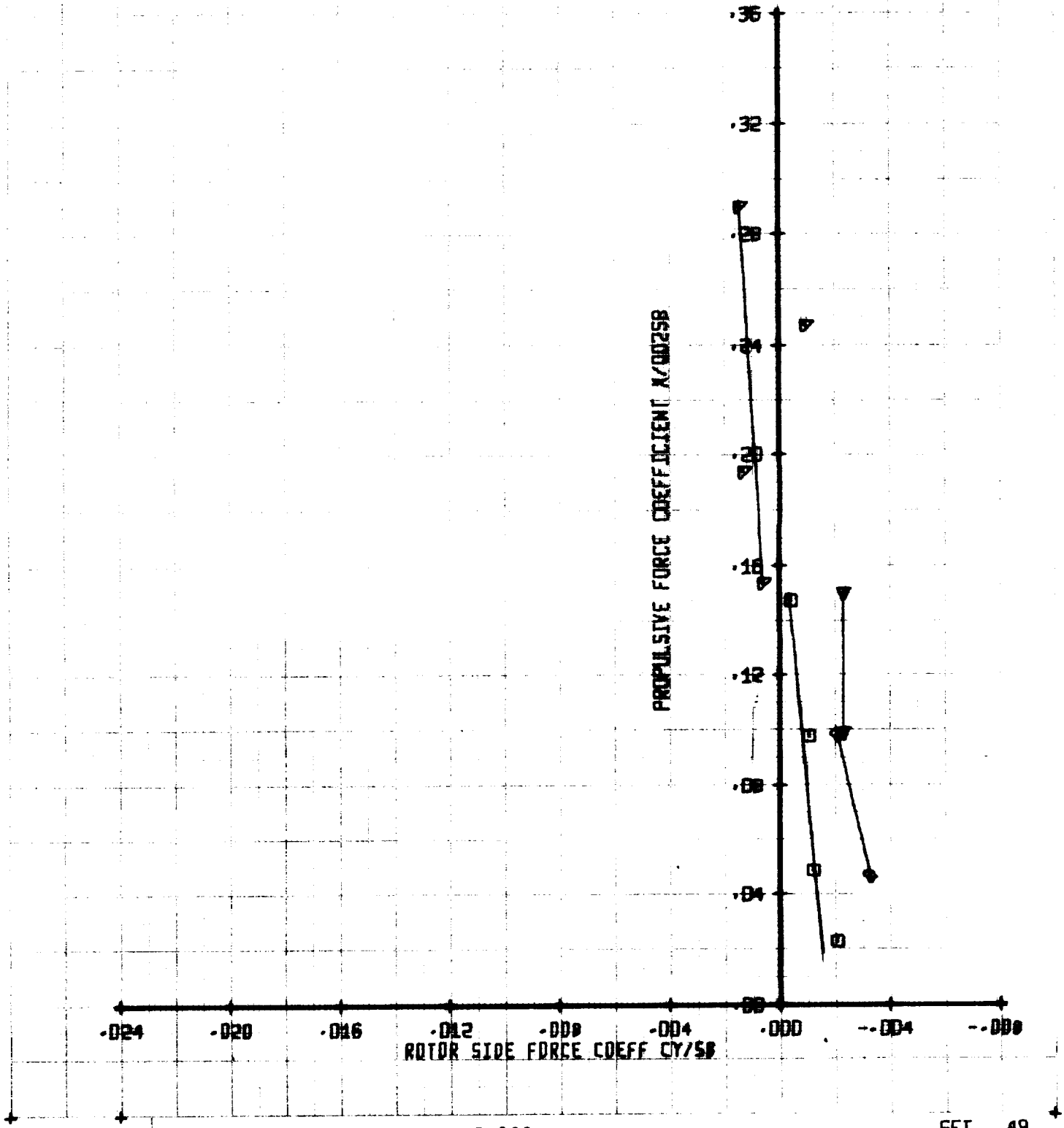
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

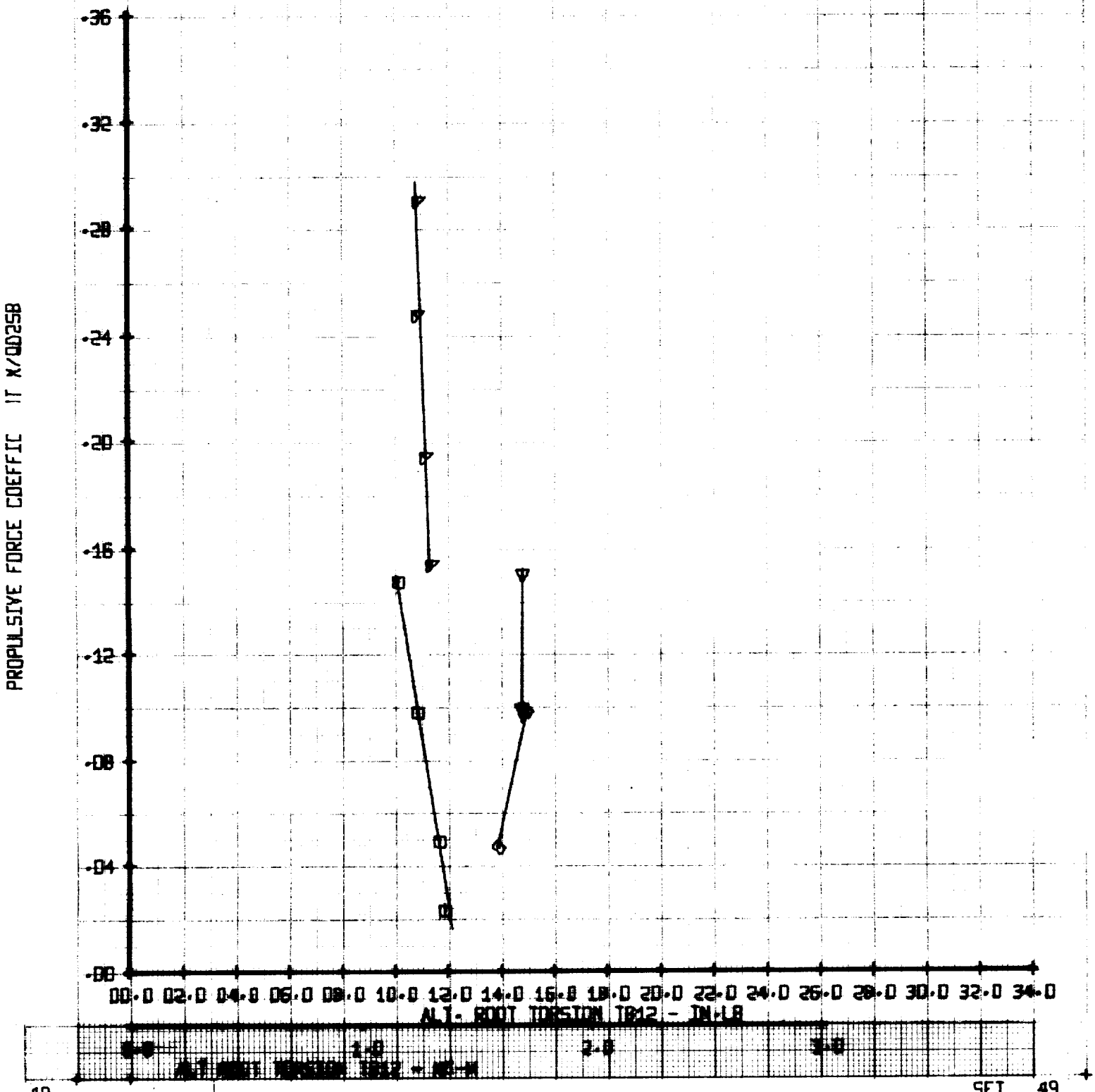


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 49
WT 193

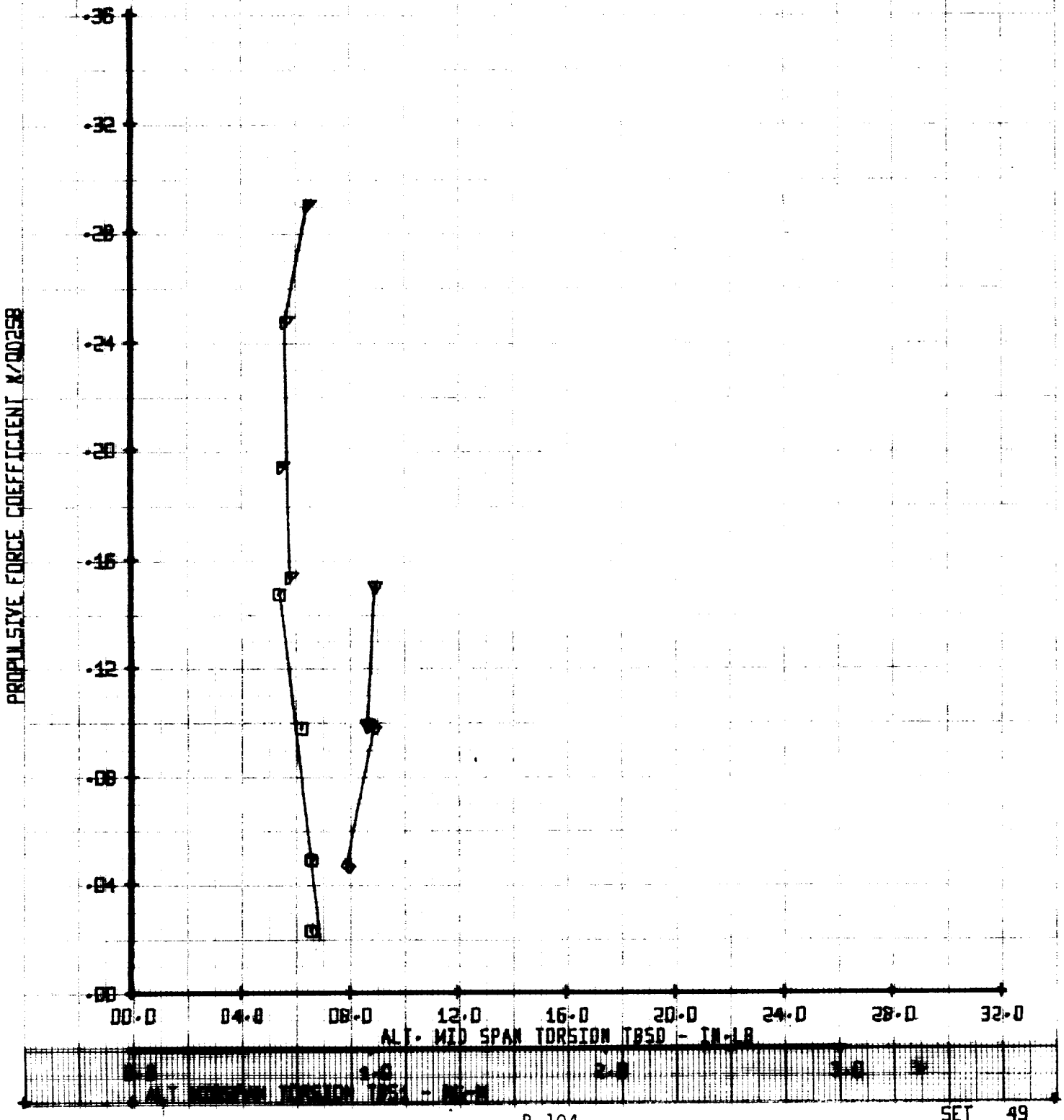
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 49
WT 193

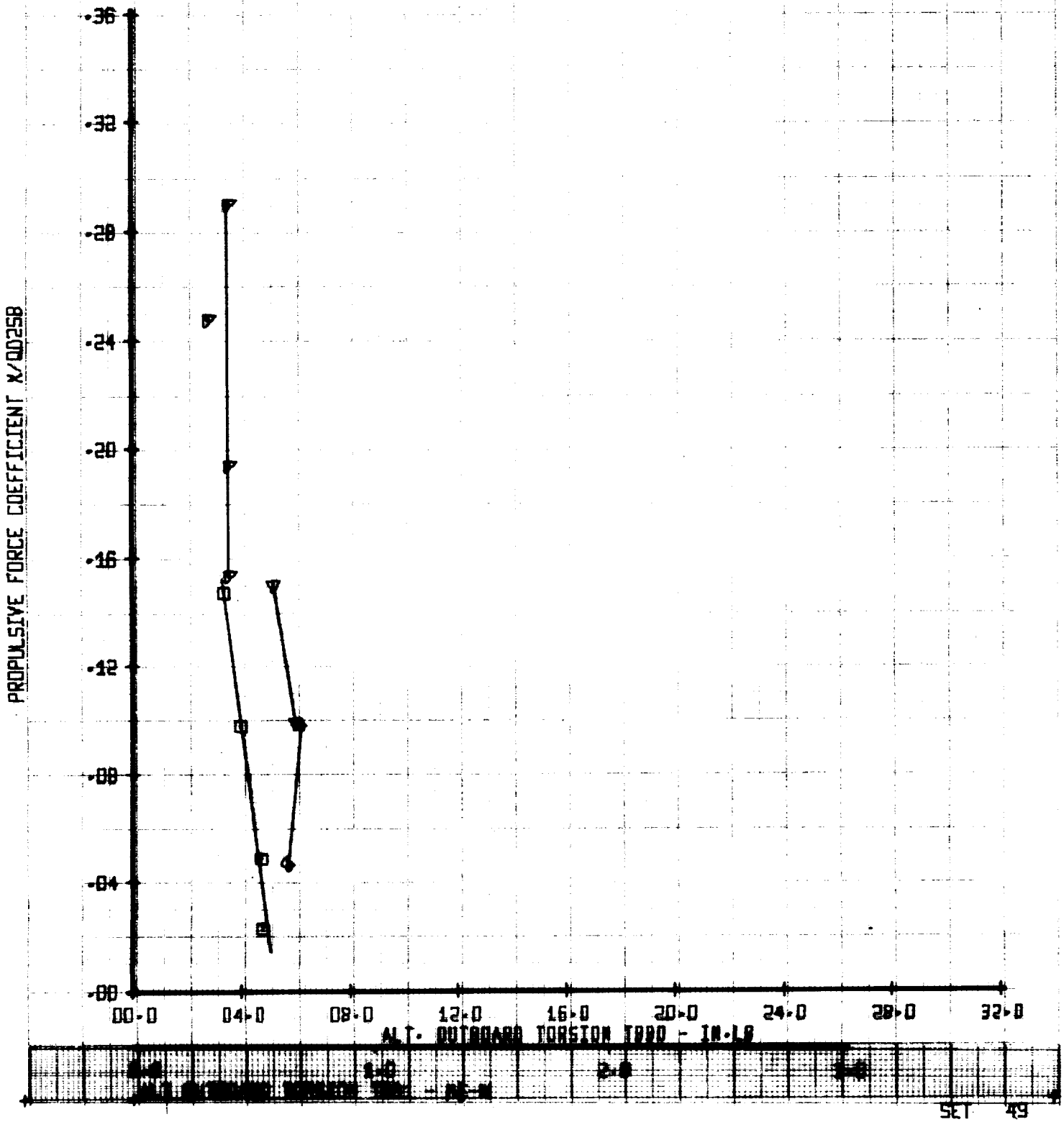
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	232	.50	.06	311
▷	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



SET 49
BWT 193

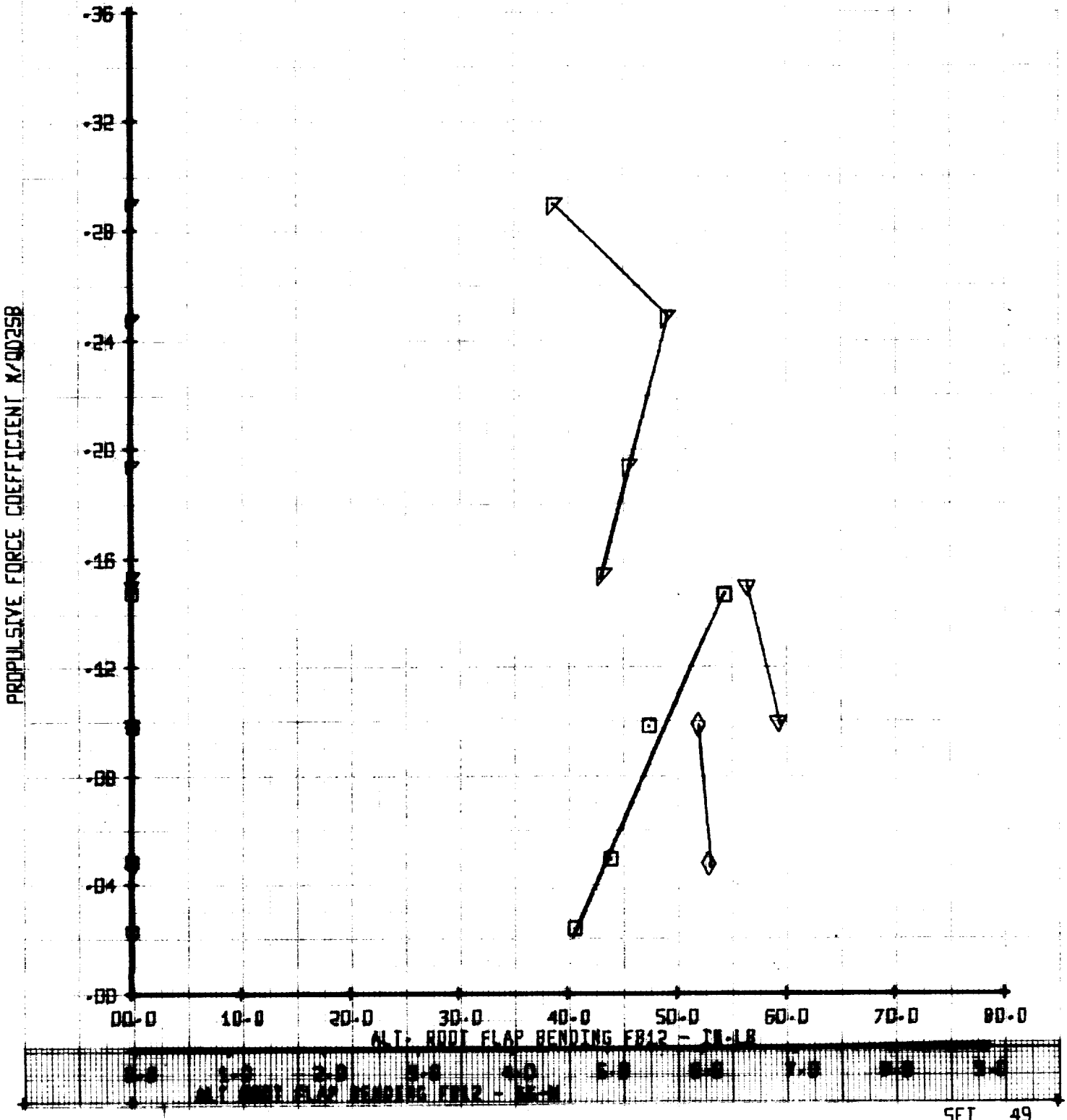
SET 49
BWT 183

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

SYM	RUN	MU'	CT'/SB	YTUN
⊡	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

LEGEND

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12

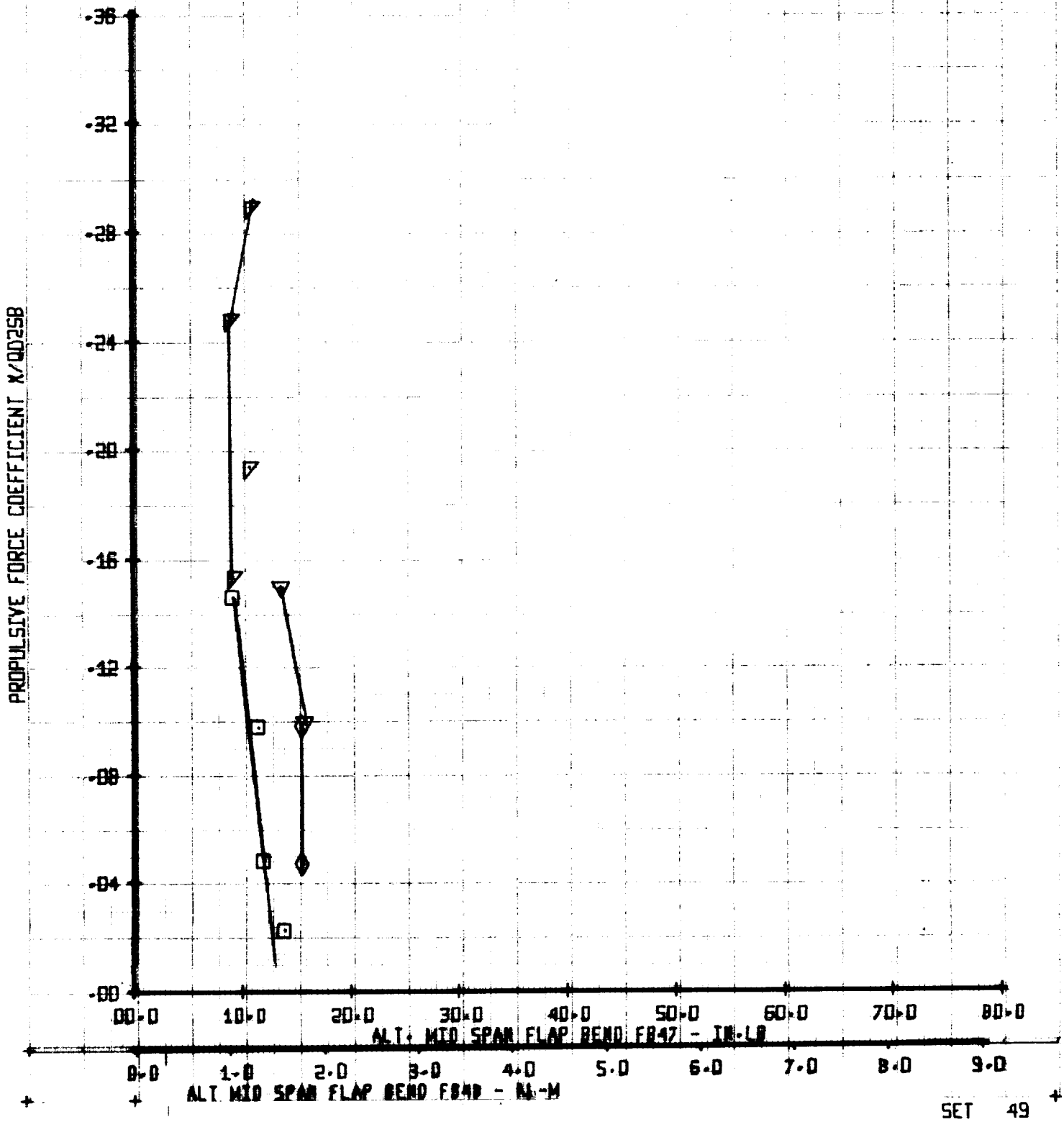


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB47



SET 49
WT 193

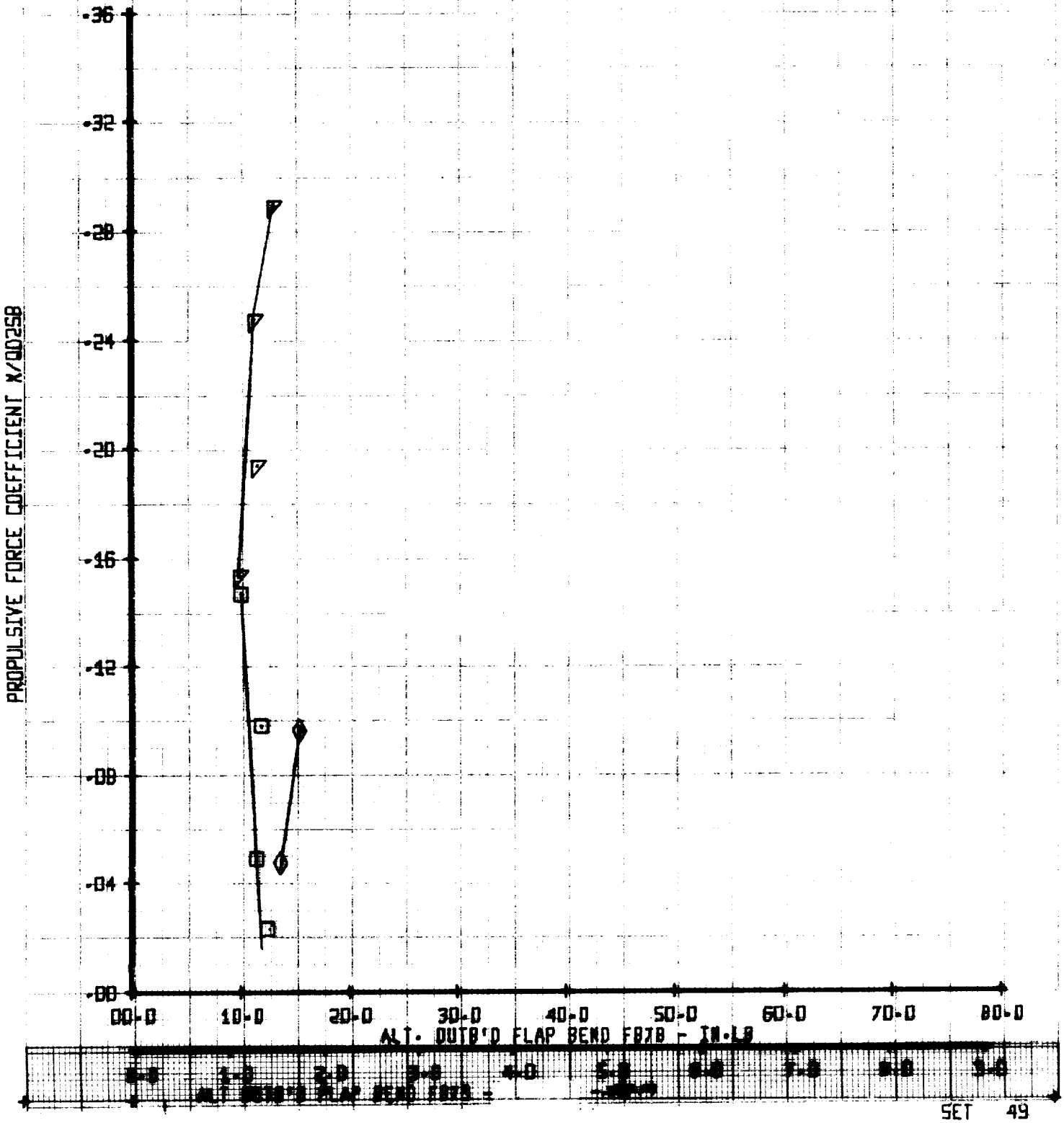
SET 49
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
▣	232	.50	.06	311
▶	233	.50	.06	311
◆	234	.50	.08	311
▼	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



SET 49
BWT 193

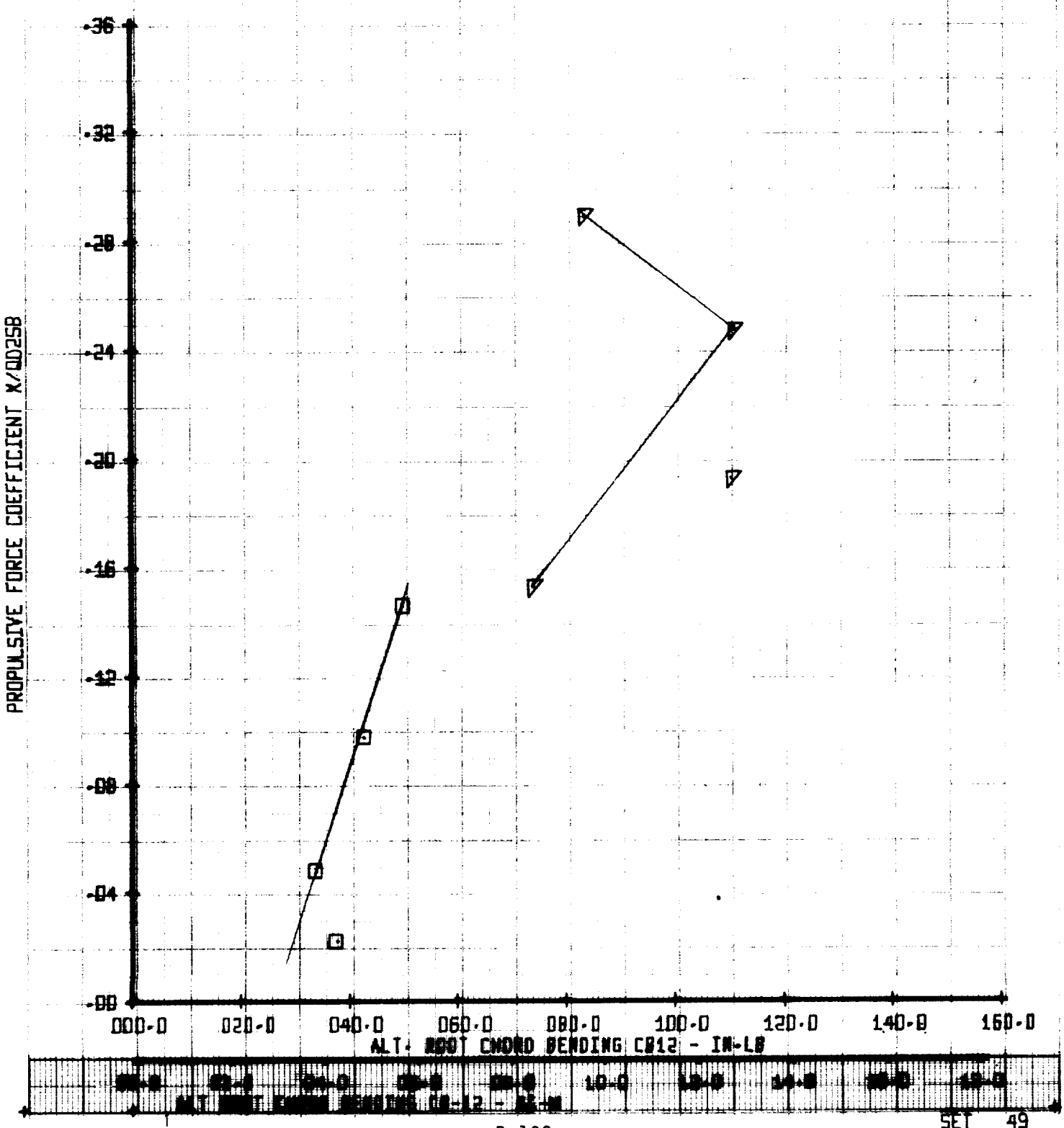
SET 49
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



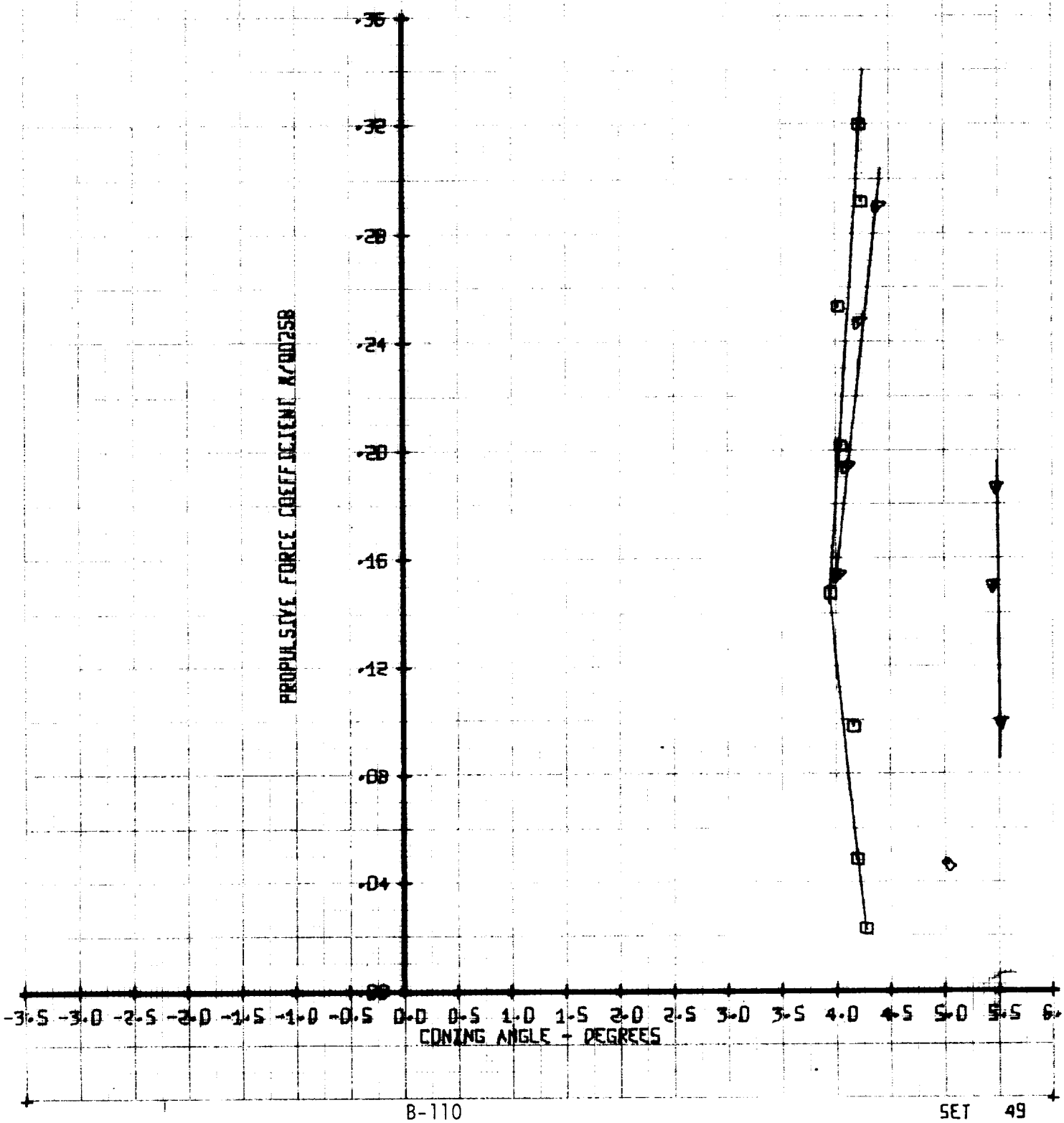
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



ET 49
WT 193

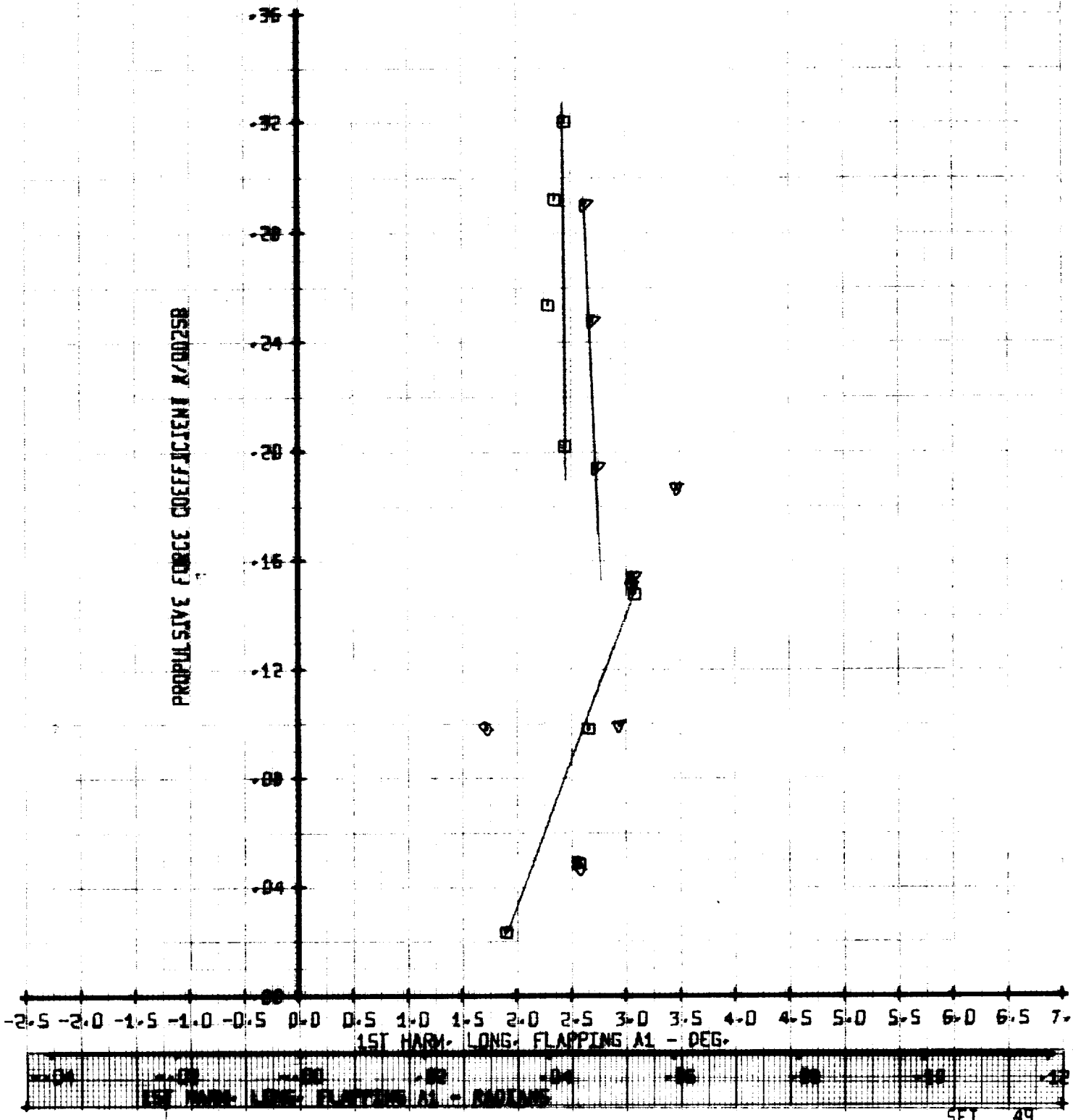
SET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTLN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

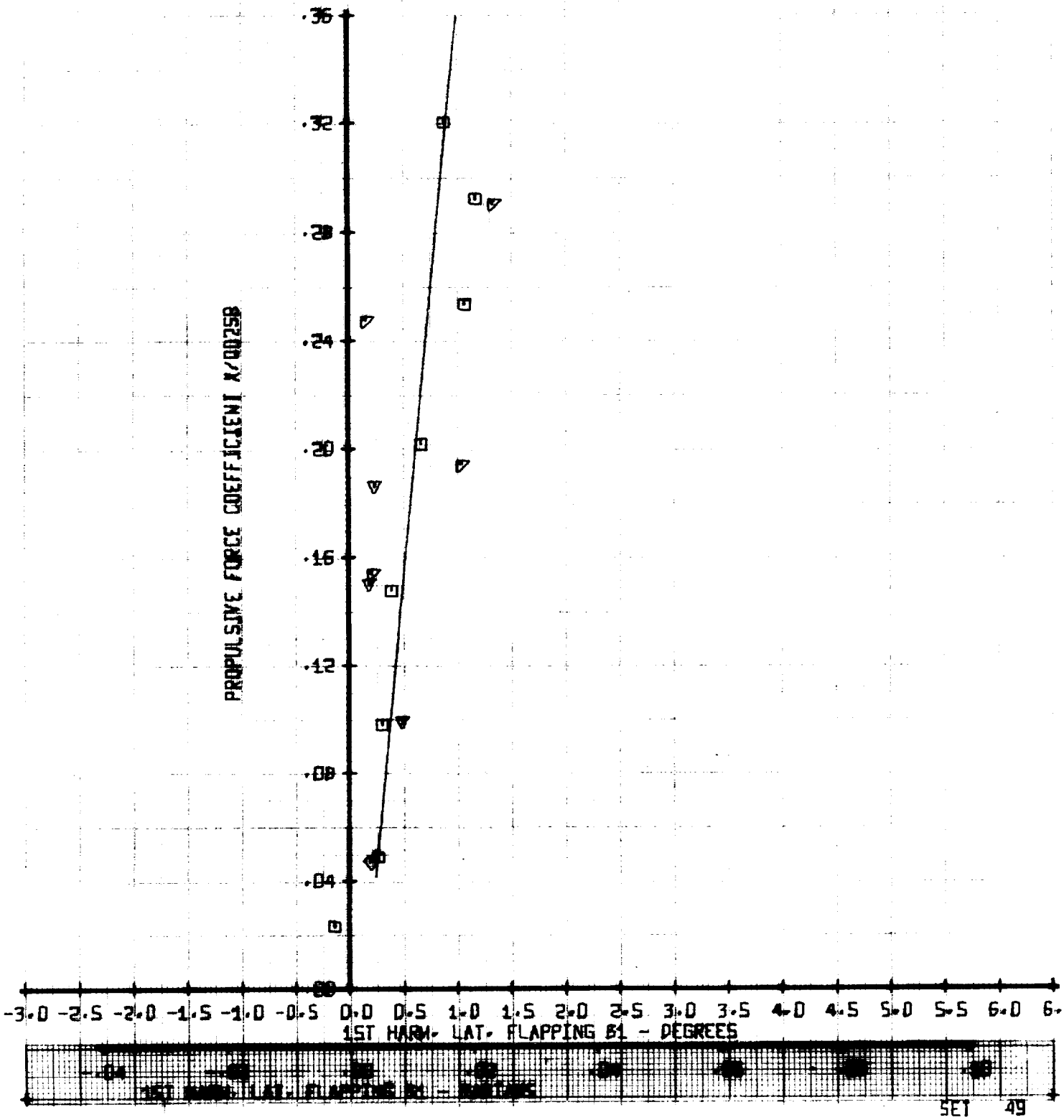


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTLN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 49
WT 193

SET 49
BVWT 193

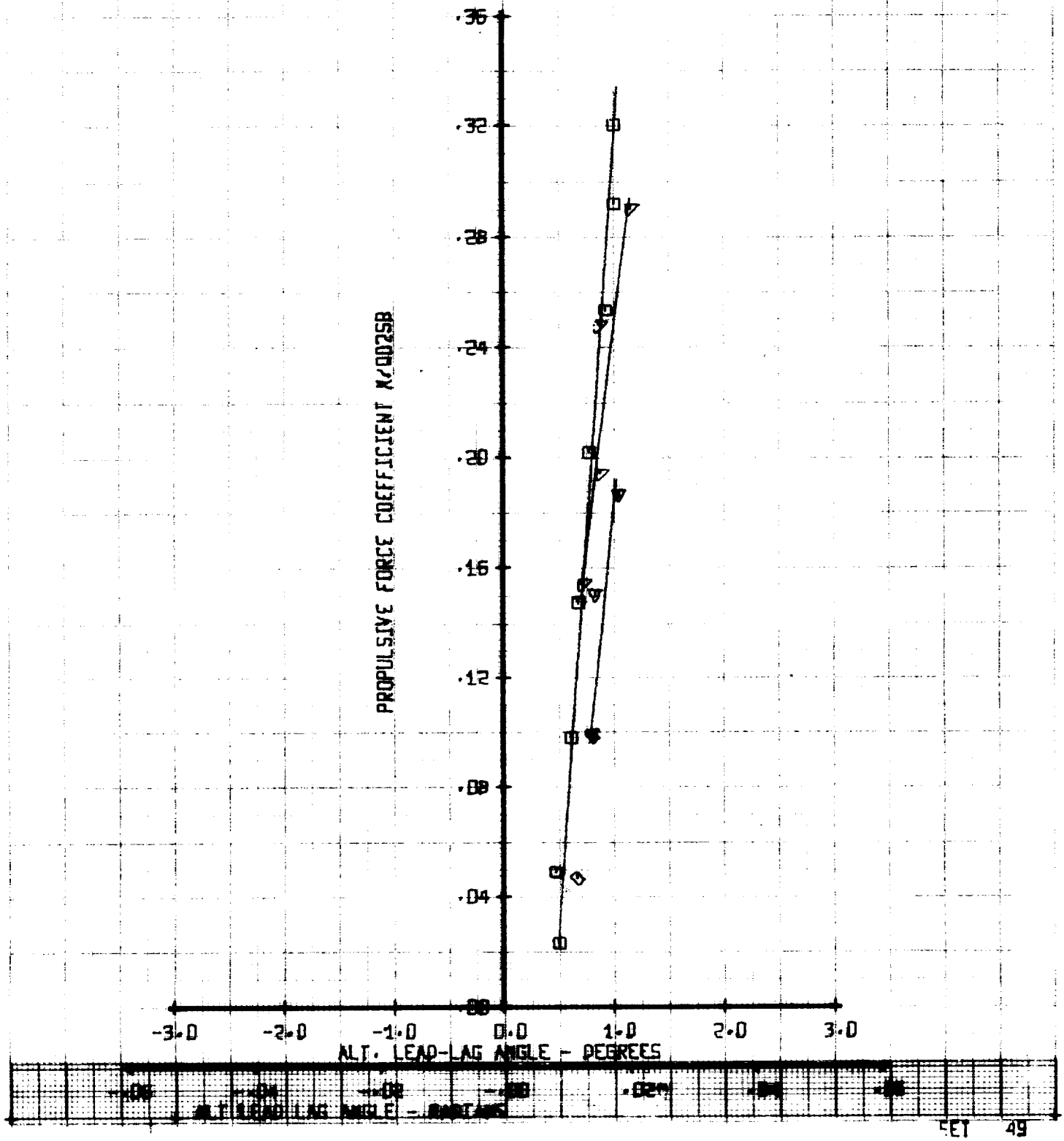
Figure B-109

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 49
WT 193

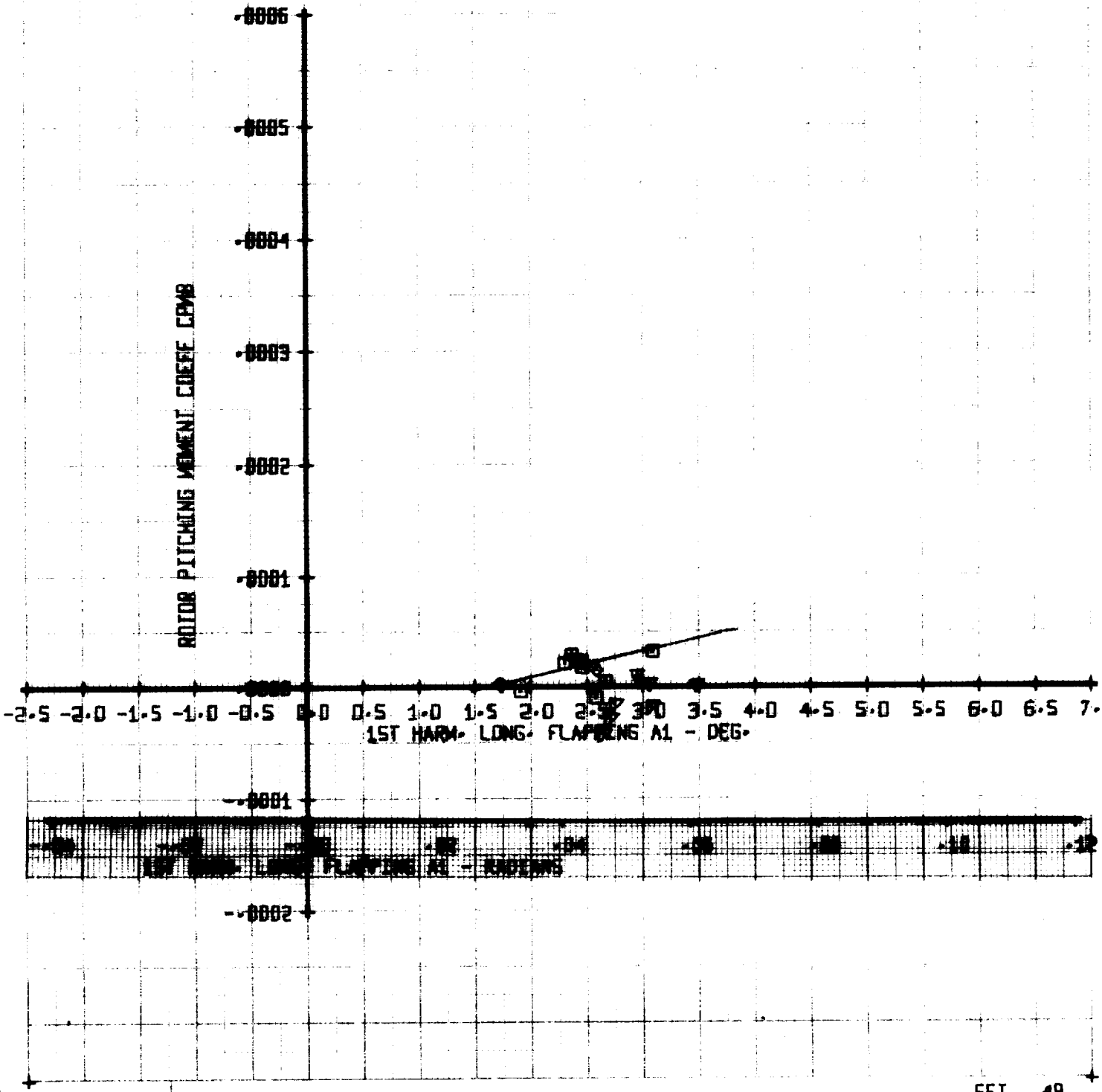
ET 49
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	232	.50	.06	311
▲	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	232	.50	.06	311
▽	233	.50	.06	311
◇	234	.50	.08	311
▽	235	.50	.08	311

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

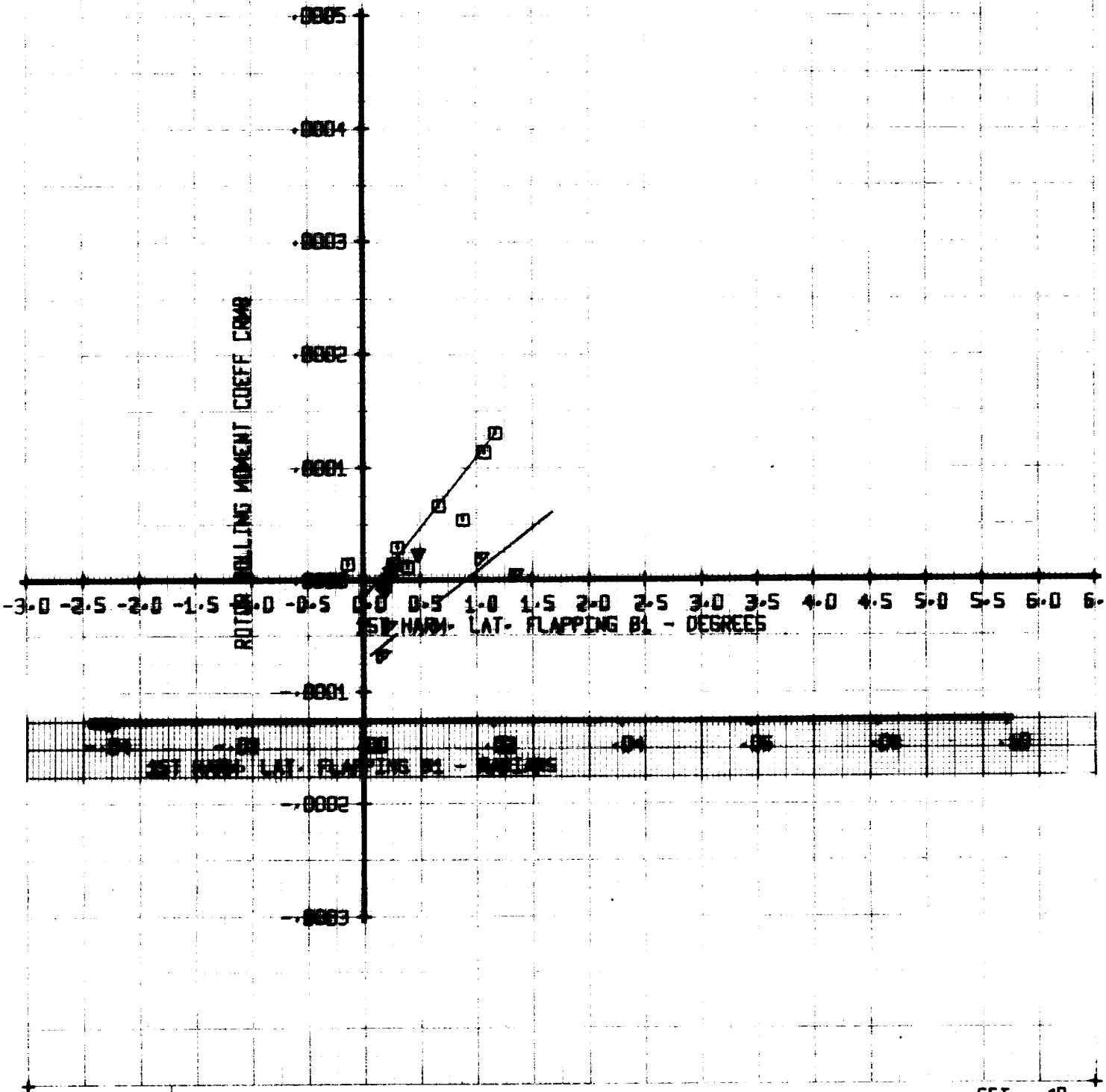


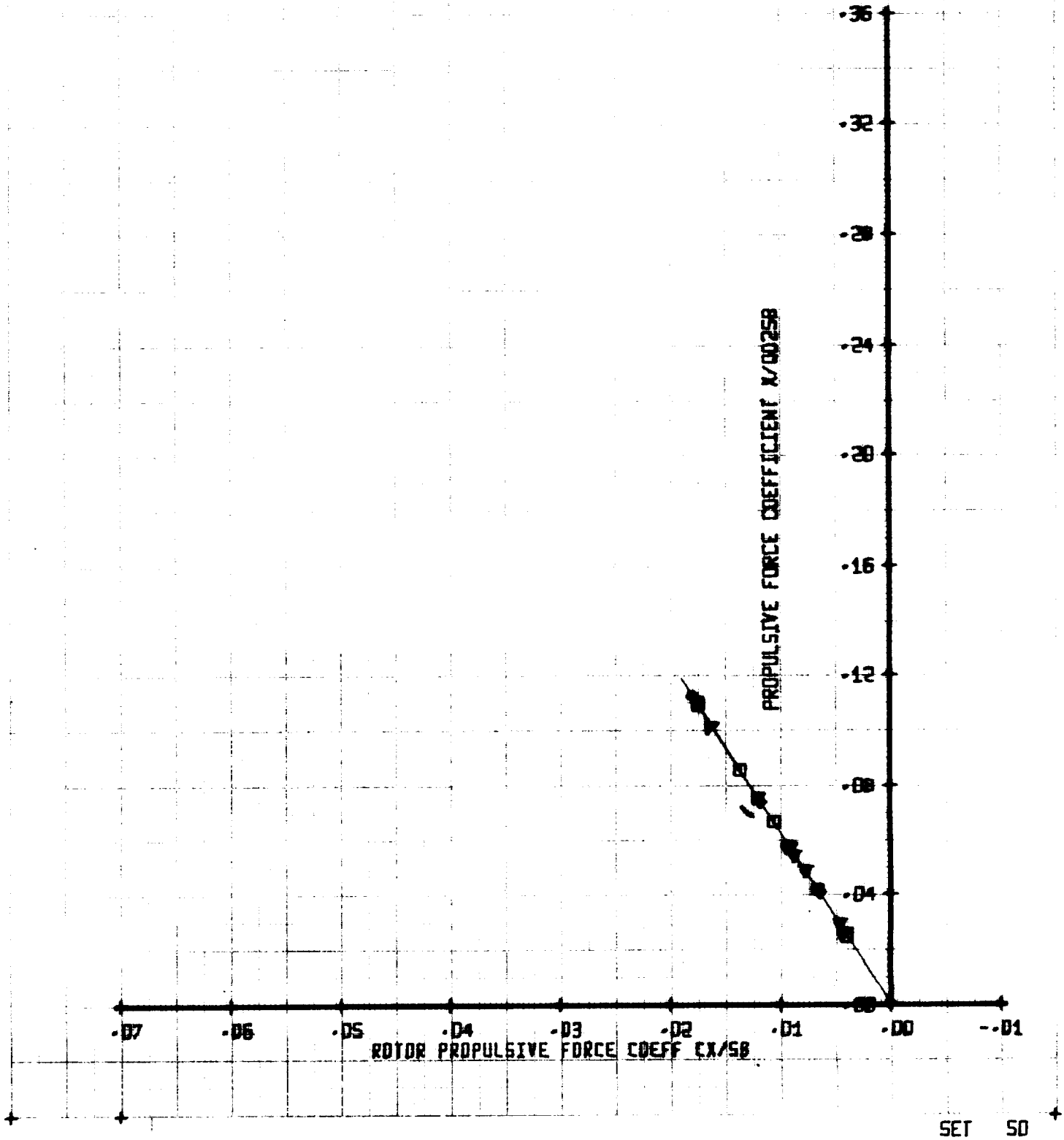
Figure B-112

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
■	269	.50	.05	311
◤	270	.50	.07	311
◆	271	.50	.08	311
▼	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 50
WT 193

SET 50
BVWT 193

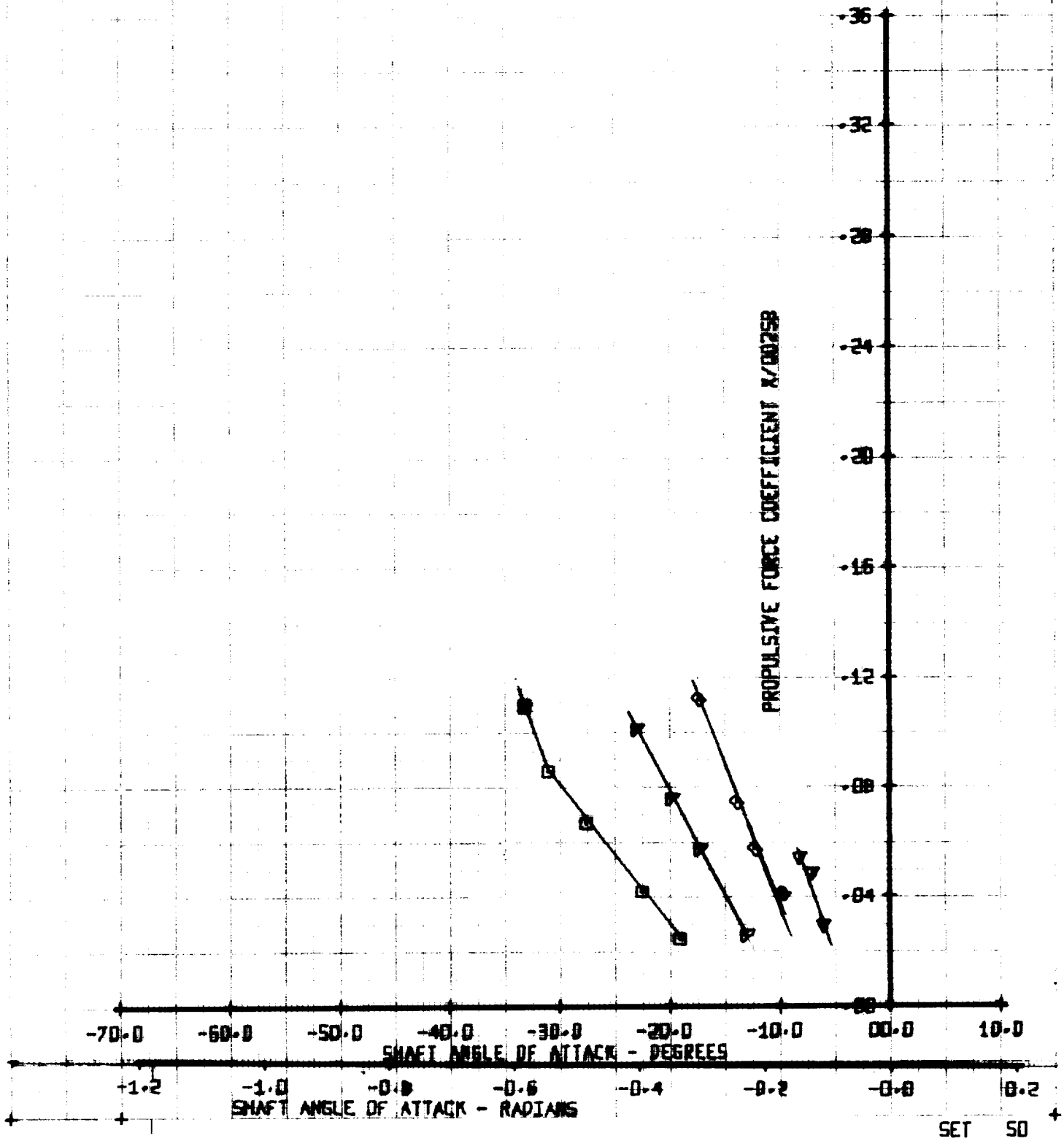
Figure B-113

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET SO
WT 193

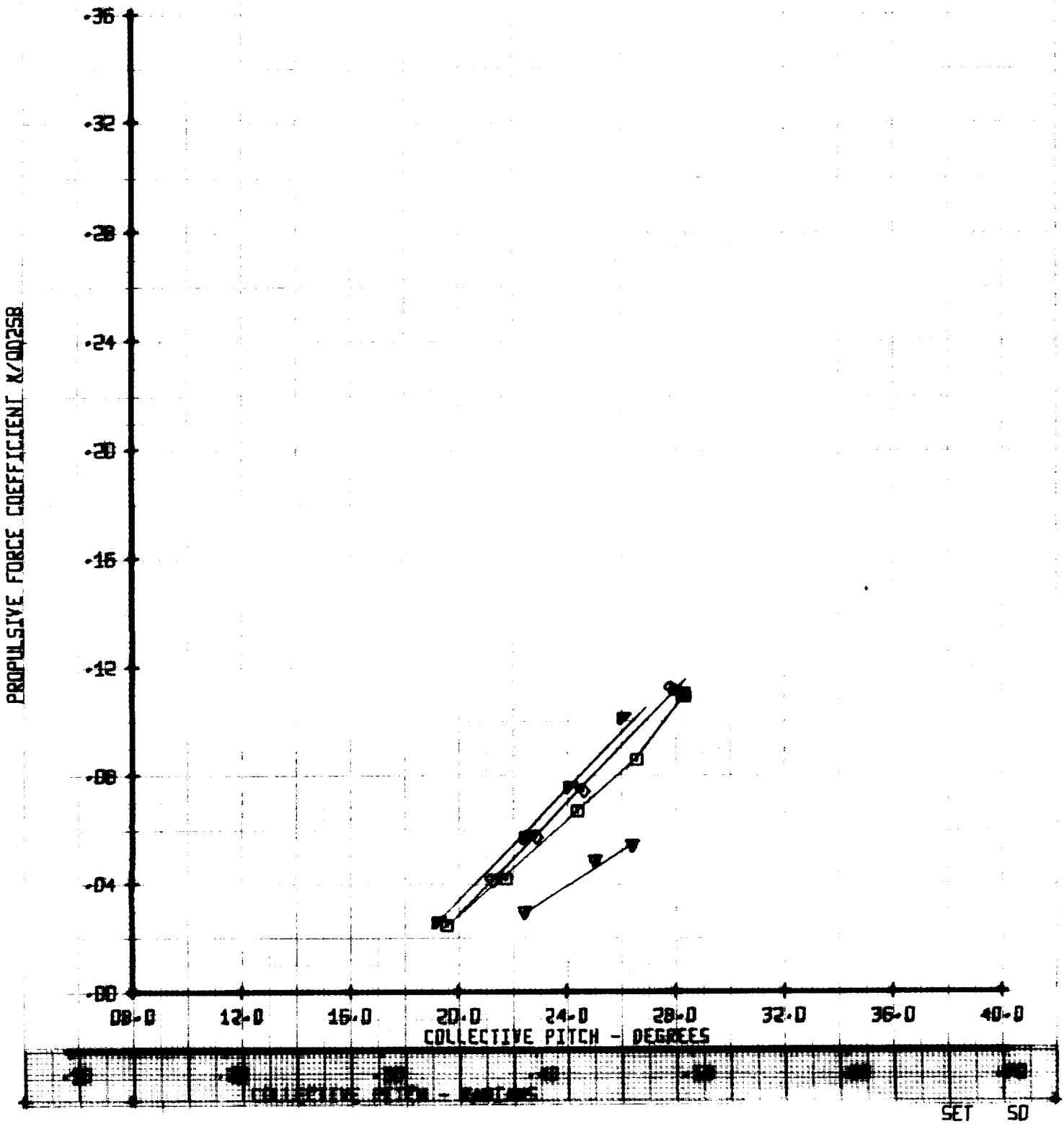
SET SO
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTLN
□	269	.50	.05	311
▷	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 50
WT 193

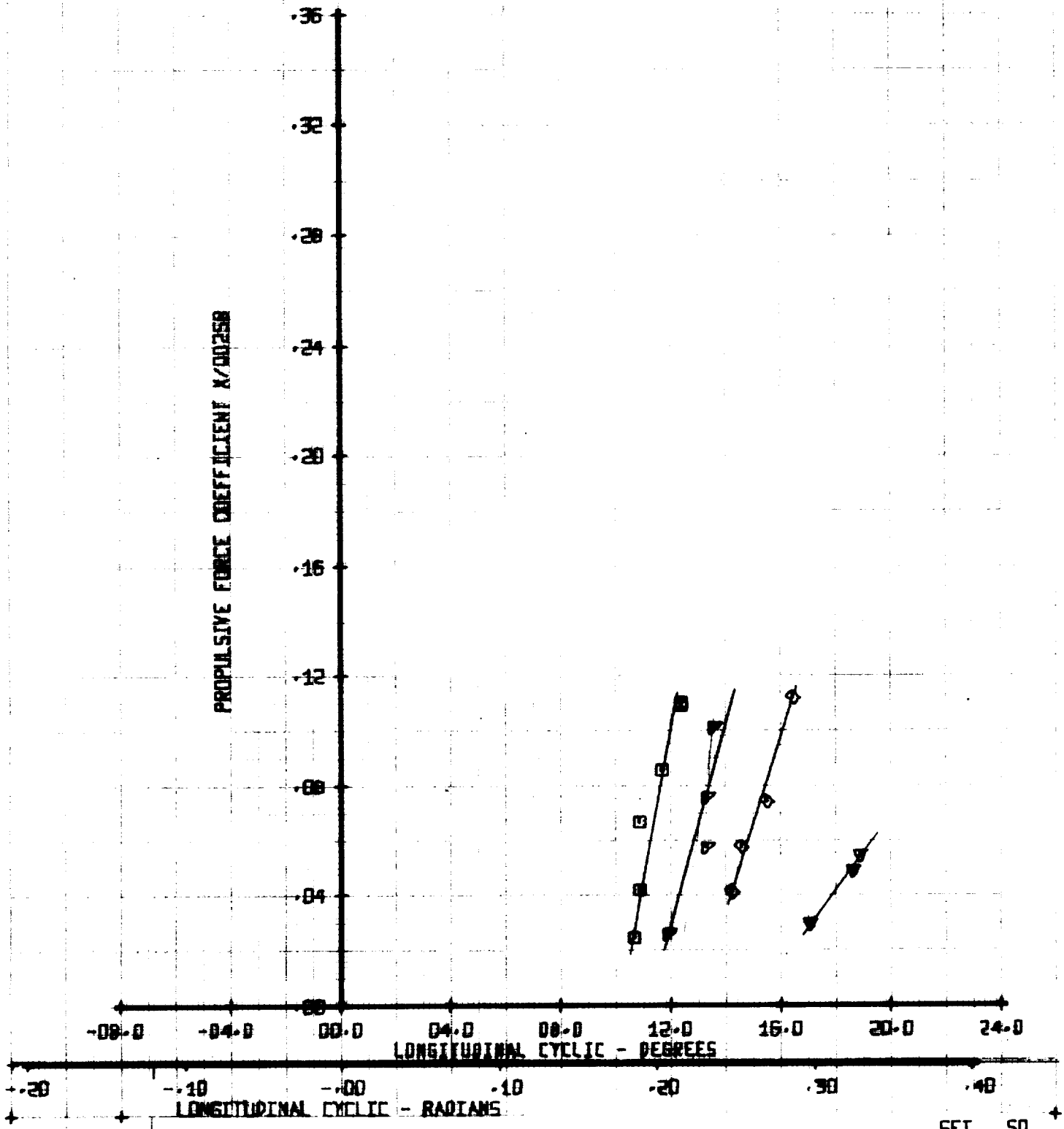
SET 50
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▼	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET SD
WT 193

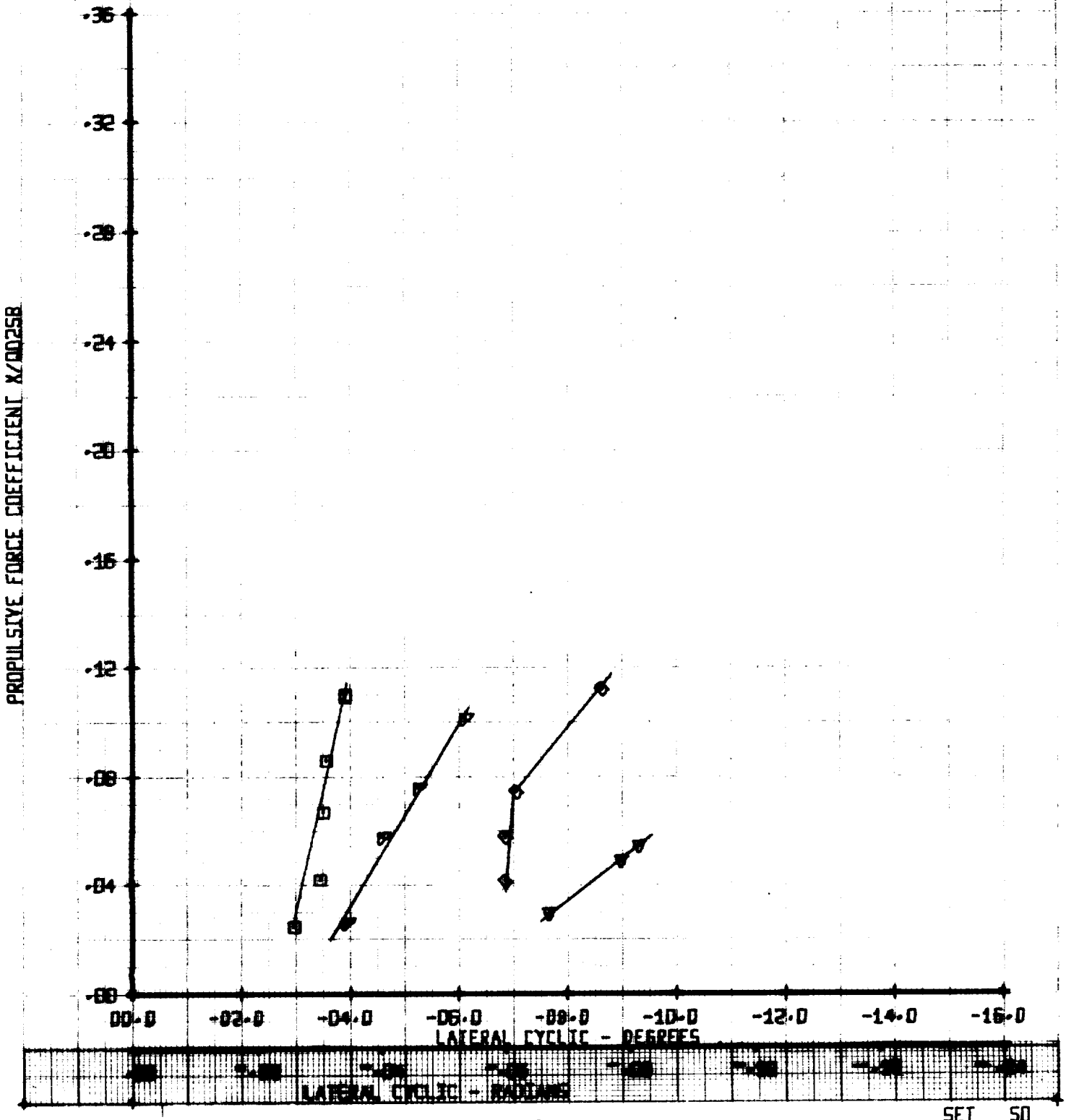
SET SD
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT/SB	YTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 50
WT 193

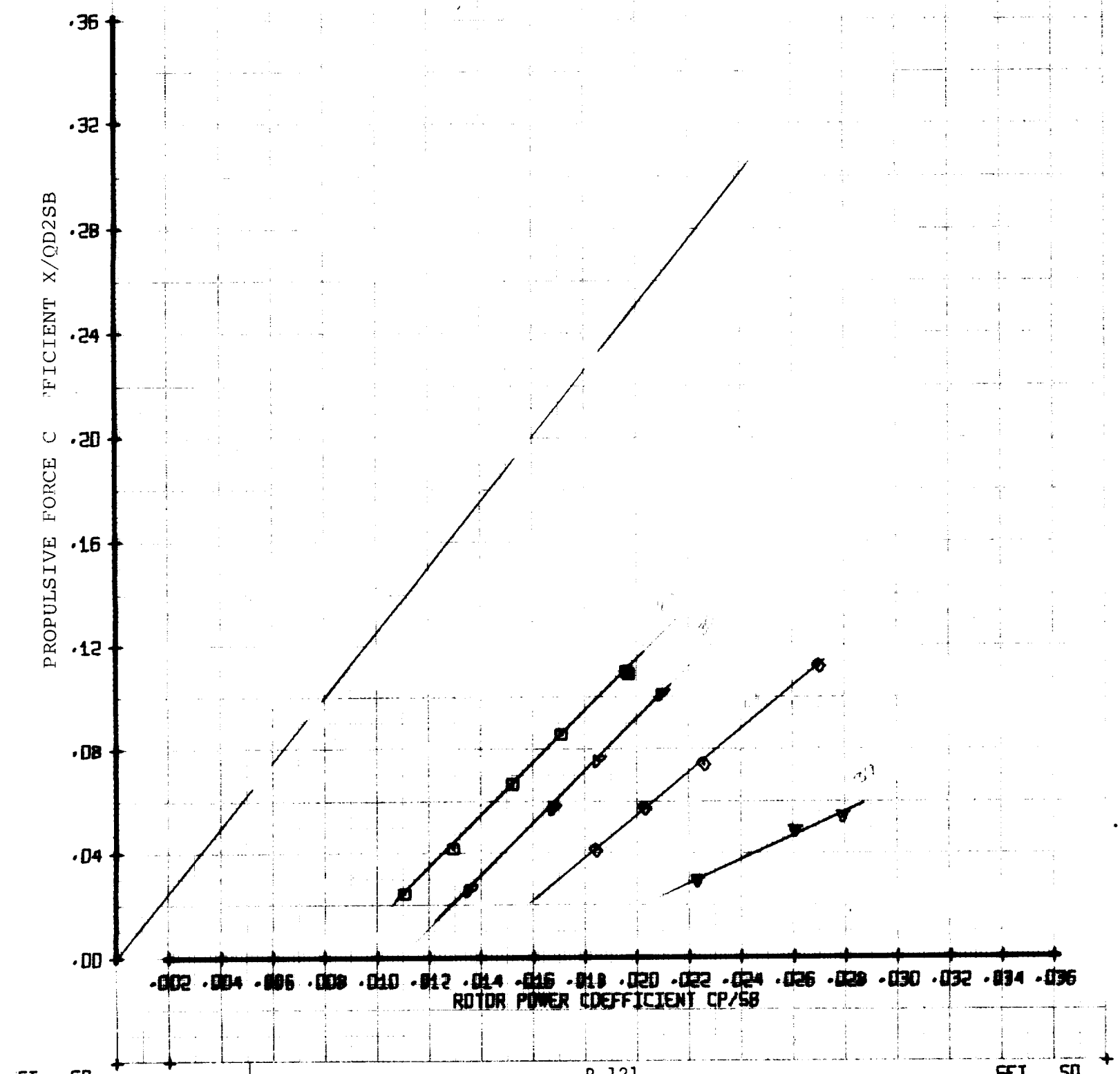
SET 50
BVWT 193

Figure B-117

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	269	.50	.05	311
▷	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



SET SO
WT 193

SET SO
BVWT 193

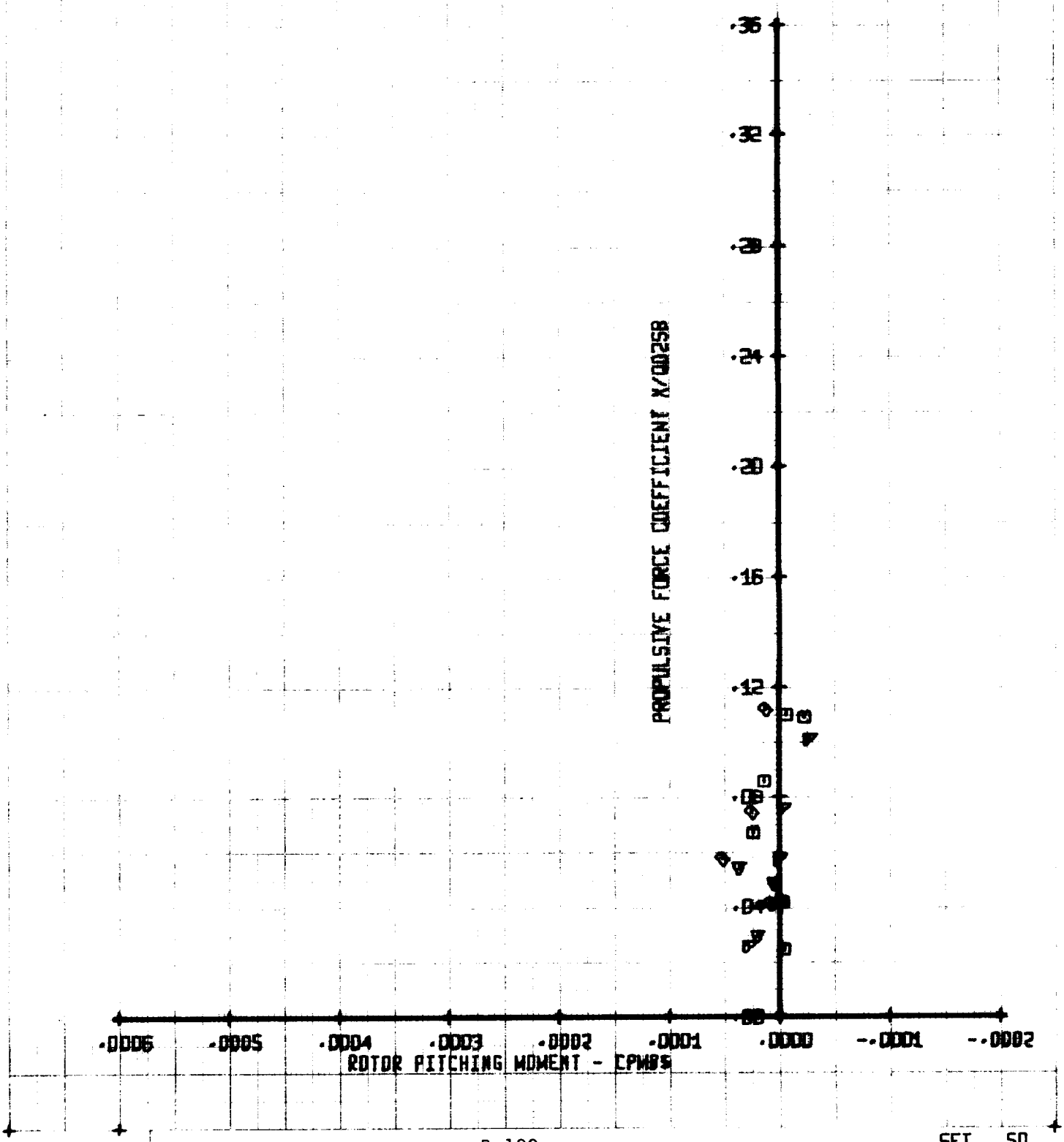
Figure B-118

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

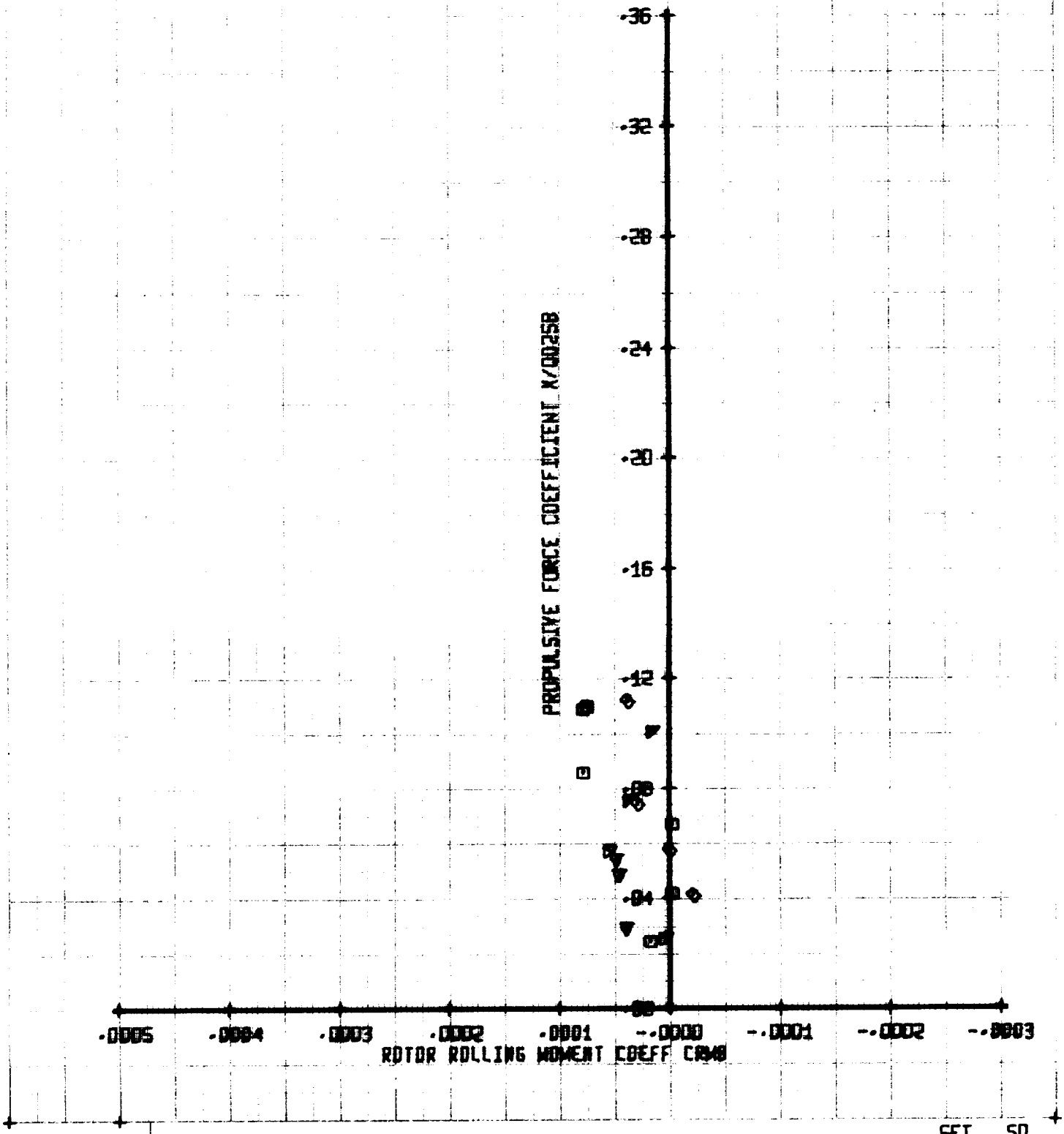


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
▫	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



ET SD
WT 193

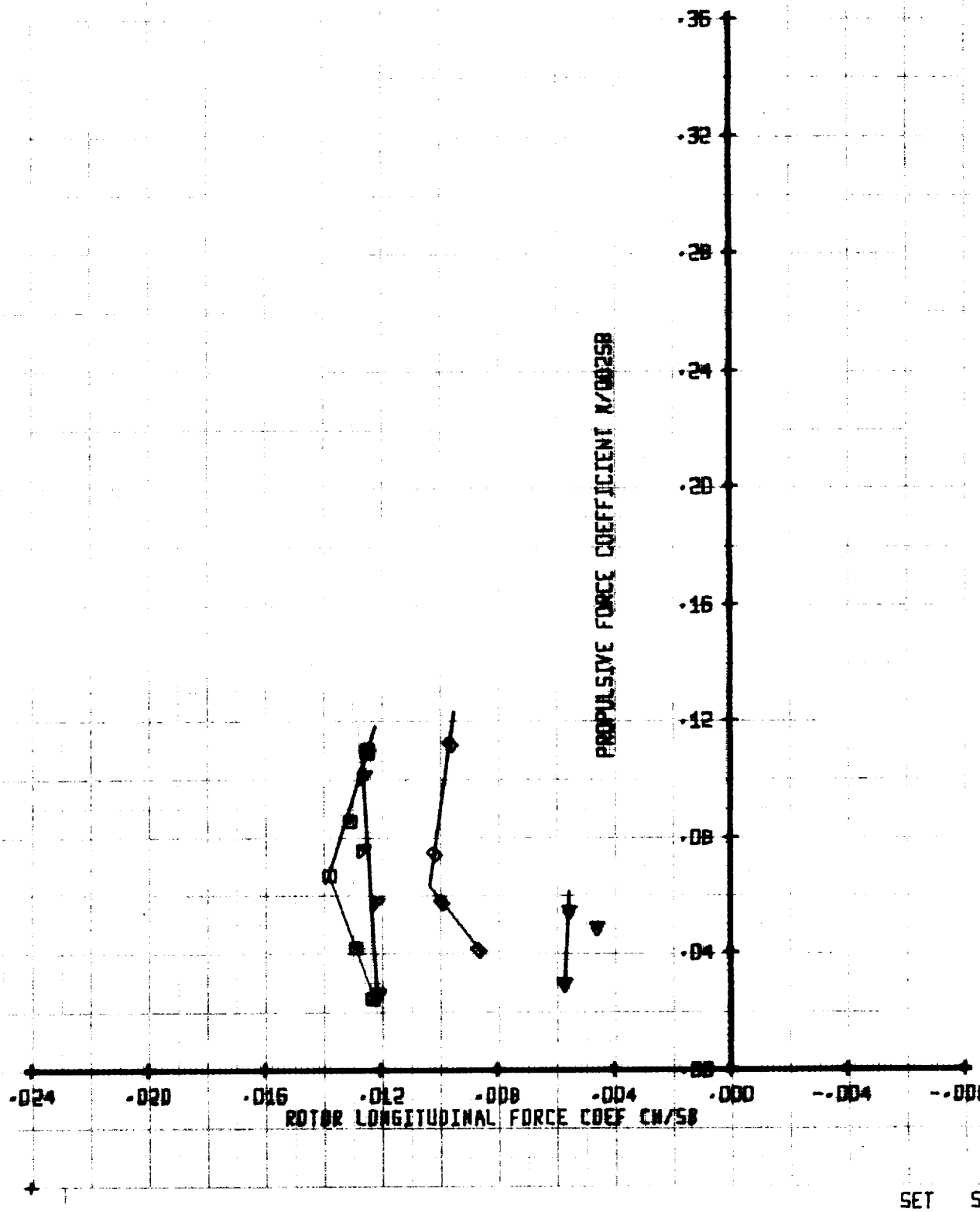
SET SD
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
▫	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▼	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET SO
WT 193

SET SO
BVWT 193

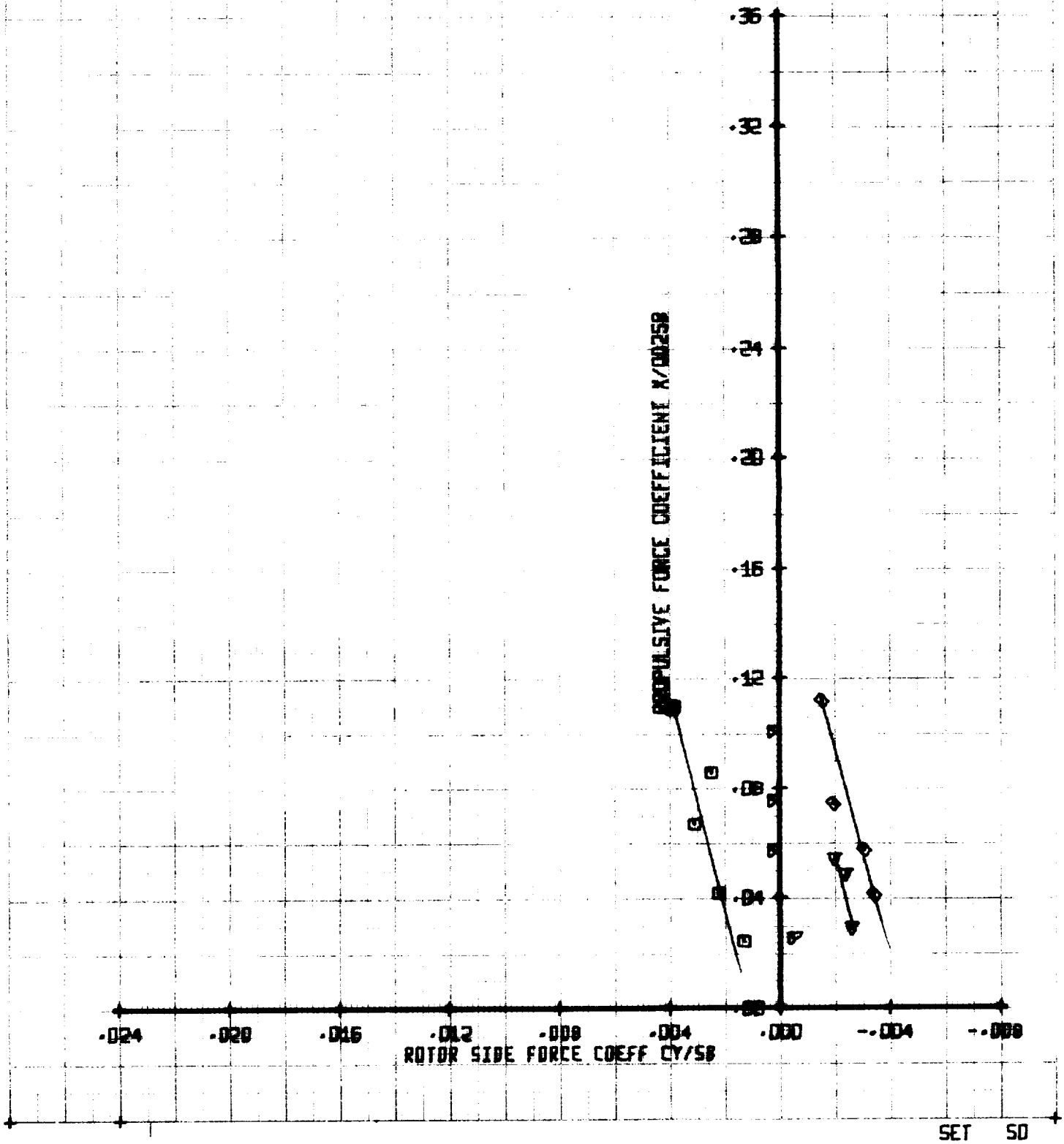
Figure B-121

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET SD
WT 193

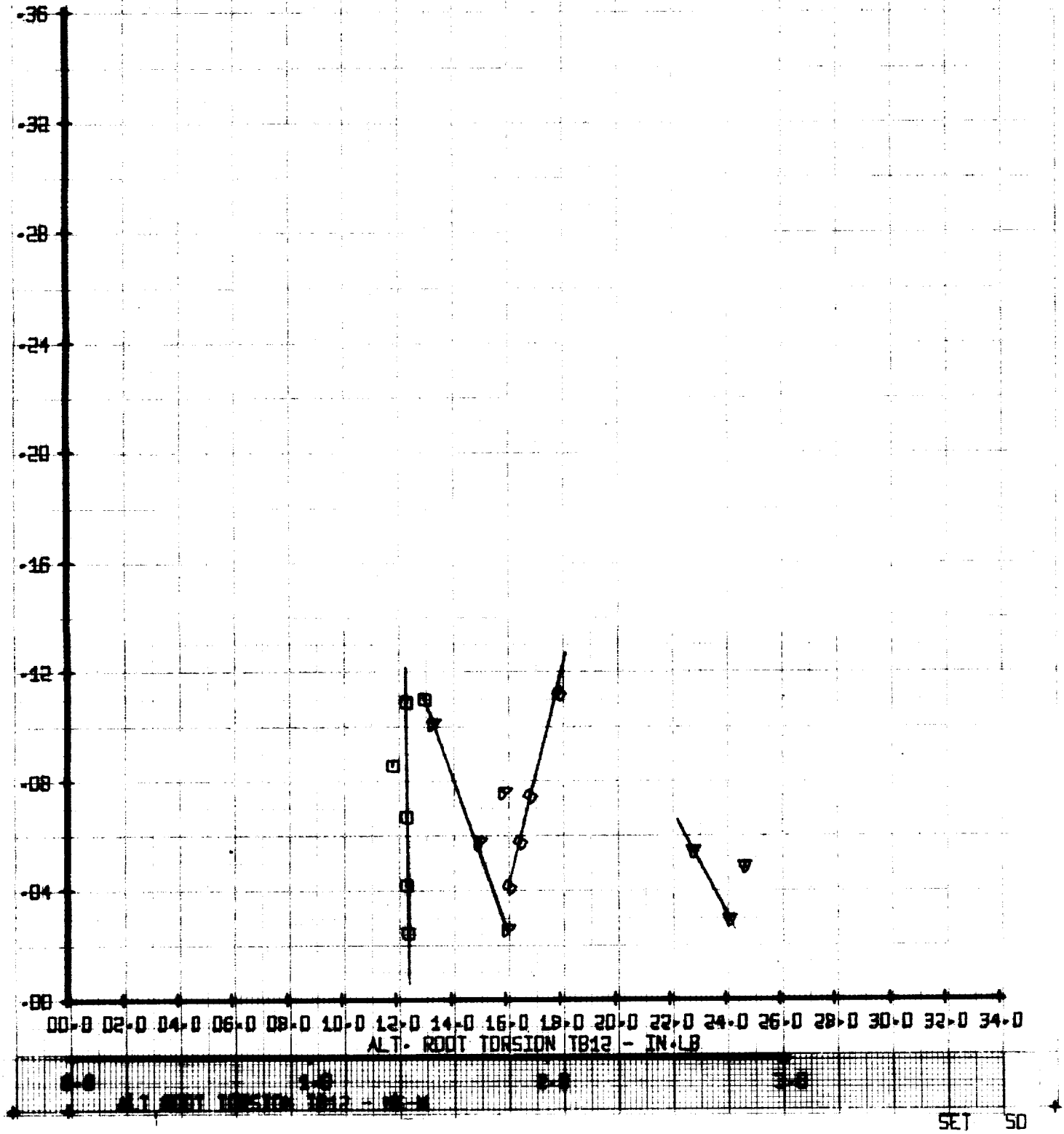
SET SD
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



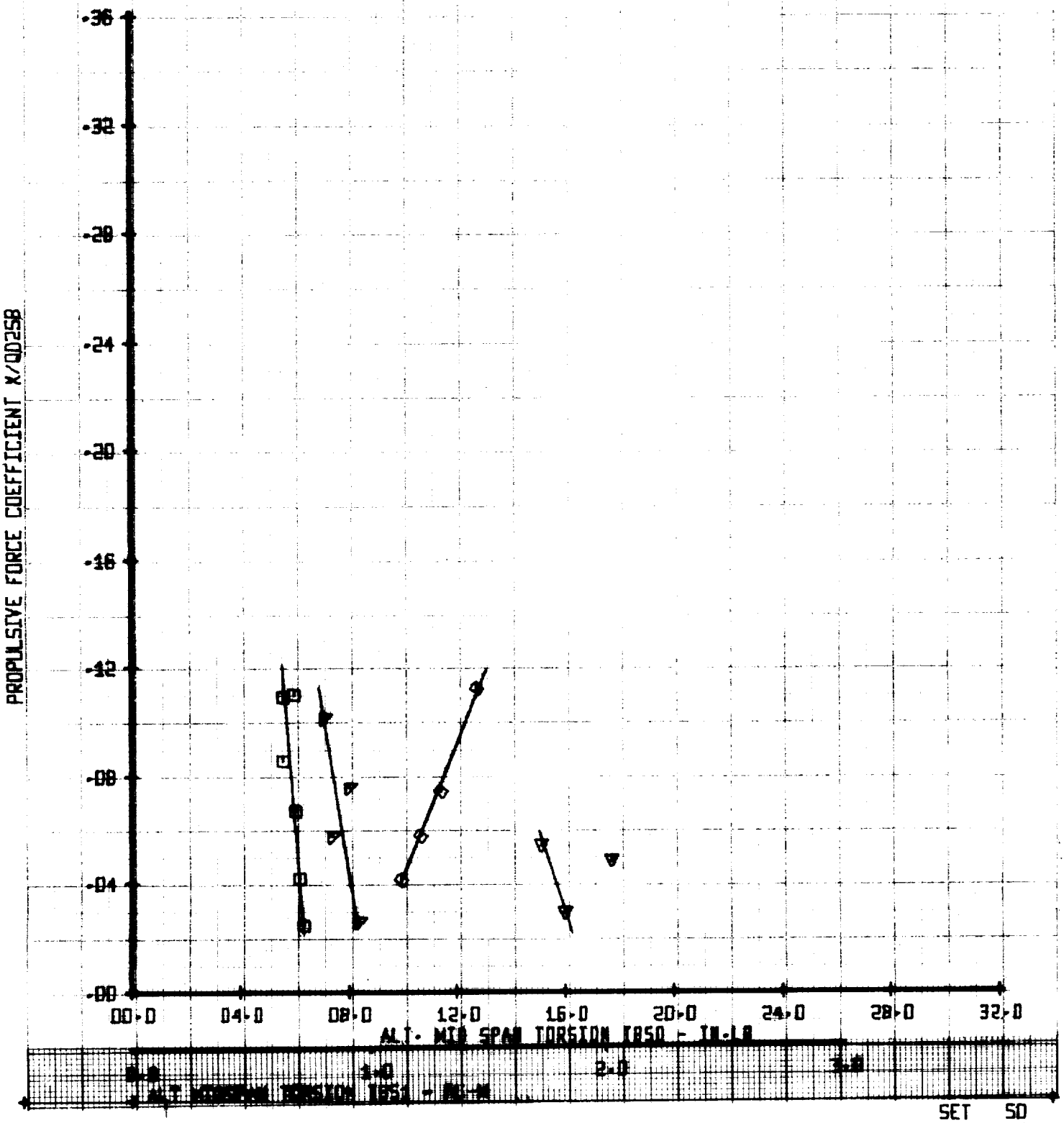
SET 50
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SO	VTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▼	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



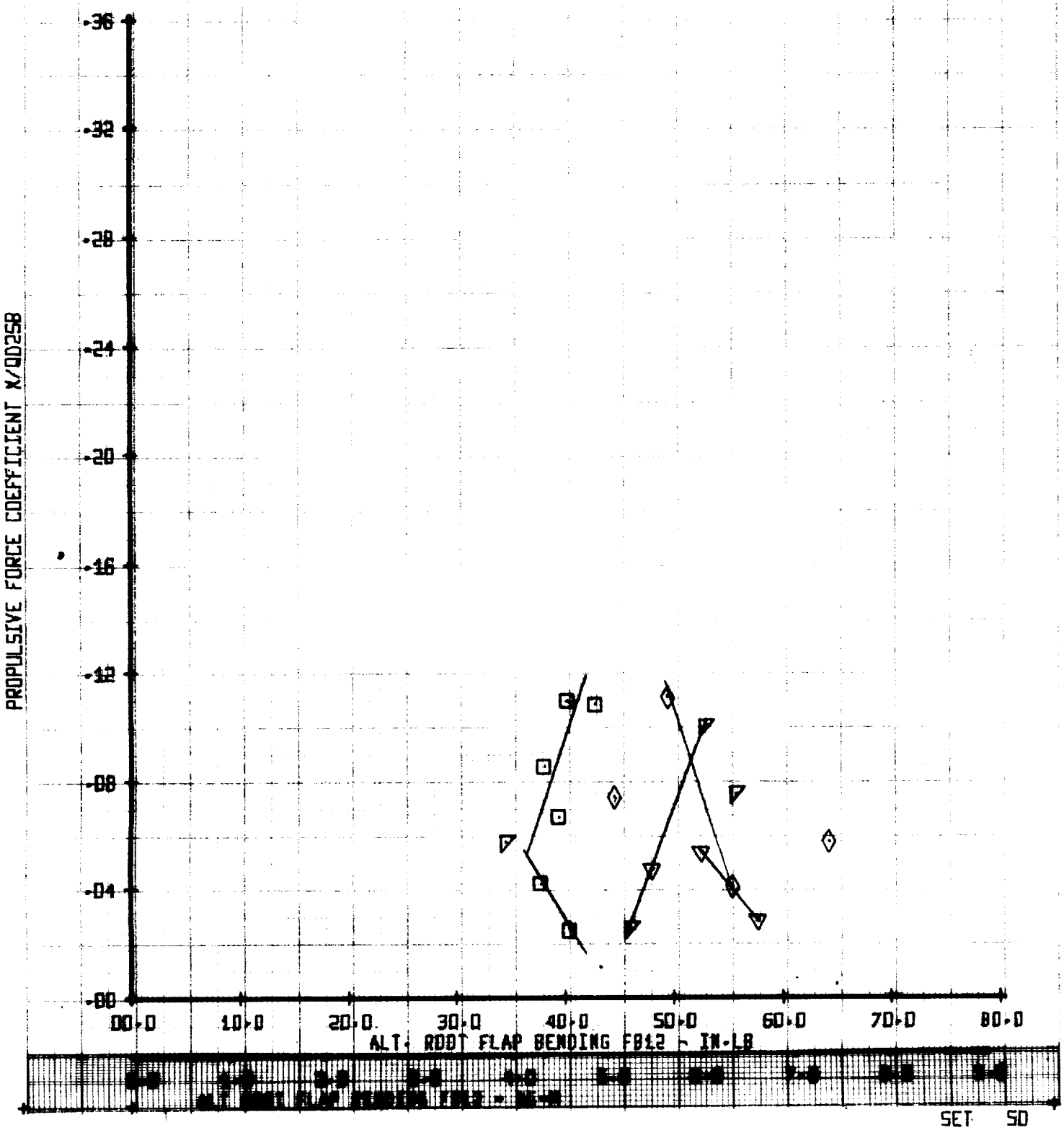
SET 50
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



SET 50
BVWT 193

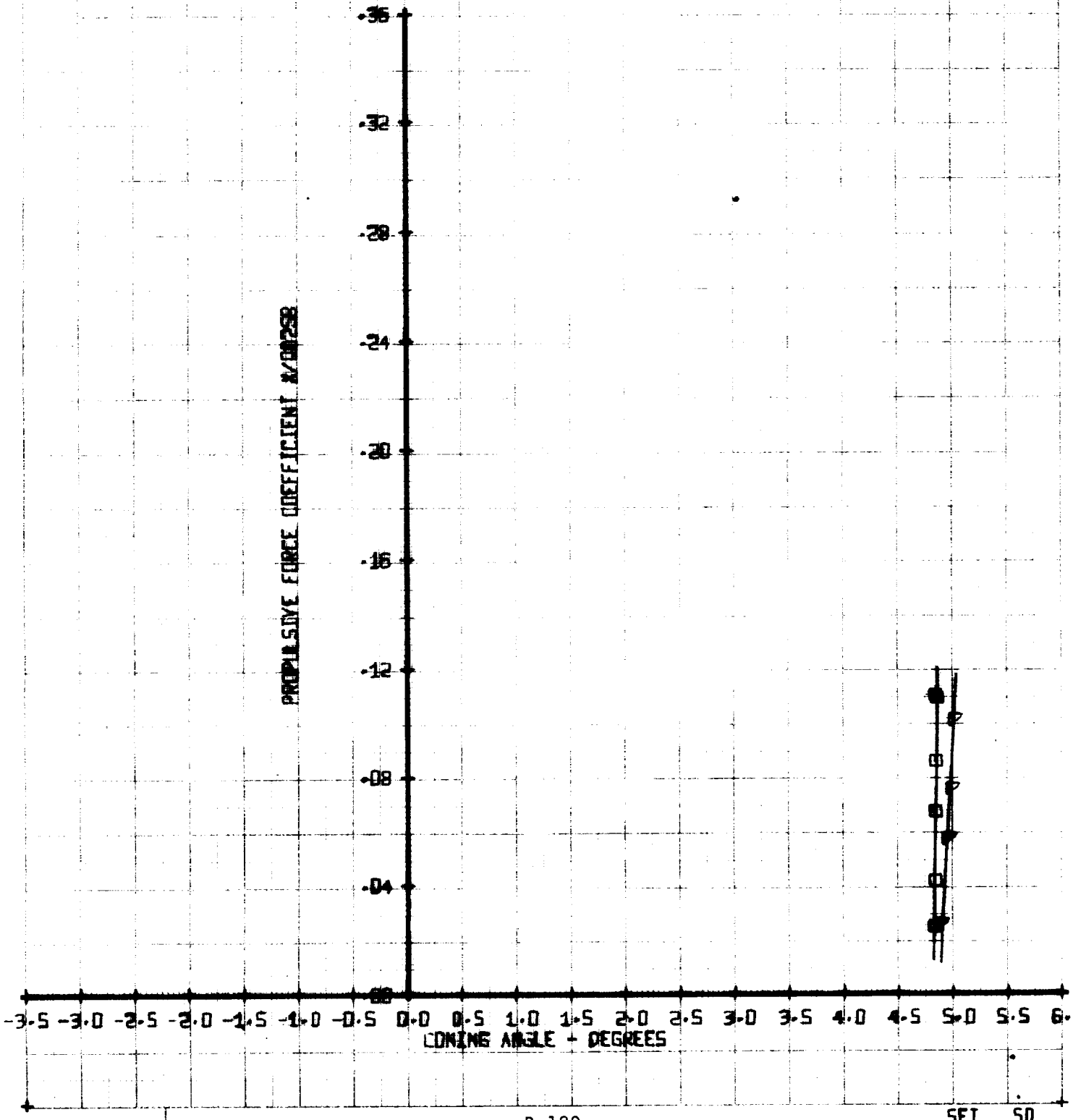
SET 50
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SIGMA	YTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



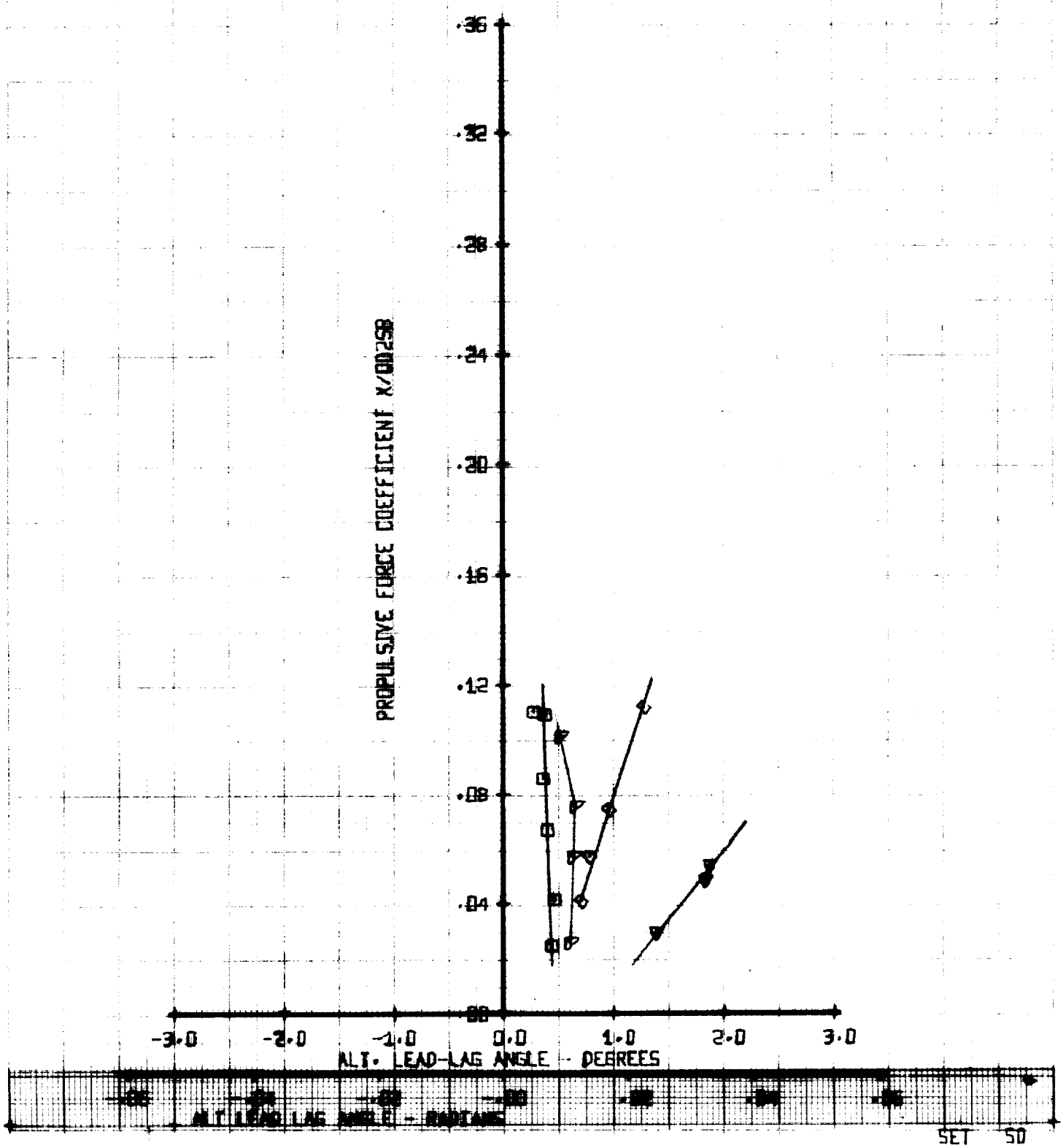
SET SD
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/σ	VTUN
□	269	.50	.05	311
▽	270	.50	.07	311
◇	271	.50	.09	311
▽	272	.50	.10	311

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



SET 50
WT 193

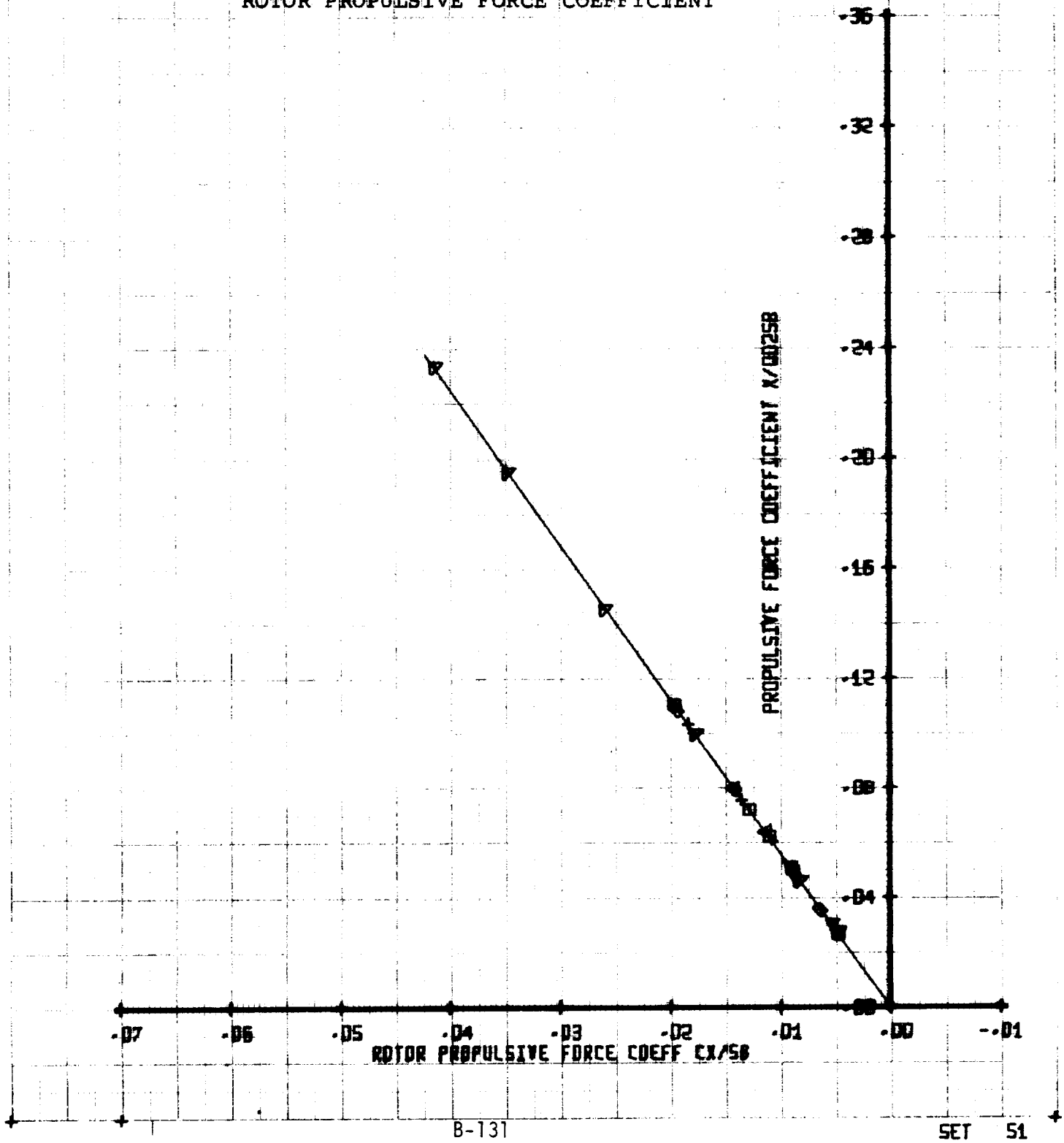
SET 50
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	268	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▼	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 51
WT 193

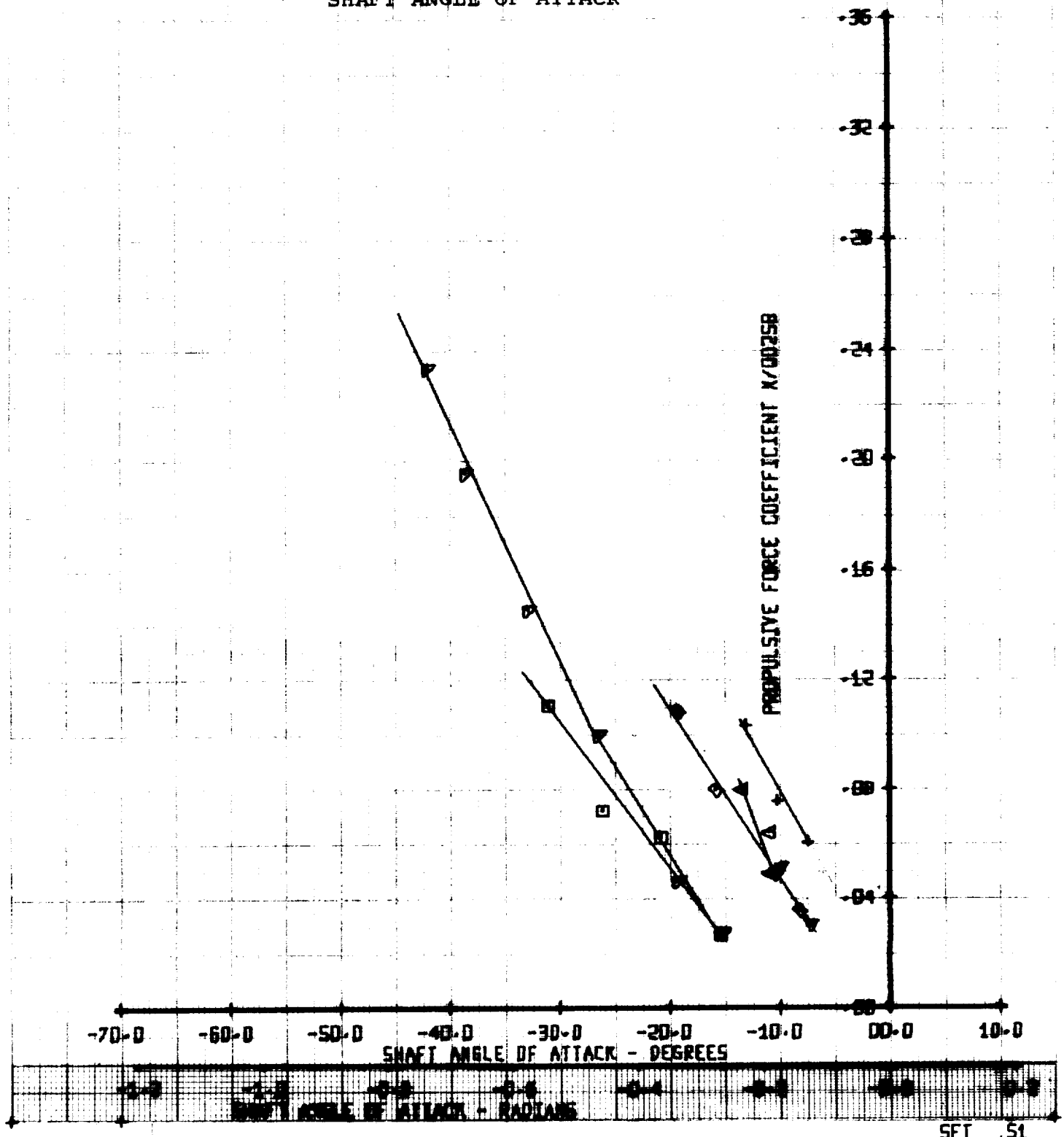
SET 51
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	260	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▼	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 51
WT 193

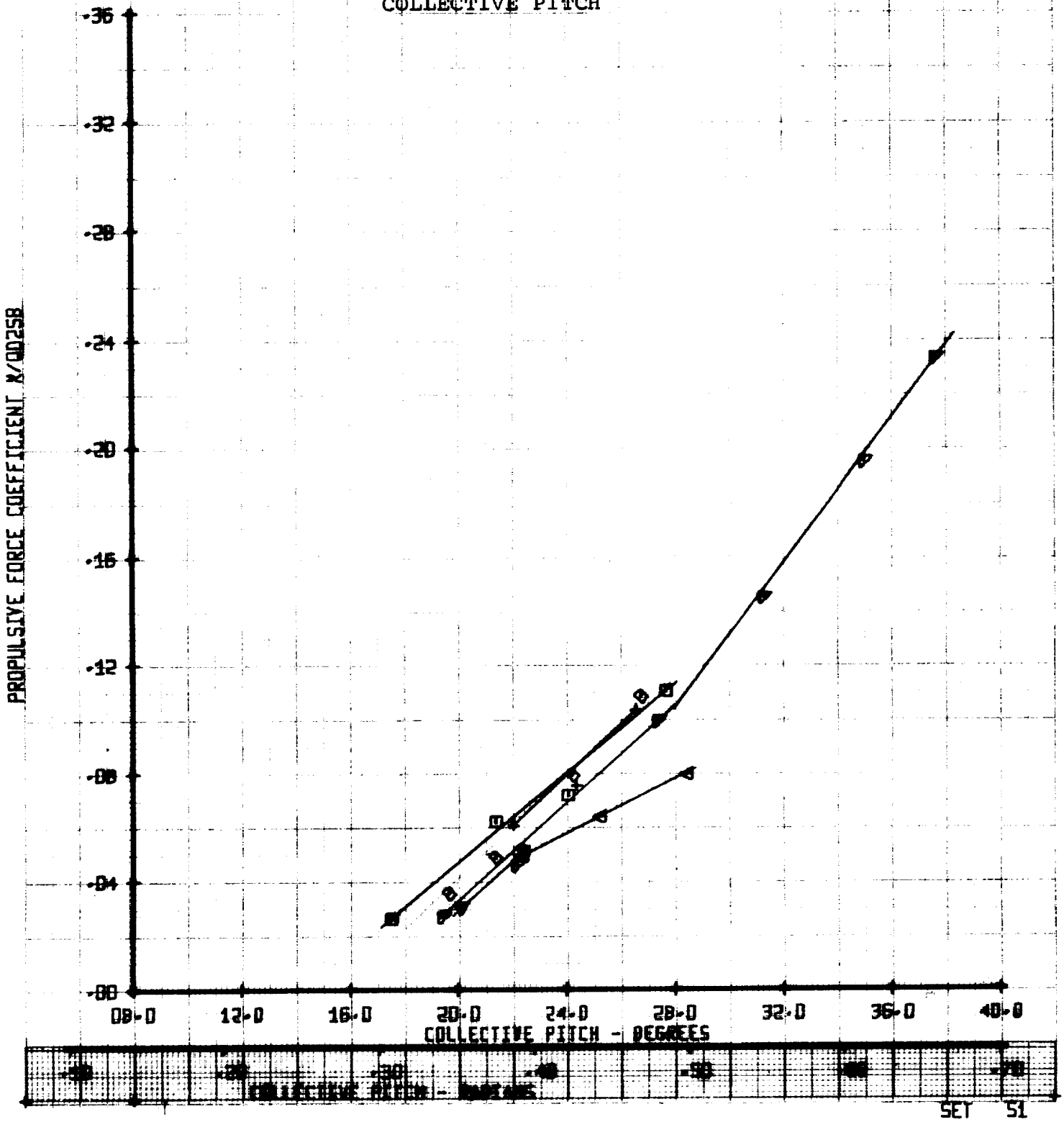
SET .51
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	260	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▼	241	.53	.09	320
◁	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 51
WT 193

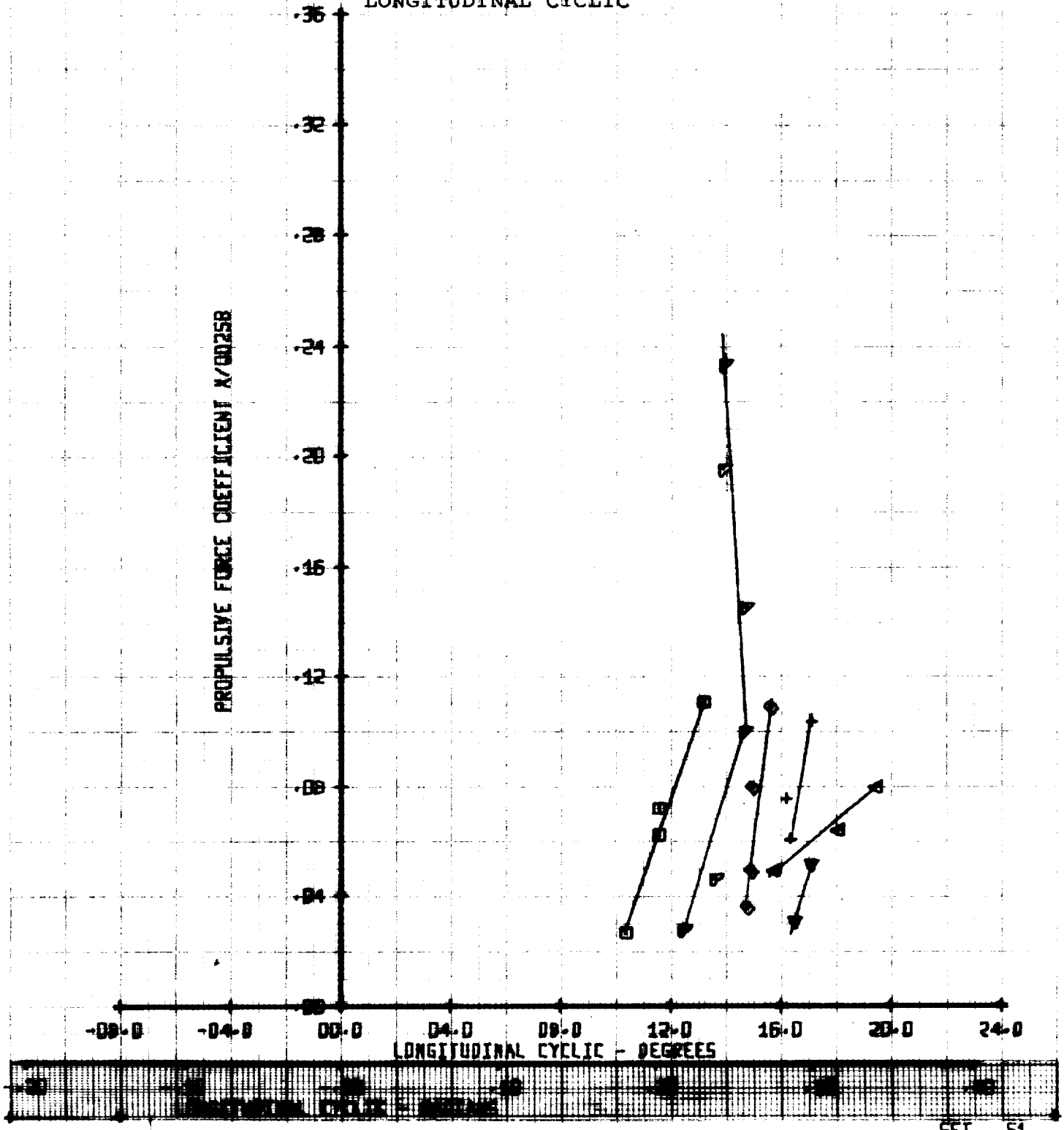
SET 51
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	260	.53	.05	320
▽	240	.53	.06	320
◇	266	.52	.08	320
▽	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC

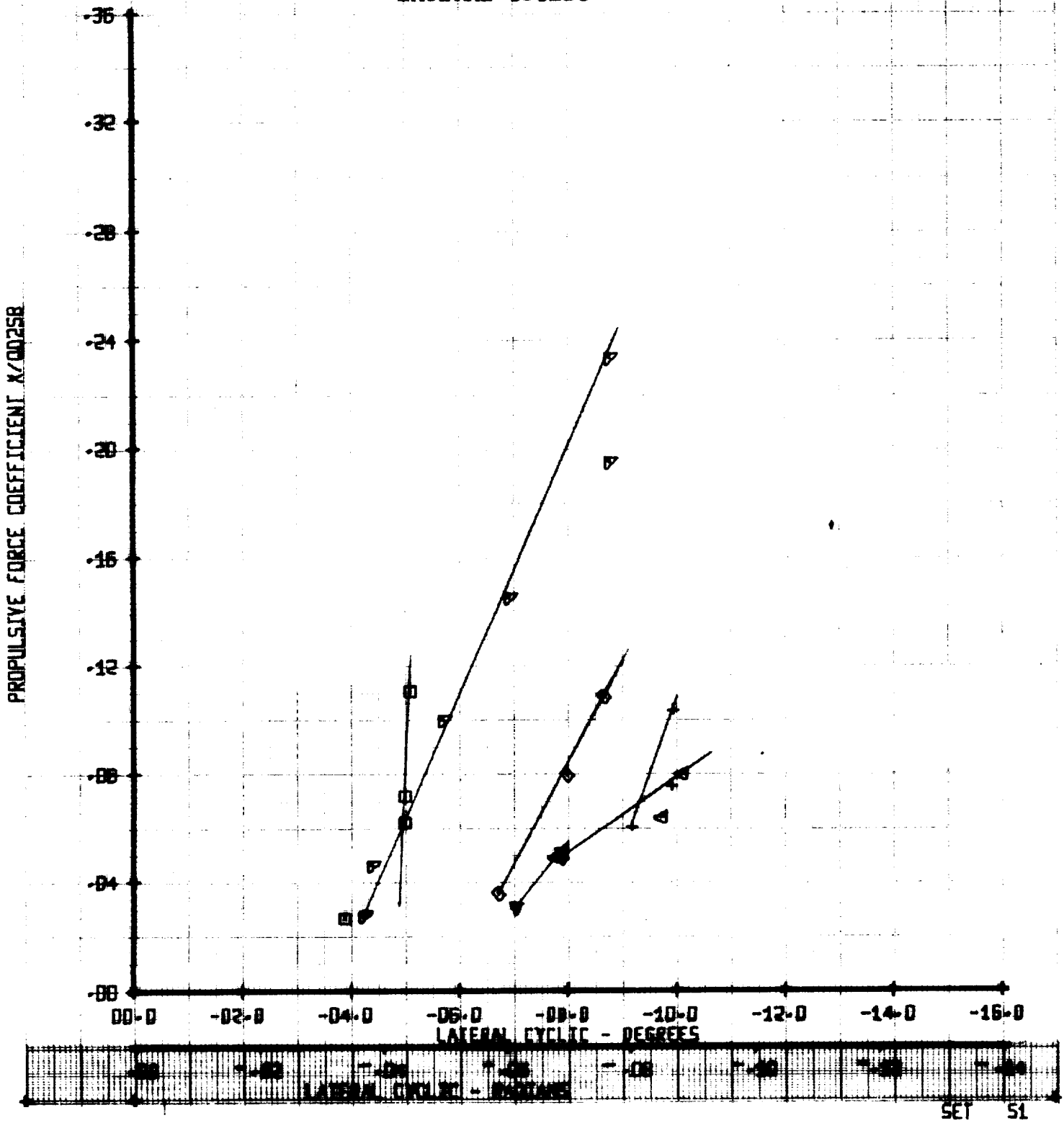


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	268	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▼	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 51
WT 193

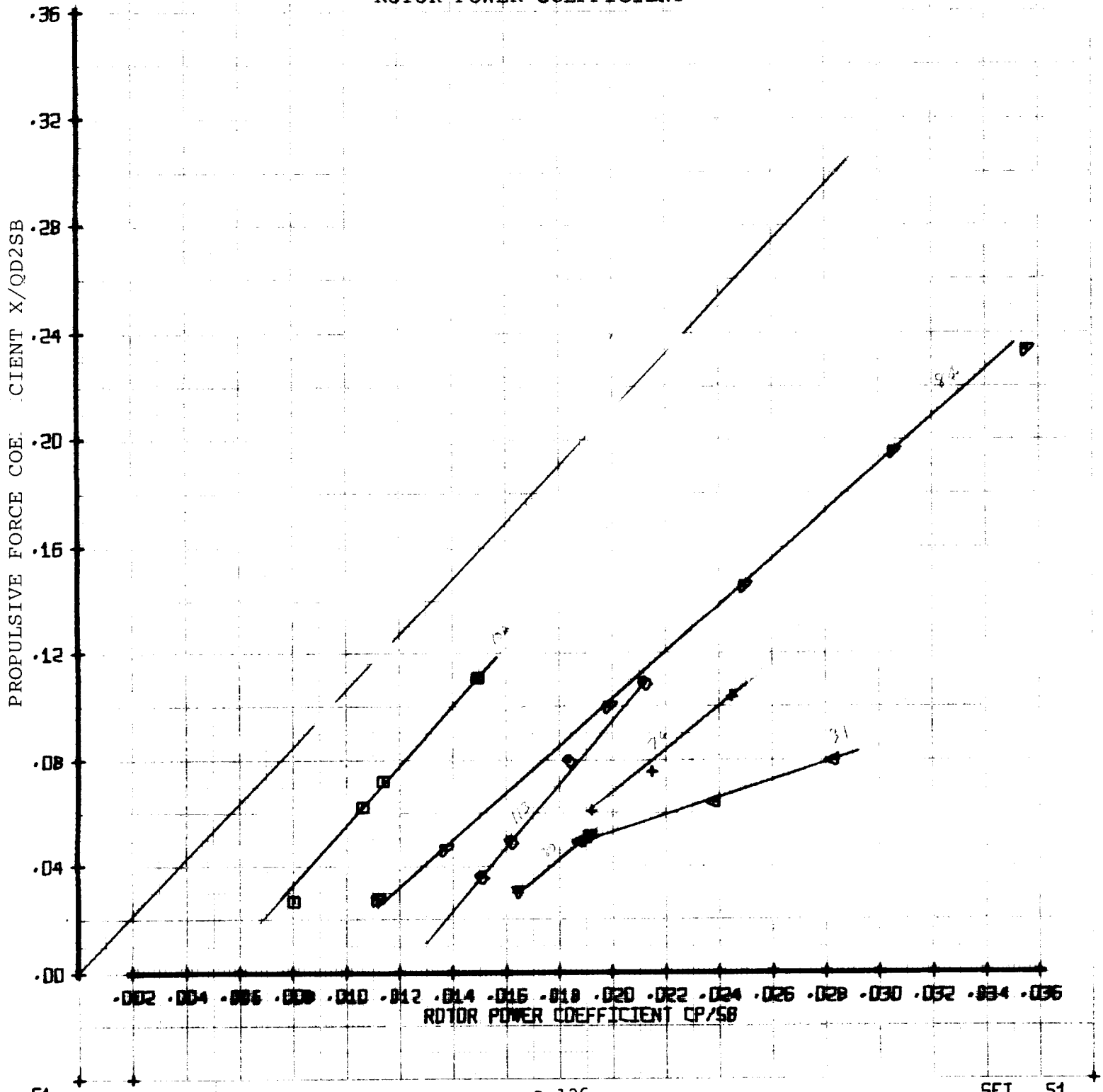
SET 51
BVWT 193

Figure B-132

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	268	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▼	241	.53	.09	320
◁	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT

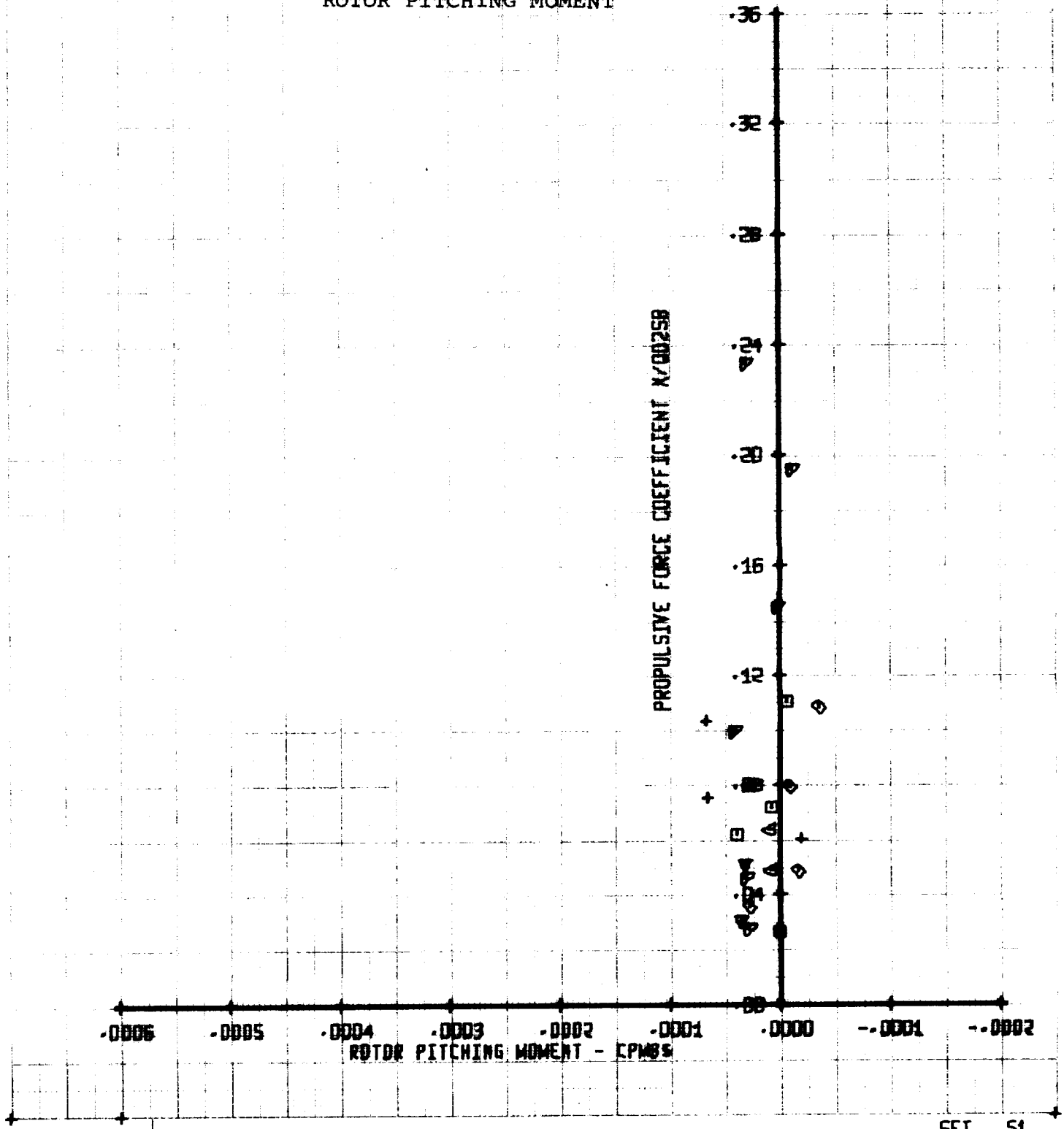


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	260	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▽	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

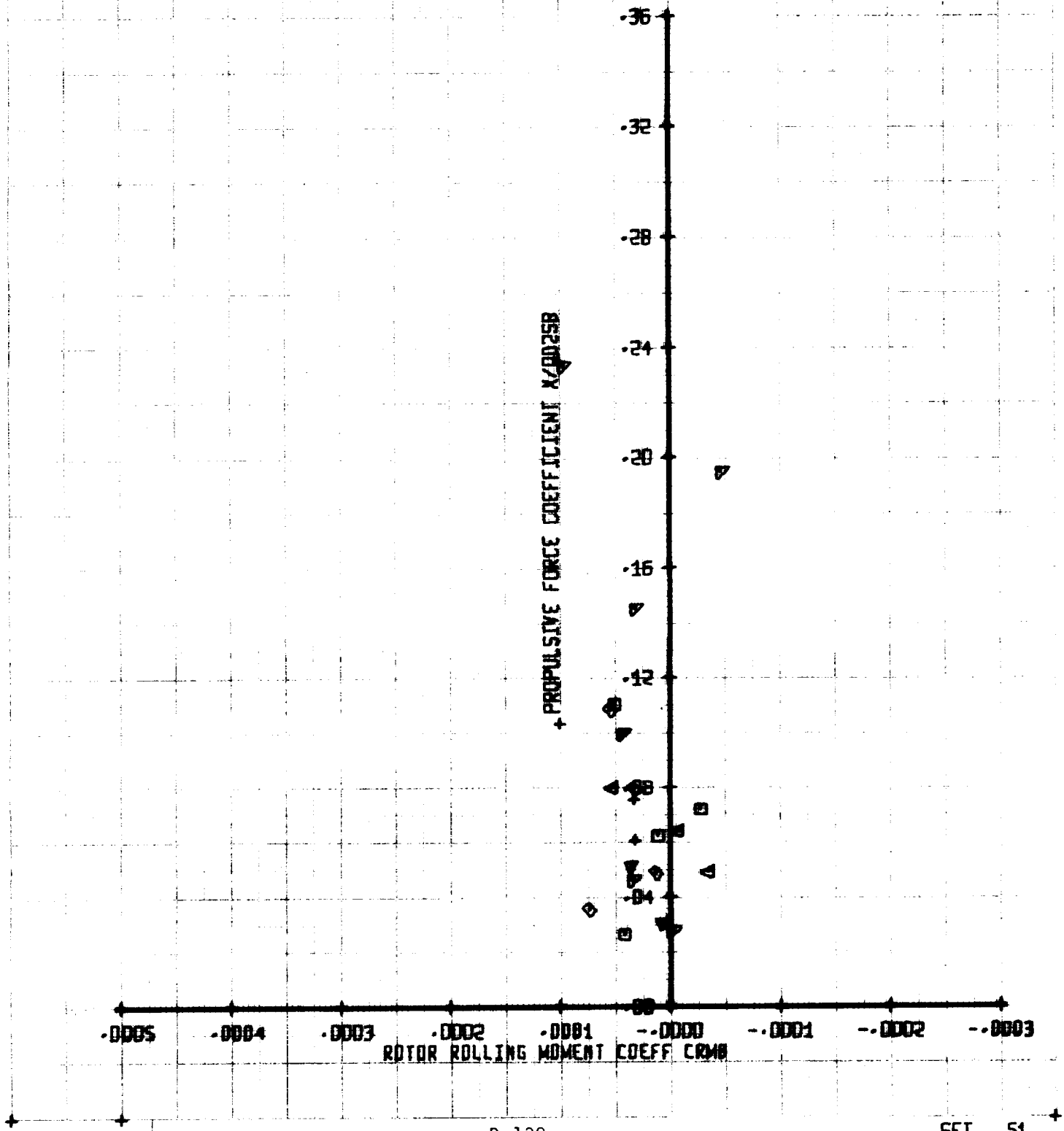


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT/SB	VTUN
□	268	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▼	241	.53	.09	328
△	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	268	.53	.05	328
▷	240	.53	.06	328
◇	266	.53	.08	328
▽	241	.53	.09	328
◁	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT

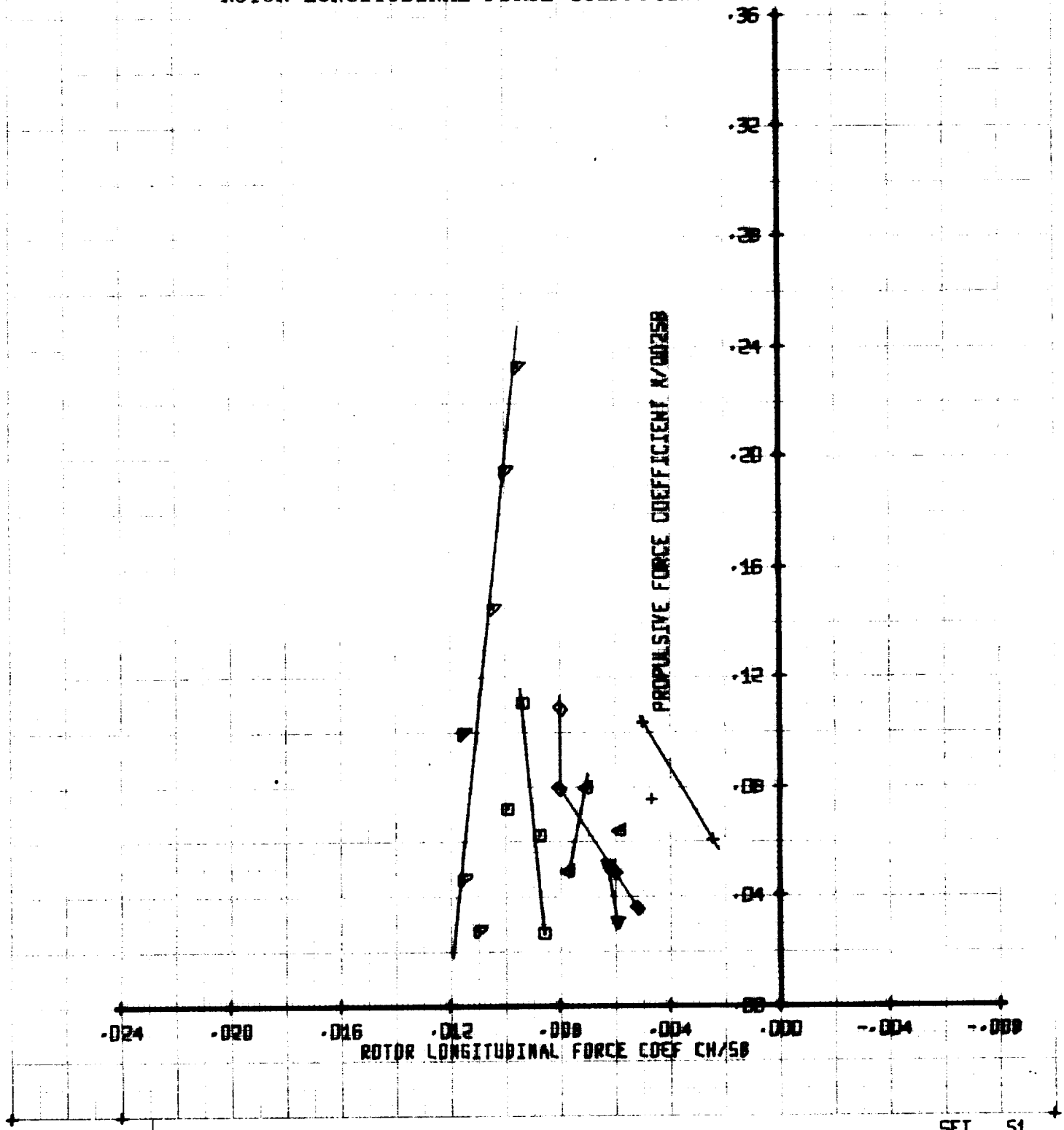


Figure B-136

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	260	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▼	241	.53	.09	328
△	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

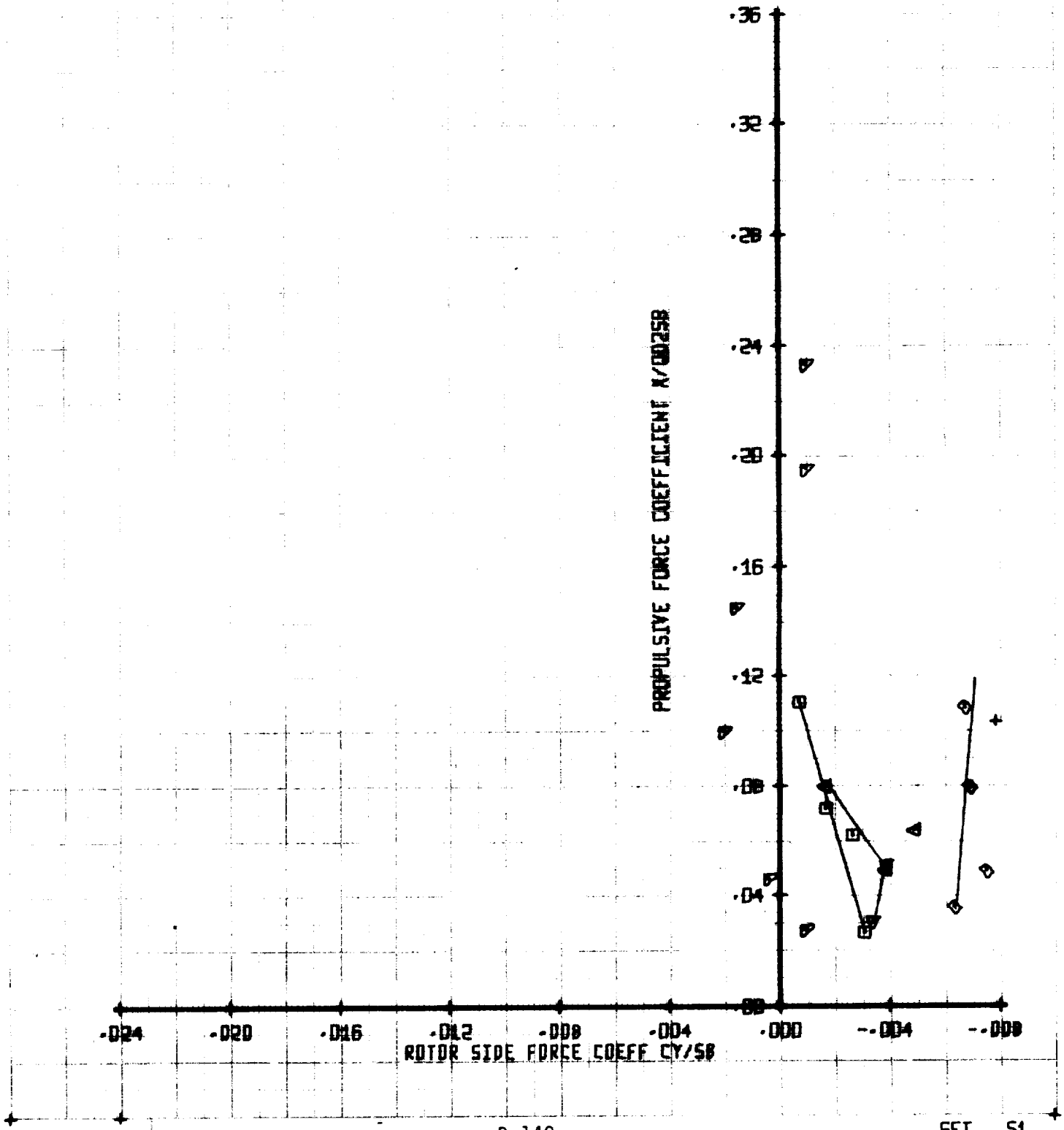


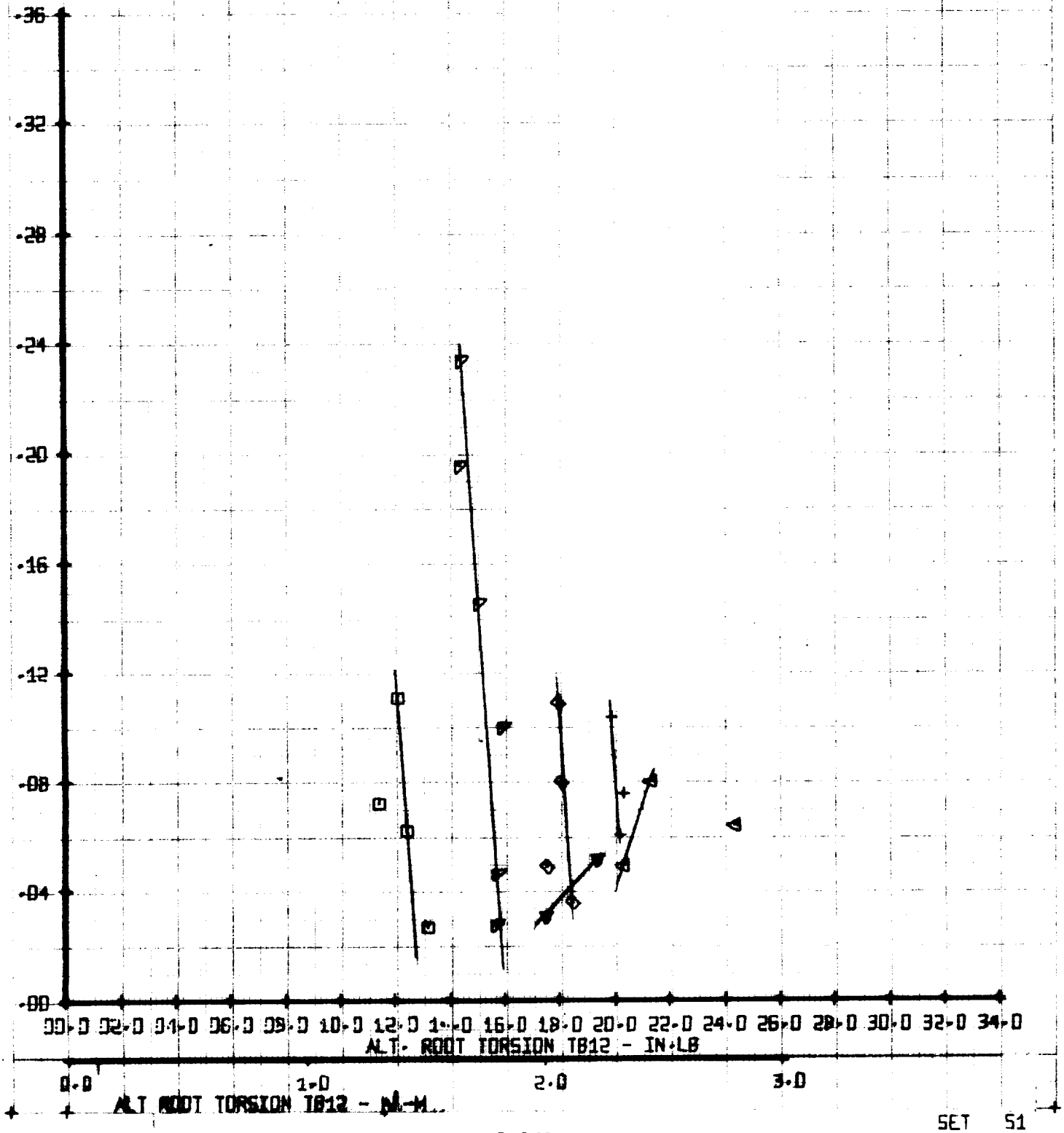
Figure B-137

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH 173 ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	209	[illegible]	.05	320
▽	240	[illegible]	.06	320
◇	266	[illegible]	.08	320
▼	241	[illegible]	.09	320
◁	242	[illegible]	.09	320
+	267	[illegible]	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



SET 51
NT 193

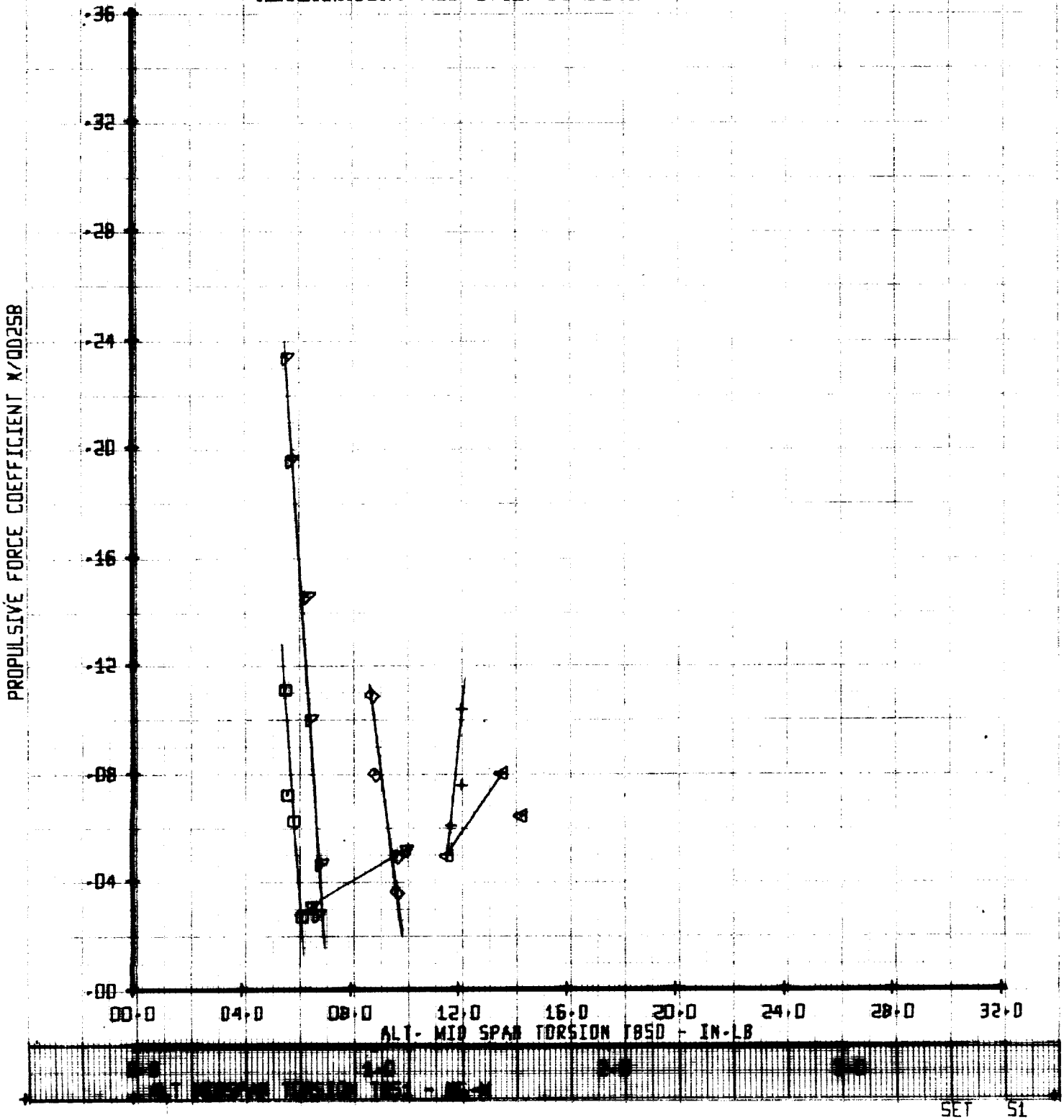
SET 51
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	268	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▼	241	.53	.09	328
◁	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



SET 51
BVWT 193

SET 51
BVWT 193

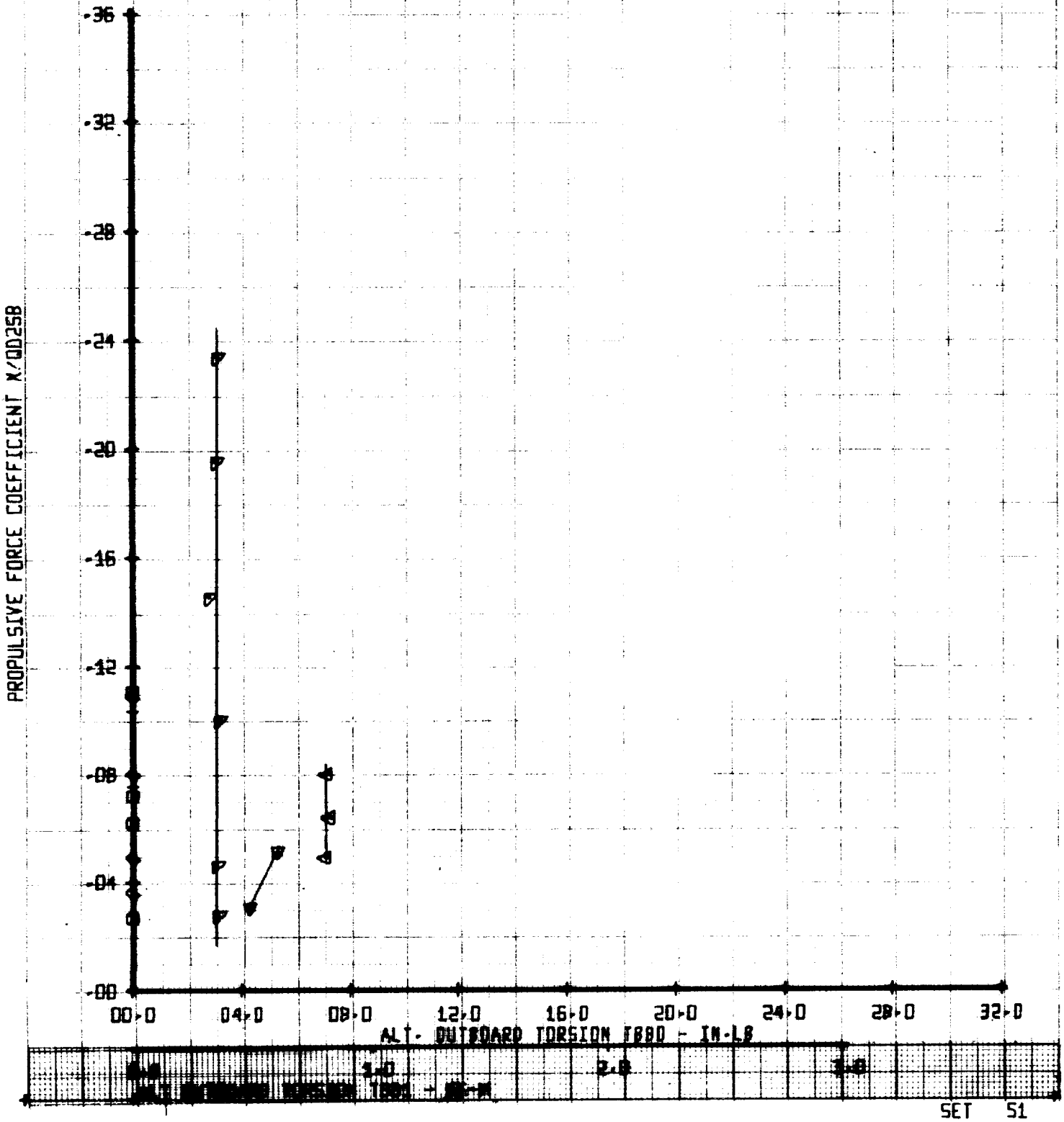
Figure B-139

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
⊡	268	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▼	241	.53	.09	328
◁	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



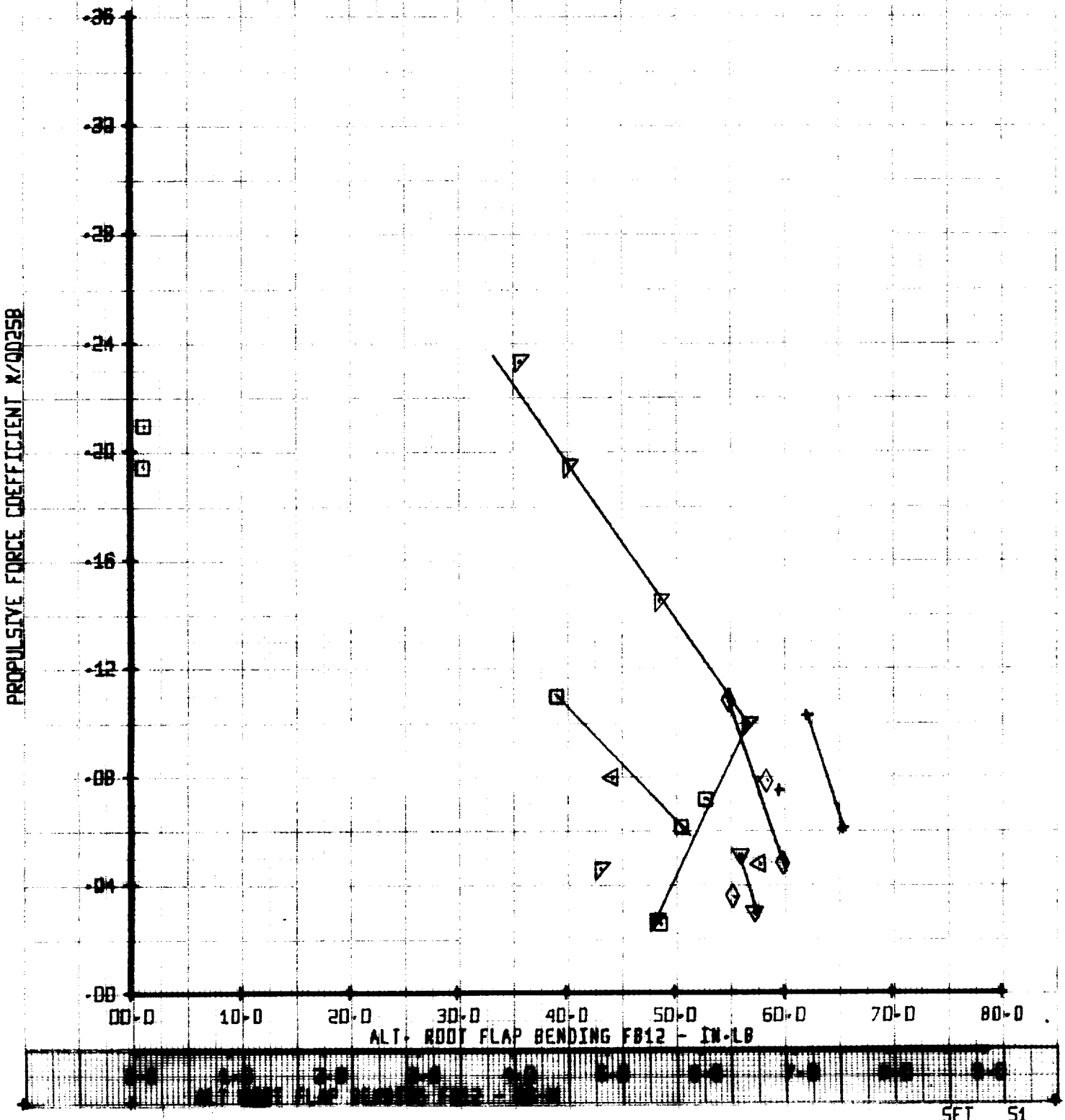
SET 51
BVWT 193

Figure B-140

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

SYM	RUN	MU'	CT'/SB	VTUN
□	268	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▽	241	.53	.09	328
△	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



ET 51
NT 193

SET 51
SVWT 193

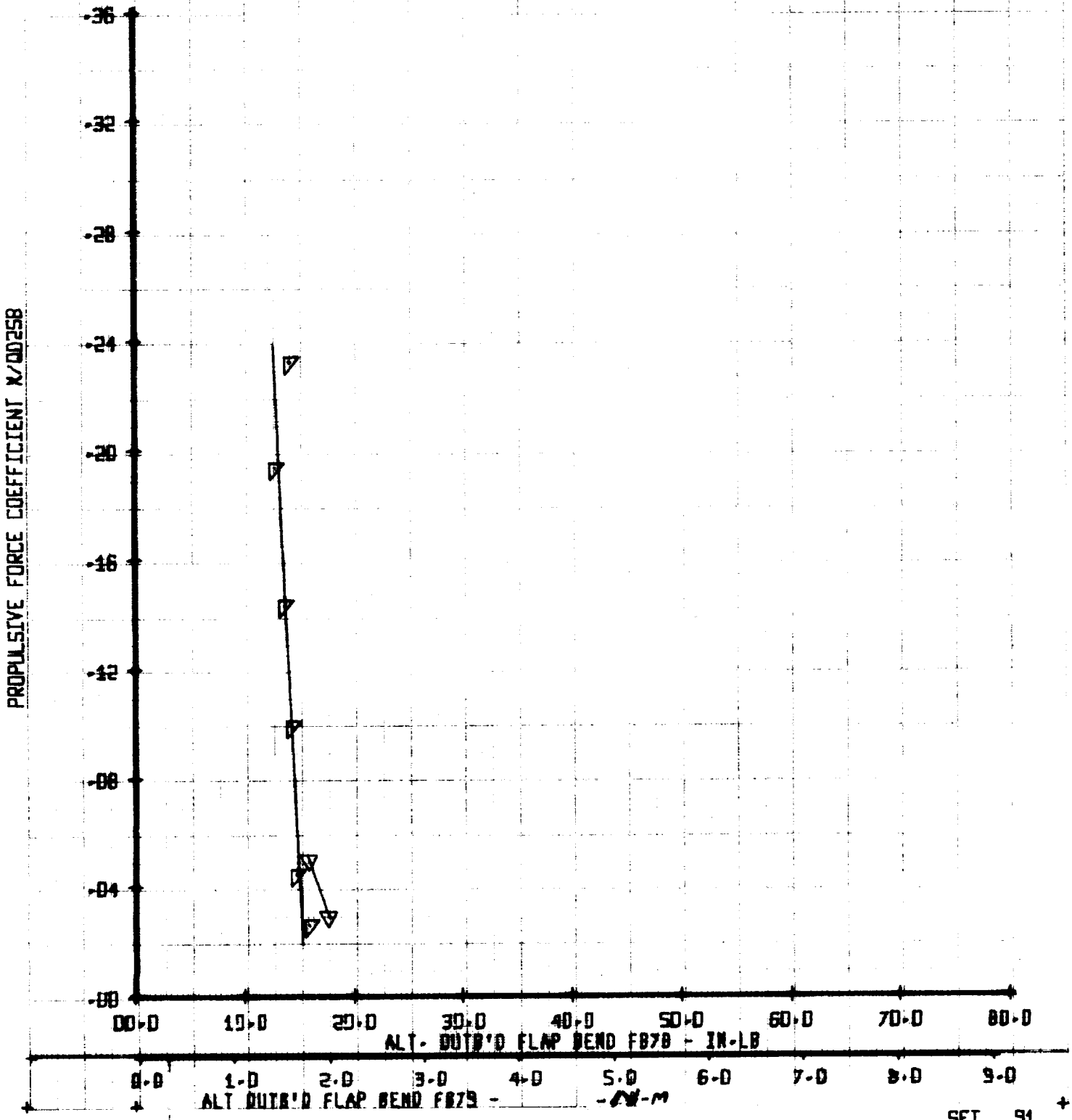
Figure B-141

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT/SB	VTUN
⊡	268	.53	.05	328
▽	240	.55	.06	328
◇	266	.55	.08	328
▼	241	.55	.09	328
◀	242	.55	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



SET 51
WT 193

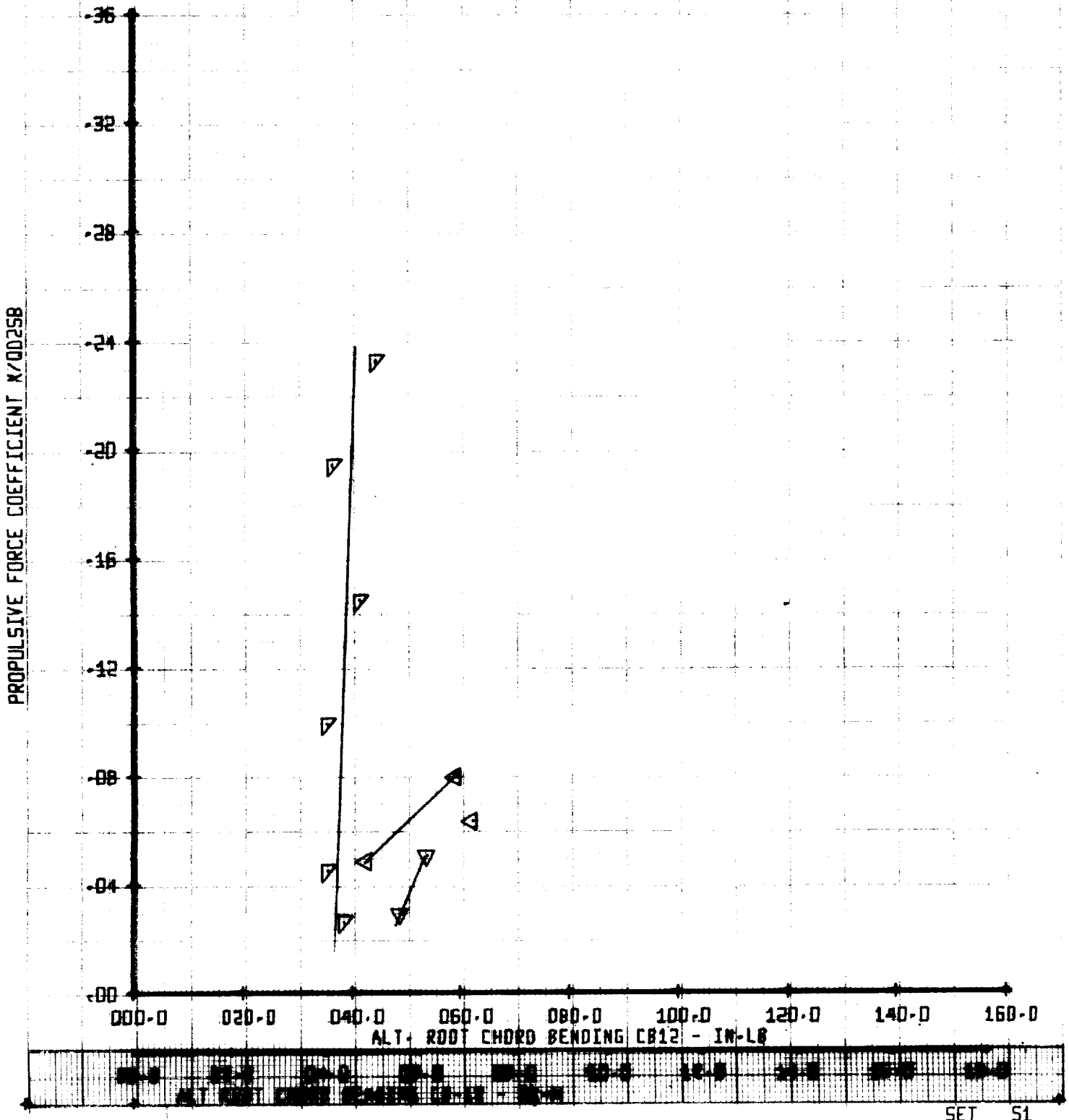
SET 91
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SØ	VTUN
□	268	.53	.05	328
▽	240	.53	.06	328
◇	266	.53	.08	328
▽	241	.53	.09	328
△	242	.53	.09	328
+	267	.53	.10	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12

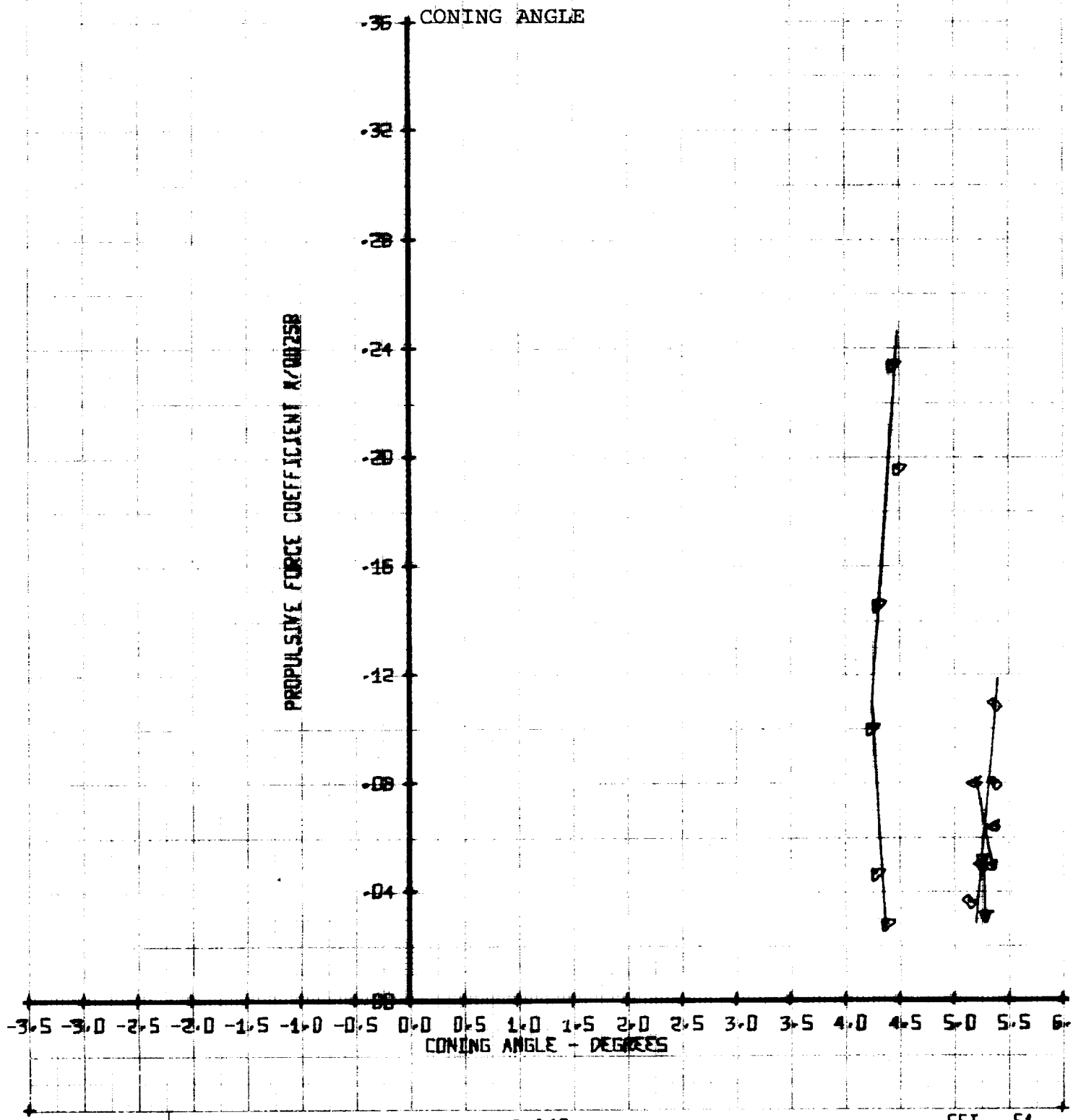


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SIGMA	VTUN
□	269	.53	.05	350
▽	240	.53	.06	350
◇	266	.53	.08	350
▽	241	.53	.03	350
△	242	.53	.09	350
+	267	.53	.10	350

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



CT S1
WT 193

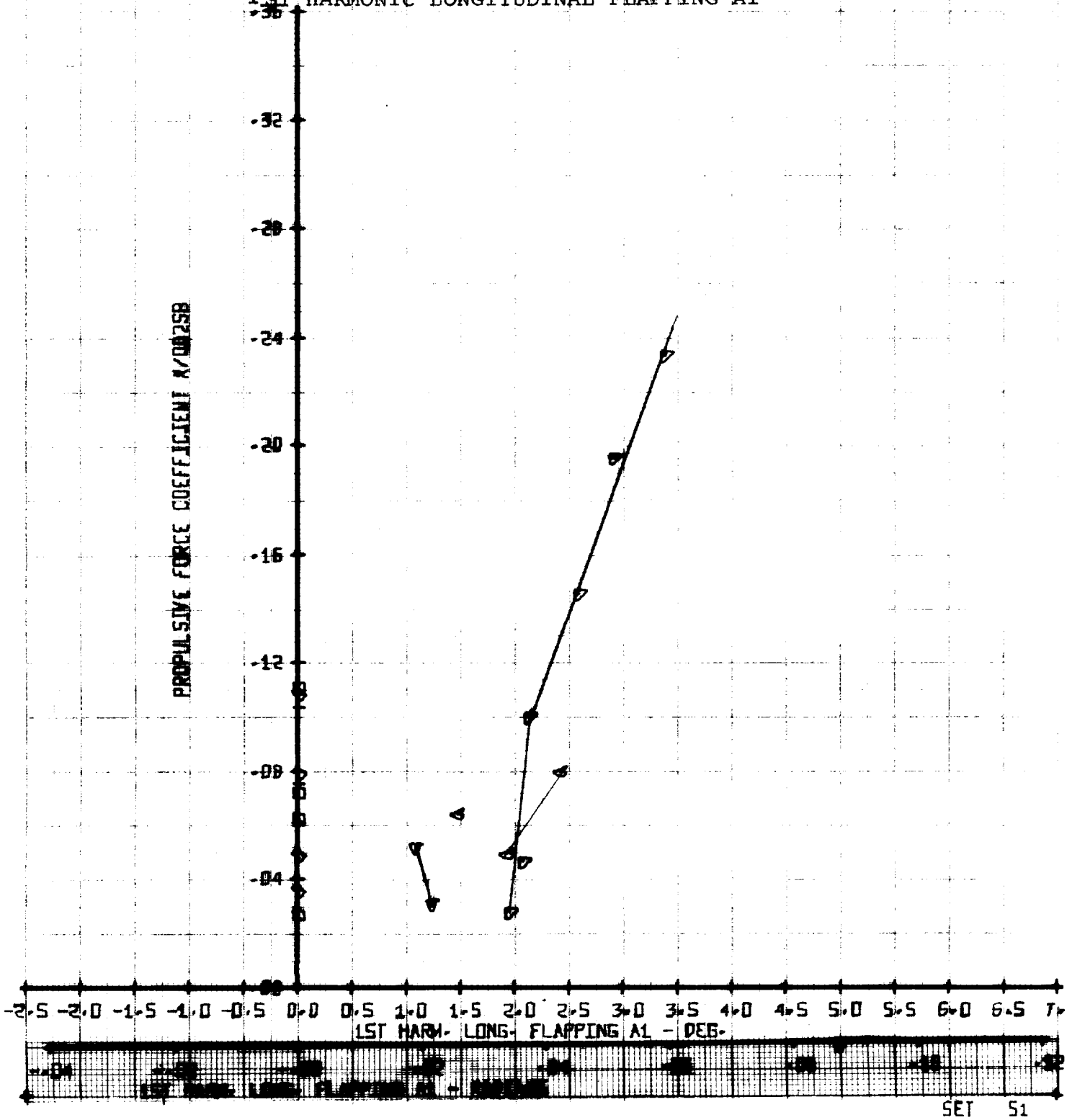
SET S1
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	269	.53	.05	329
▽	240	.53	.06	329
◇	266	.53	.08	329
▽	241	.53	.09	329
△	242	.53	.09	329
+	267	.53	.10	329

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

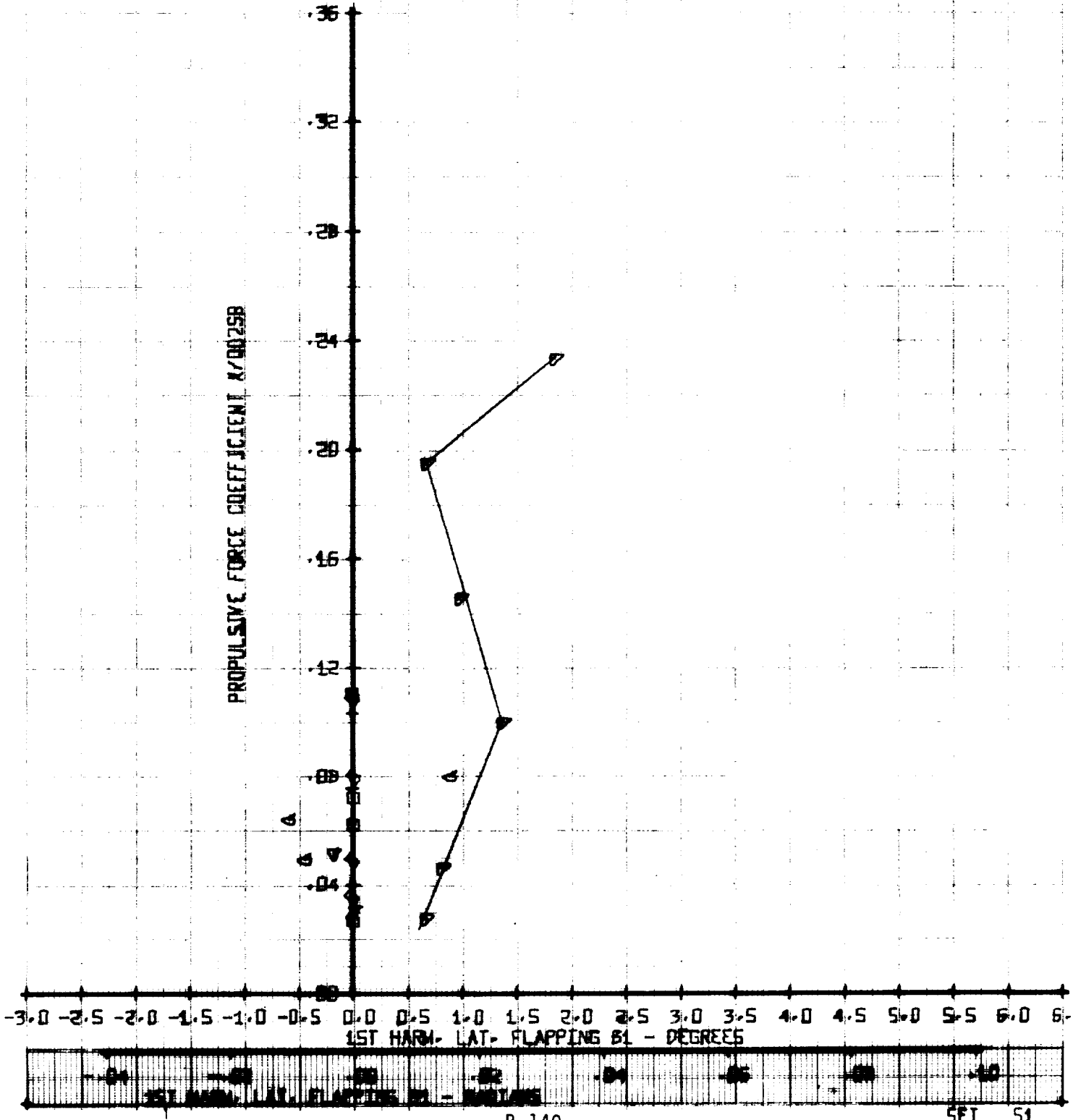


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	260	.53	.05	320
▽	240	.53	.06	320
◇	266	.53	.08	320
▽	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

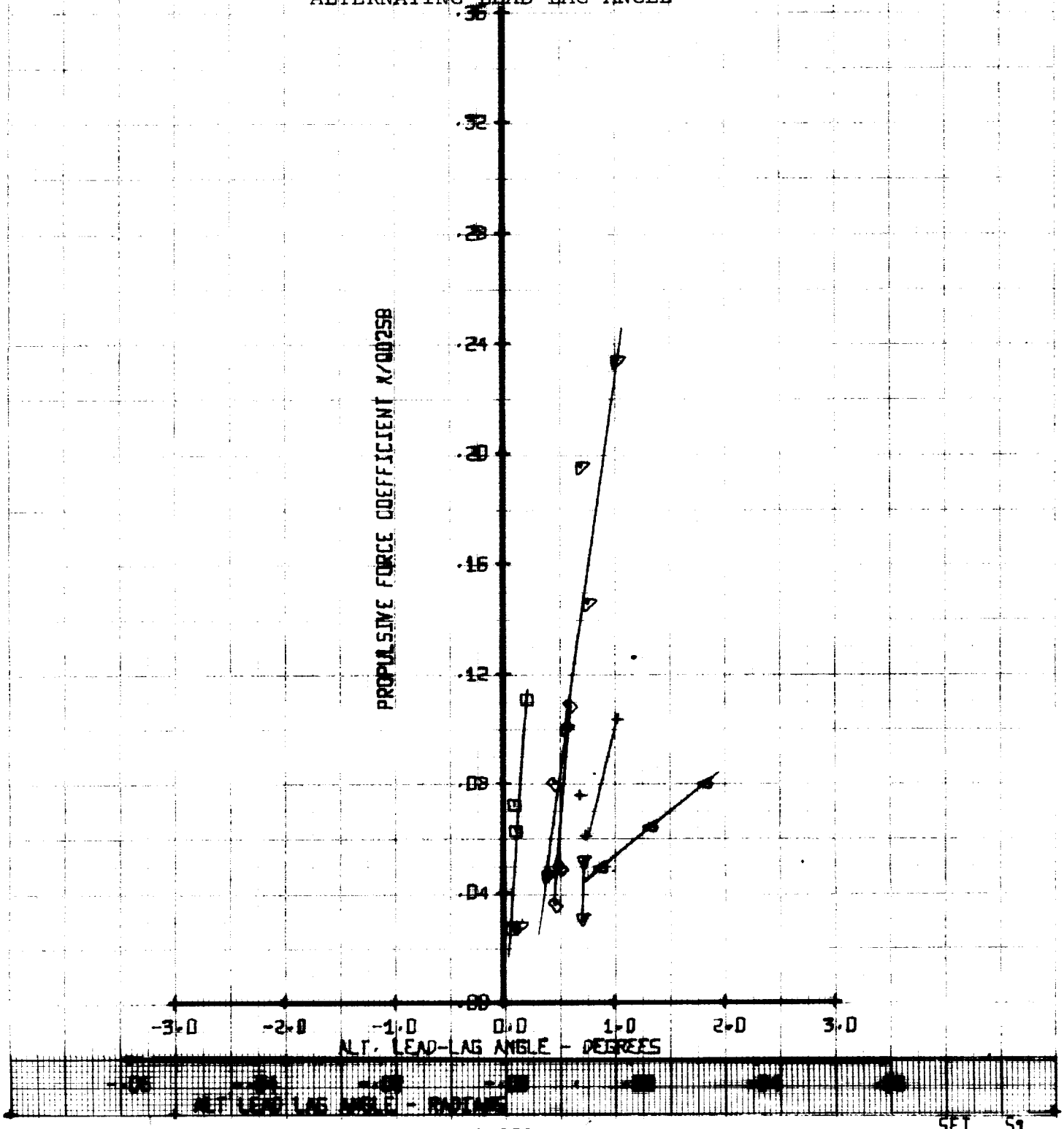


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTLN
□	238	.53	.05	320
▽	240	.53	.06	320
◇	236	.53	.08	320
▽	241	.53	.09	320
△	242	.53	.09	320
+	267	.53	.10	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

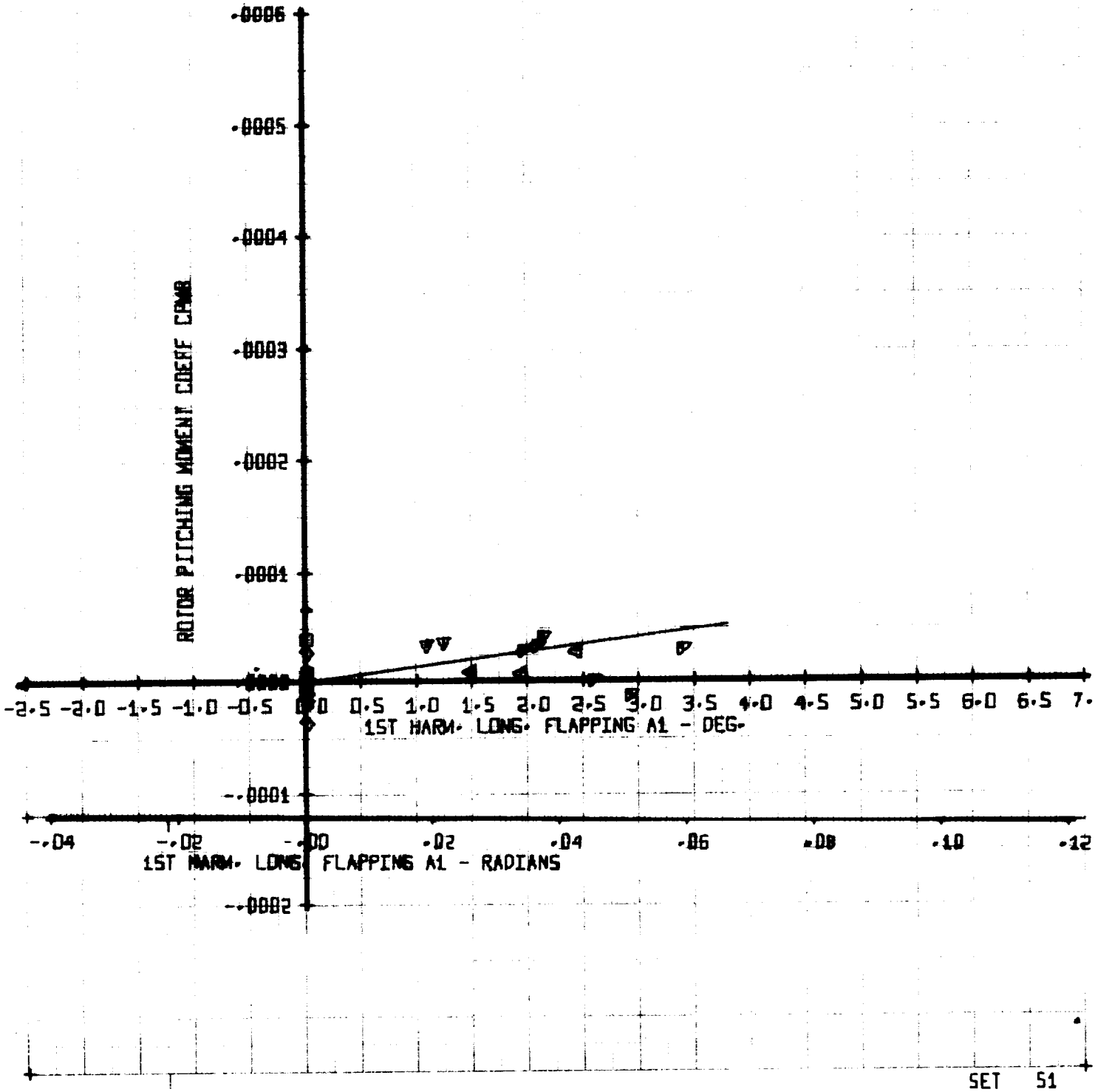


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	268	.53	.05	328
◁	240	.53	.06	328
◇	266	.53	.08	328
▽	241	.53	.09	328
△	242	.53	.09	328
+	267	.53	.10	328

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

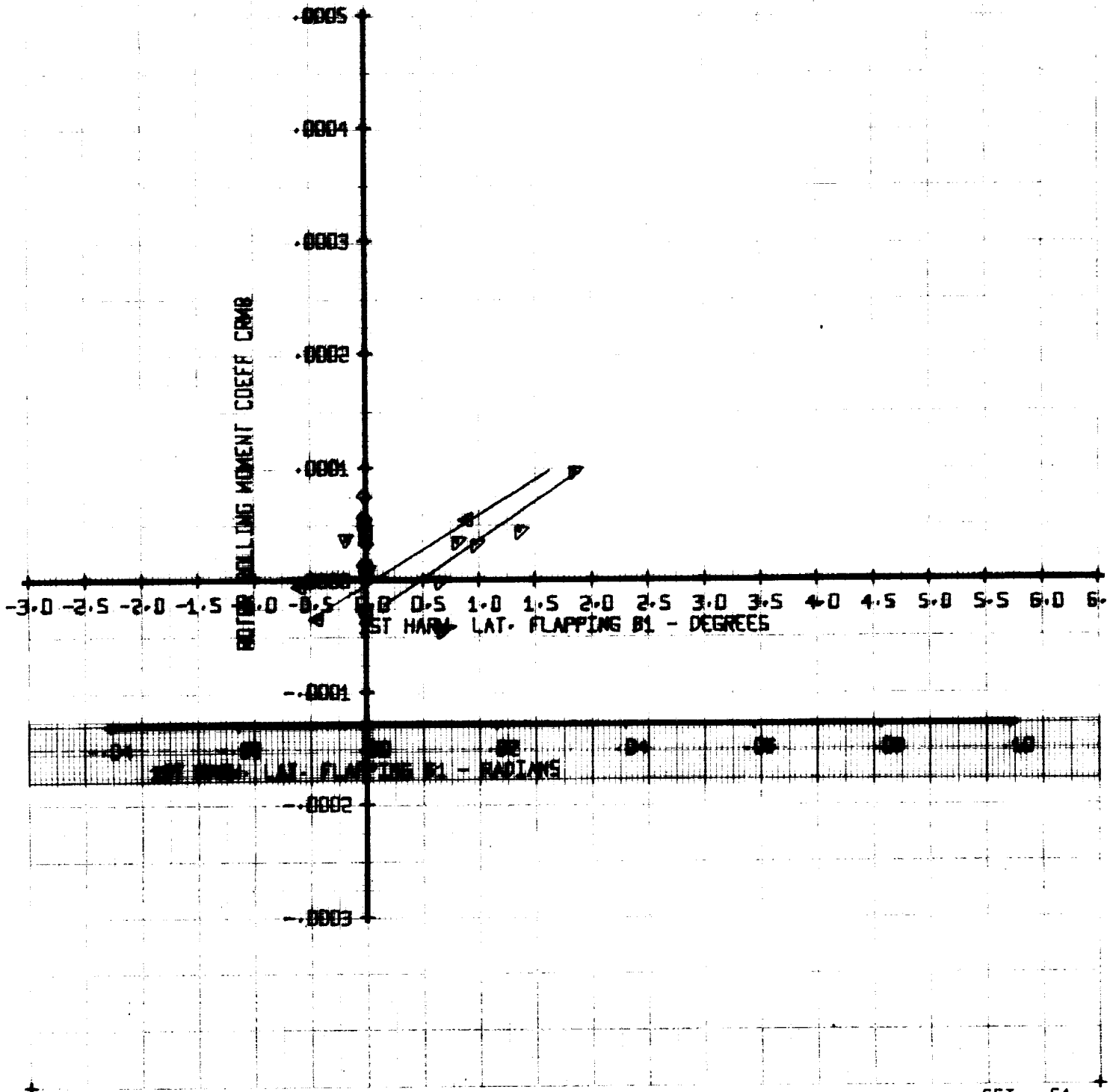


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	238	.53	.05	320
▷	240	.53	.06	320
◇	266	.53	.08	320
▽	241	.53	.09	320
◁	242	.53	.09	320
+	267	.53	.10	320

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 51
WT 193

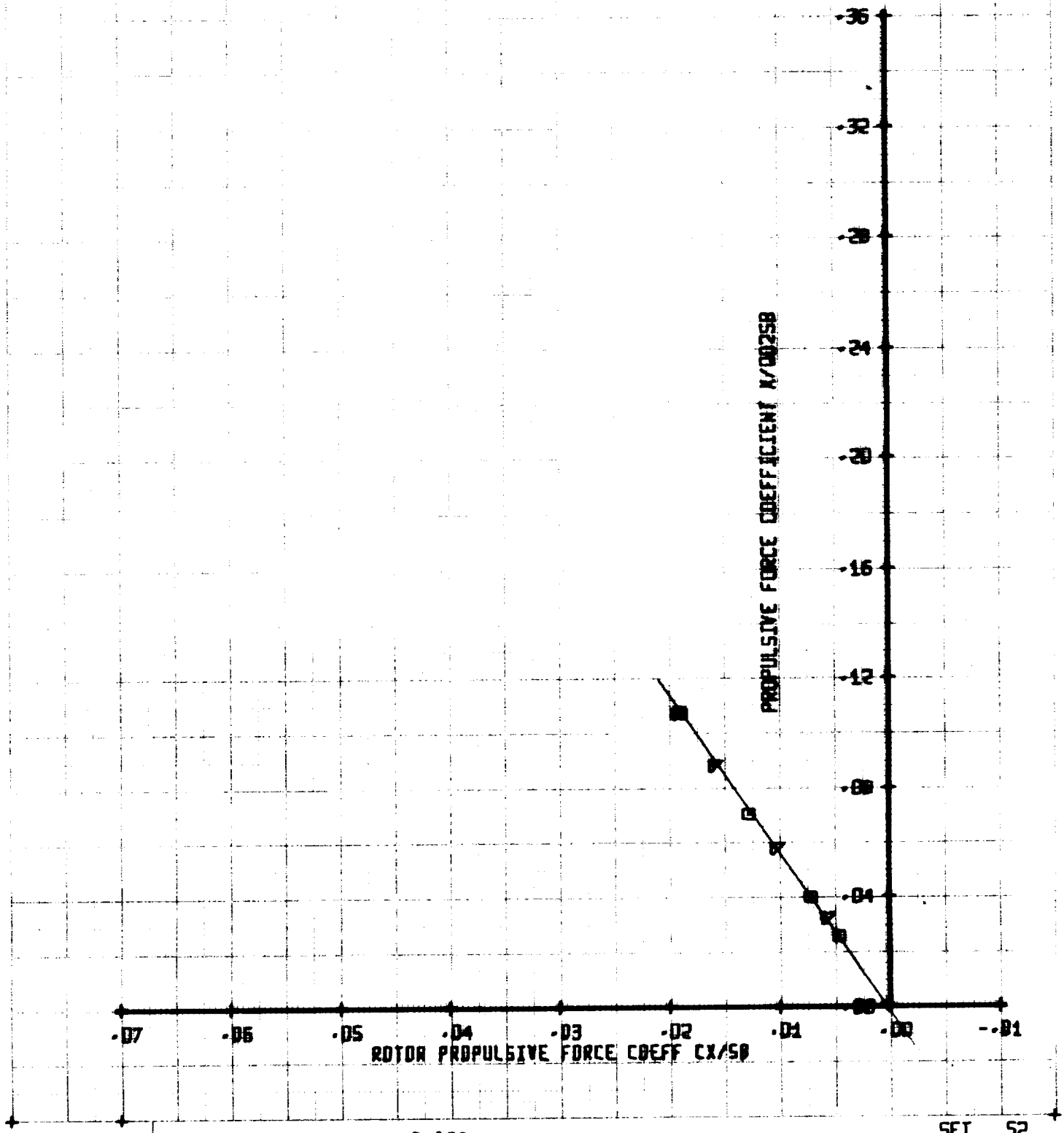
SET 51
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
◻	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



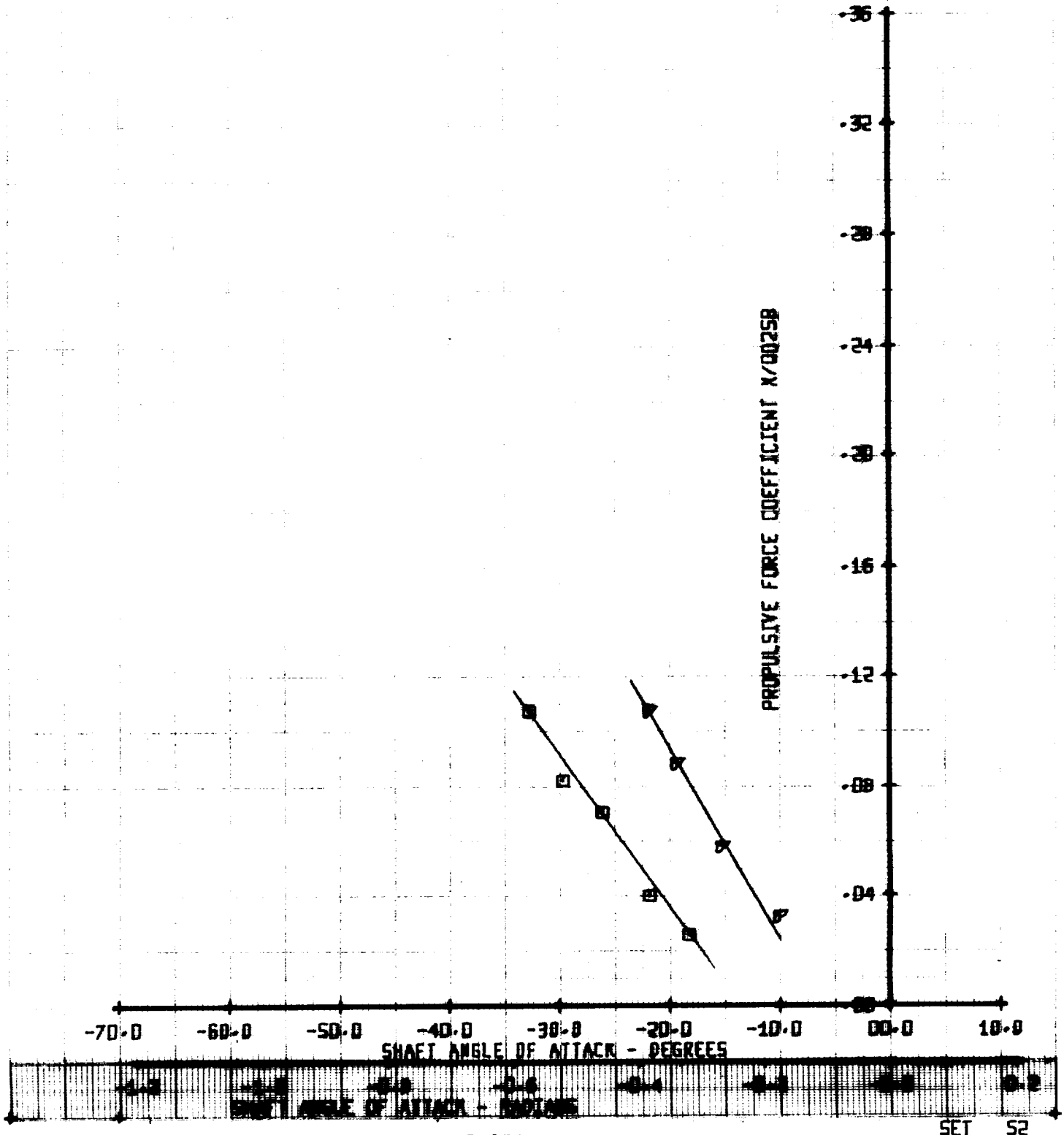
ET 52
WT 193

SET 52
BYWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YIUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK

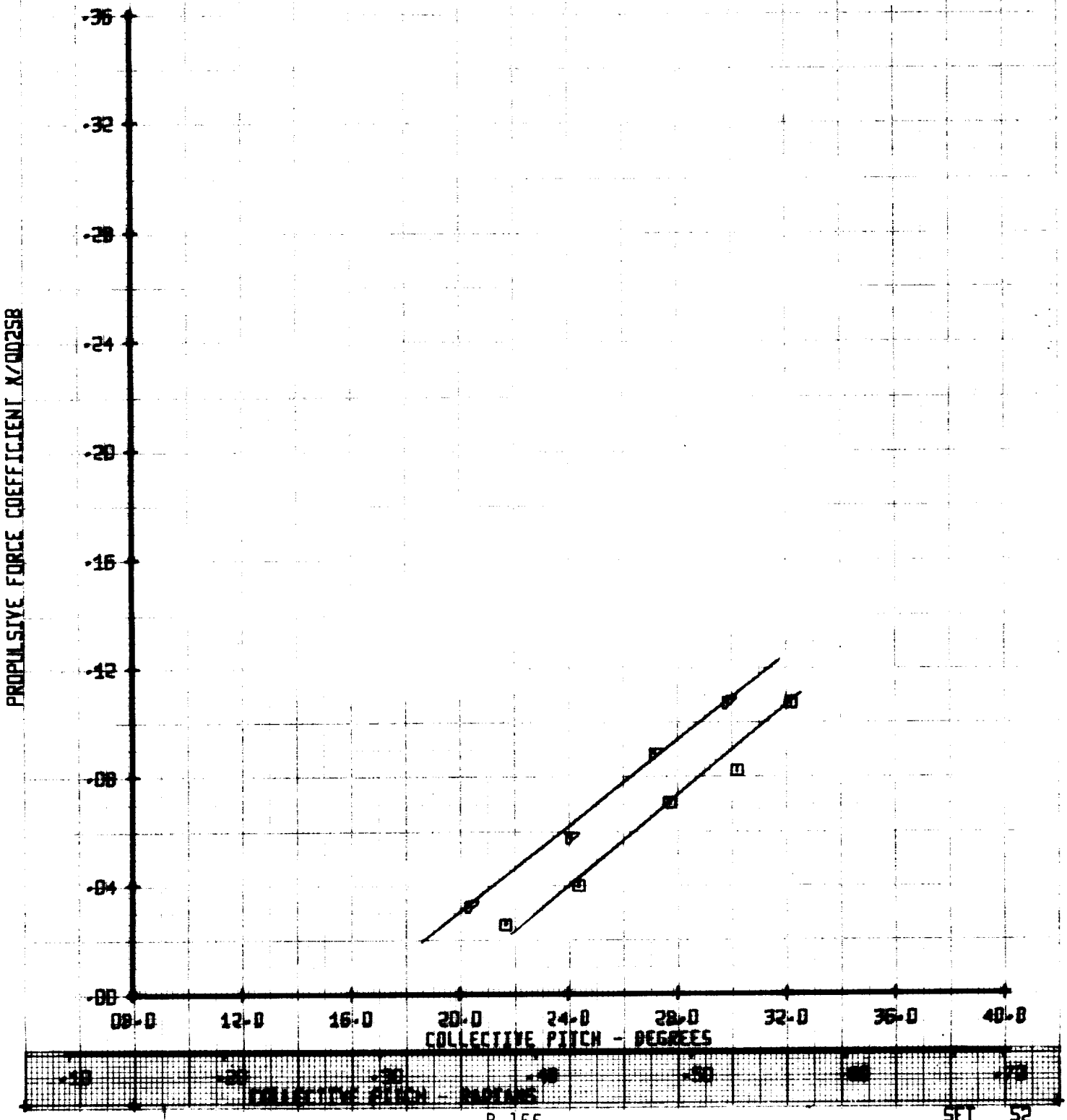


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 52
WT 193

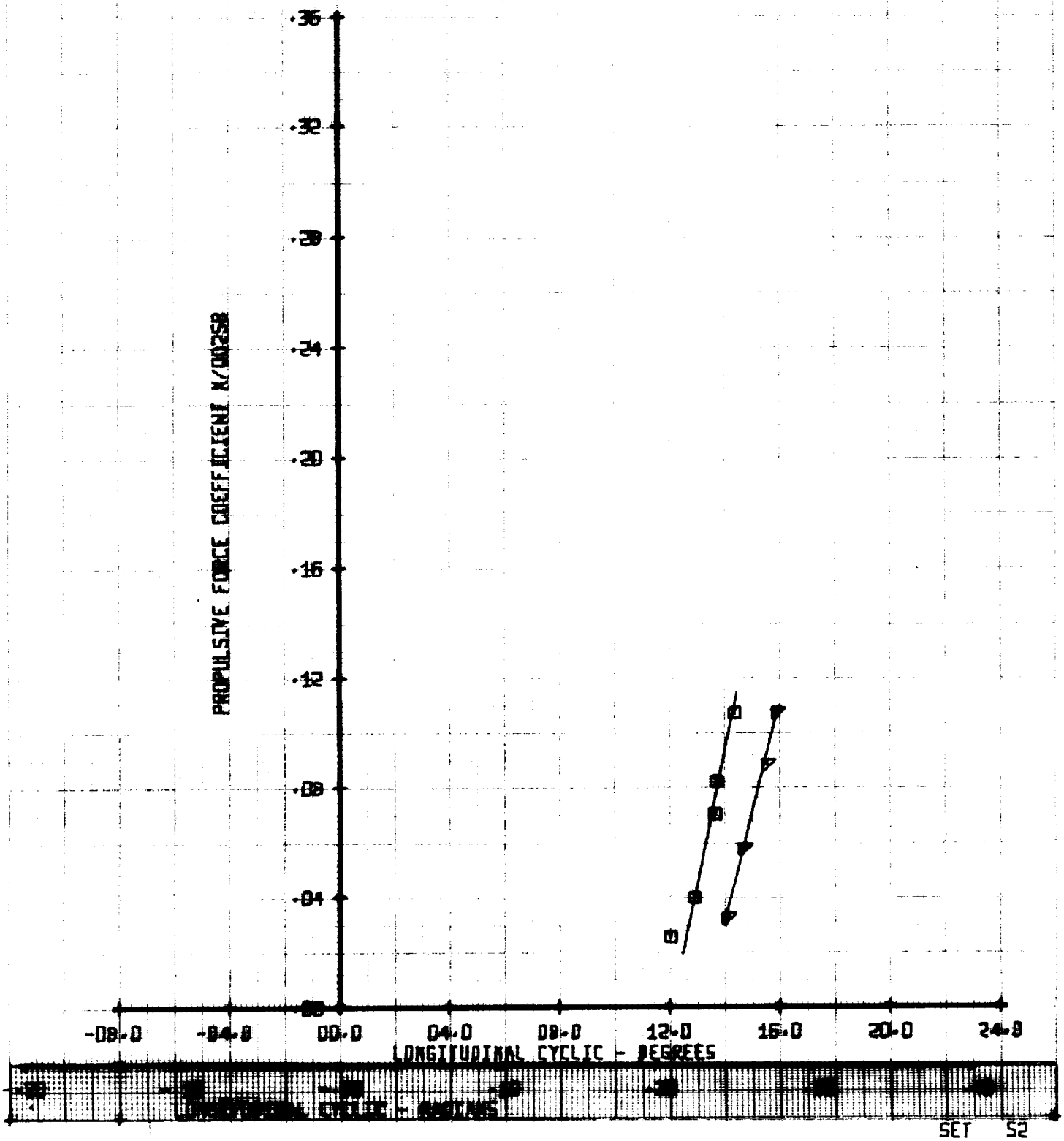
SET 52
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	264	.53	.05	329
▽	265	.53	.07	329

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 52
WT 193

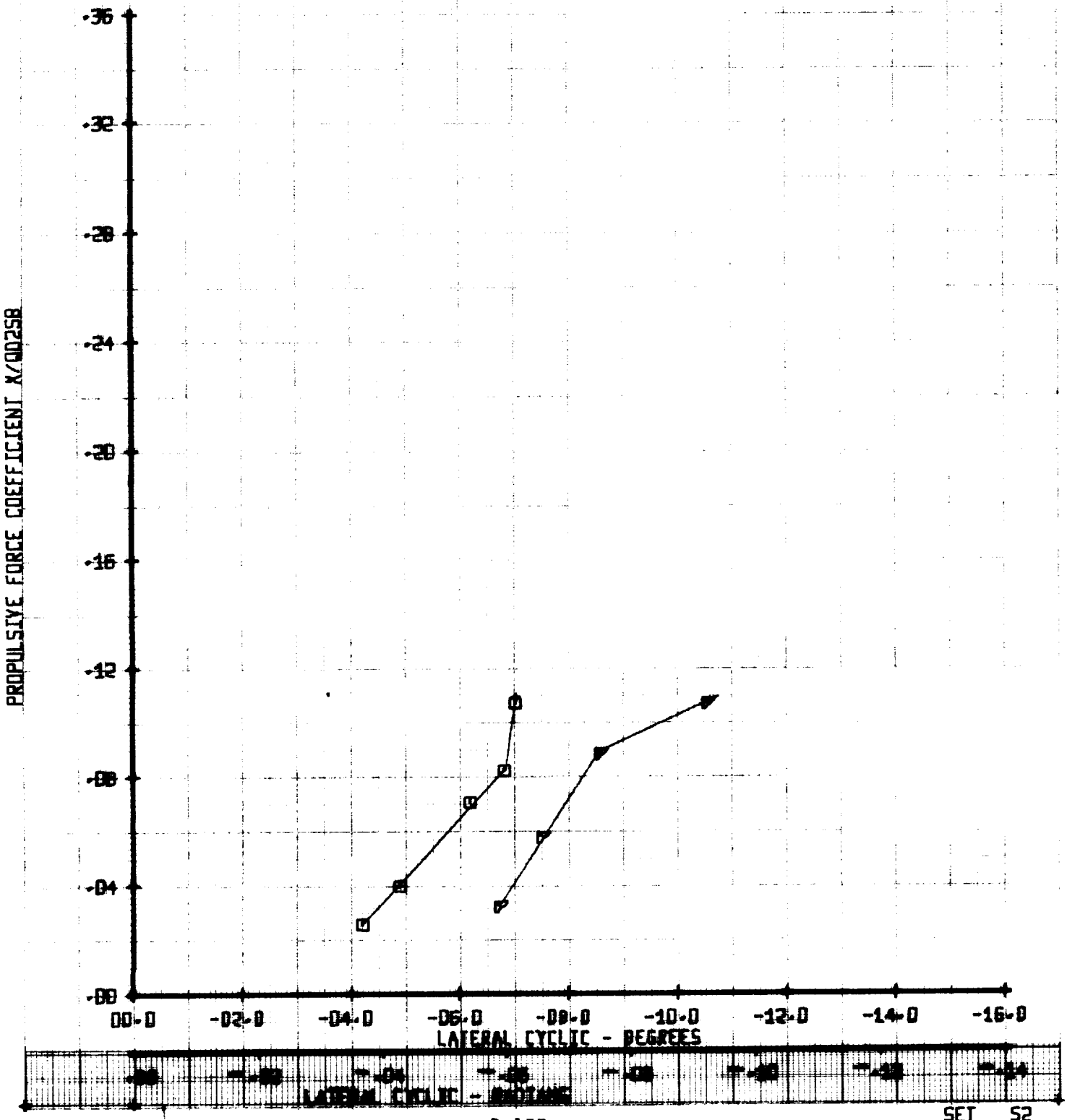
SET 52
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	264	.53	.05	320
▽	265	.53	.07	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



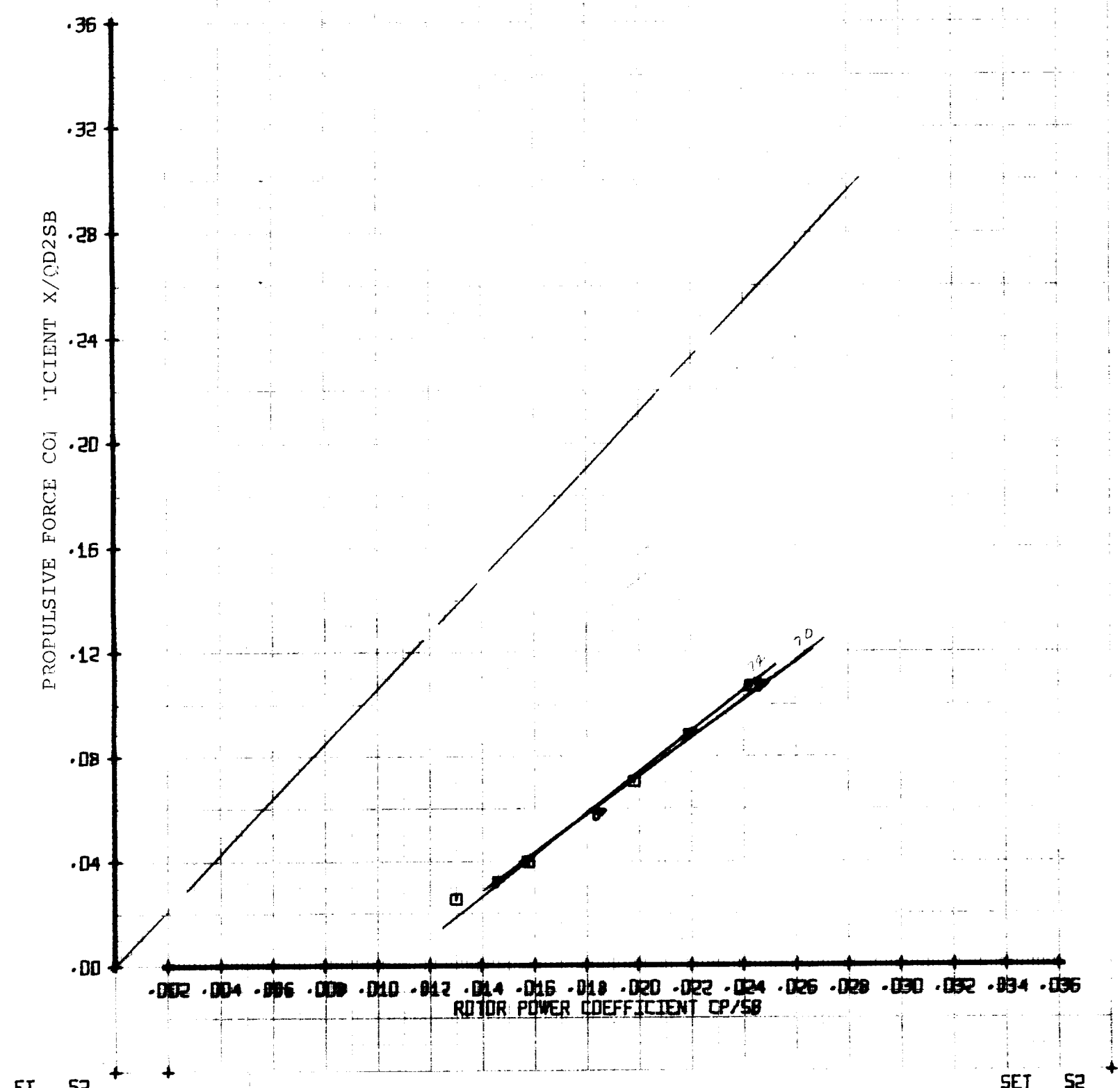
ET S2
WT 193

SET S2
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	264	.53	.05	320
▽	265	.53	.07	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET S2
WT 193

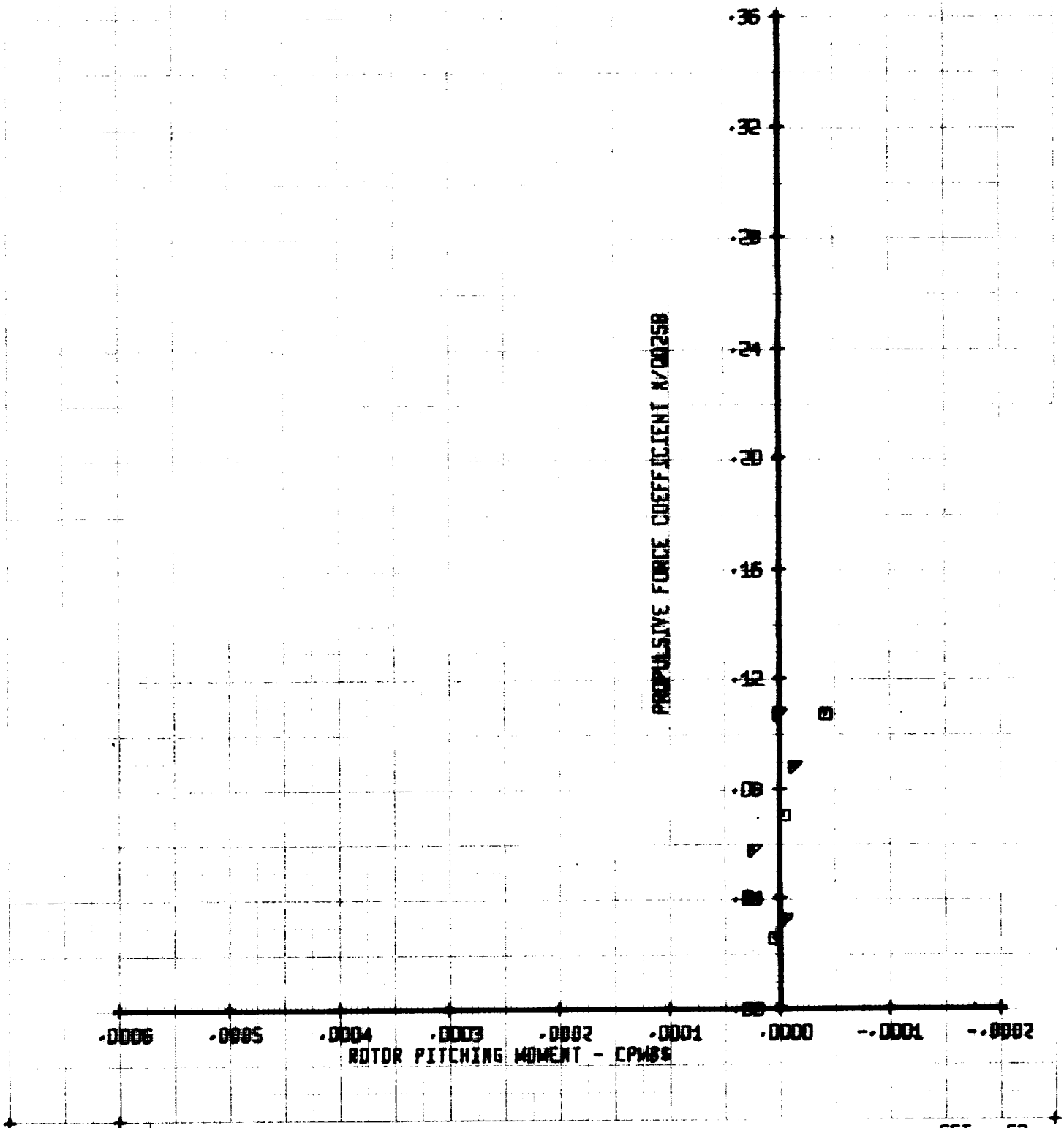
SET S2
BWT 193

Figure B-155

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 52
WT 193

SET 52
BVWT 193

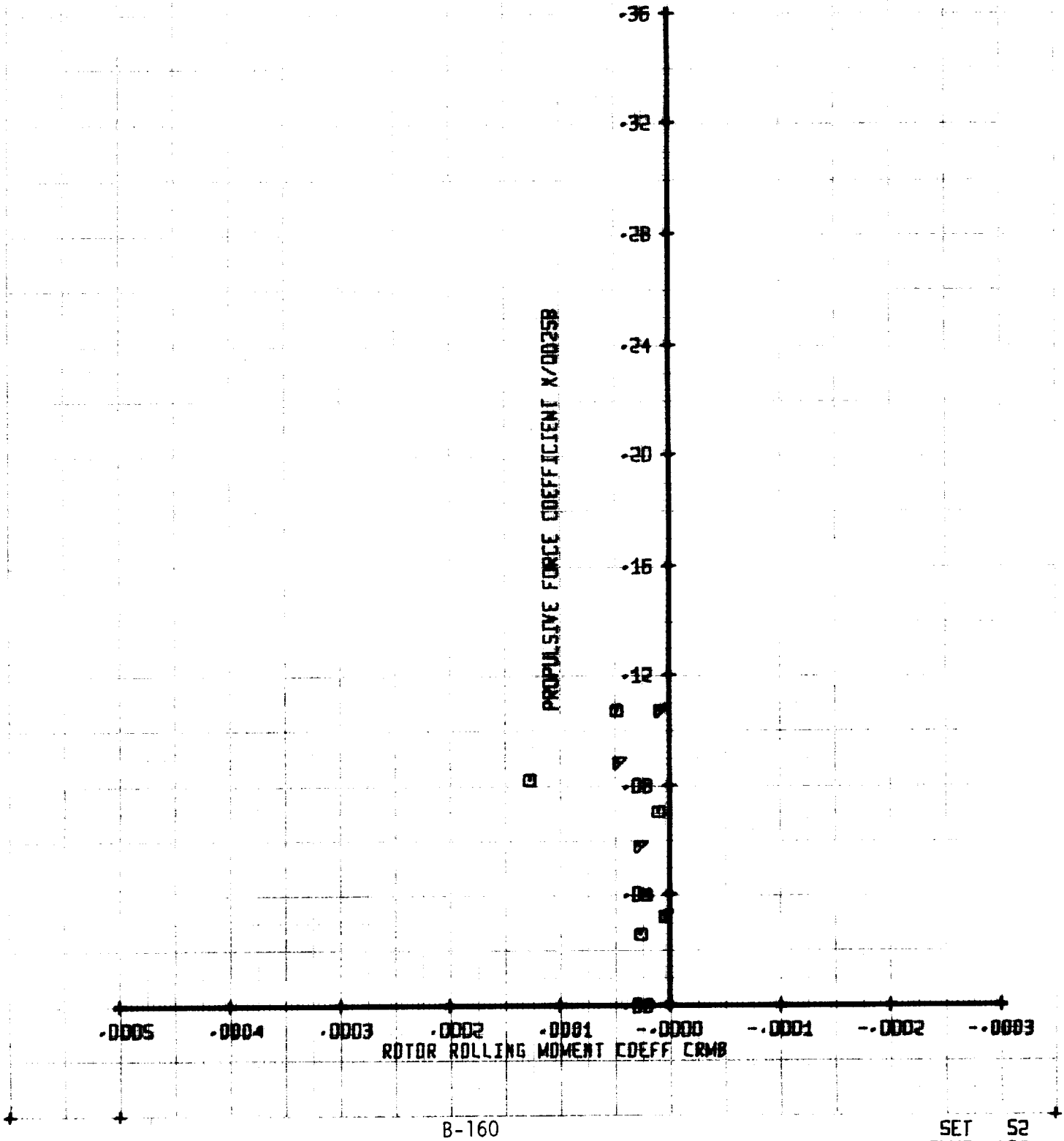
Figure B-156

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

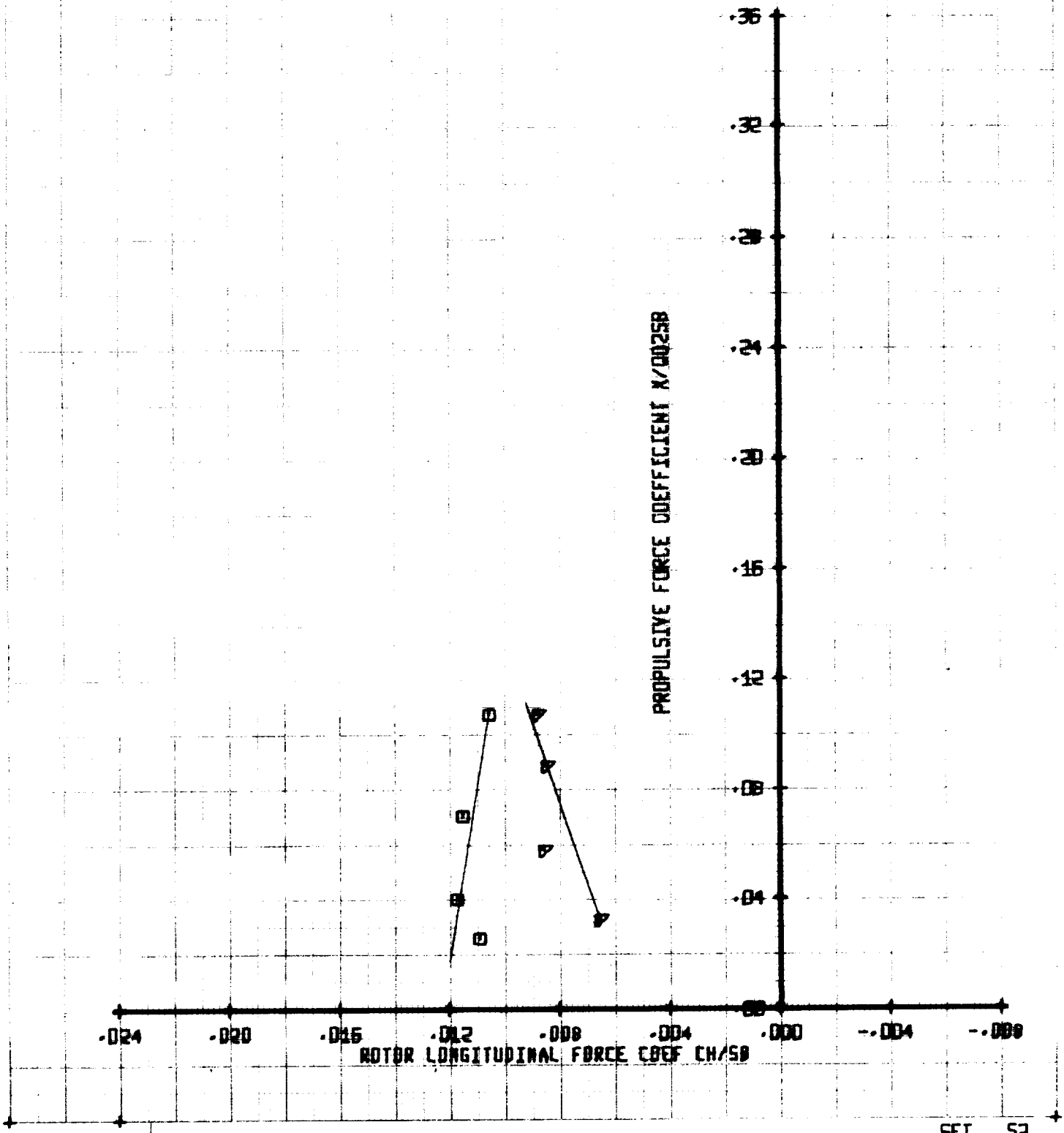


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFIICENT



ET 52
WT 193

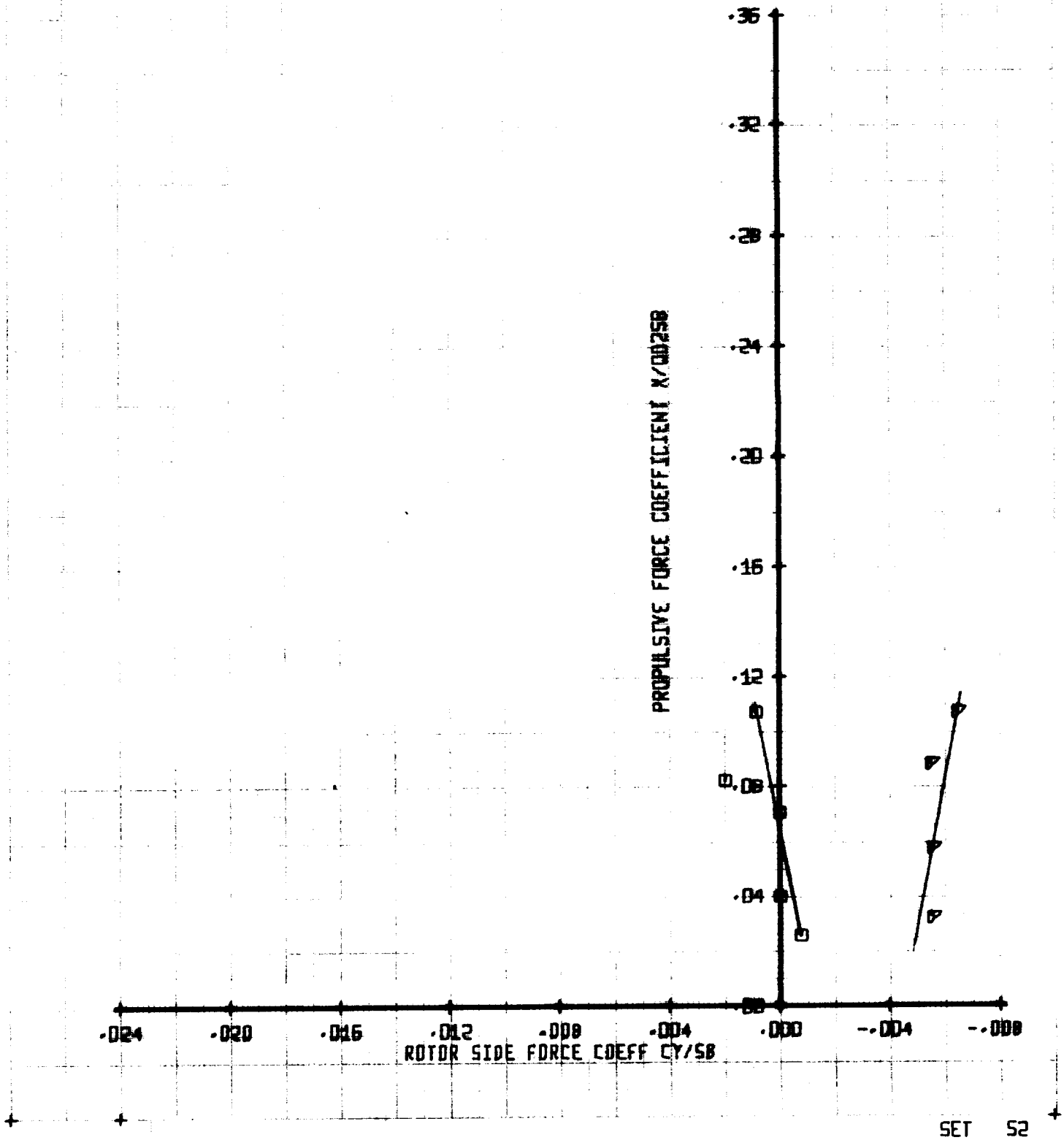
SET 52
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	264	.53	.05	320
▽	265	.53	.07	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET 52
WT 193

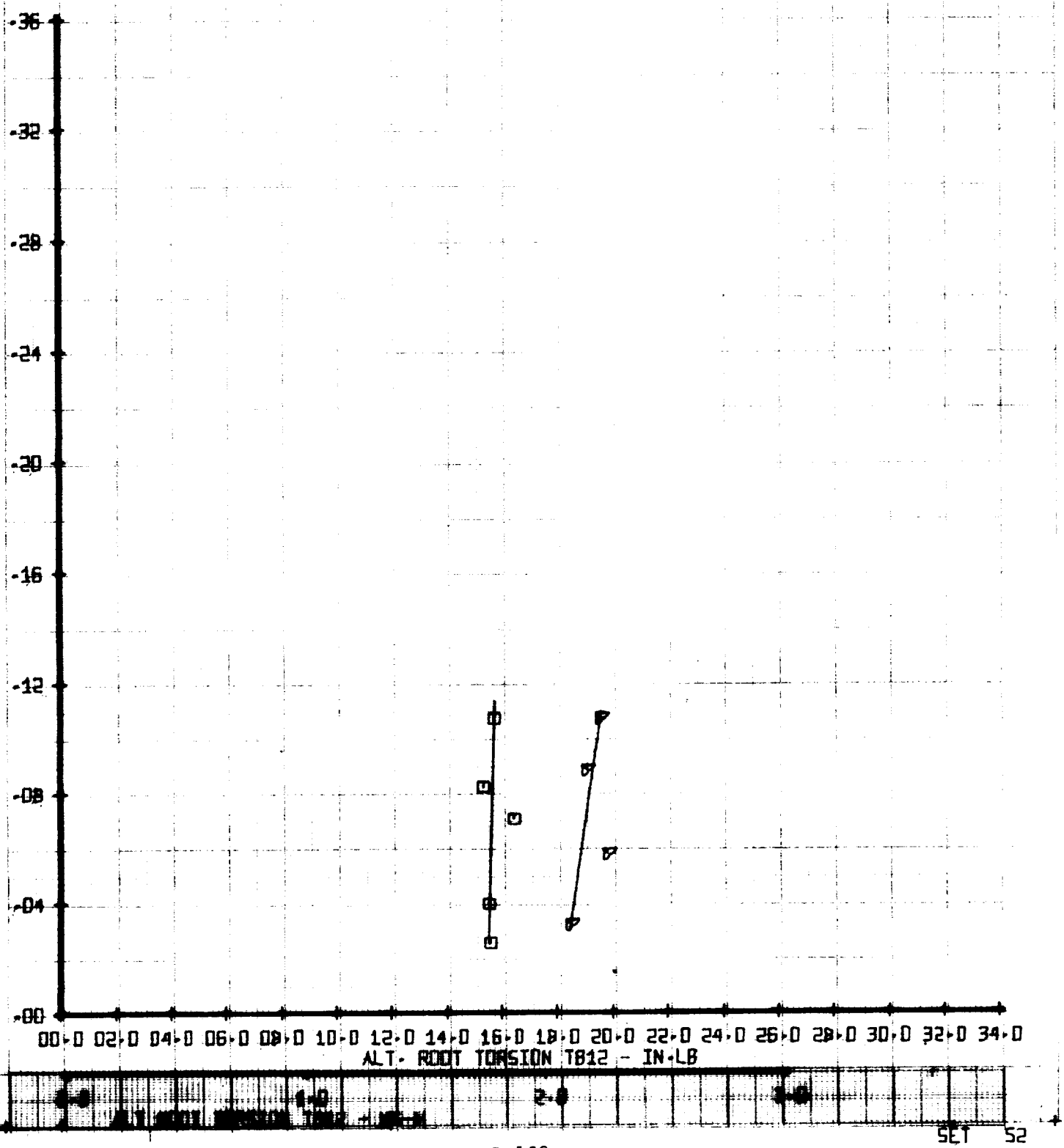
SET 52
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



SET 52
WT 193

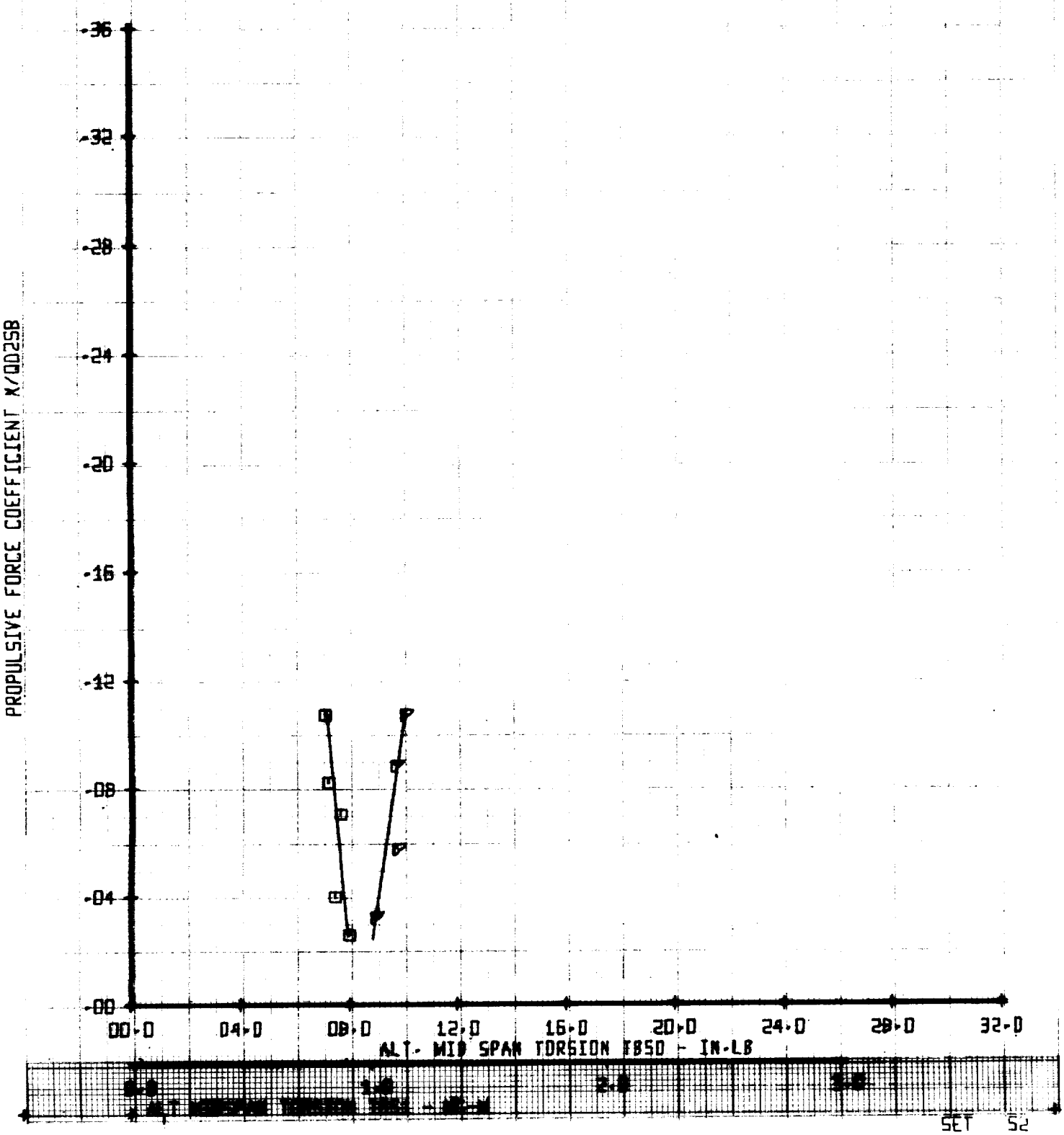
SET 52
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTIP
☐	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



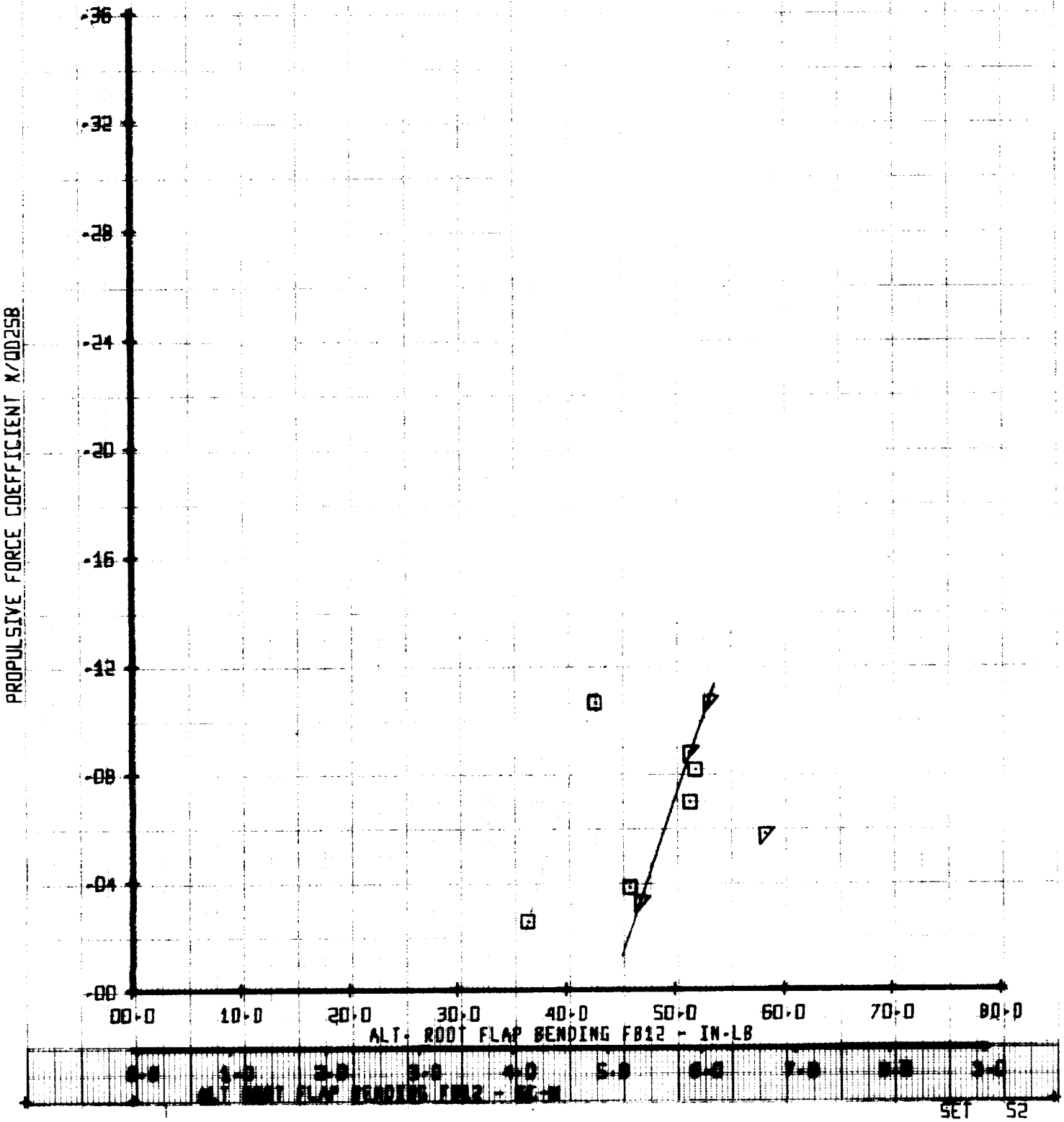
SET 52
BWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
☐	264	.53	.05	320
▽	265	.53	.07	320

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



SET 52
BVNT 193

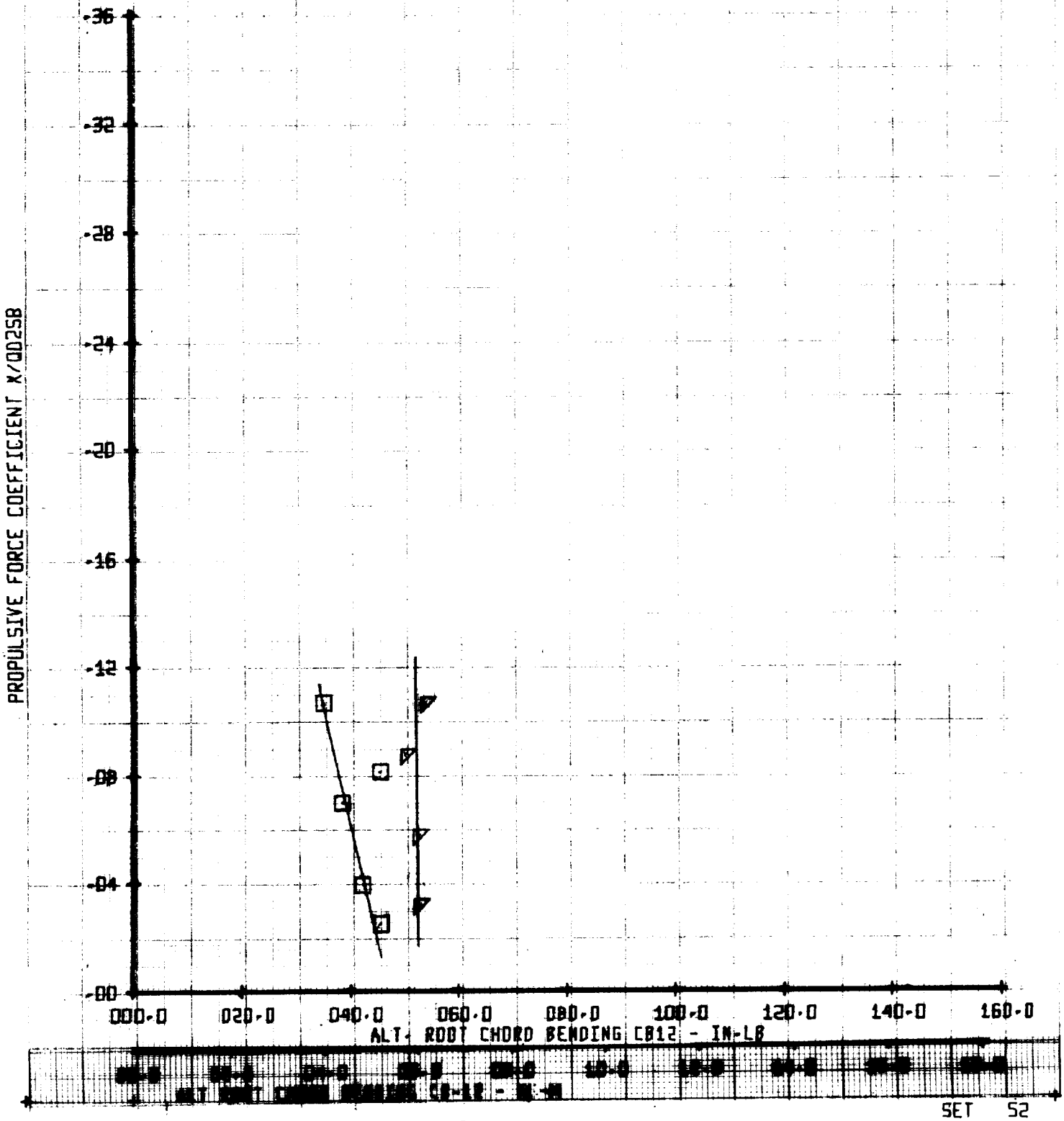
Figure B-162

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	264	.53	.05	328
▽	265	.53	.07	328

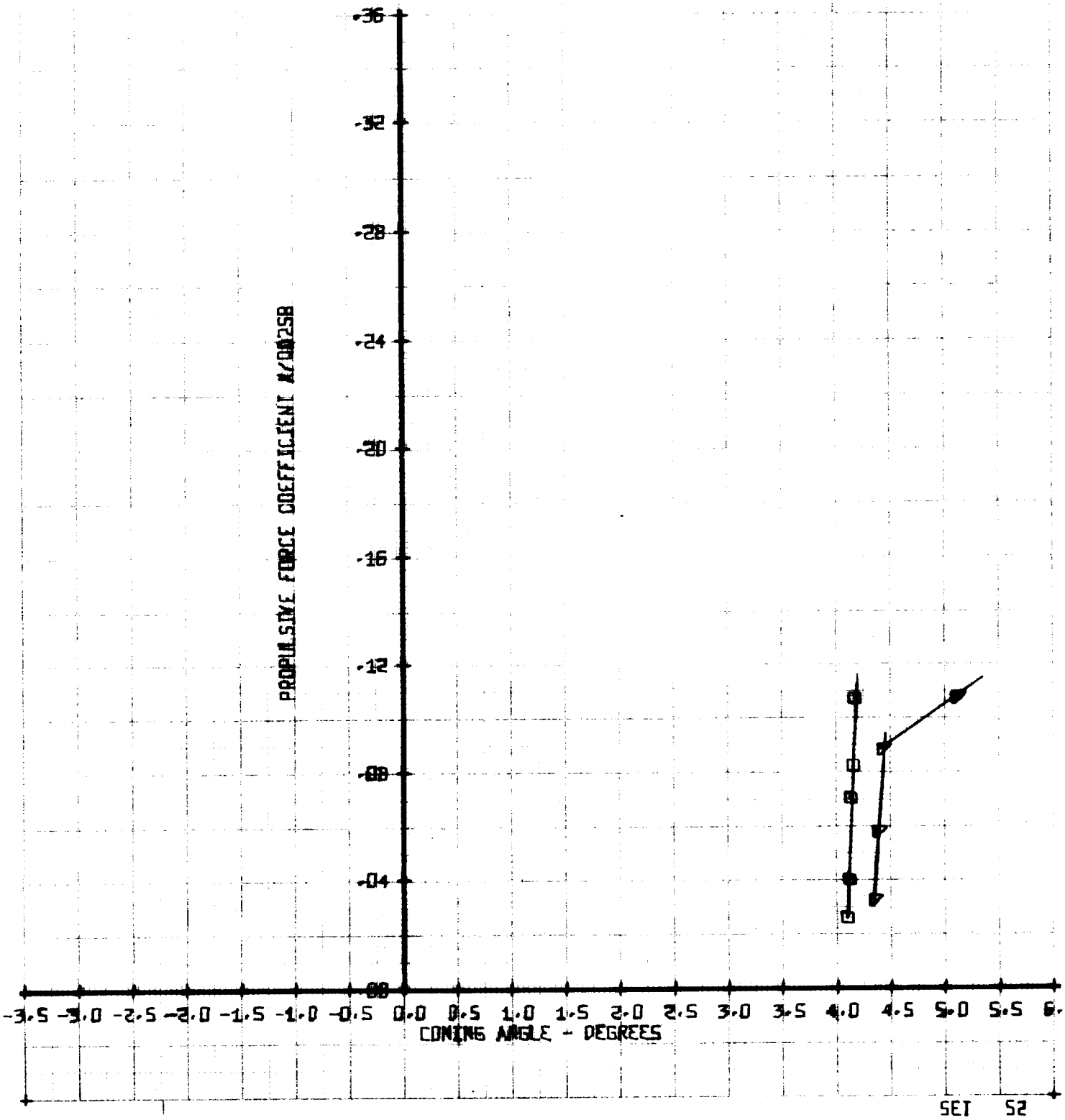
PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SIGMA	YTUN
□	264	.53	.05	338
▽	265	.53	.07	338

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE

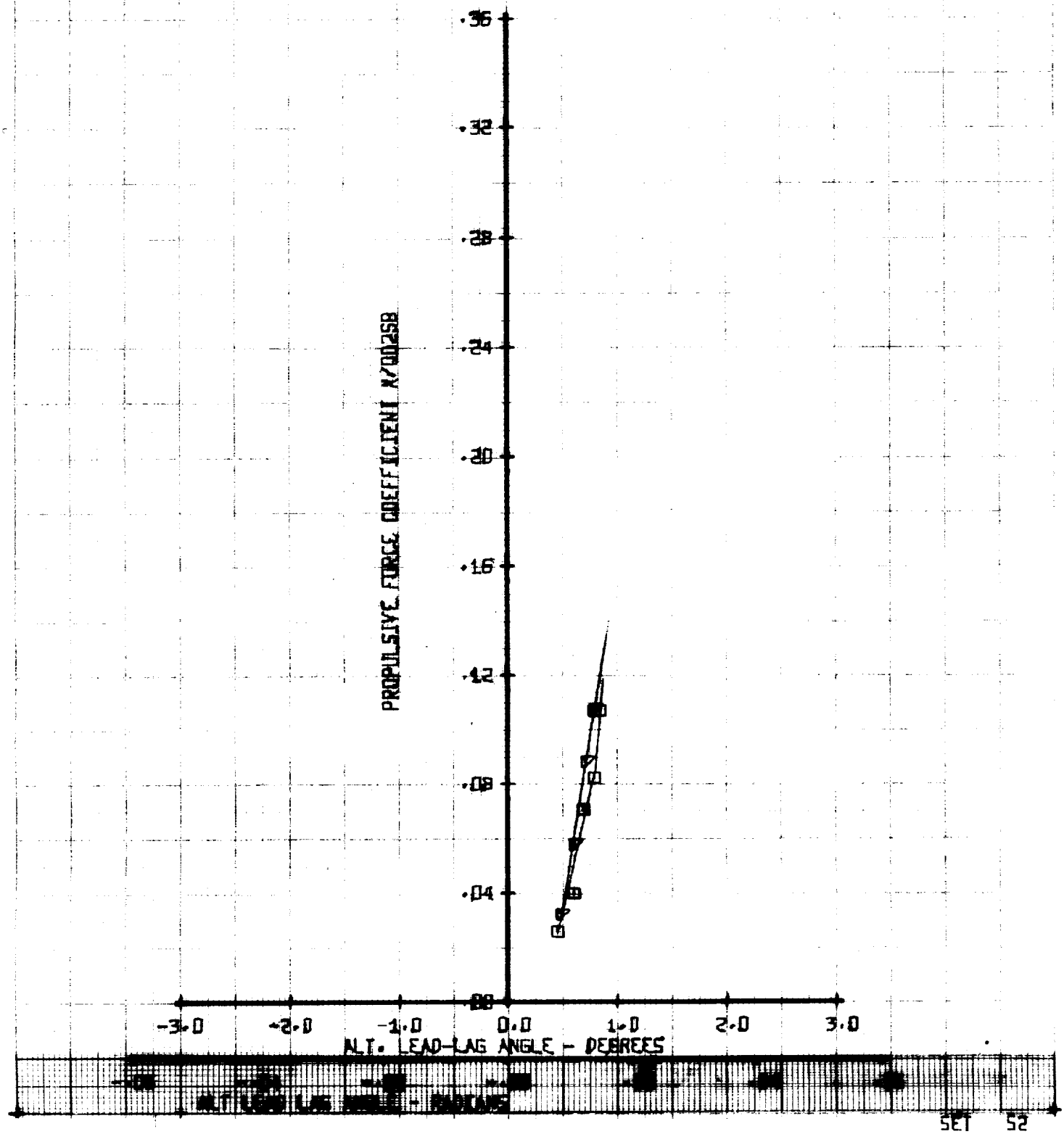


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YILN
□	264	.53	.05	328
▽	265	.53	.07	328

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



SET 52
WT 193

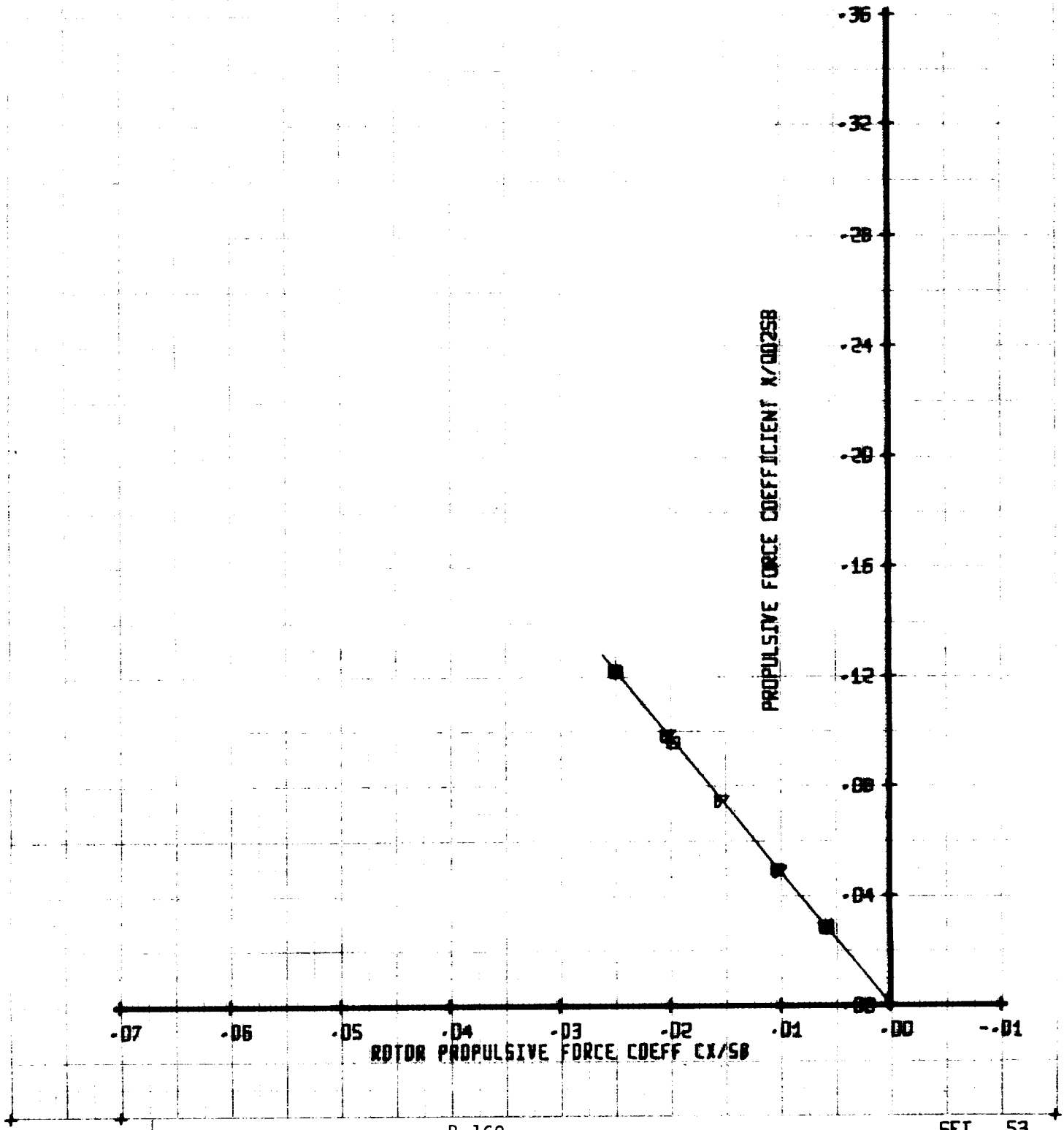
SET 52
SVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
◻	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 53
WT 193

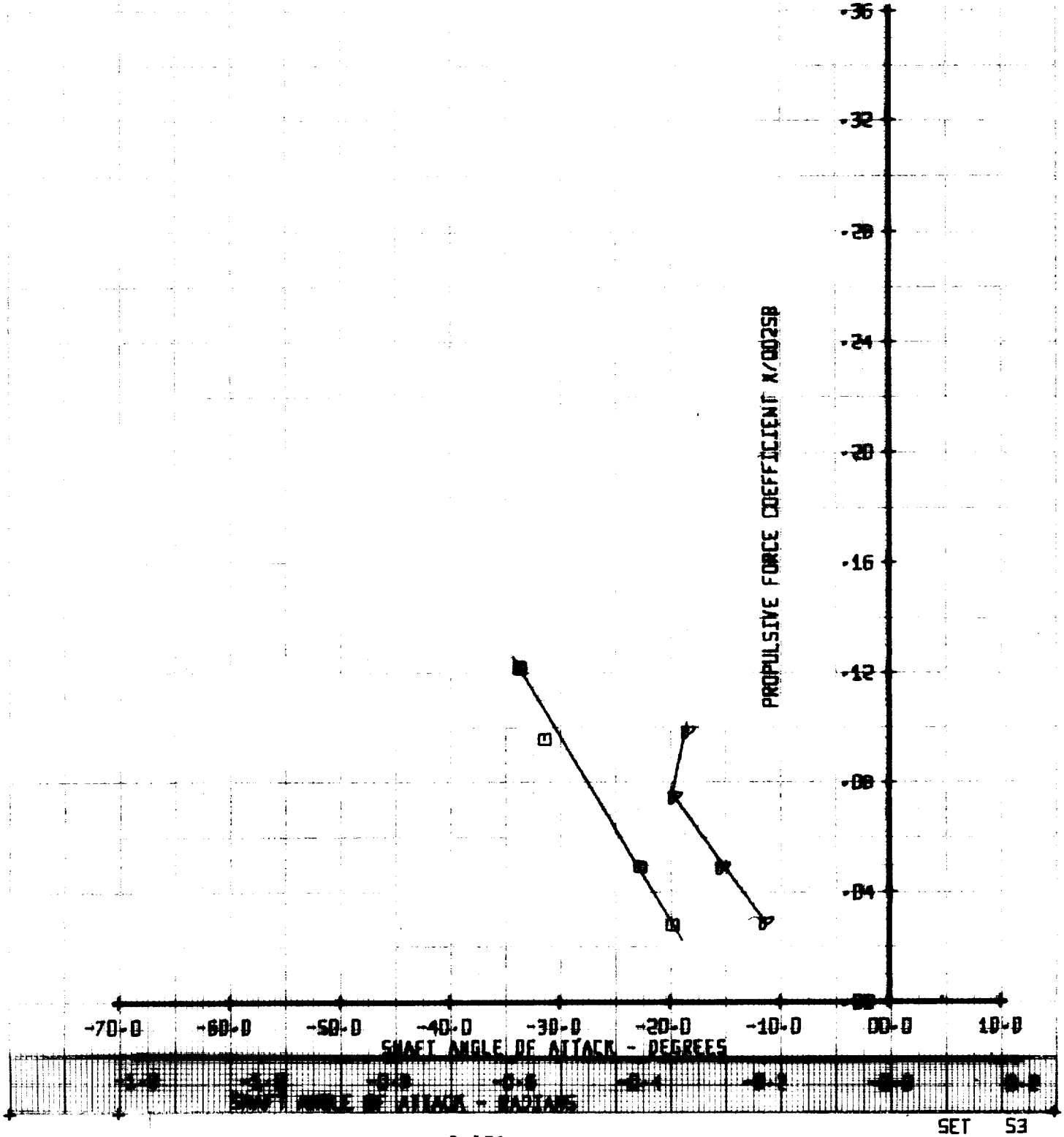
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUM
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 53
WT 193

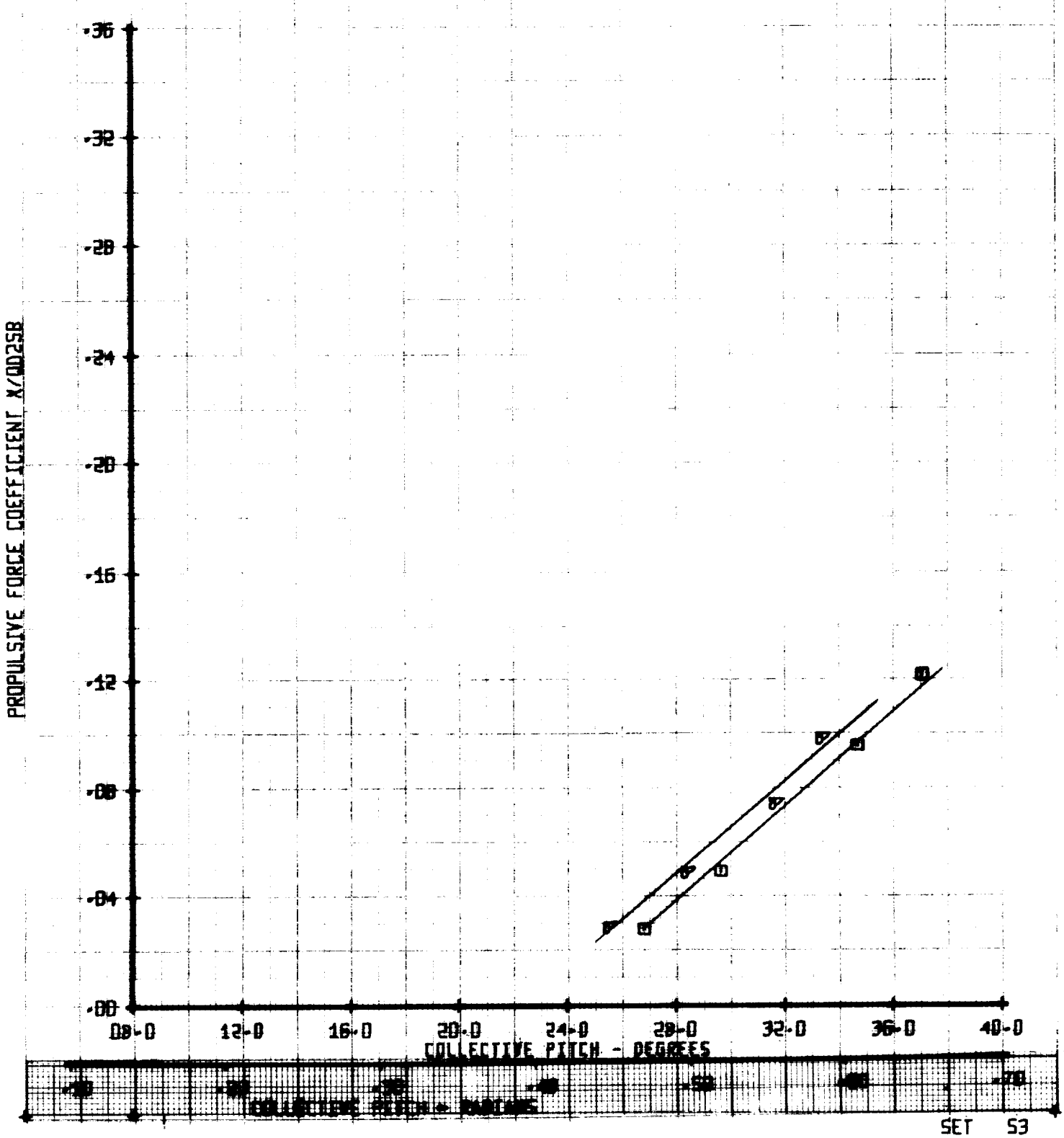
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
▽	237	.57	-076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 53
WT 193

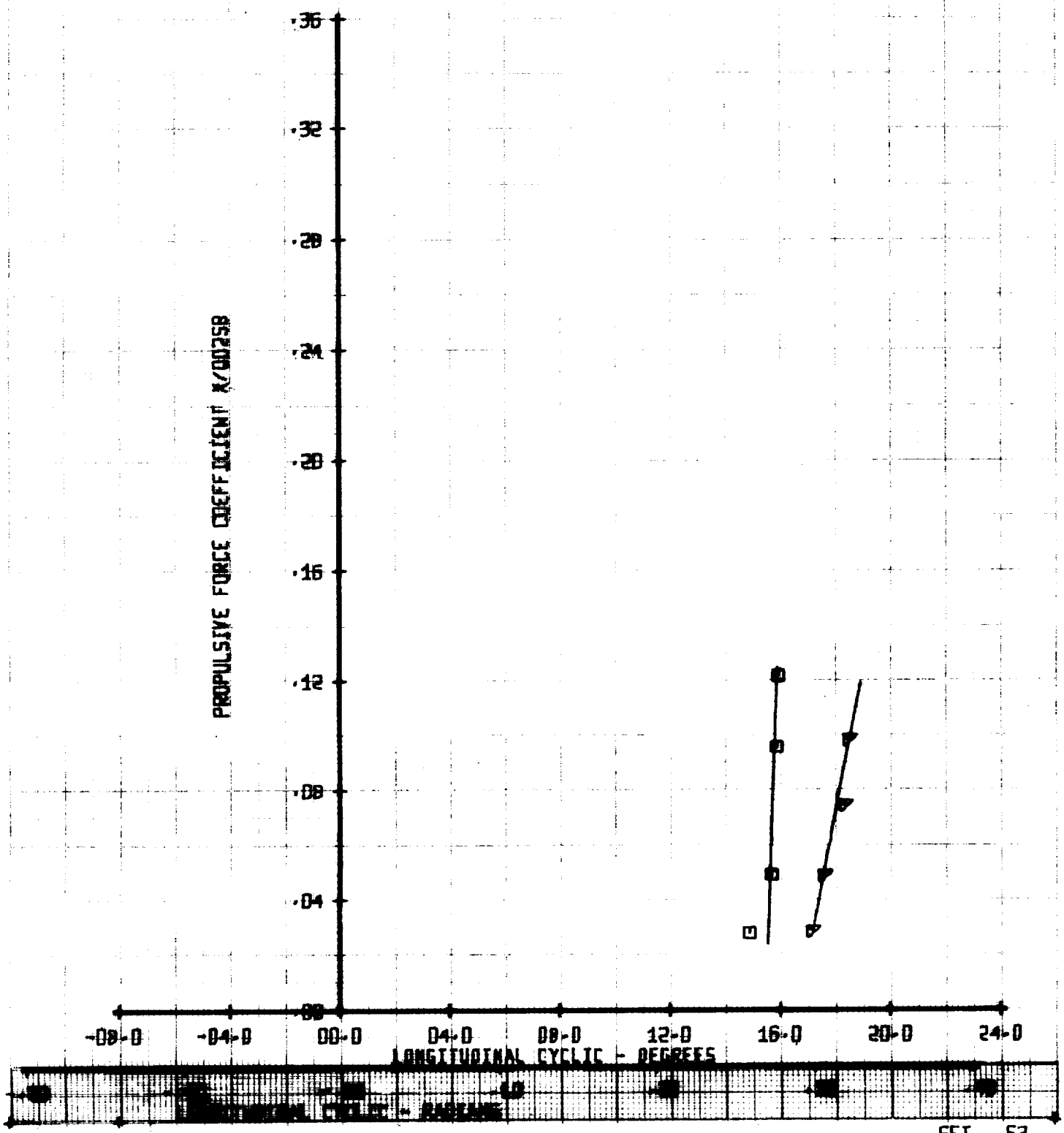
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT/SB	VTUN
□	236	.57	06	358
▽	237	.57	.076	358

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC

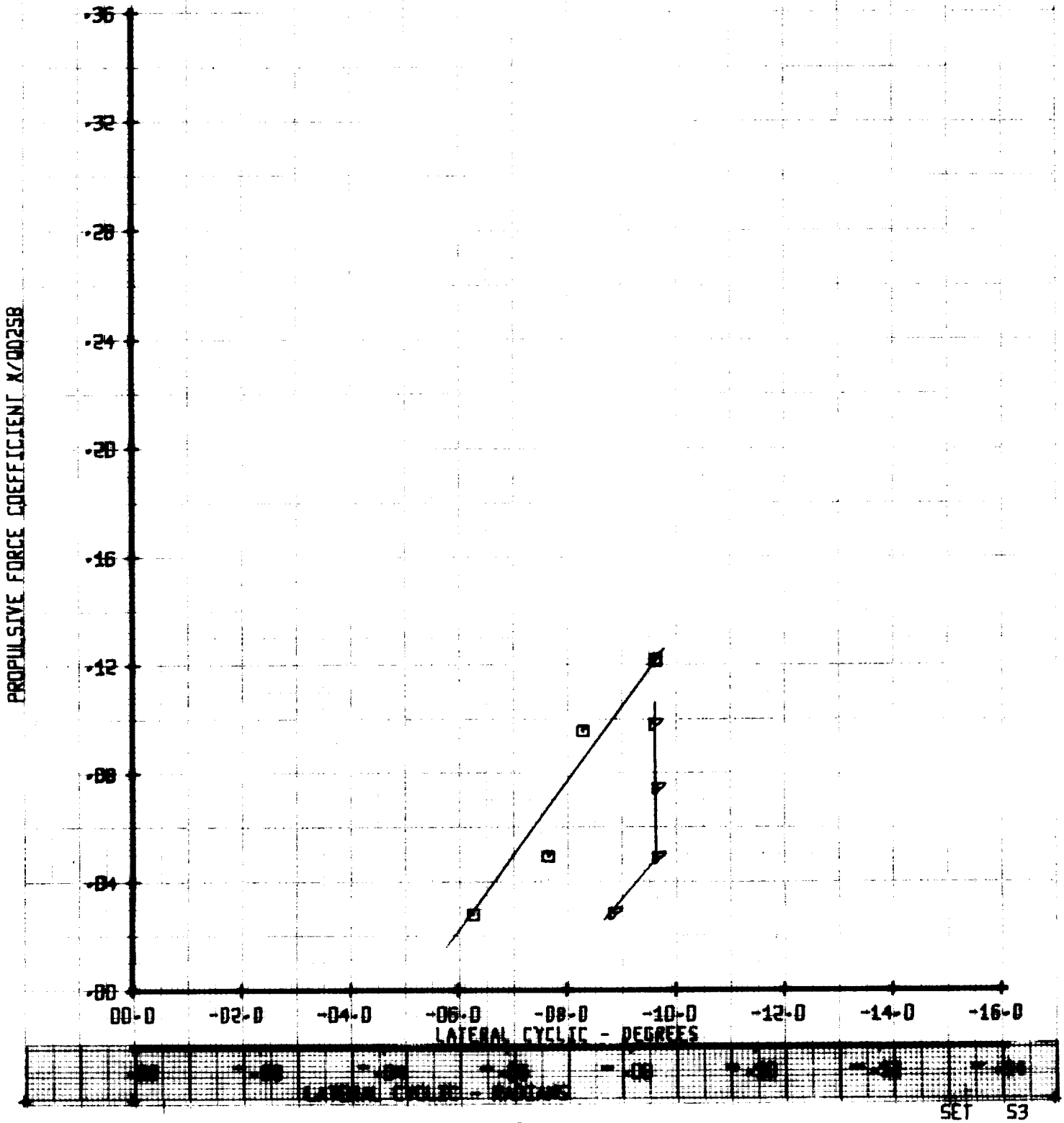


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 53
WT 193

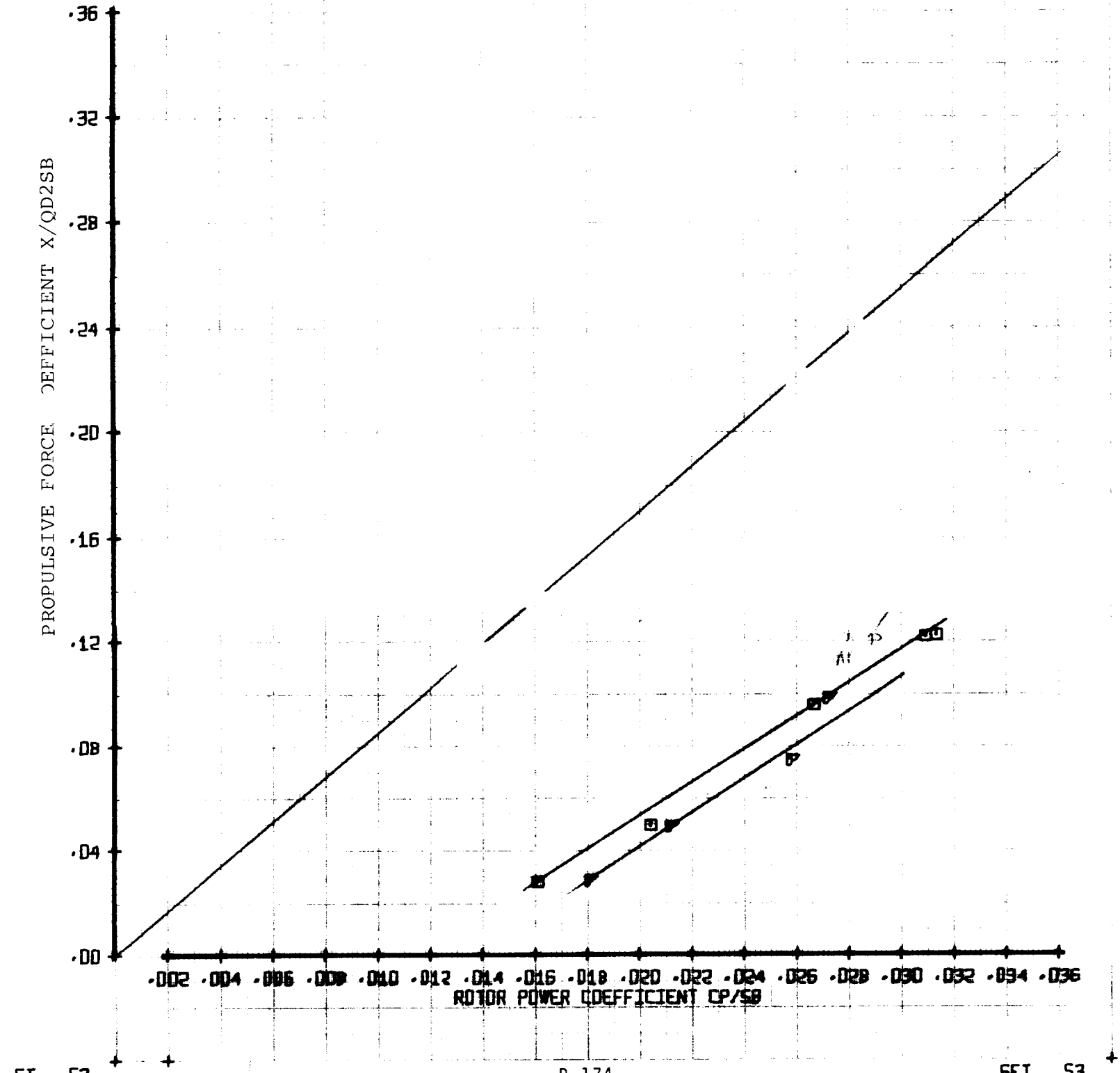
SET 53
BVWT 193

Figure B-170

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	358
▽	237	.57	.076	358

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 53
WT 193

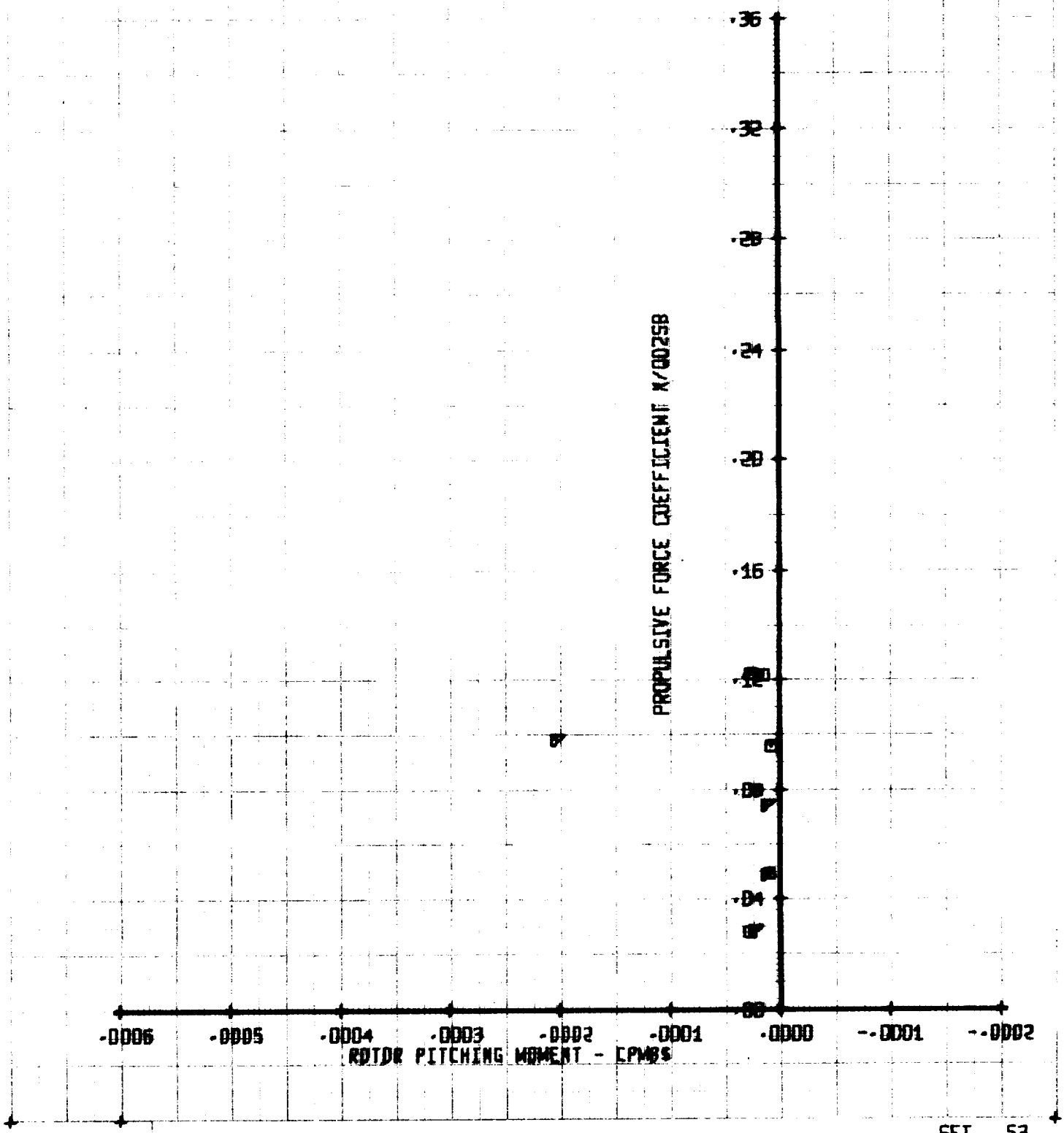
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	358
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

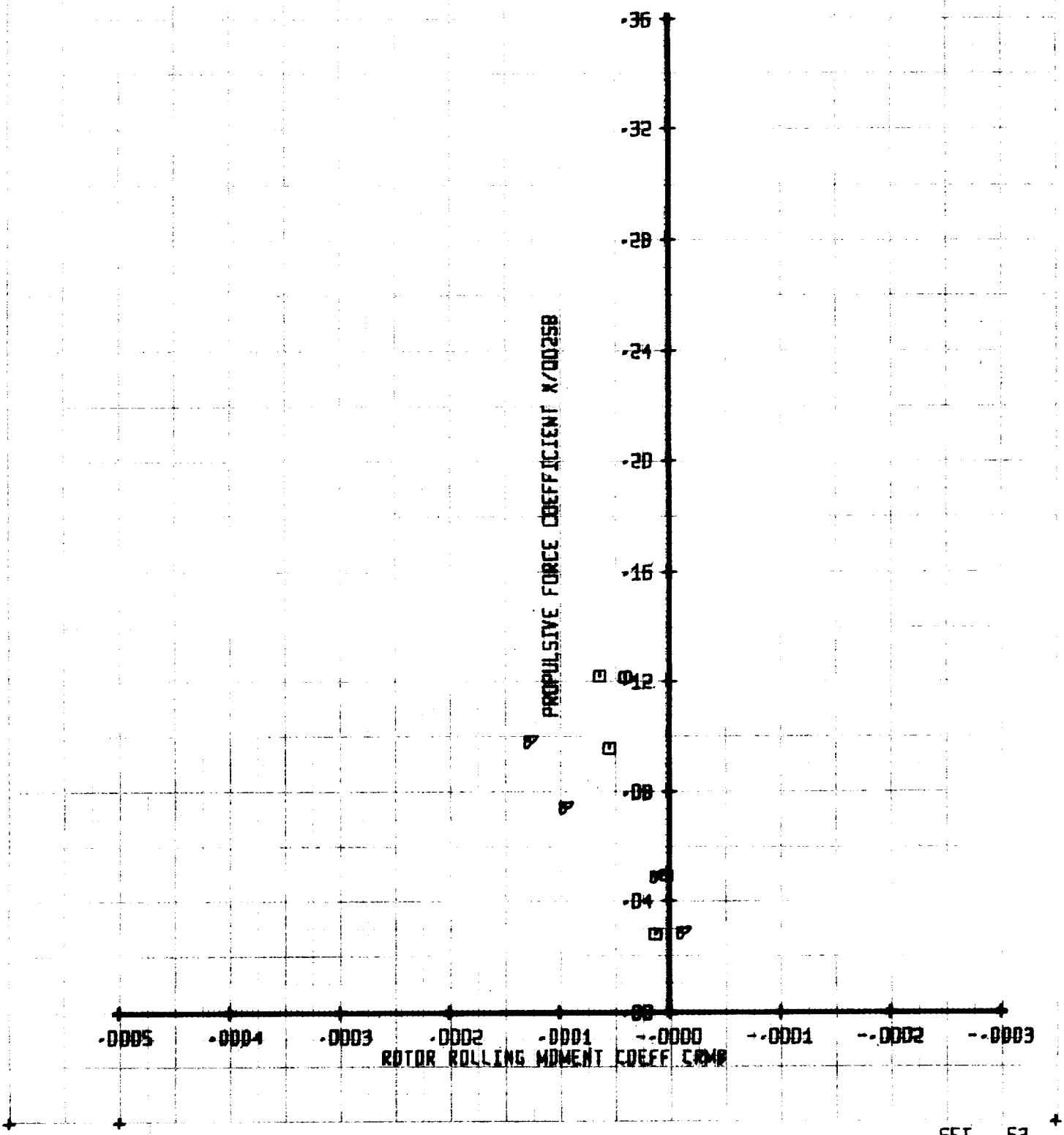


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT/SB	VTUM
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

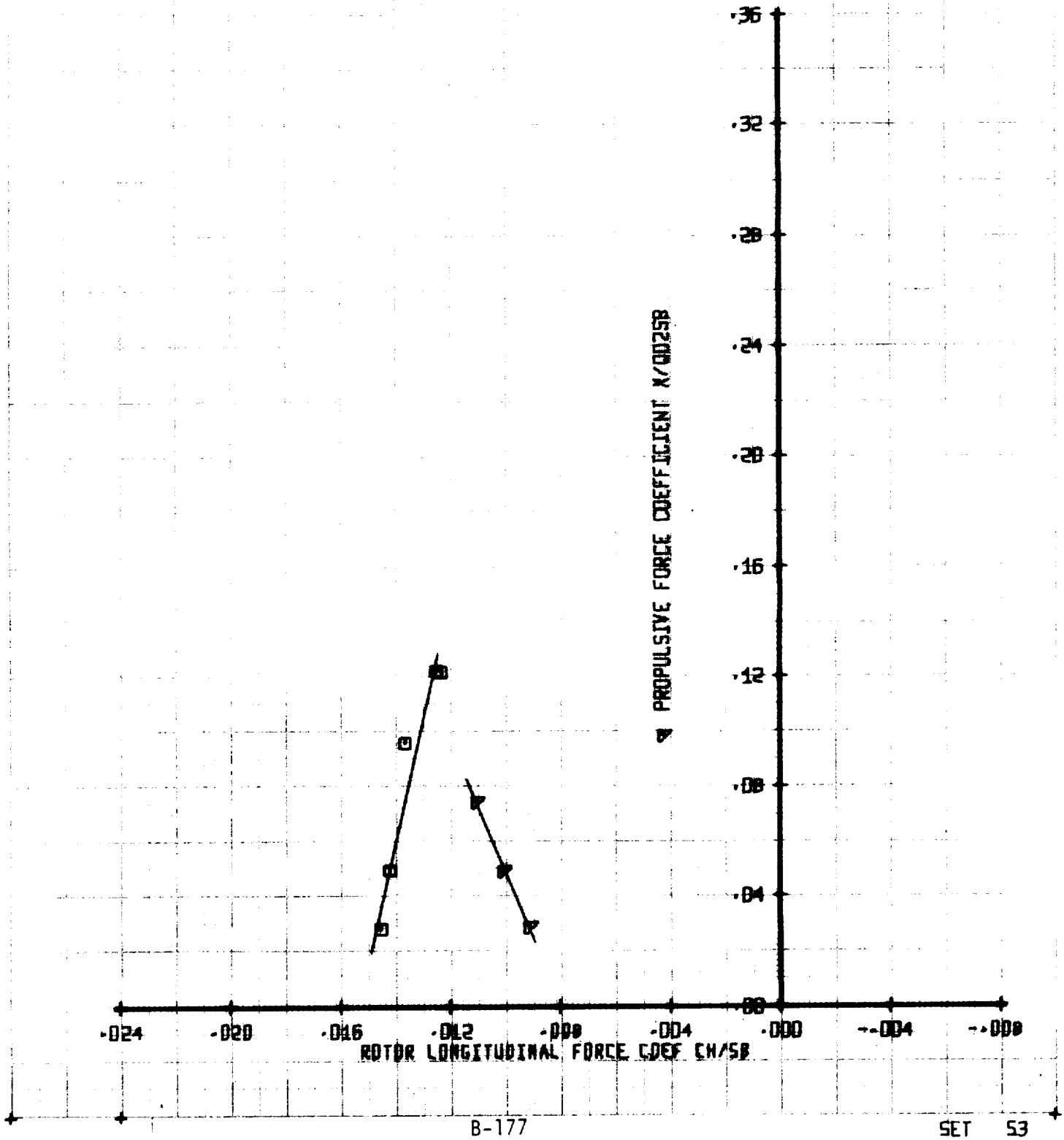


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
◻	236	.57	06	353
◇	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET 53
WT 193

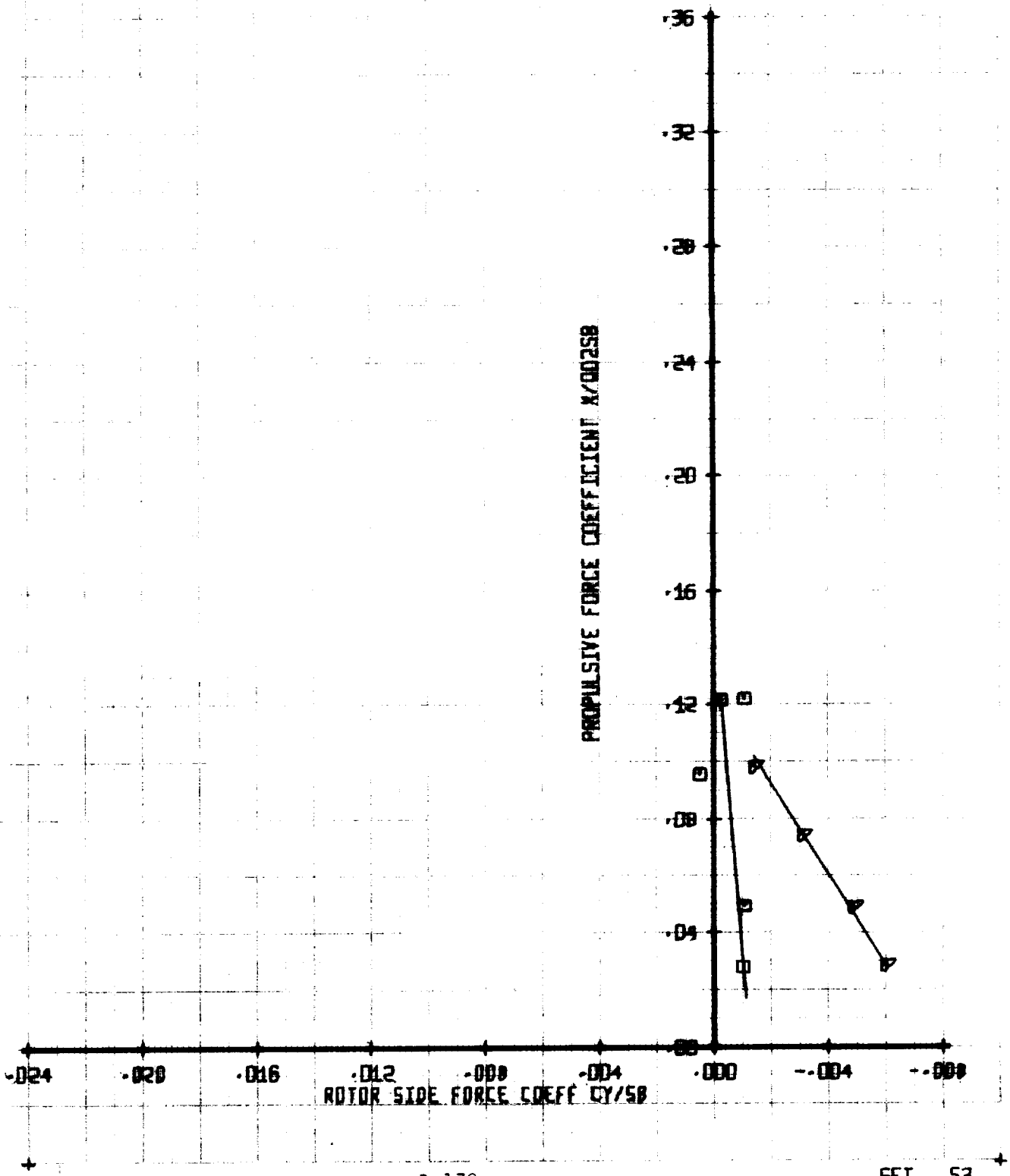
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

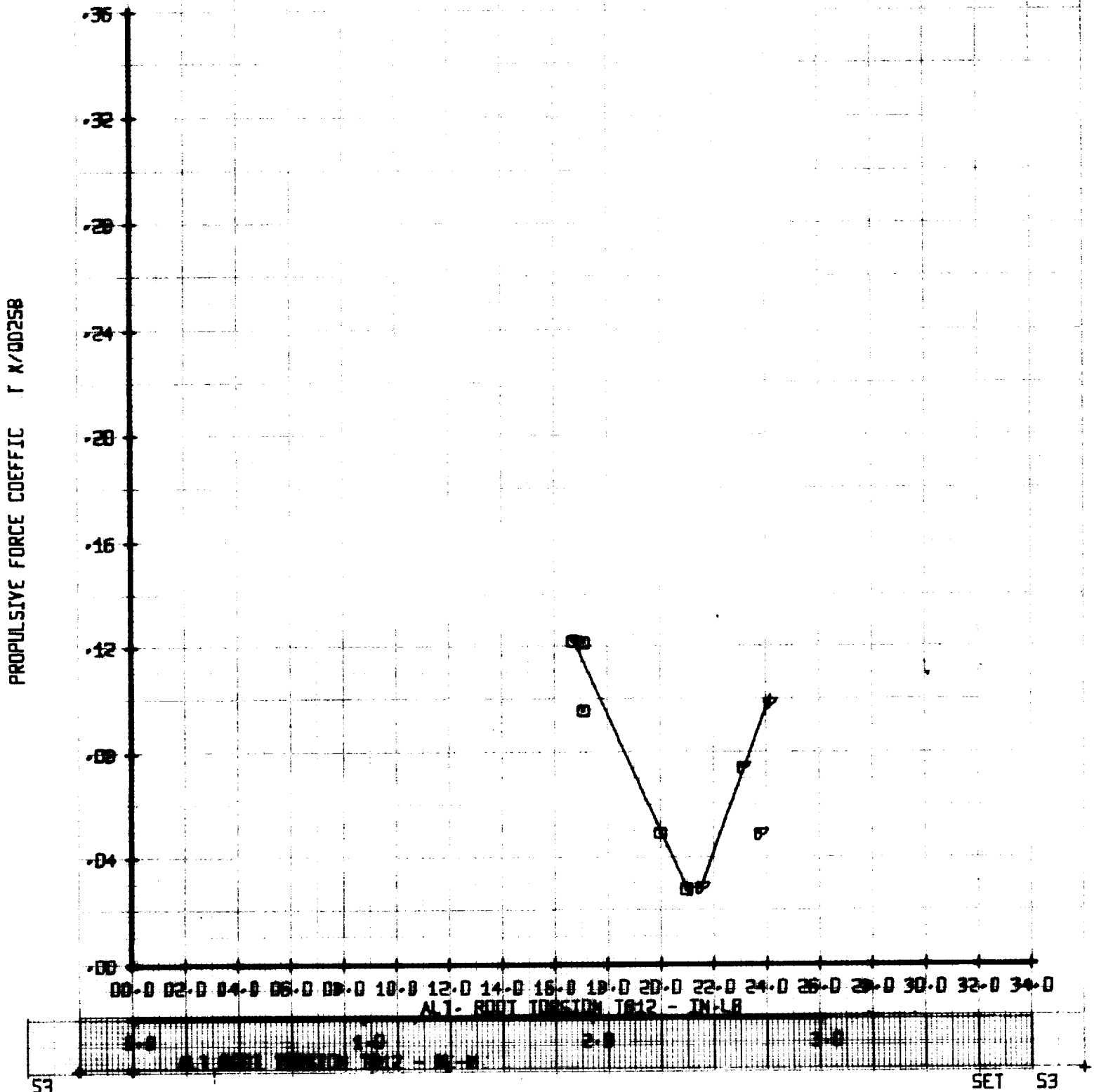


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



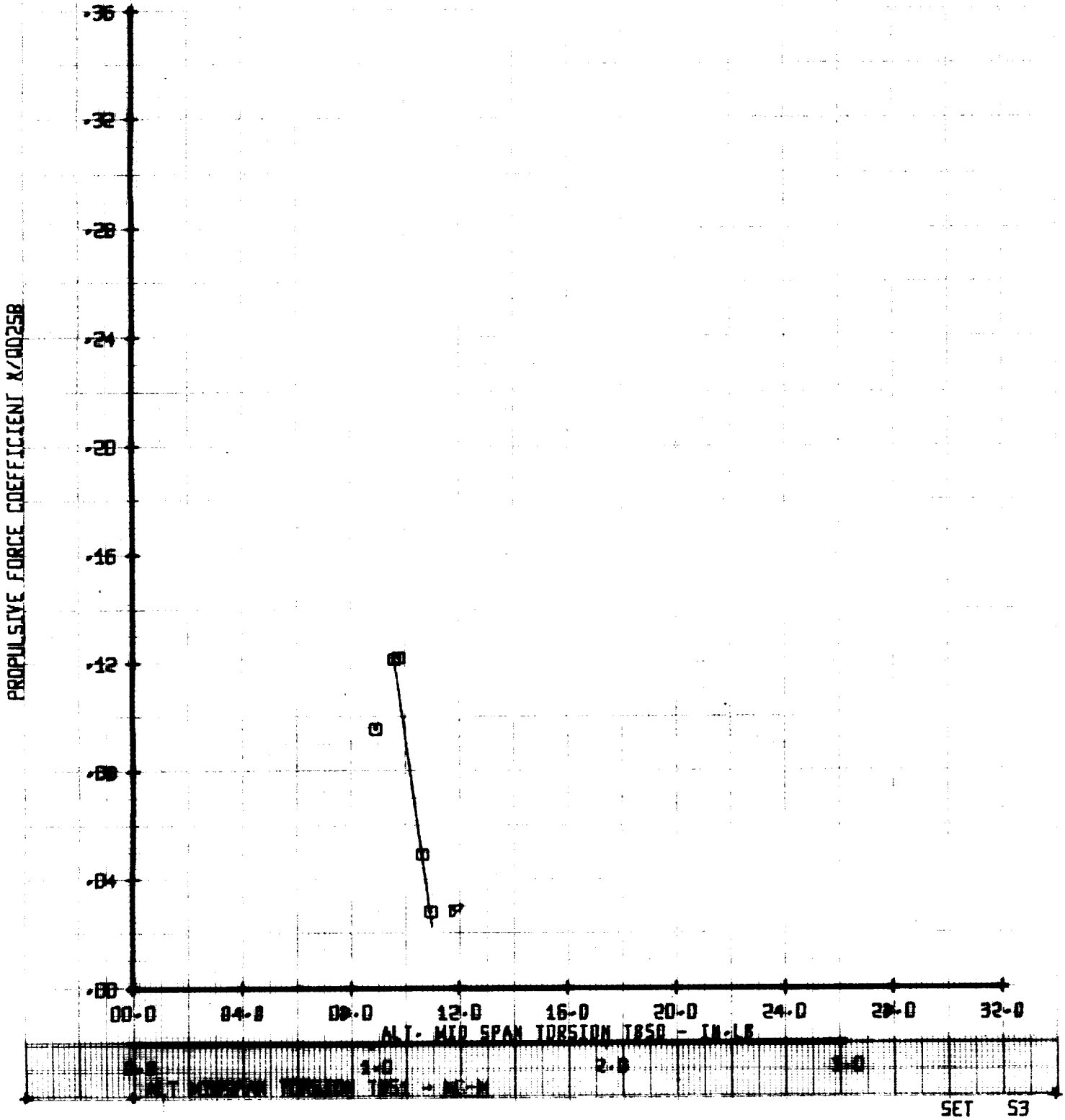
ET 53
WT 193

SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 53
WT 193

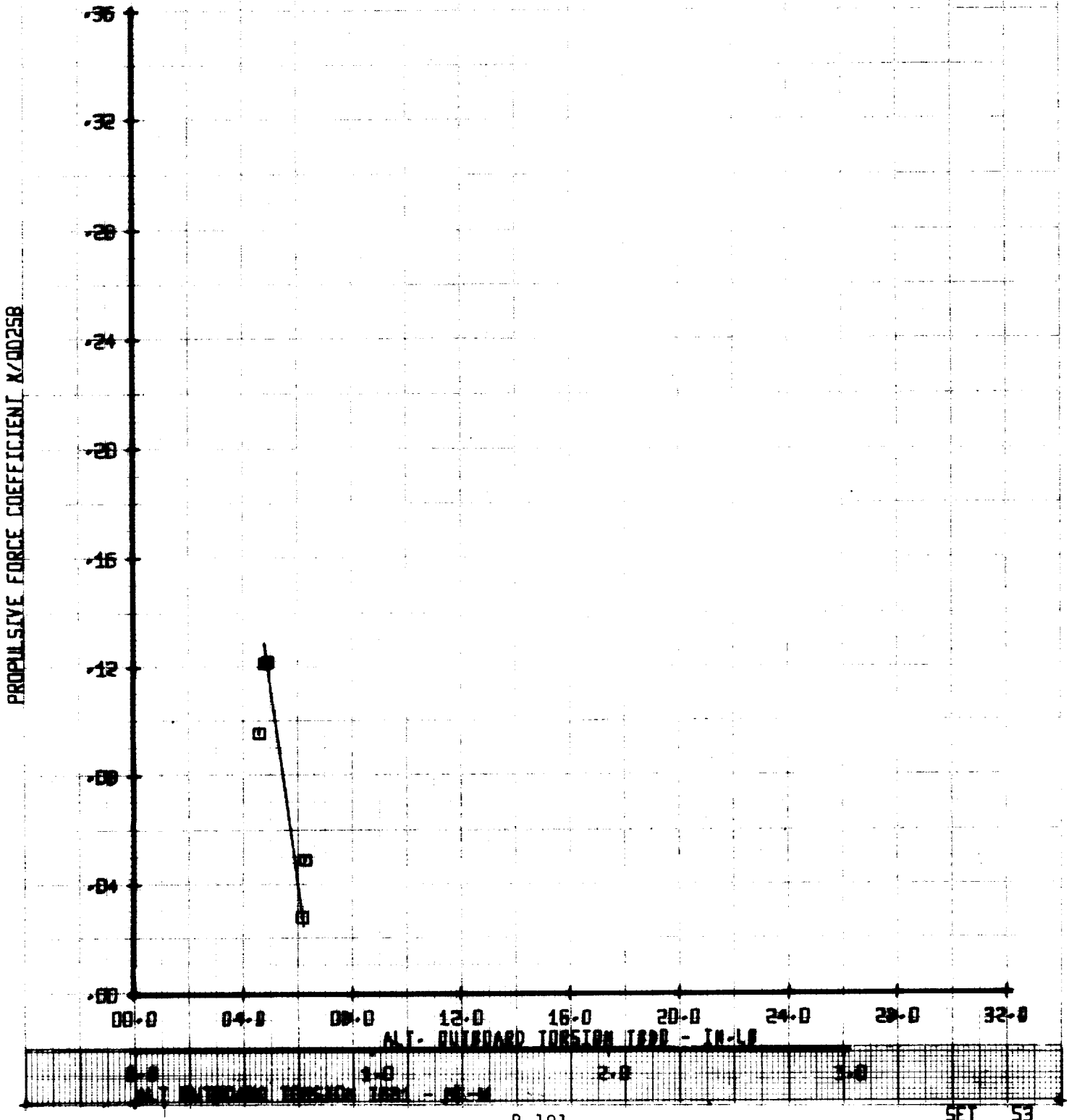
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
◇	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 53
WT 193

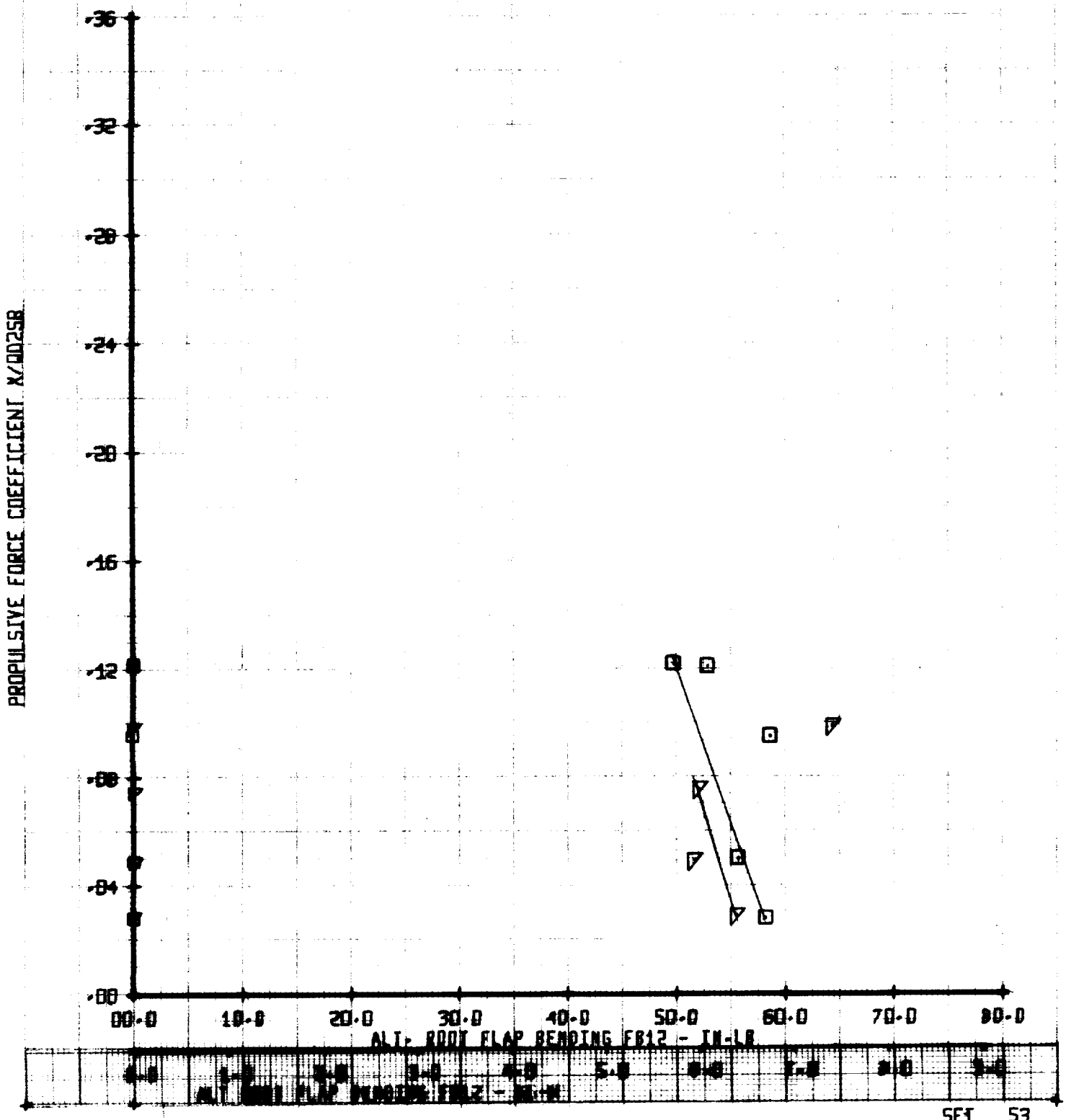
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



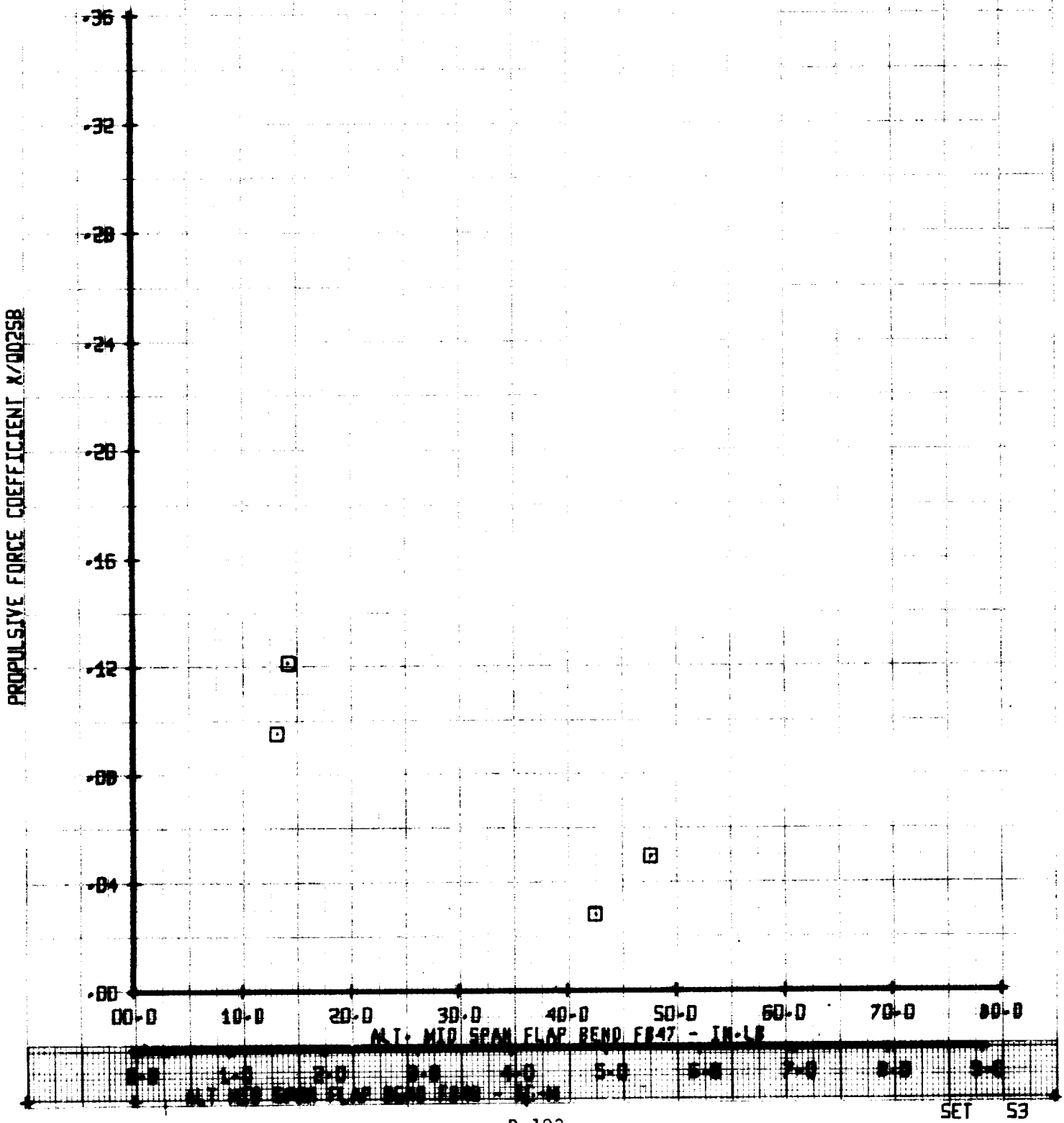
ET 53
WT 193

SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	236	.57	06	353
◇	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN FLAP BENDING FB47



ET 53
WT 193

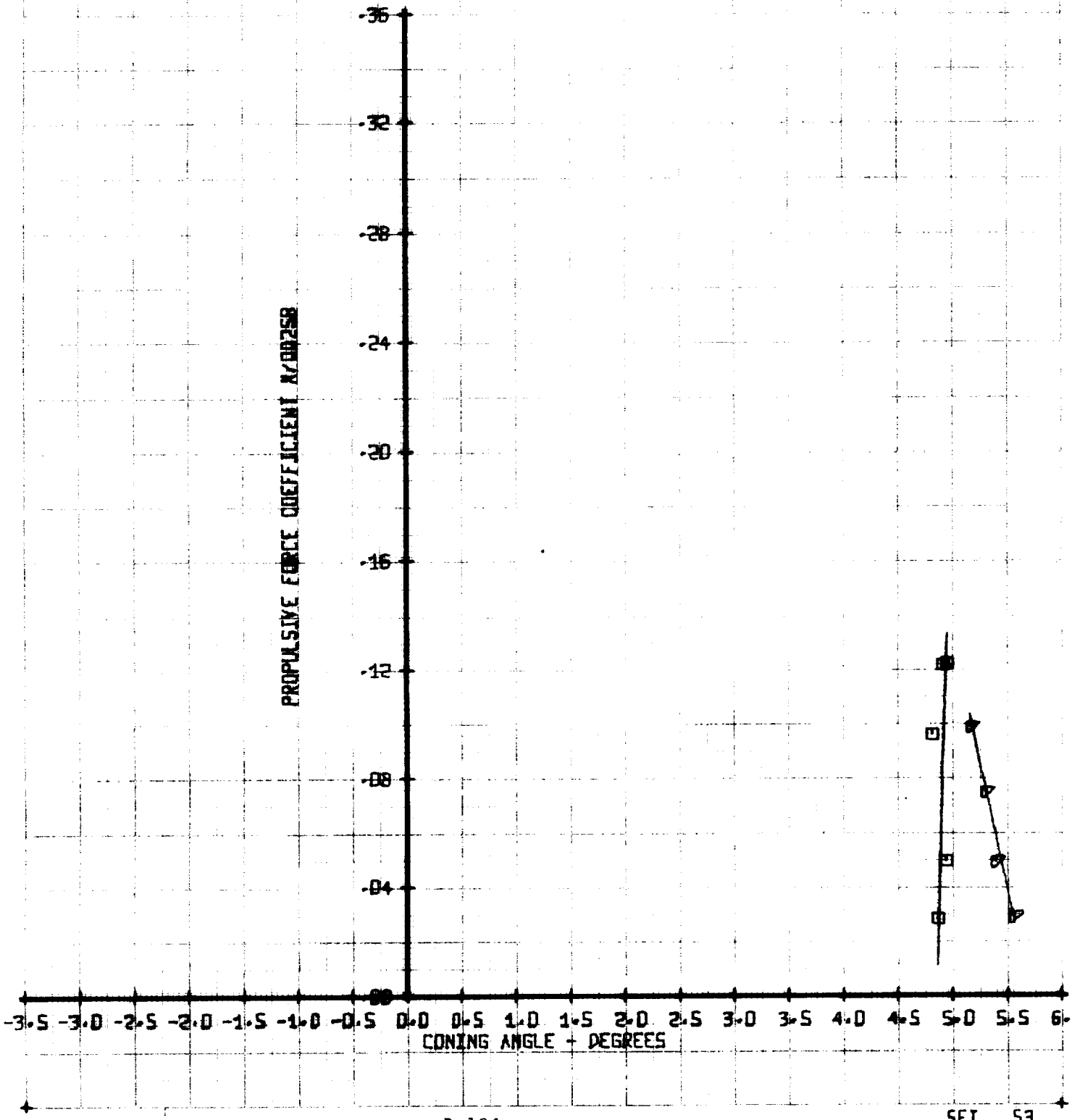
SET 53
BVWT 193

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTLN
□	236	.57	06	359
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE

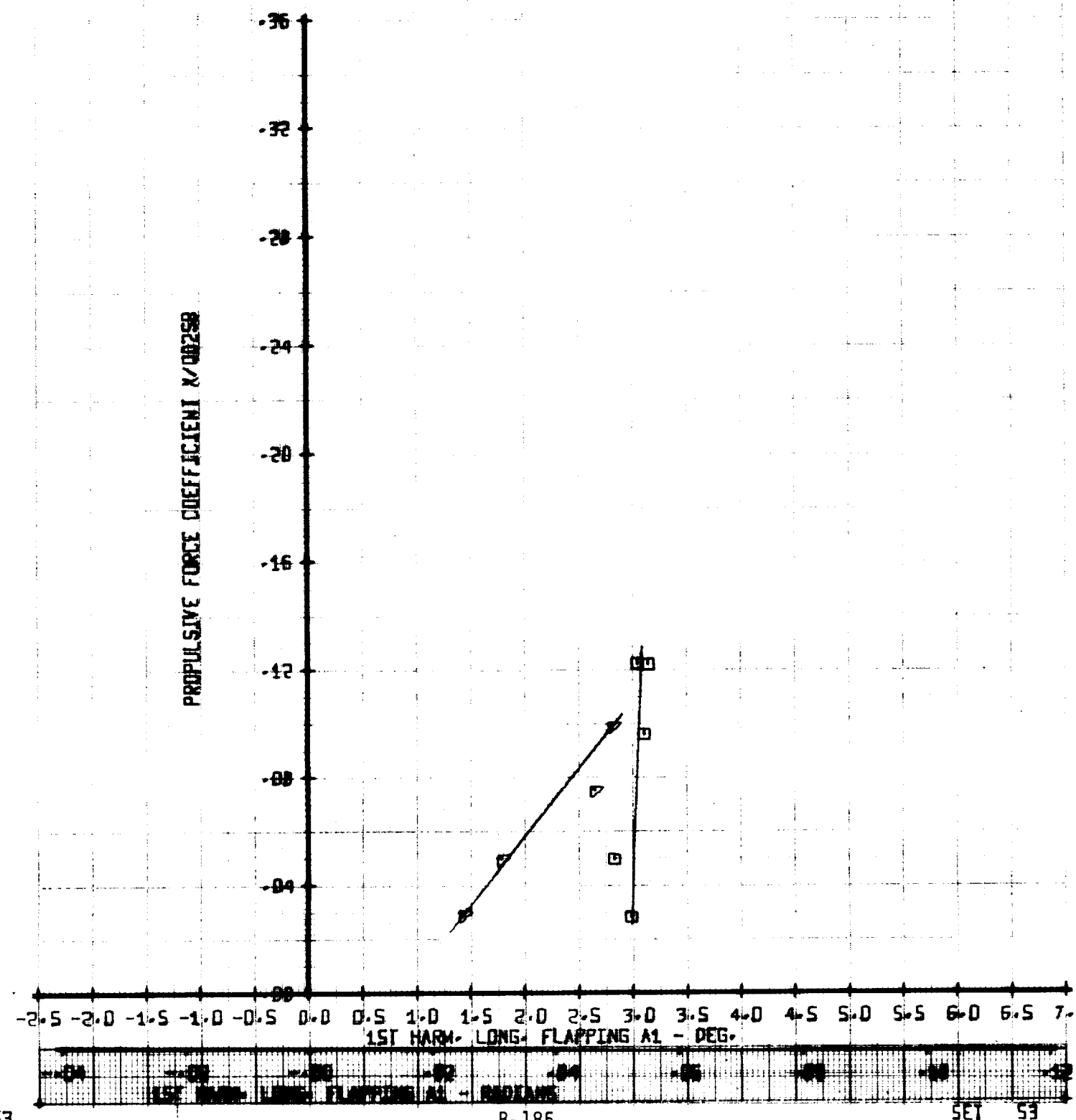


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

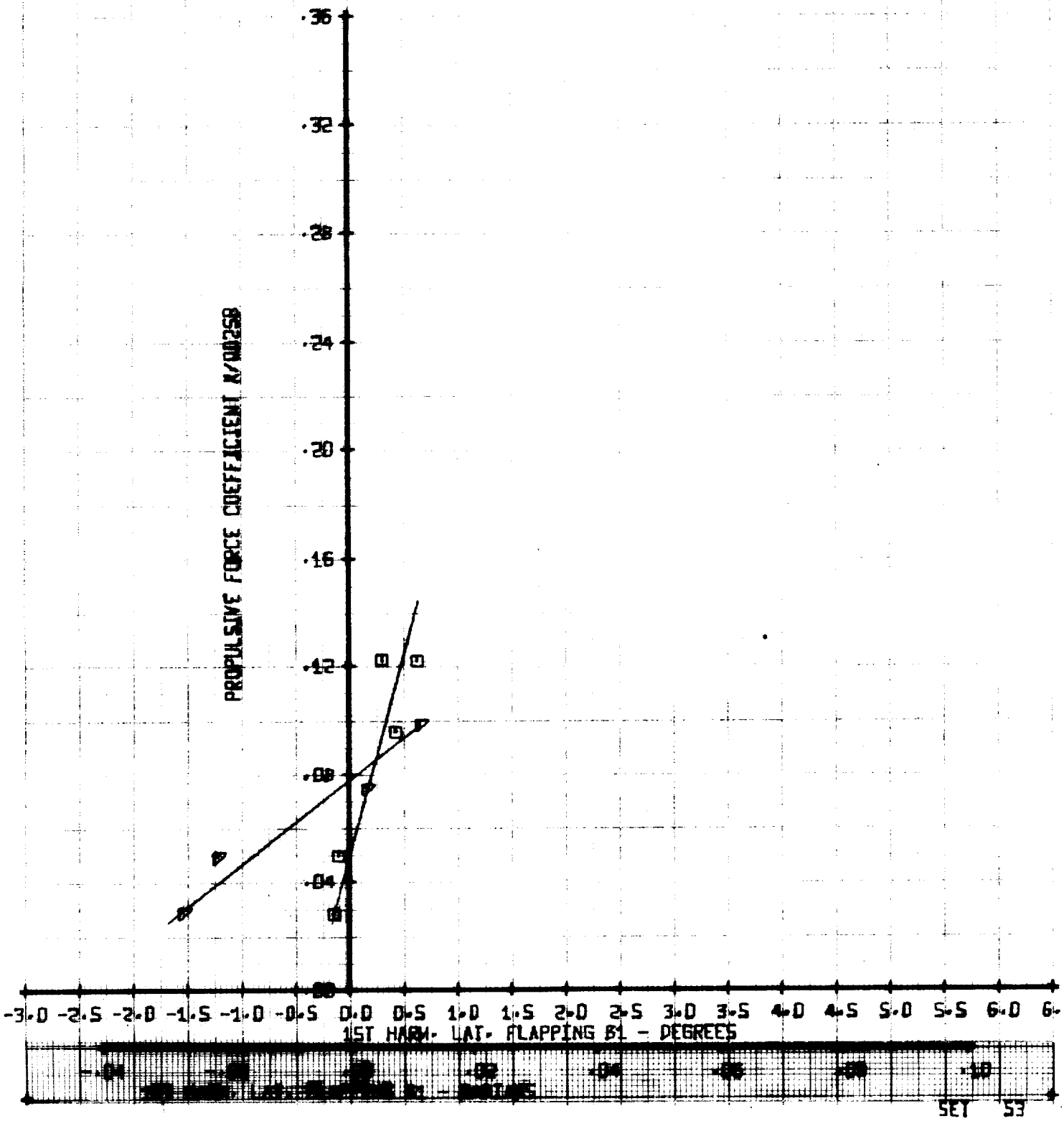


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	236	.57	06	353
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



ET 53
WT 193

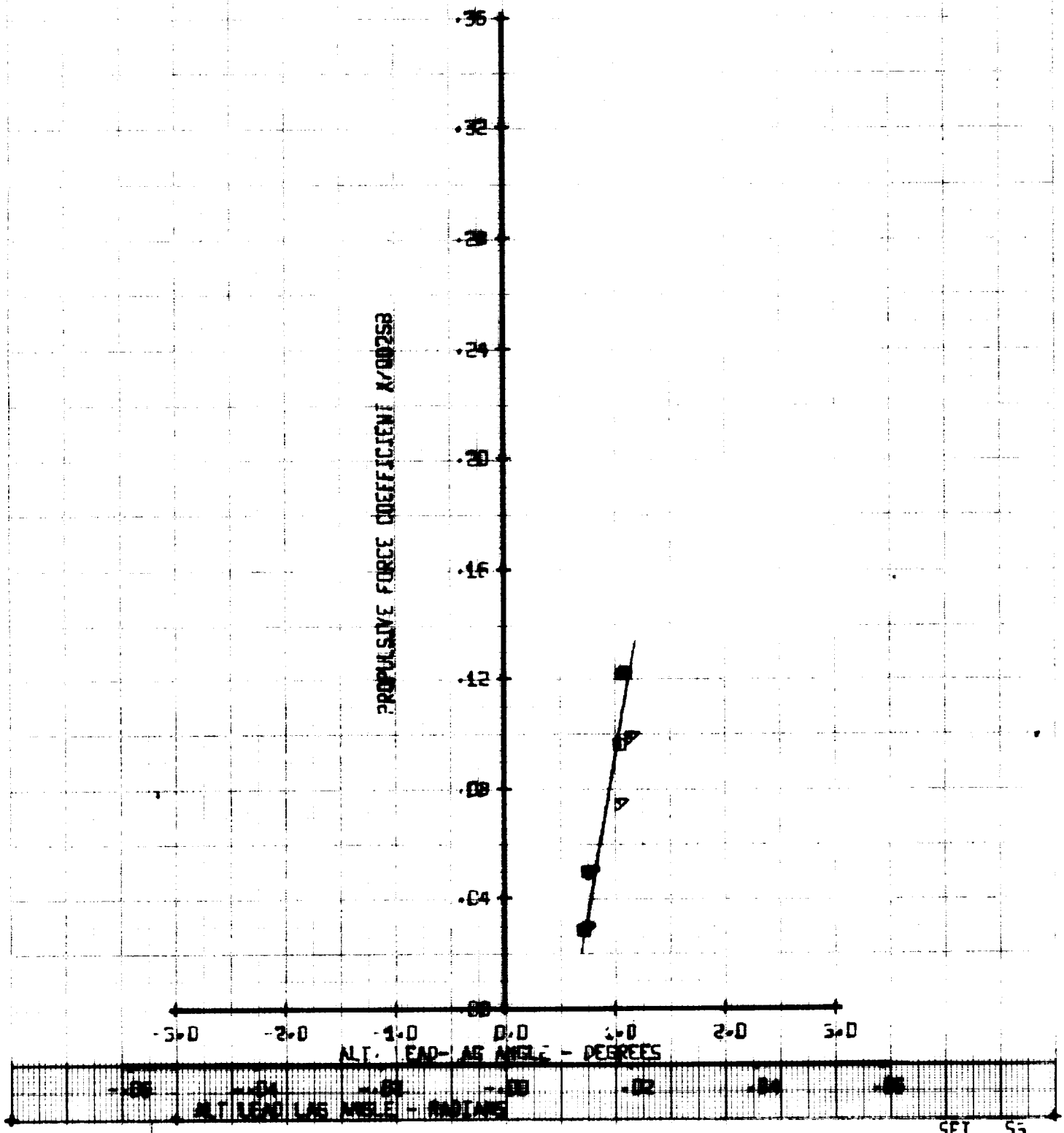
SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YT'IN
◻	236	.57	06	356
▽	237	.57	.076	353

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 53
WT 193

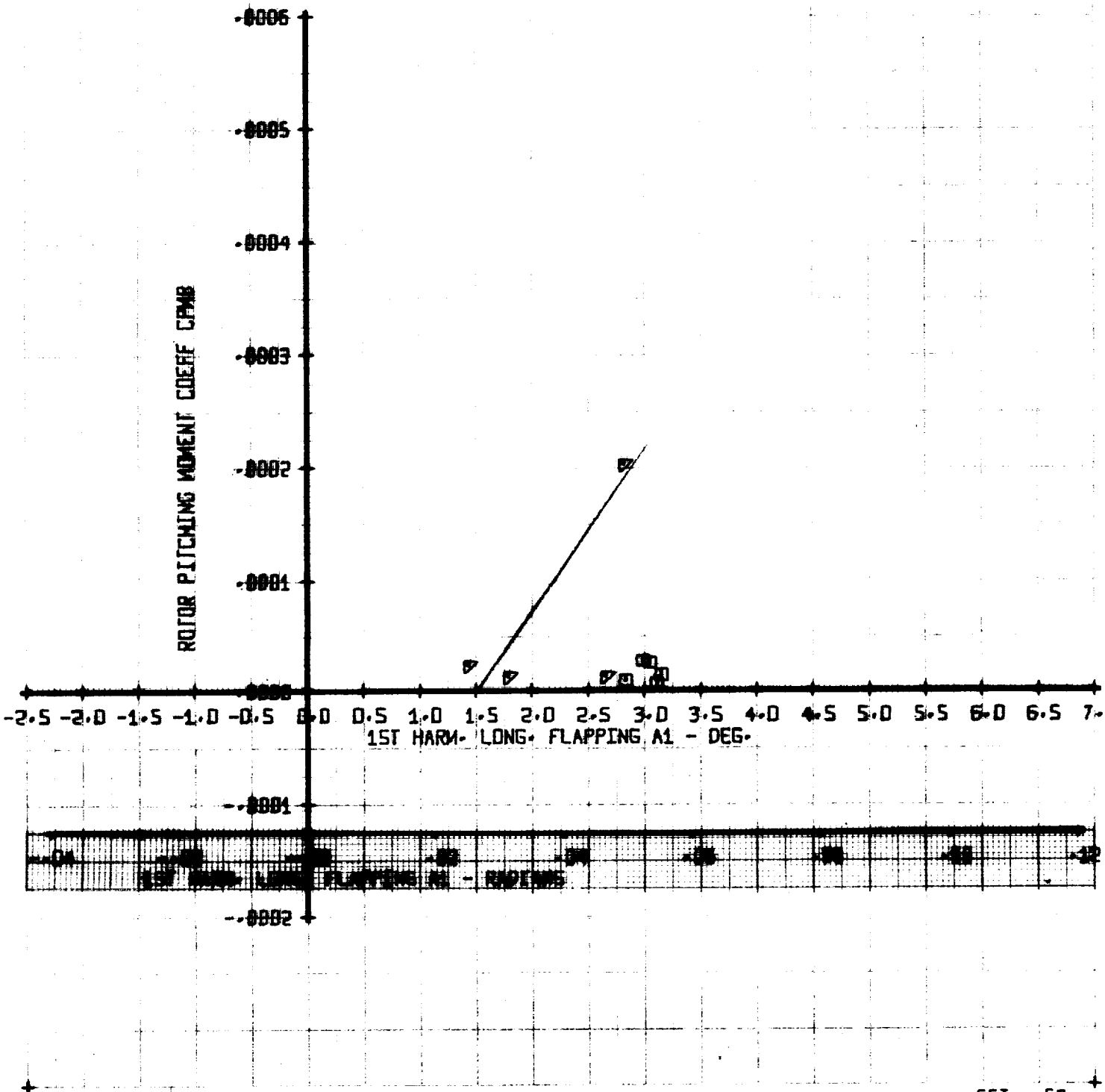
SET 55
BYWT 195

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
⊡	236	.57	.06	353
▽	237	.57	-.076	353

ROTOR PITCHING MOMENT COEFFICENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1



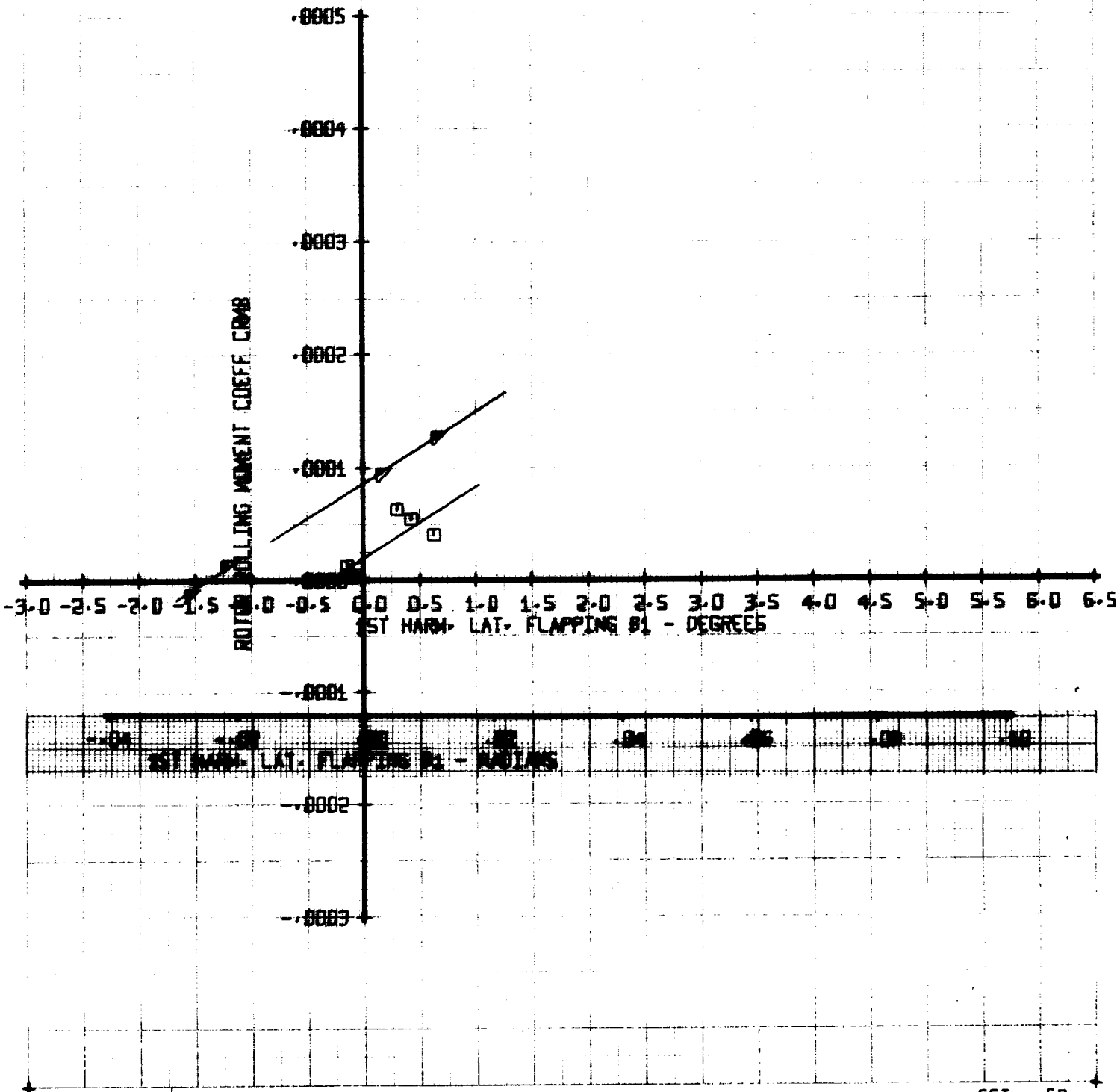
ET 53
WT 193

SET 53
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
□	236	.57	.06	353
▽	237	.57	.076	353

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

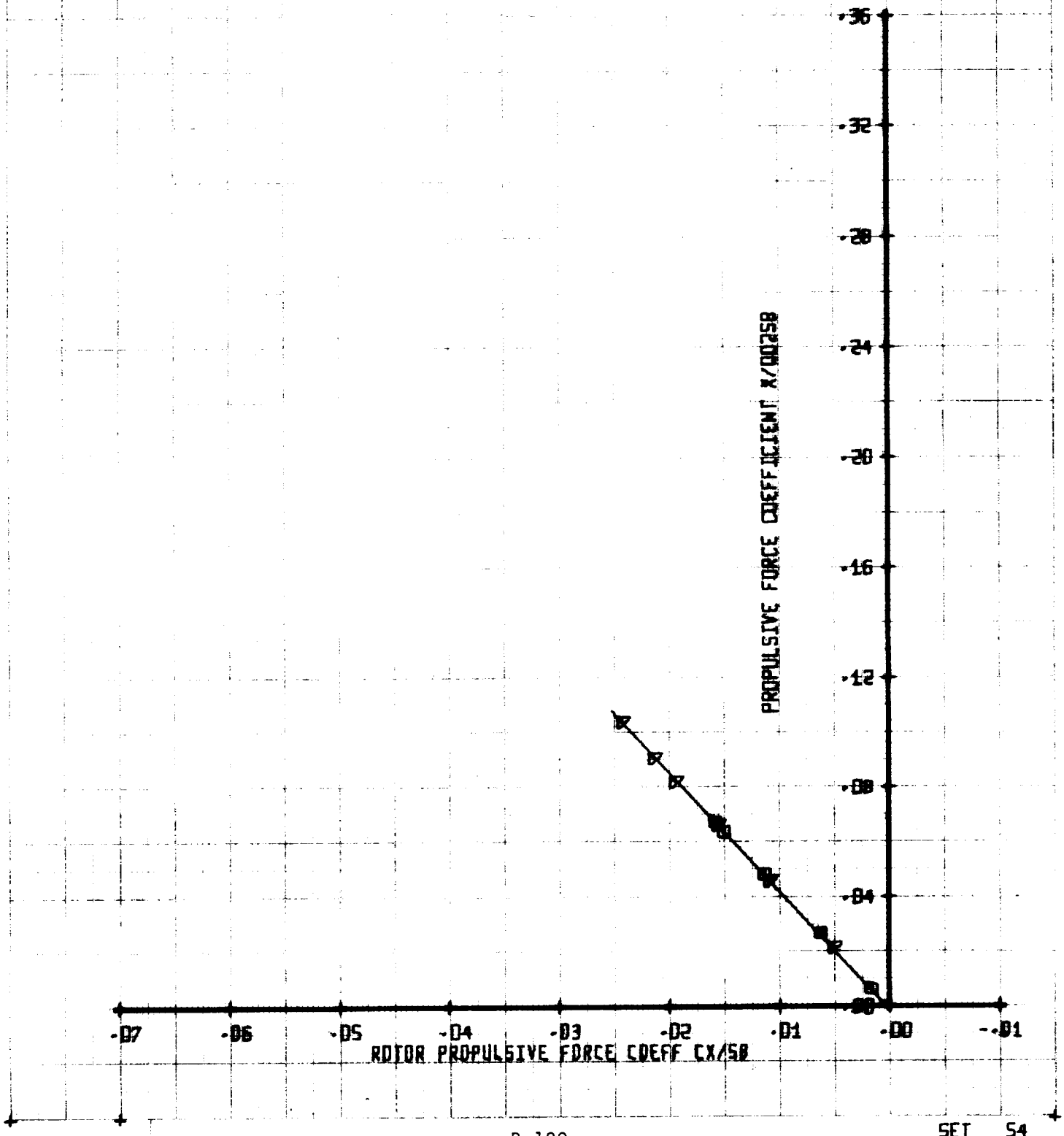


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT



ET 54
WT 193

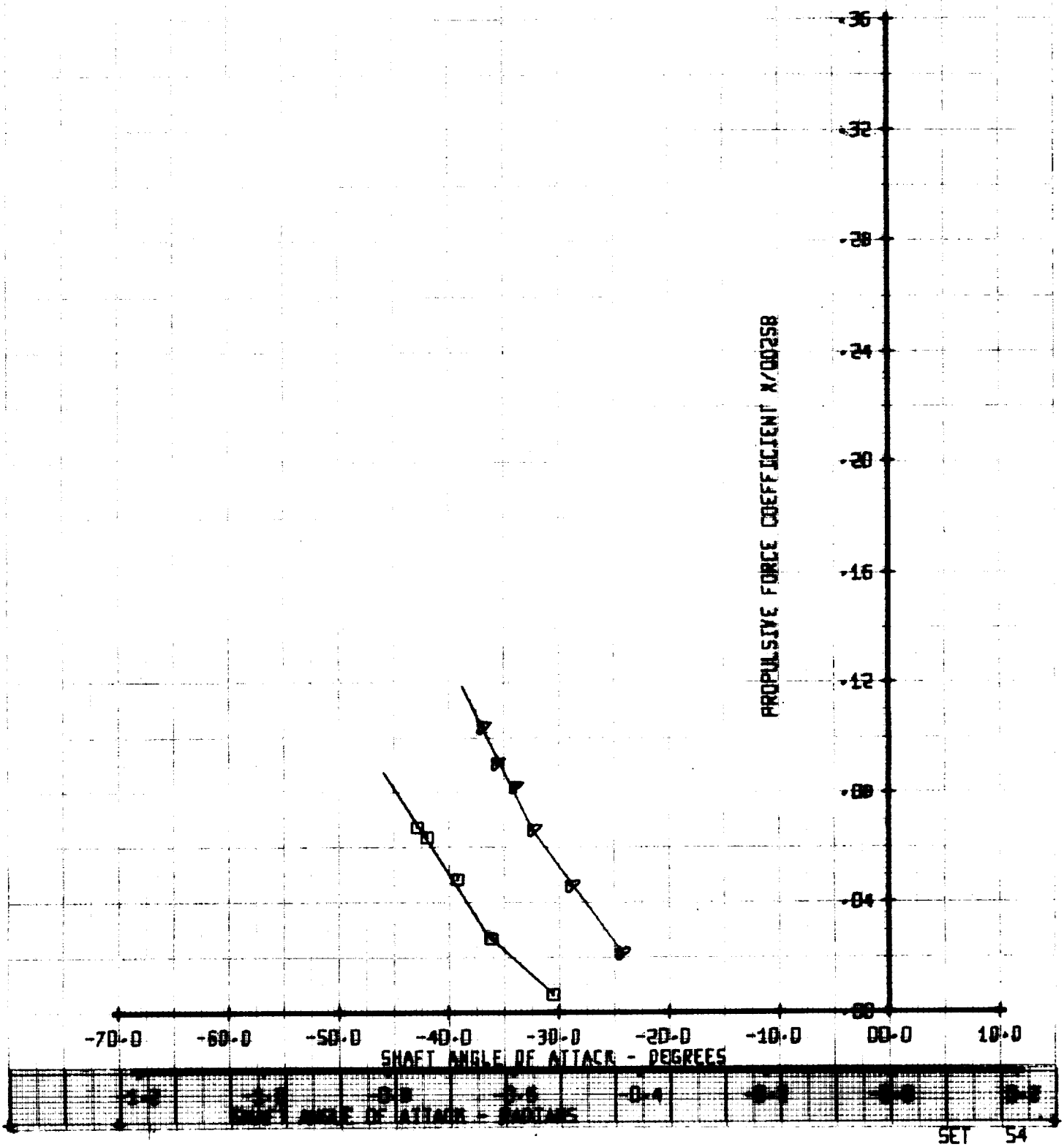
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	239	.61	.04	370
▽	238	.61	.055	370

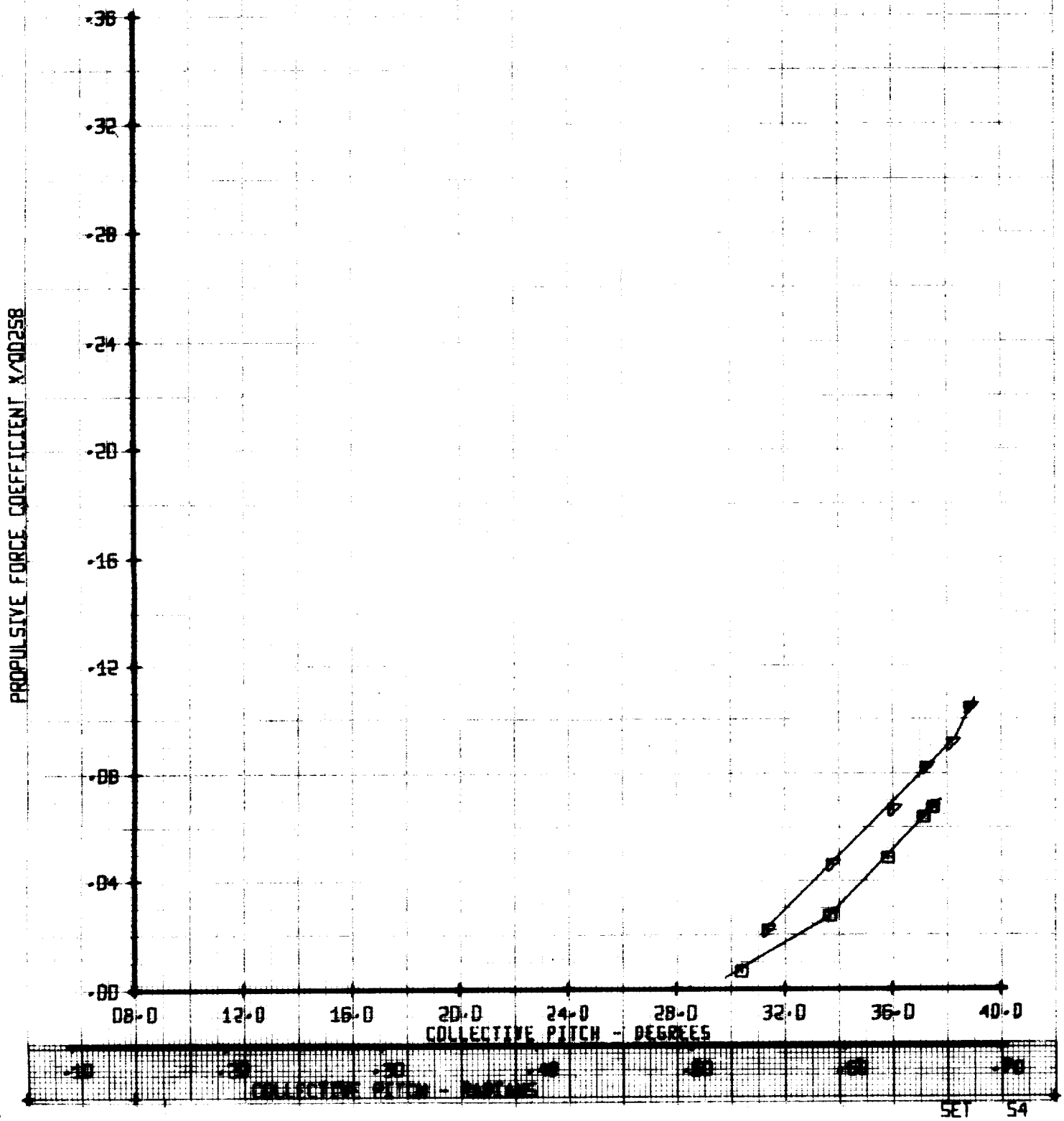
PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
◻	239	.61	.04	378
▽	239	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



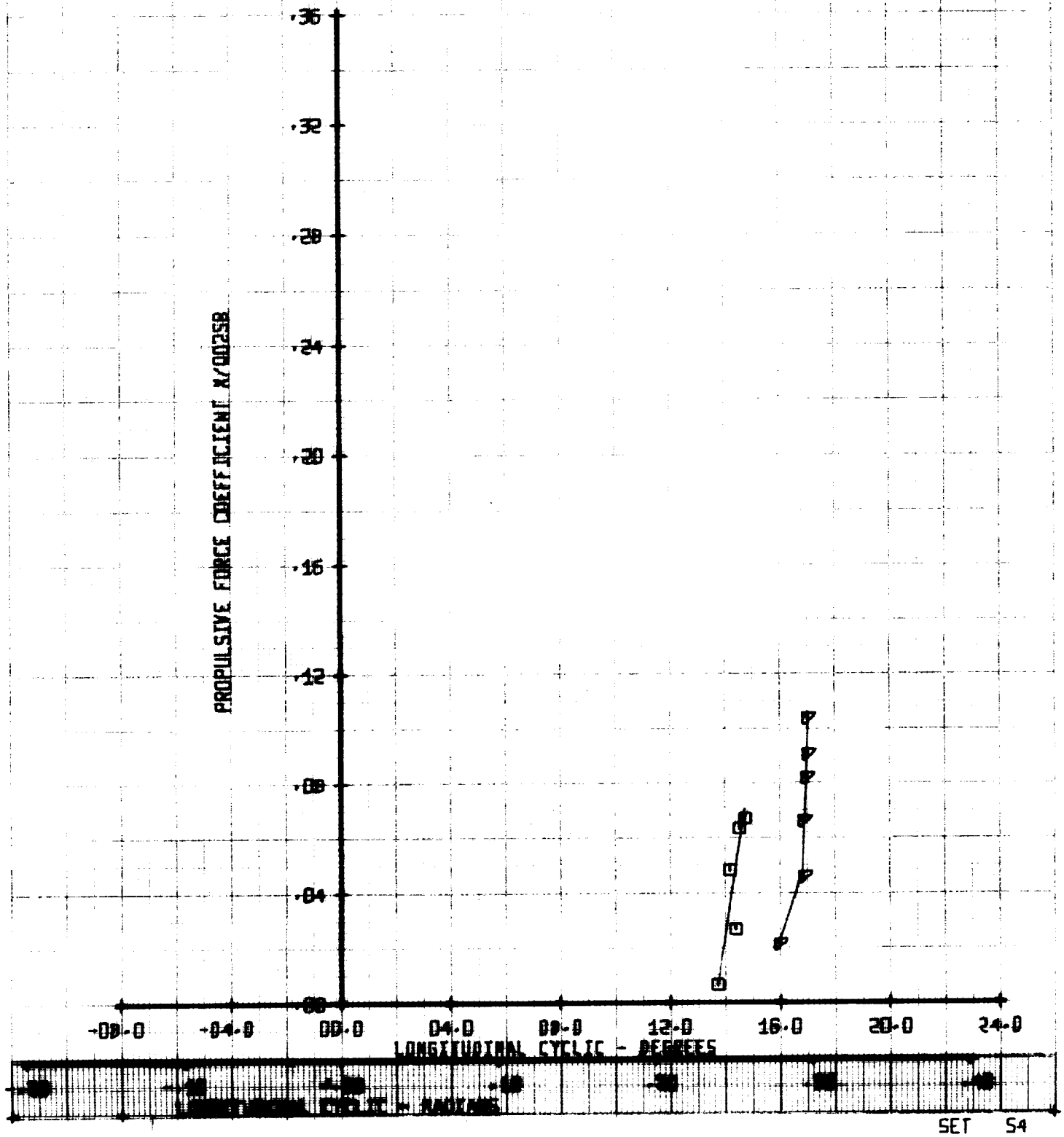
ET 54
WT 193

SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
◇	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



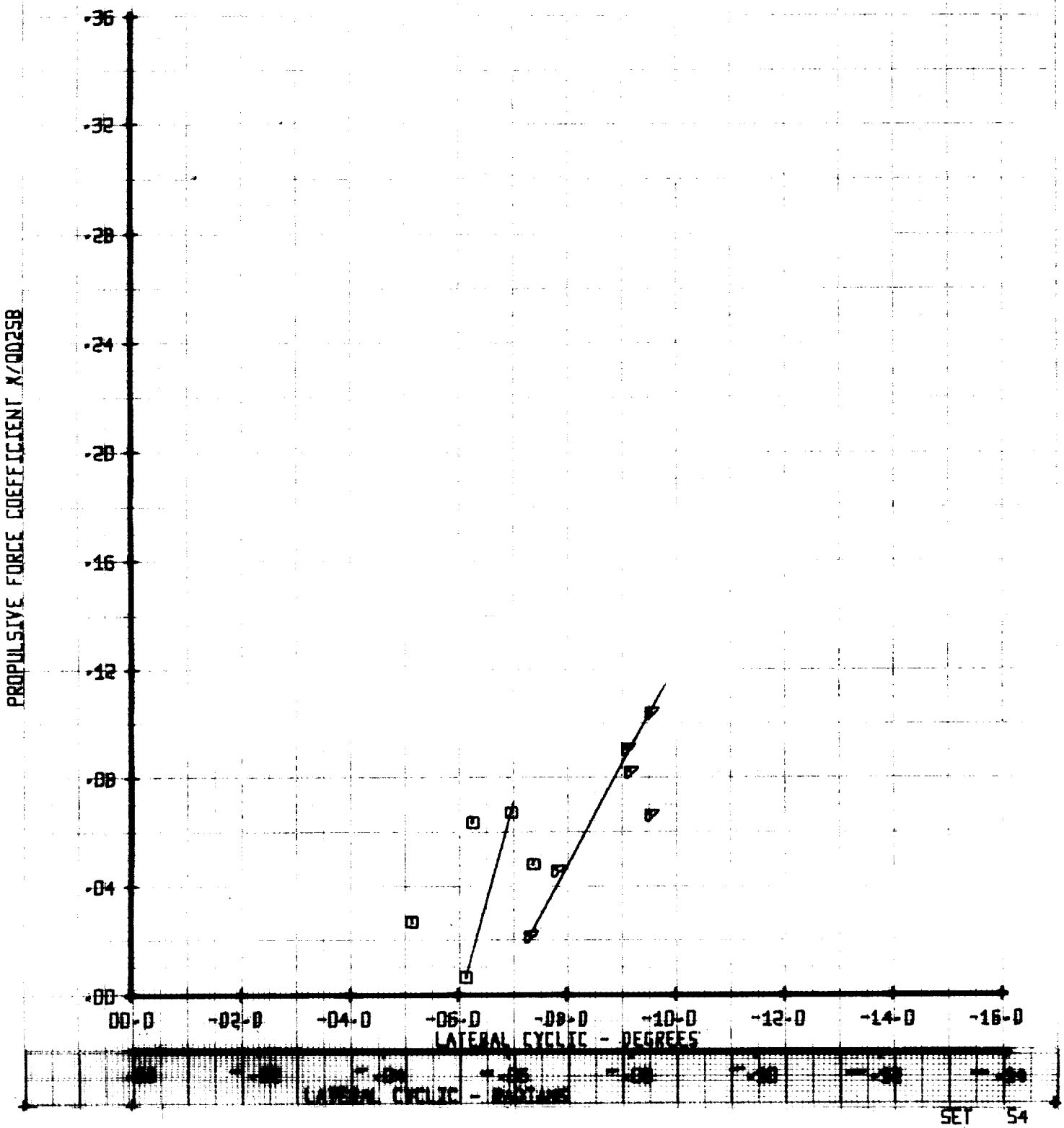
ET 54
WT 193

SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU	CT/SB	VTUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 54
WT 193

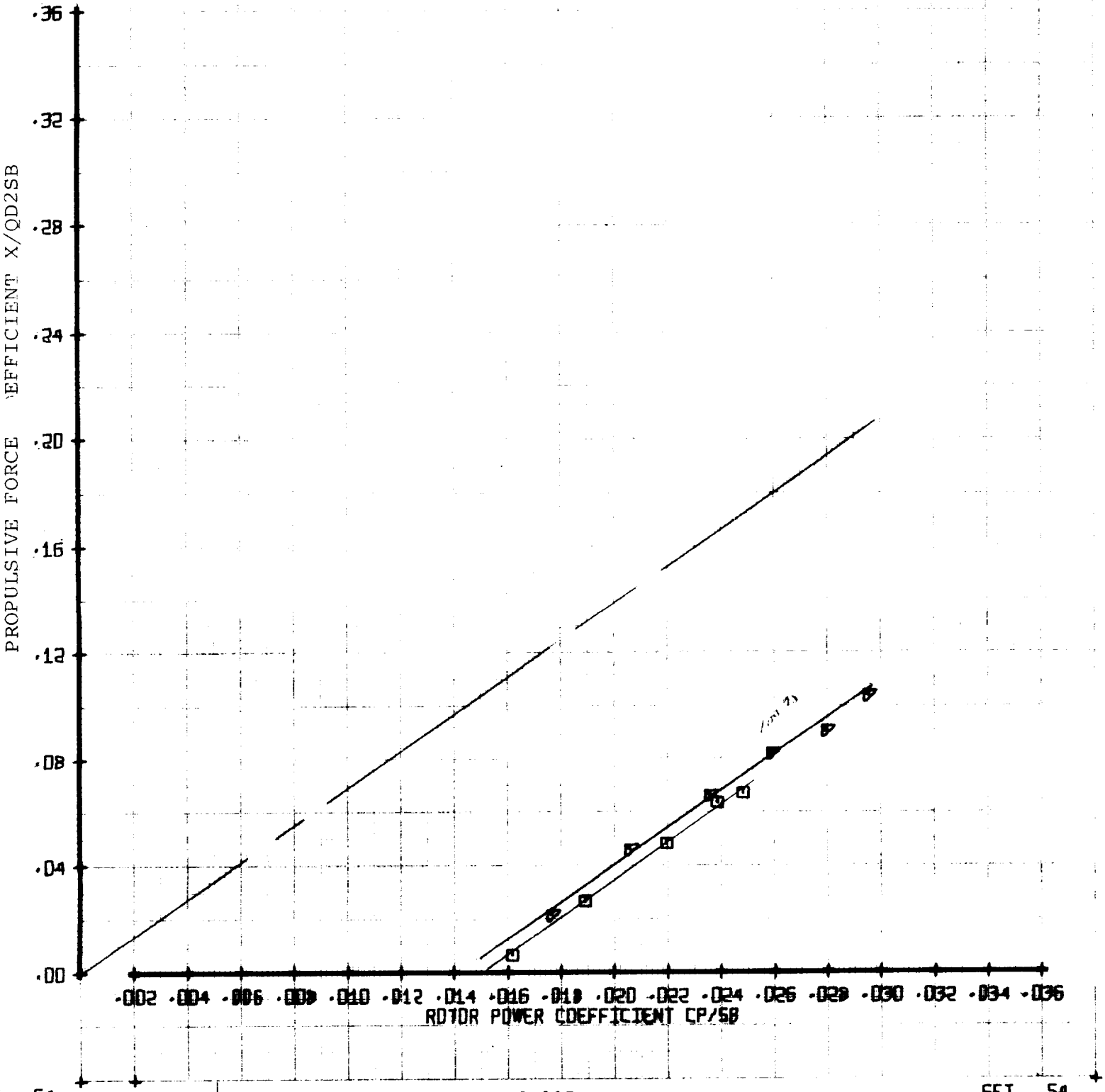
SET 54
BVWT 193

Figure B-191

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
◇	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 54
WT 193

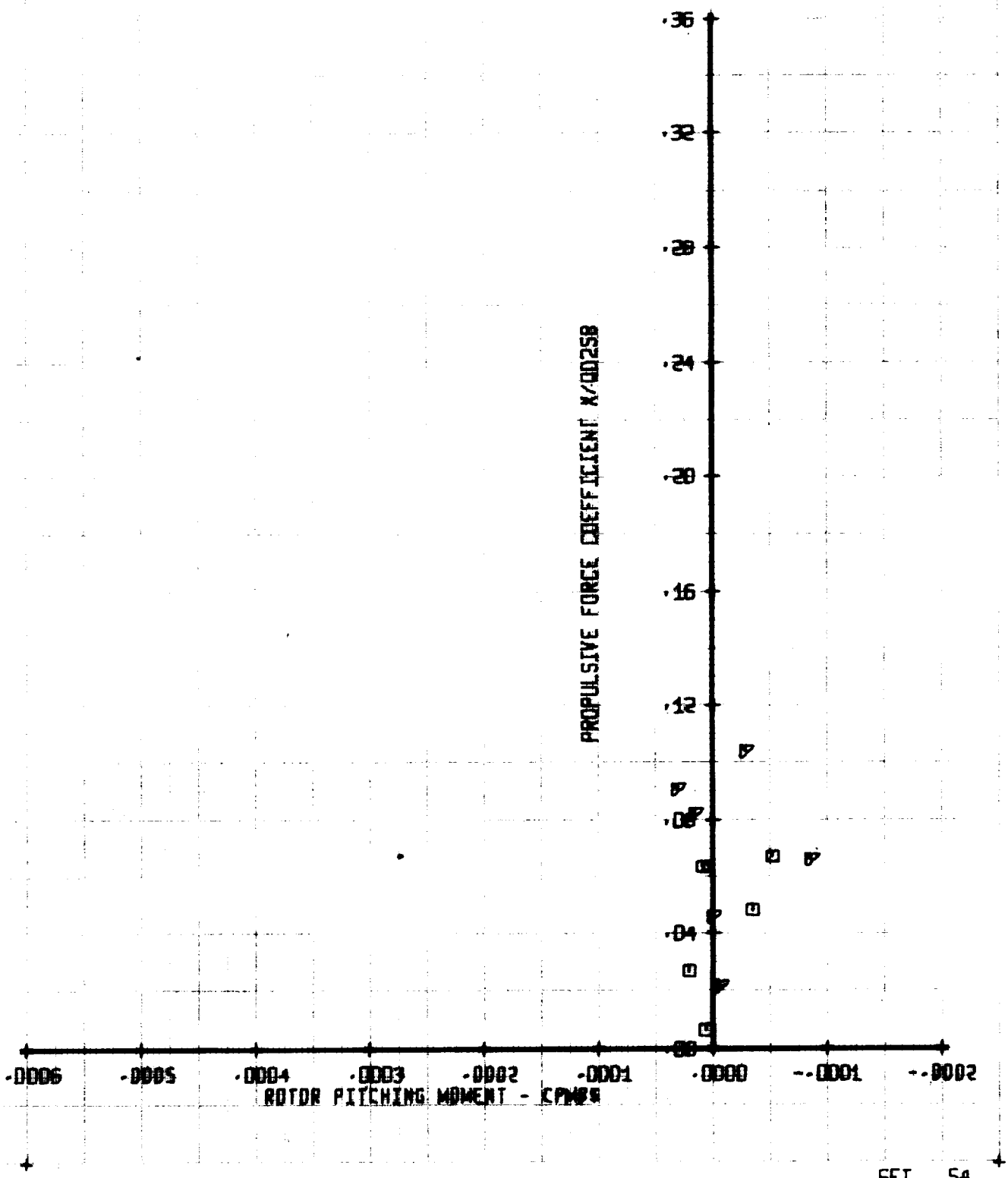
SET 54
BVWT 193

Figure B-192

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT



ET 54
WT 193

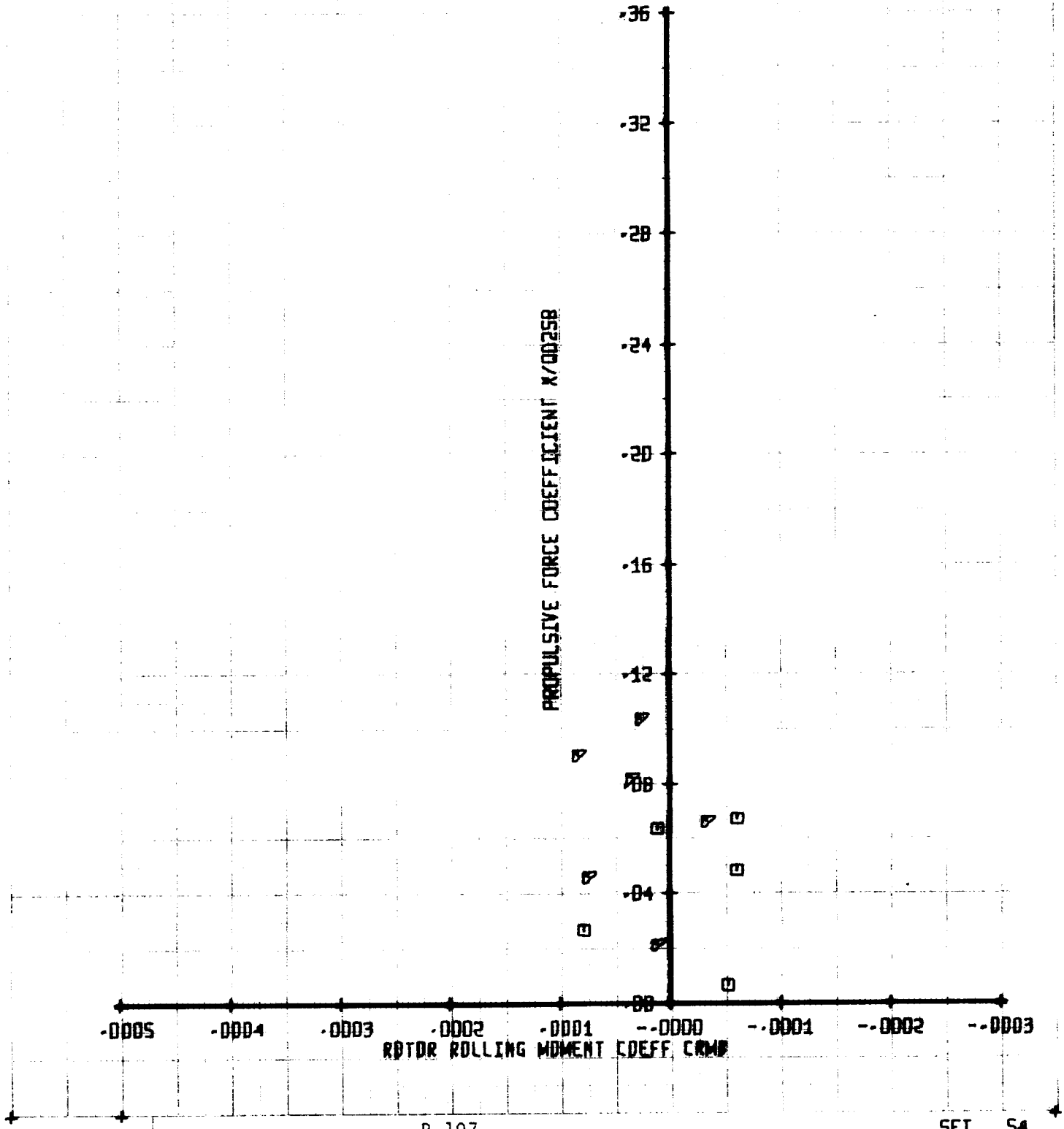
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	239	.61	.04	378
▽	238	.61	.055	378

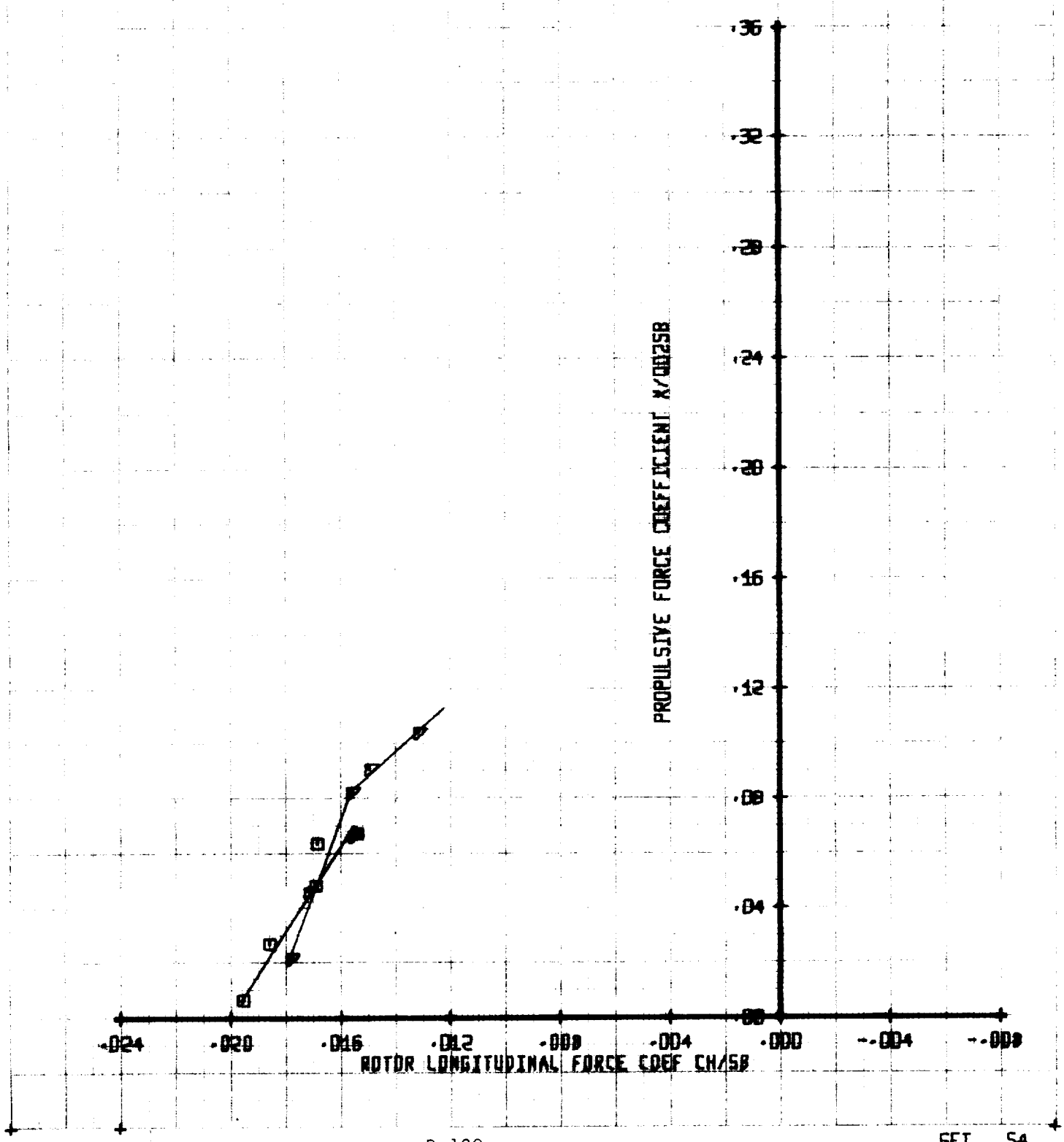
PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT



LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	370
○	238	.61	.055	370

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



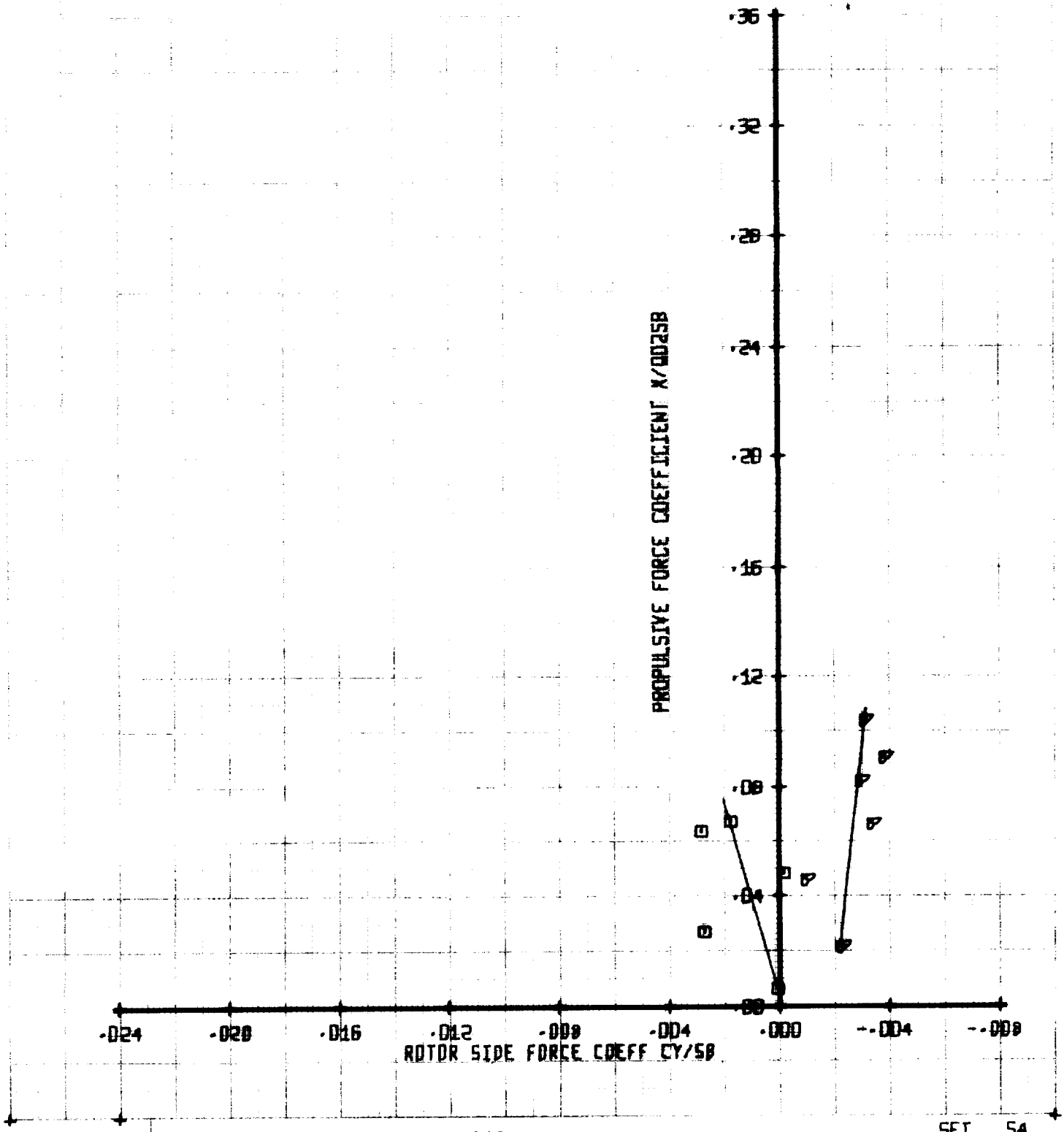
ET 54
WT 193

SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT

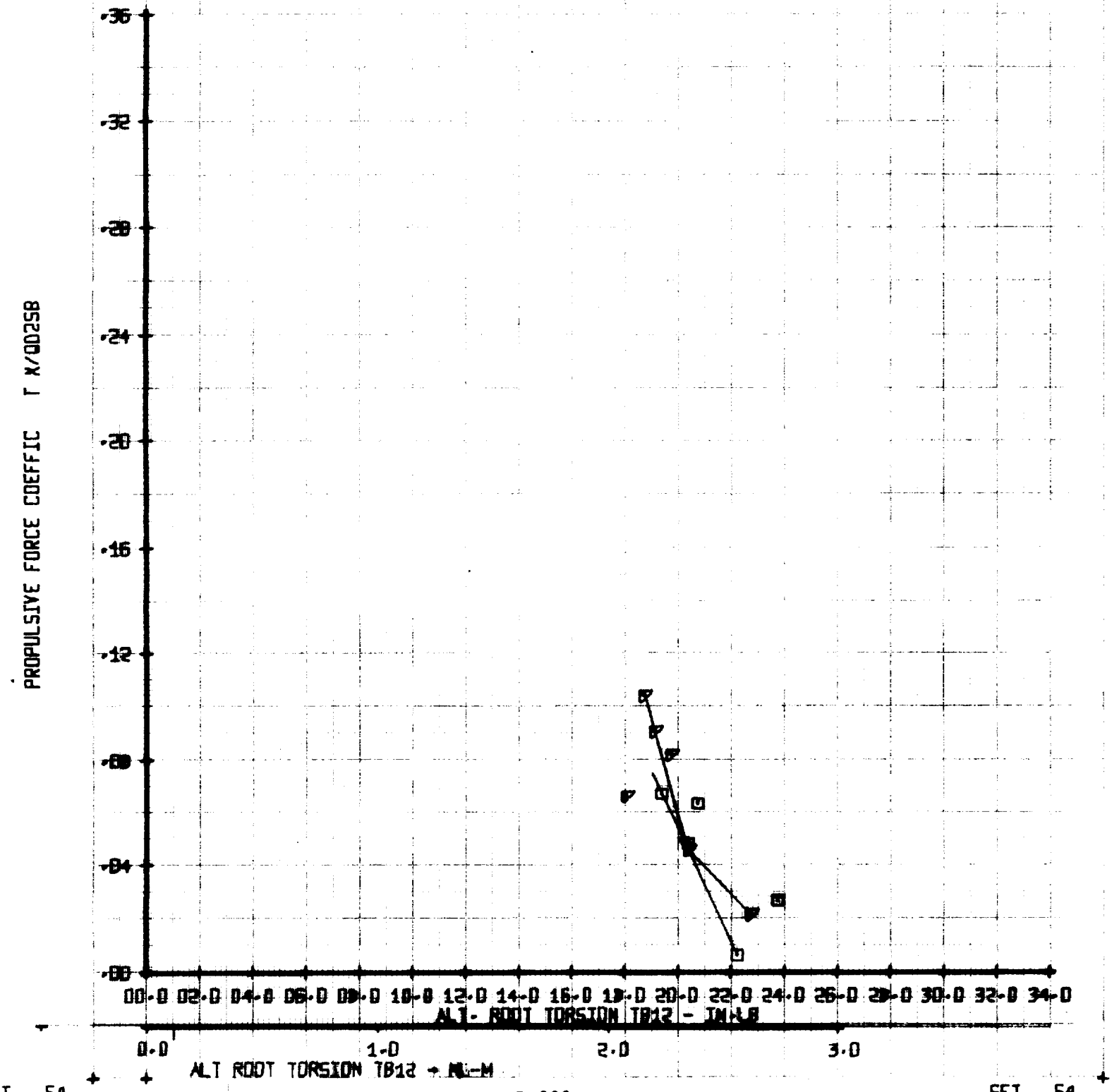


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 54
WT 193

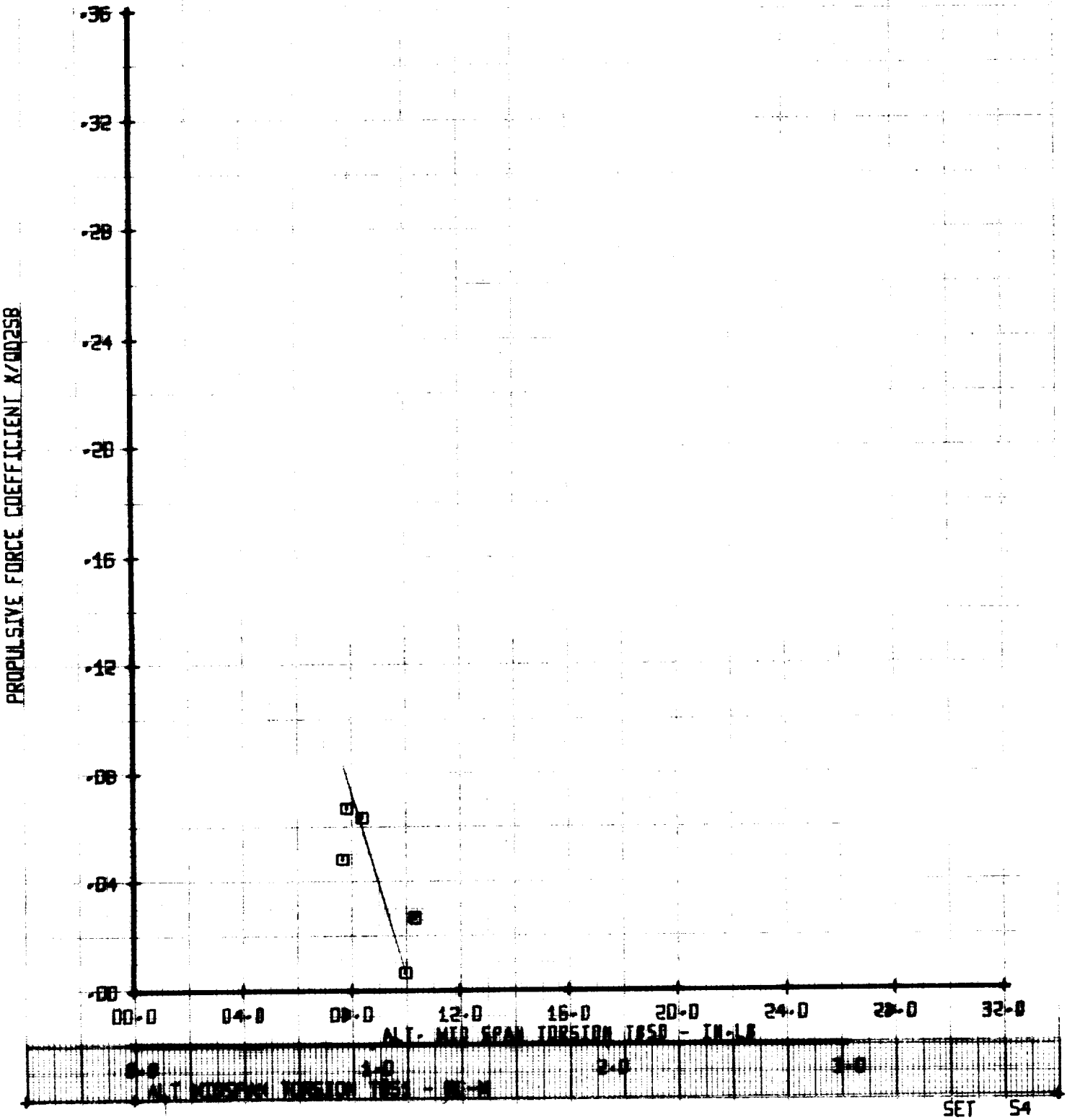
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING MID SPAN TORSION TB50



ET 54
WT 193

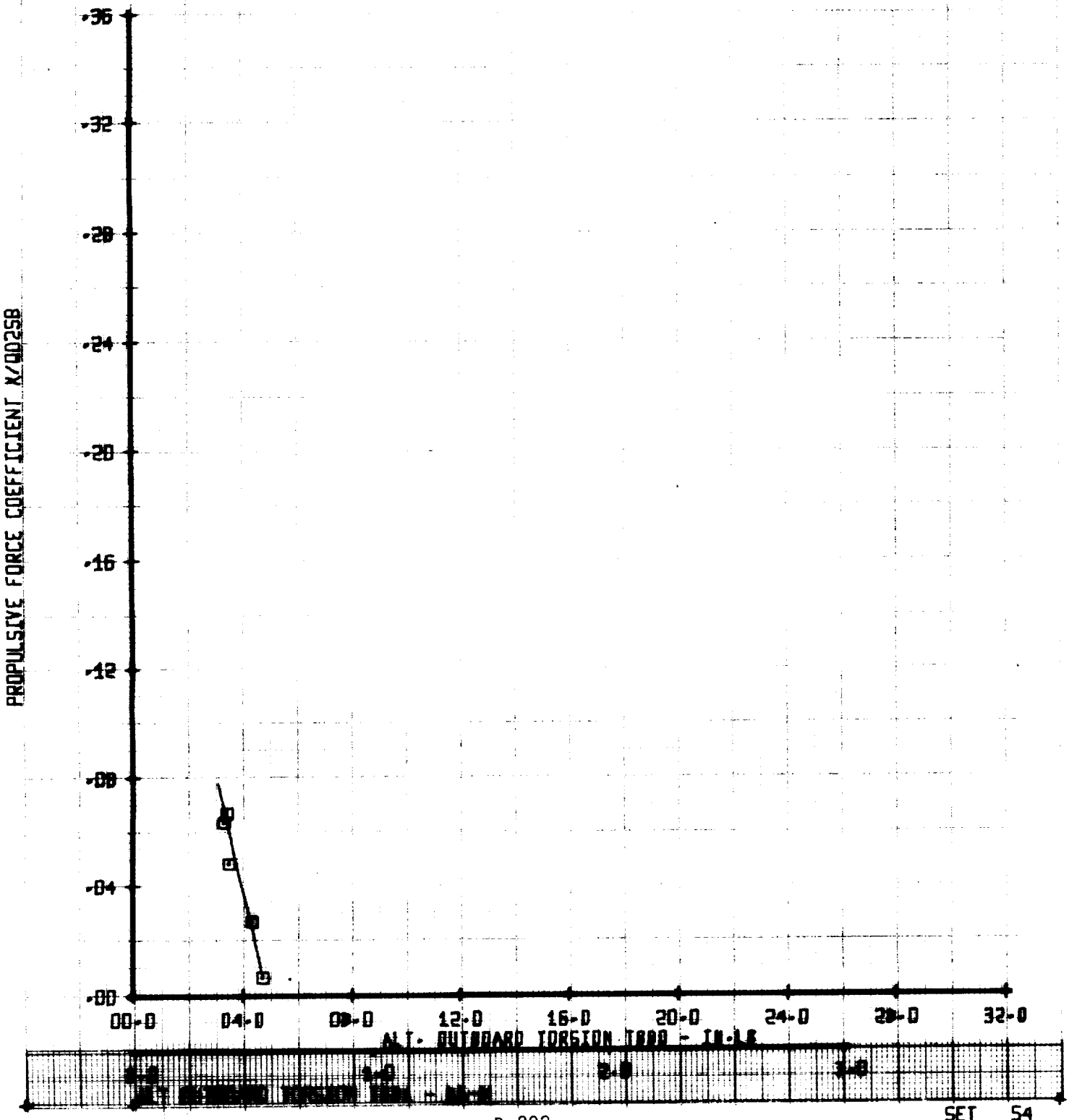
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD TORSION TB80



ET 54
WT 193

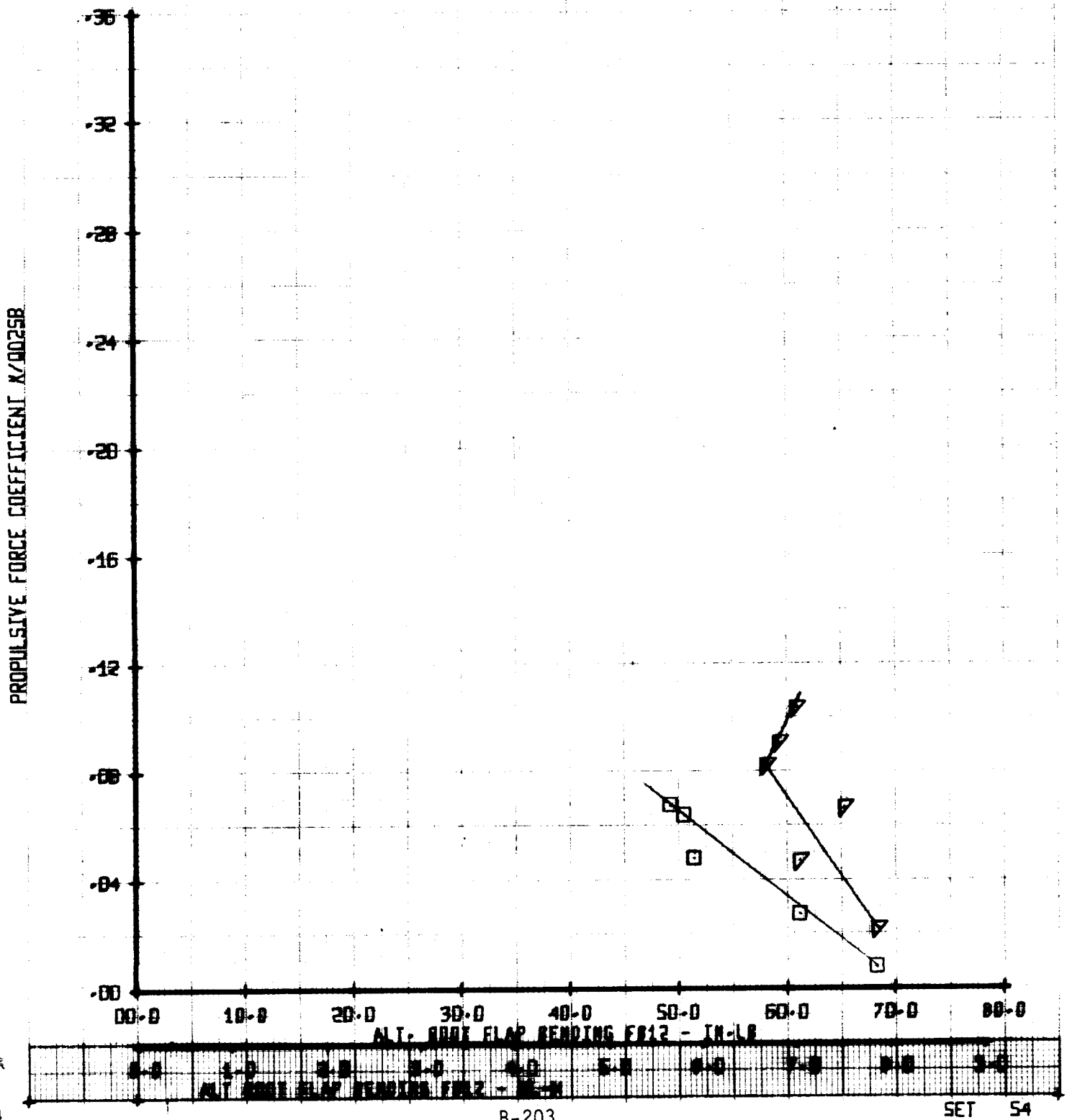
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12

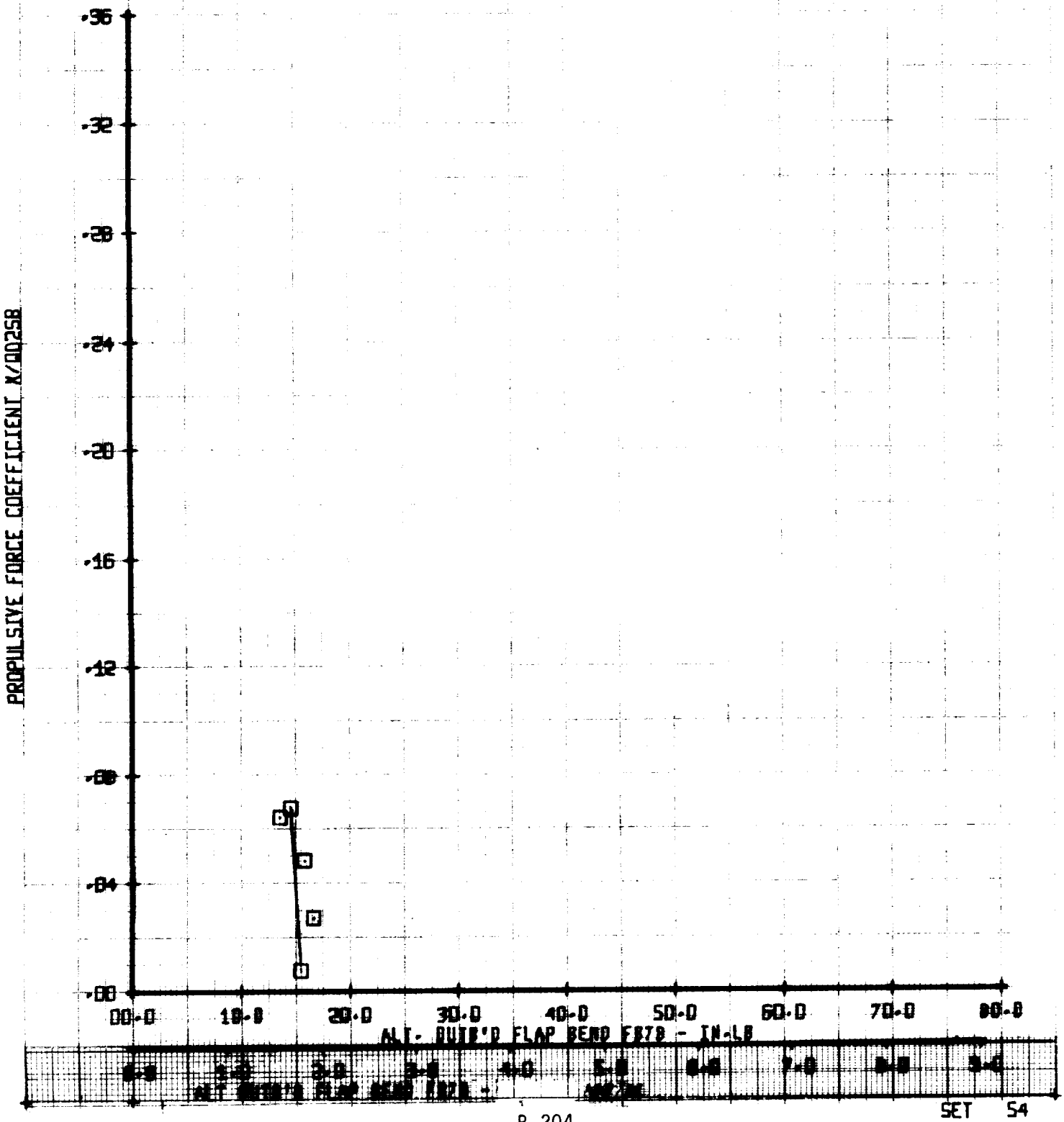


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	239	.61	.04	378
◇	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING OUTBOARD FLAP BENDING FB78



ET 54
WT 193

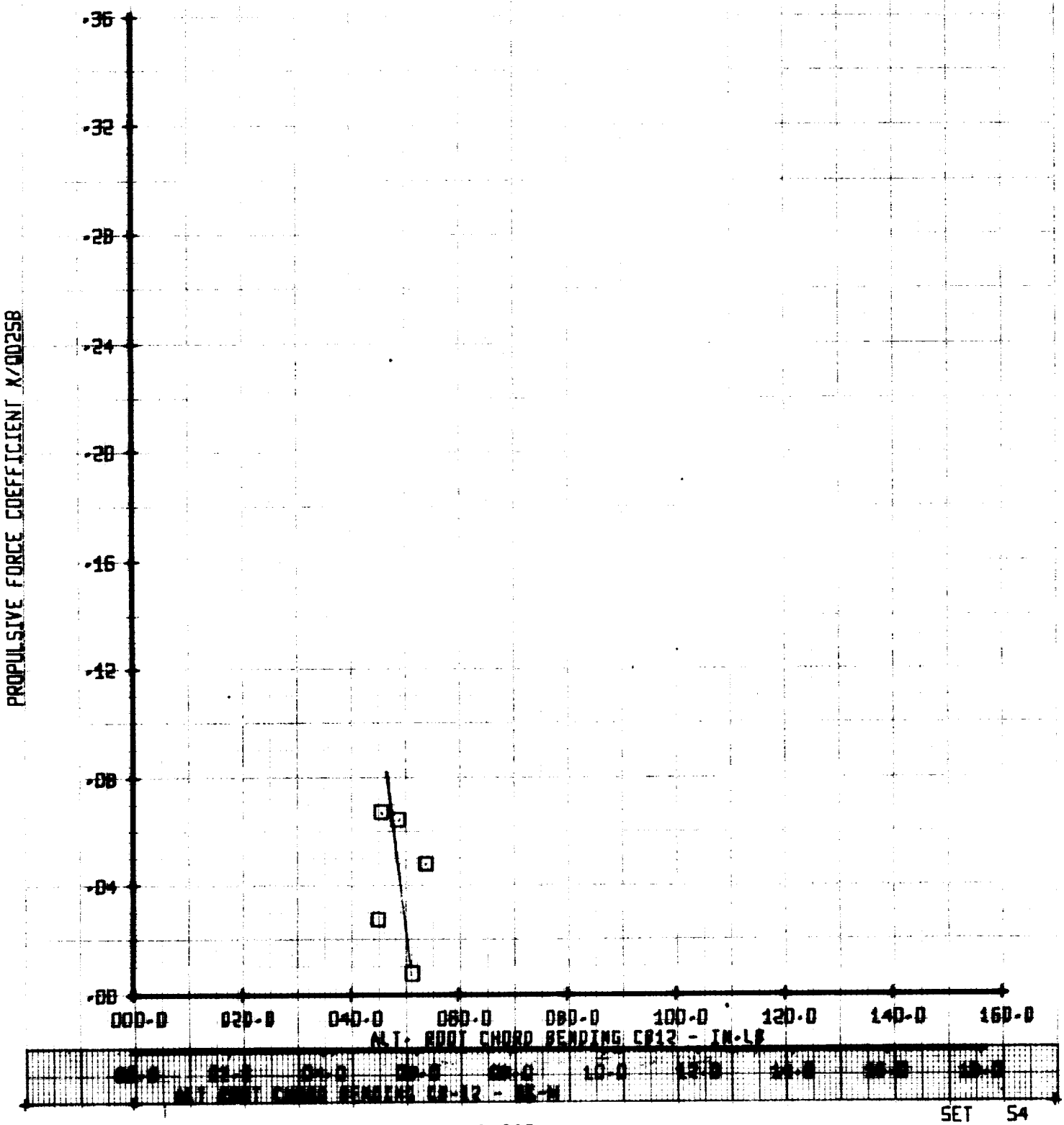
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	239	.61	.04	378
⊡	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT CHORD BENDING CB12



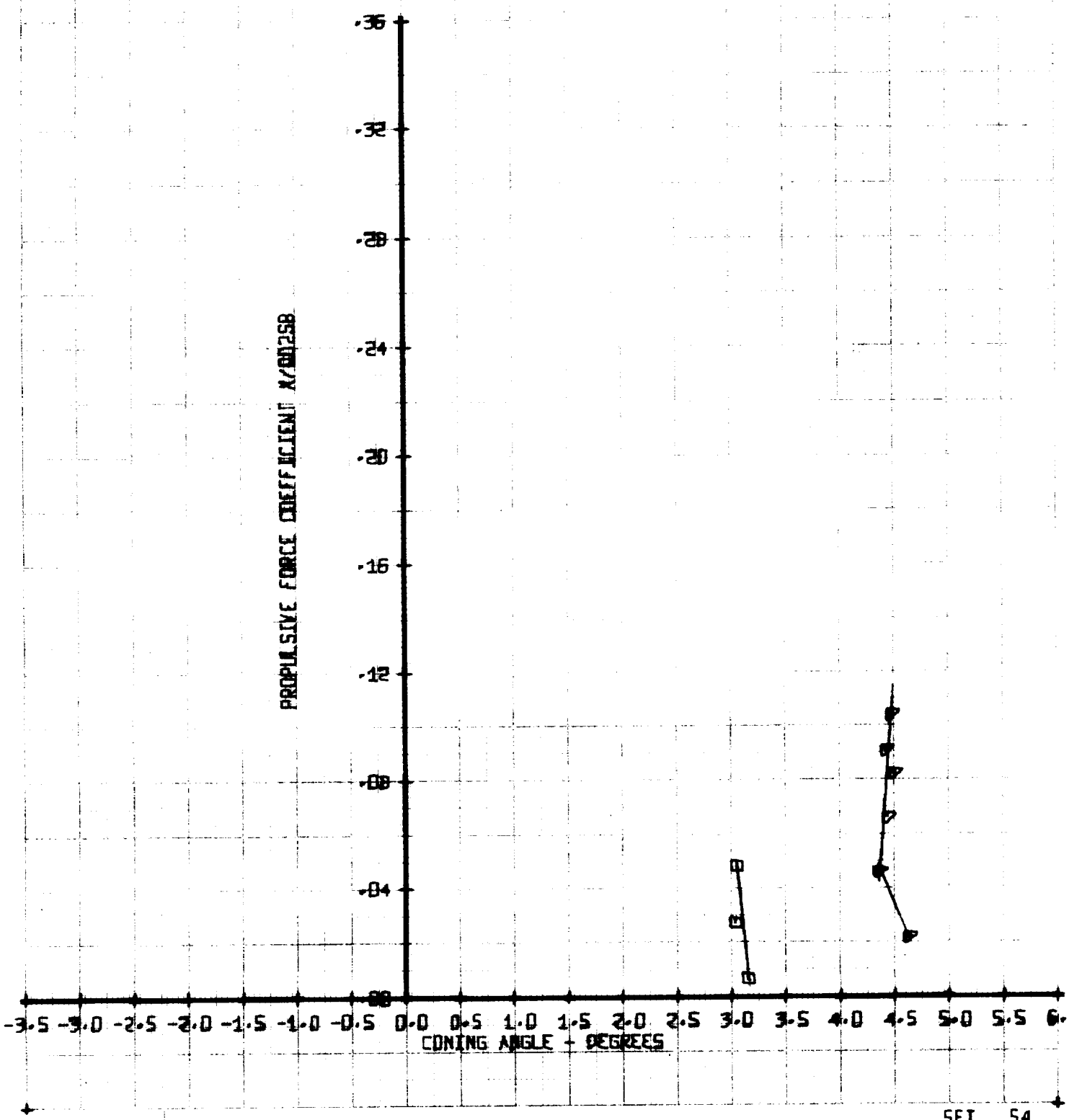
ET 54
WT 193

SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YRUN
□	239	.61	.04	378
▽	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE

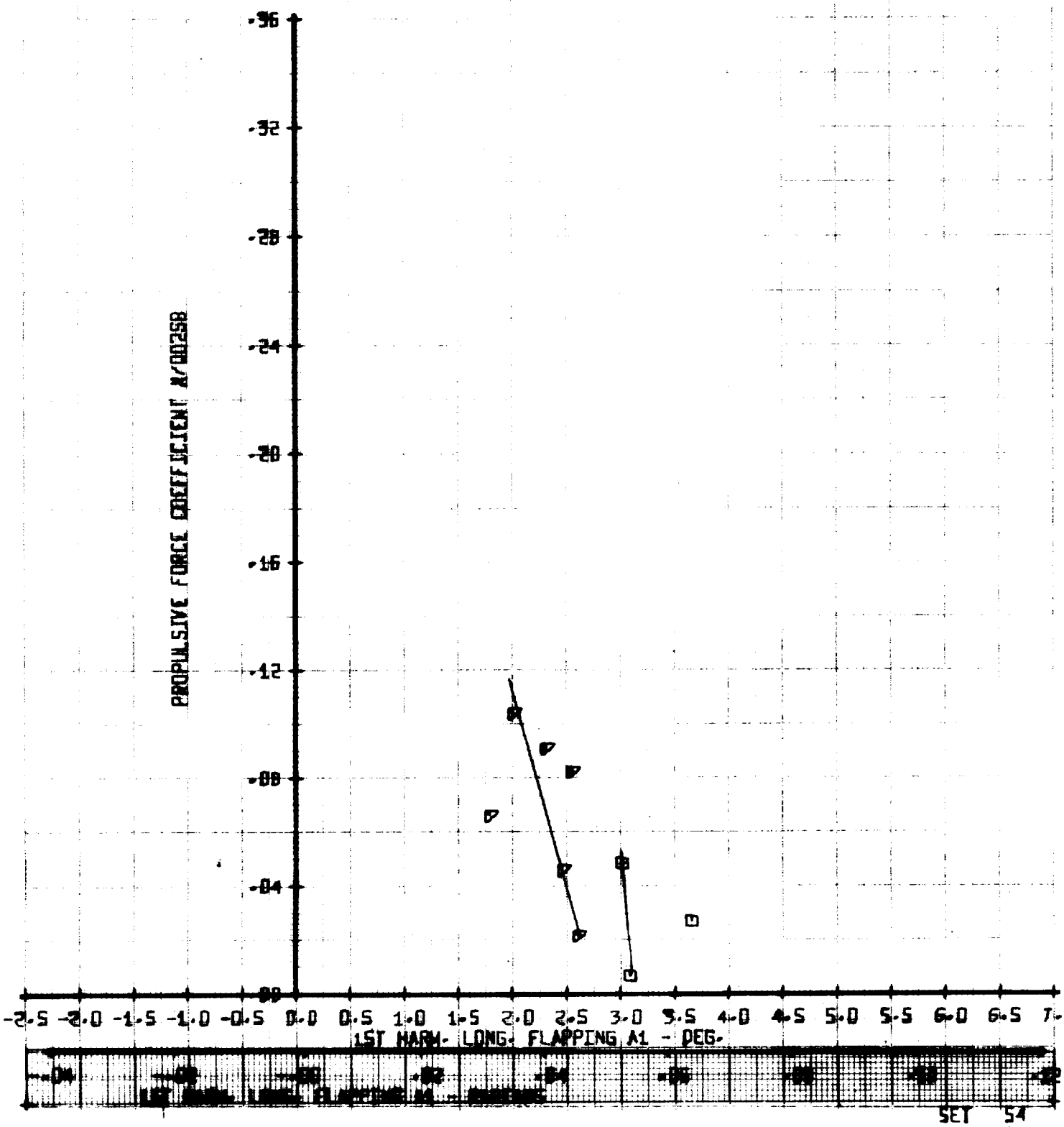


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YAW
□	239	.61	.04	37B
▽	238	.61	.055	37B

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

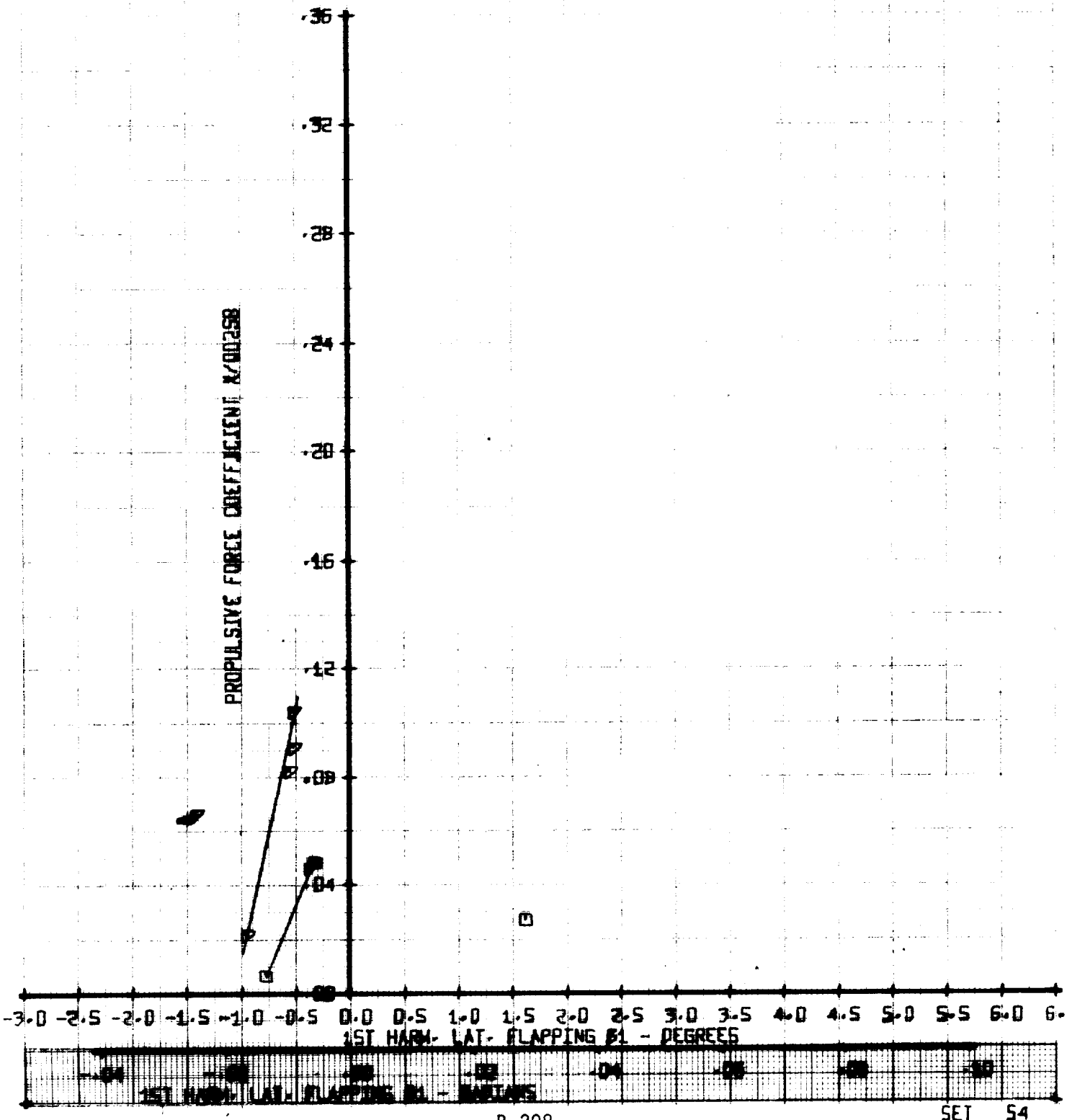


LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	239	.61	.04	378
◇	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1



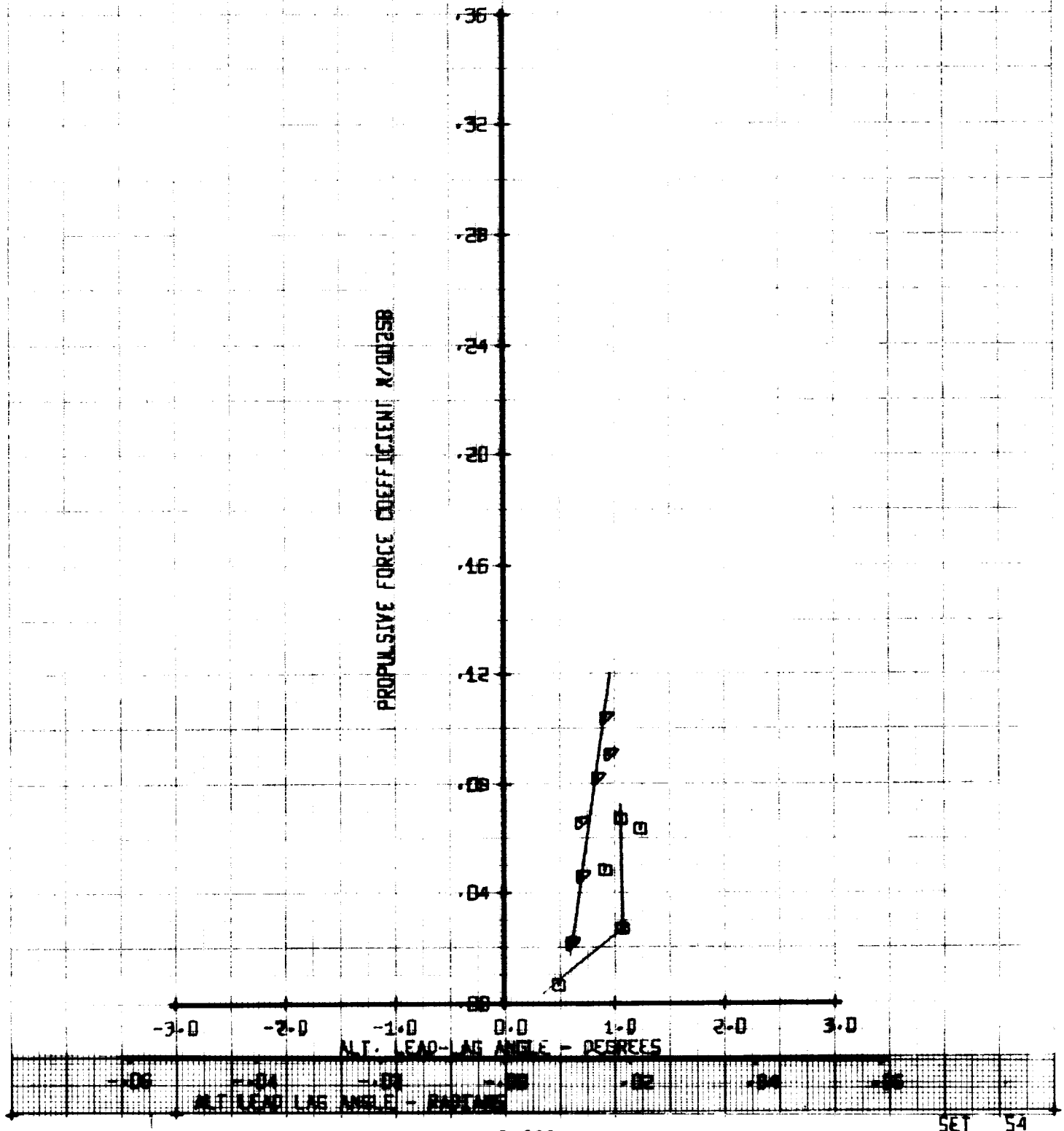
SET 54
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	239	.61	.04	378
◇	238	.61	.055	378

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE

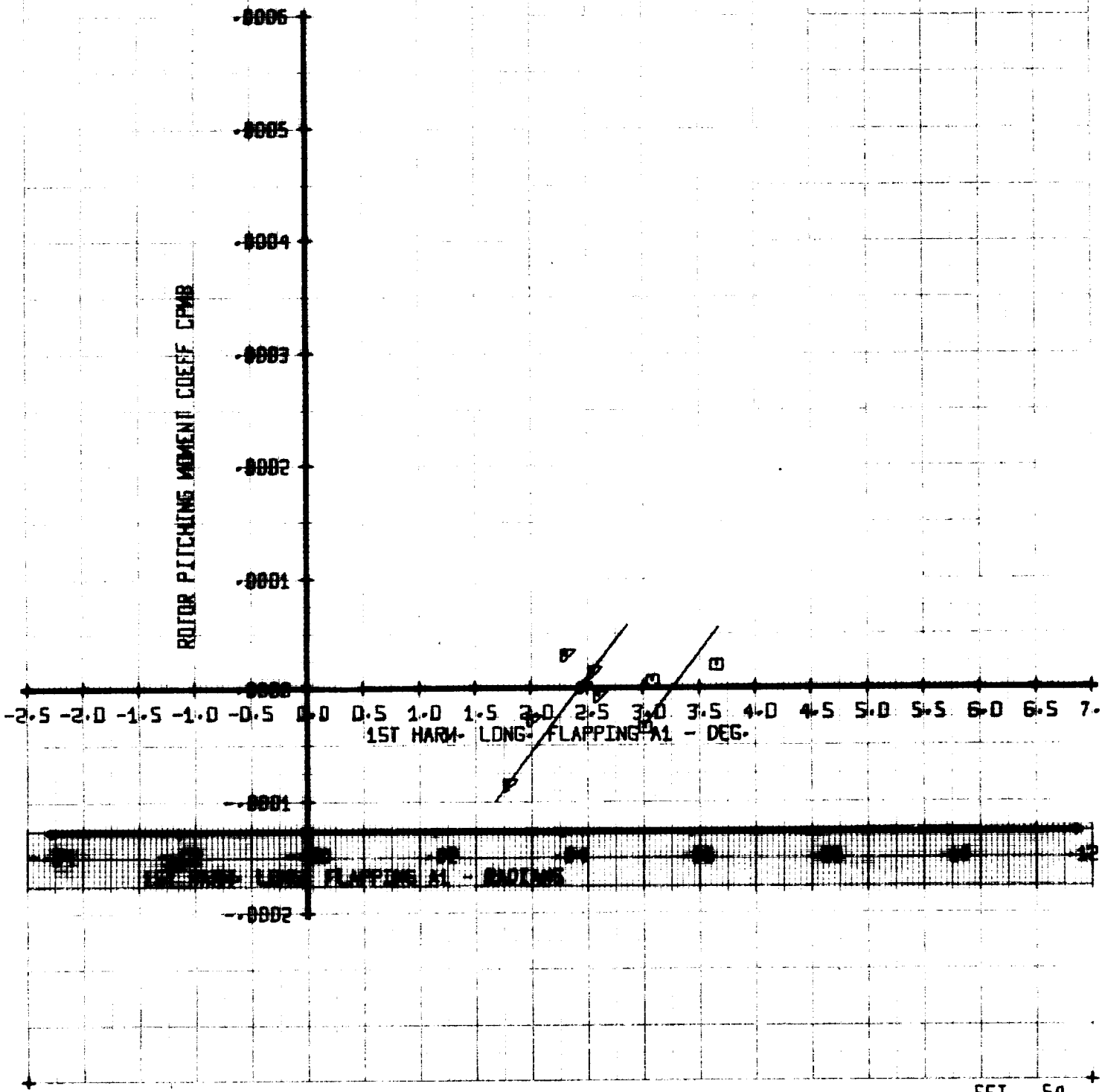


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	239	.61	.04	37B
▽	238	.61	.055	37B

ROTOR PITCHING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

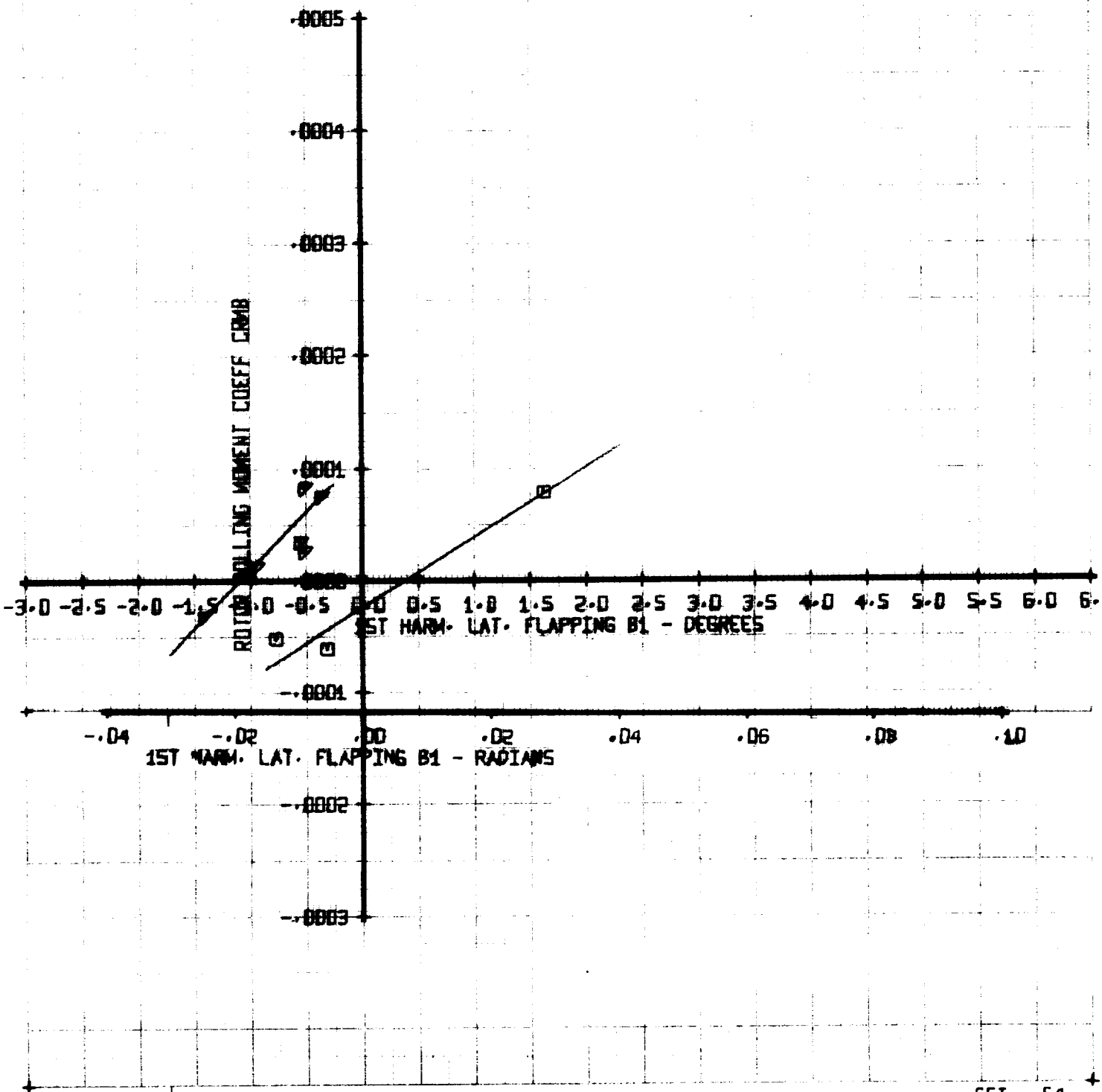


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	239	.61	.04	378
▽	238	.61	.055	378

ROTOR ROLLING MOMENT COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

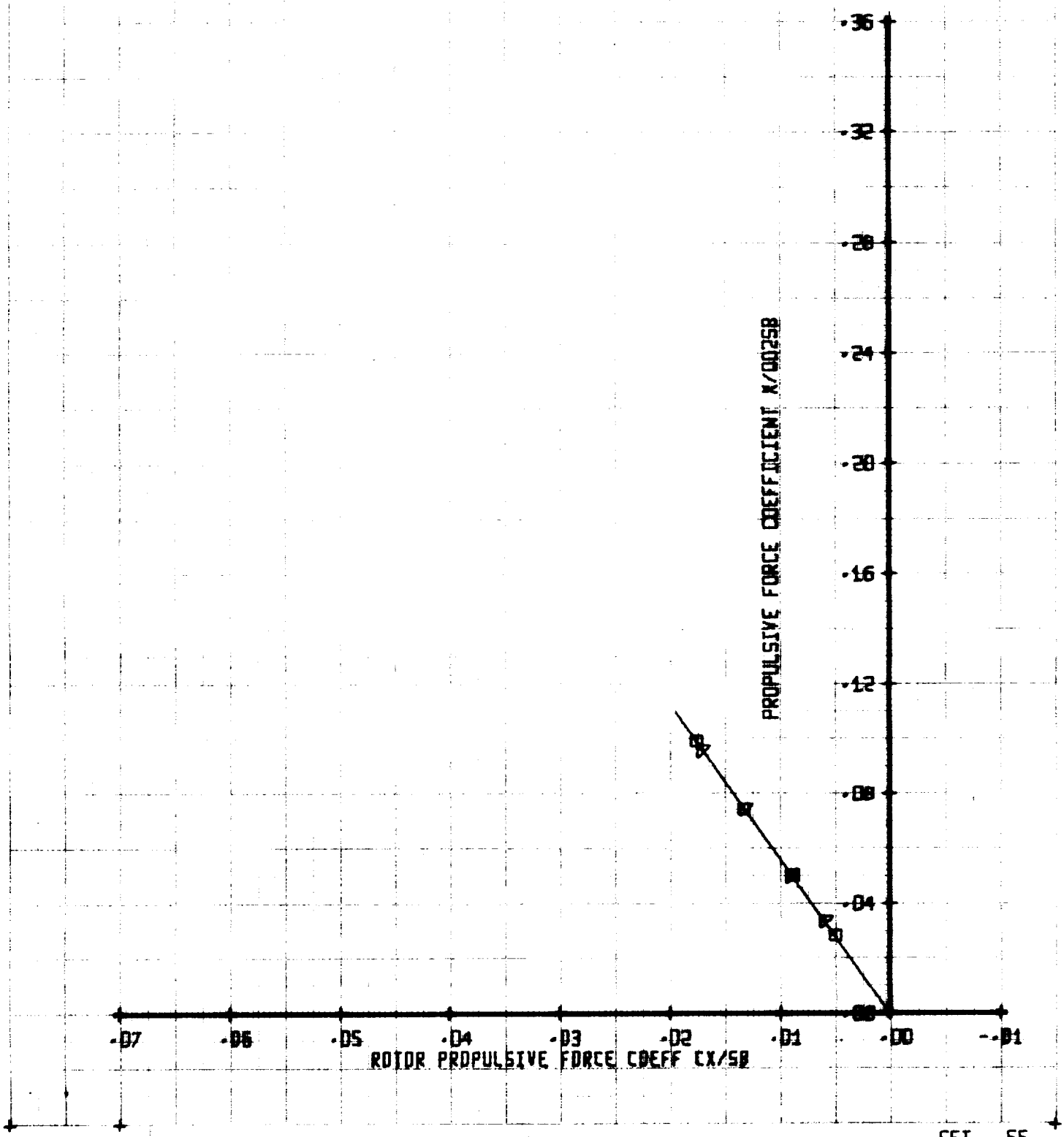


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
◇	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PROPULSIVE FORCE COEFFICIENT

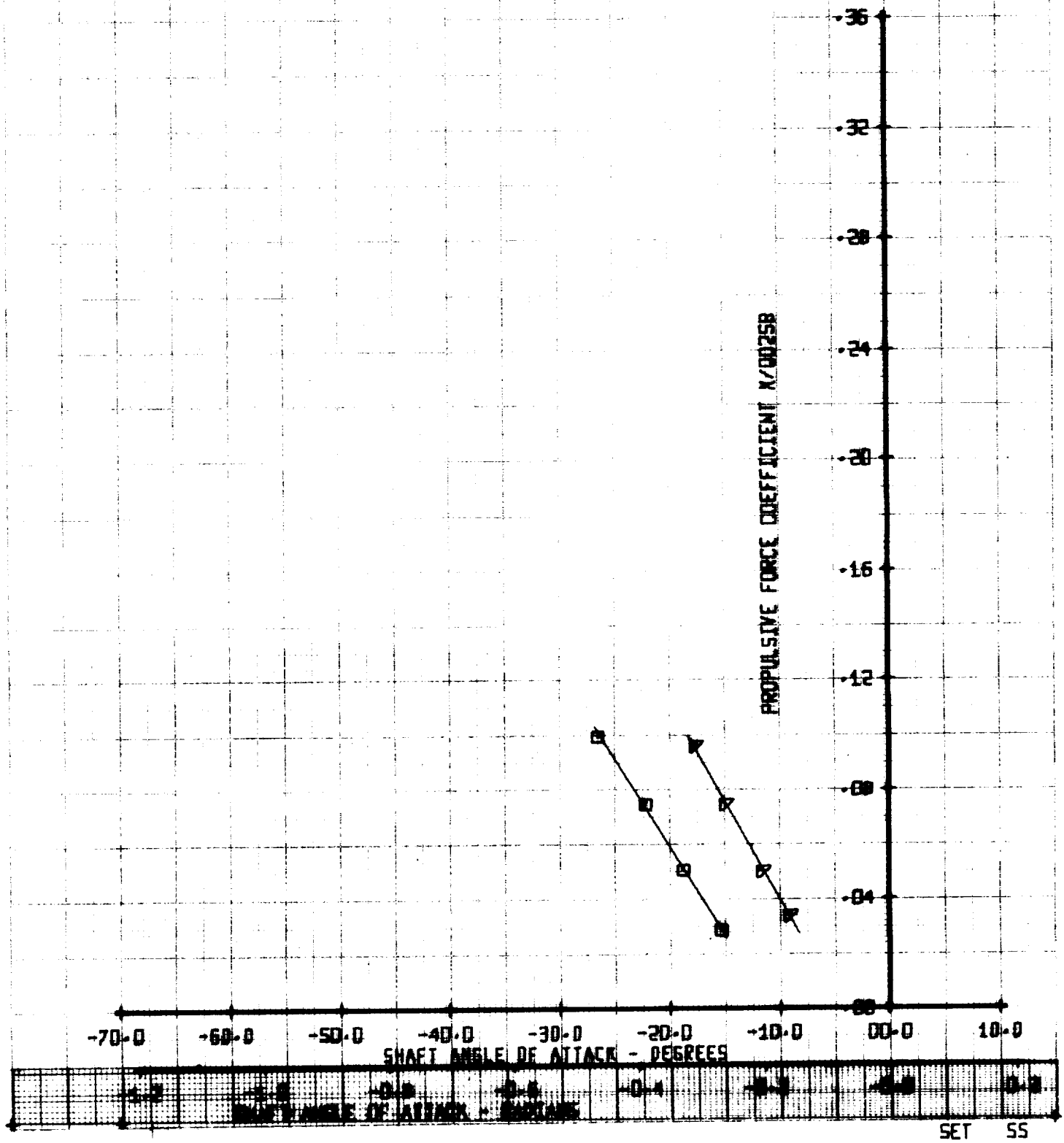


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
○	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
SHAFT ANGLE OF ATTACK



ET 55
WT 193

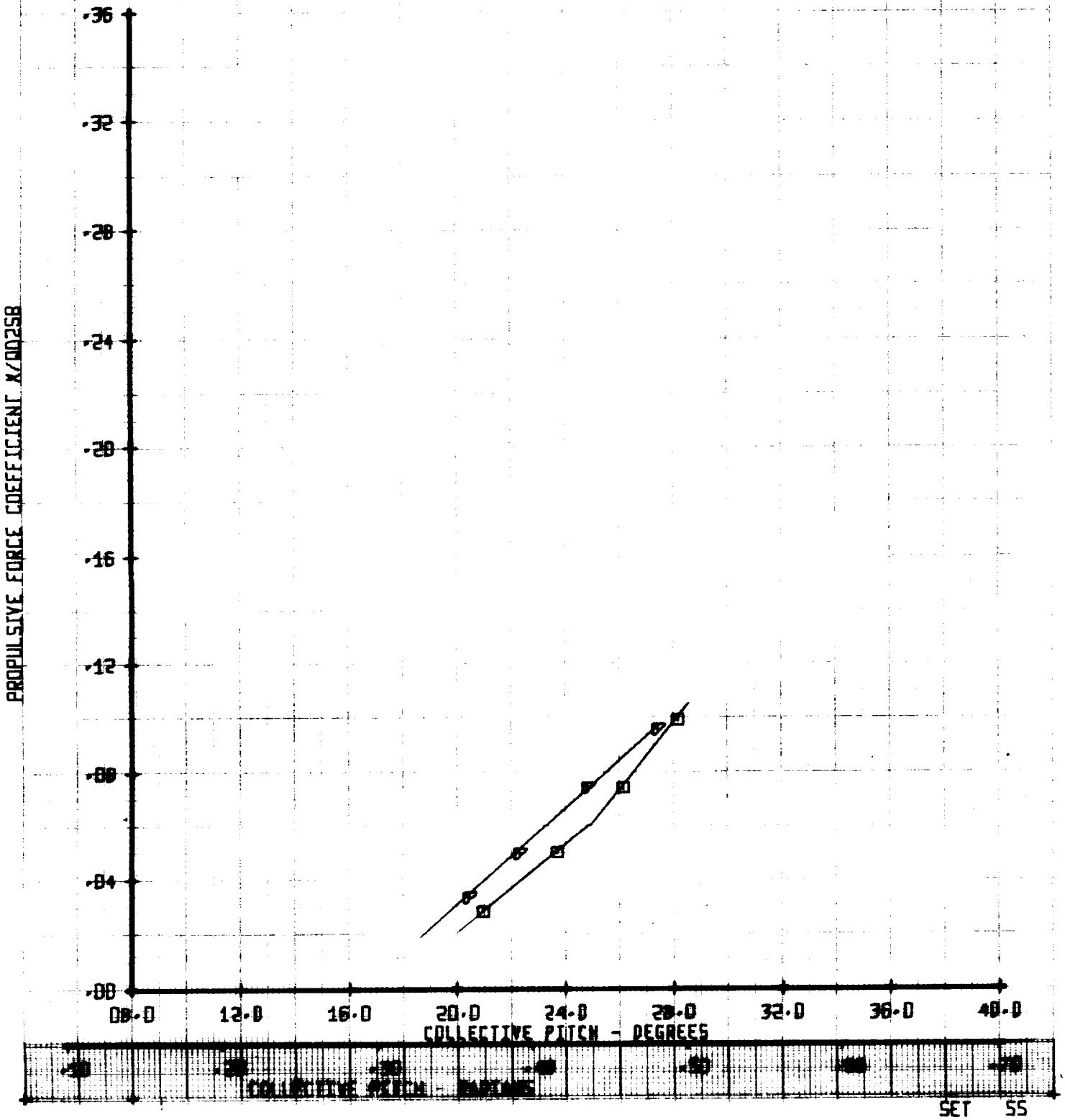
SET 55
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
COLLECTIVE PITCH



ET 55
WT 193

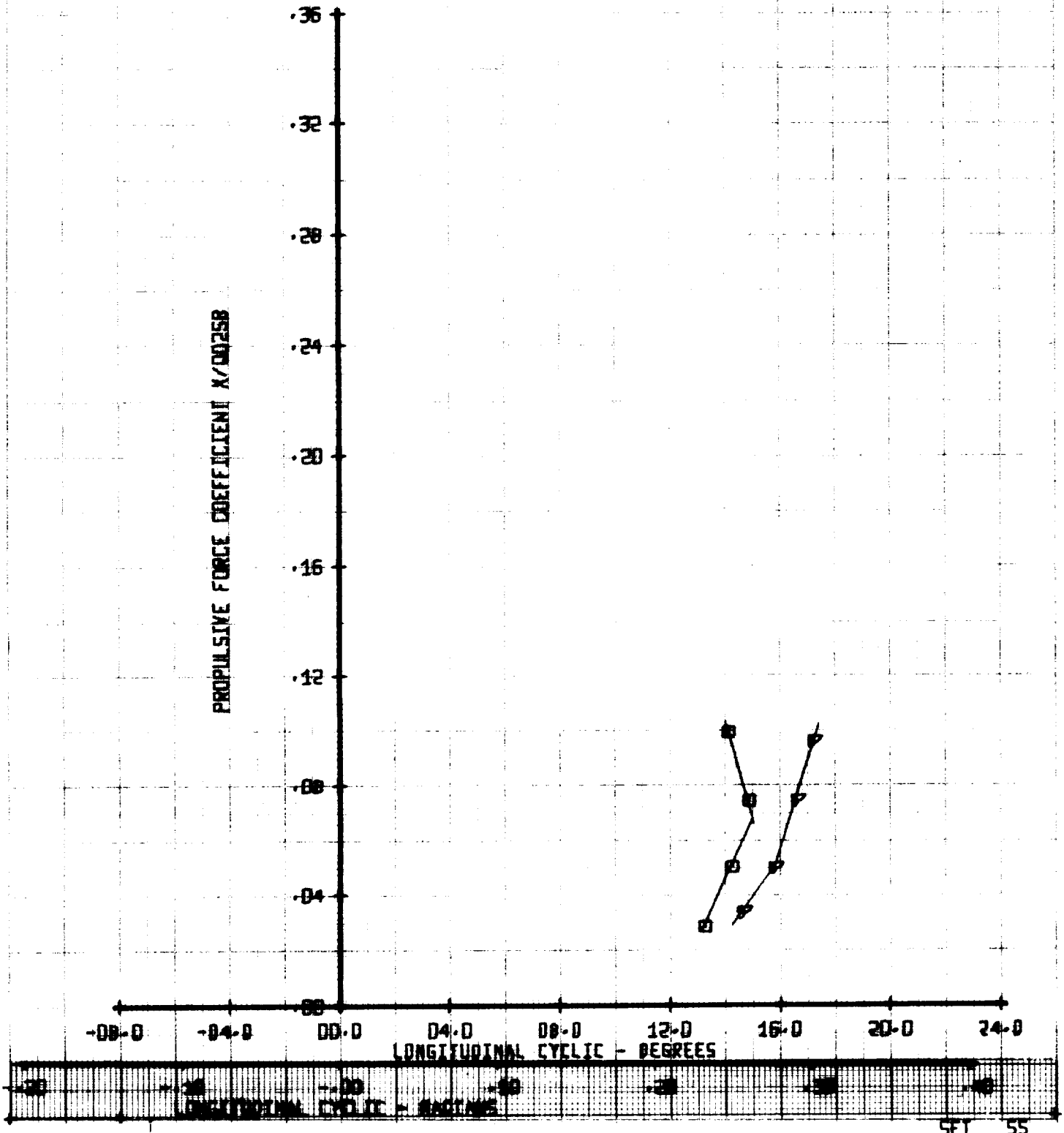
SET 55
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
LONGITUDINAL CYCLIC



ET 55
WT 193

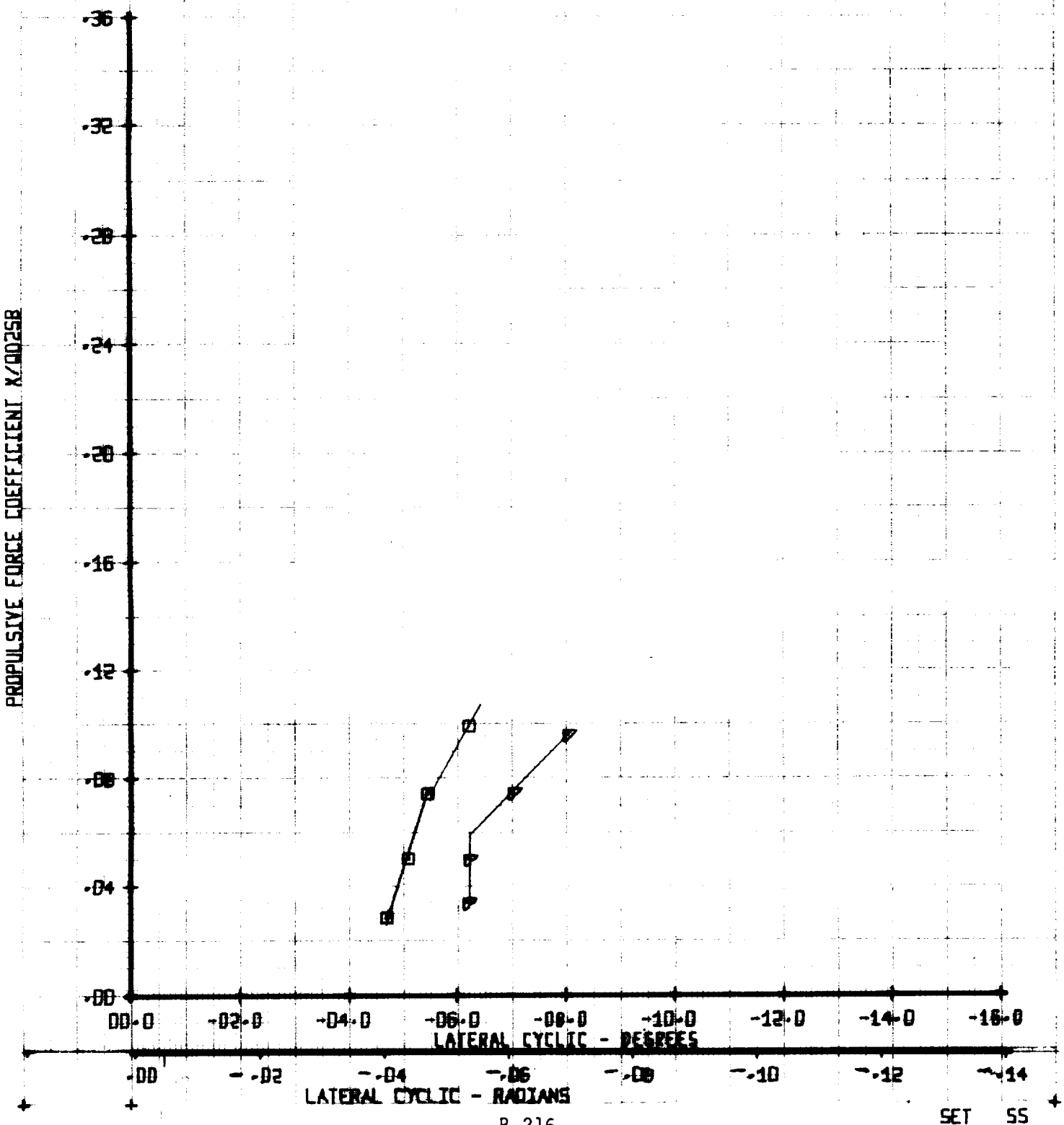
SET 55
BVWT 193

Figure B-212

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▷	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
LATERAL CYCLIC



ET 55
WT 193

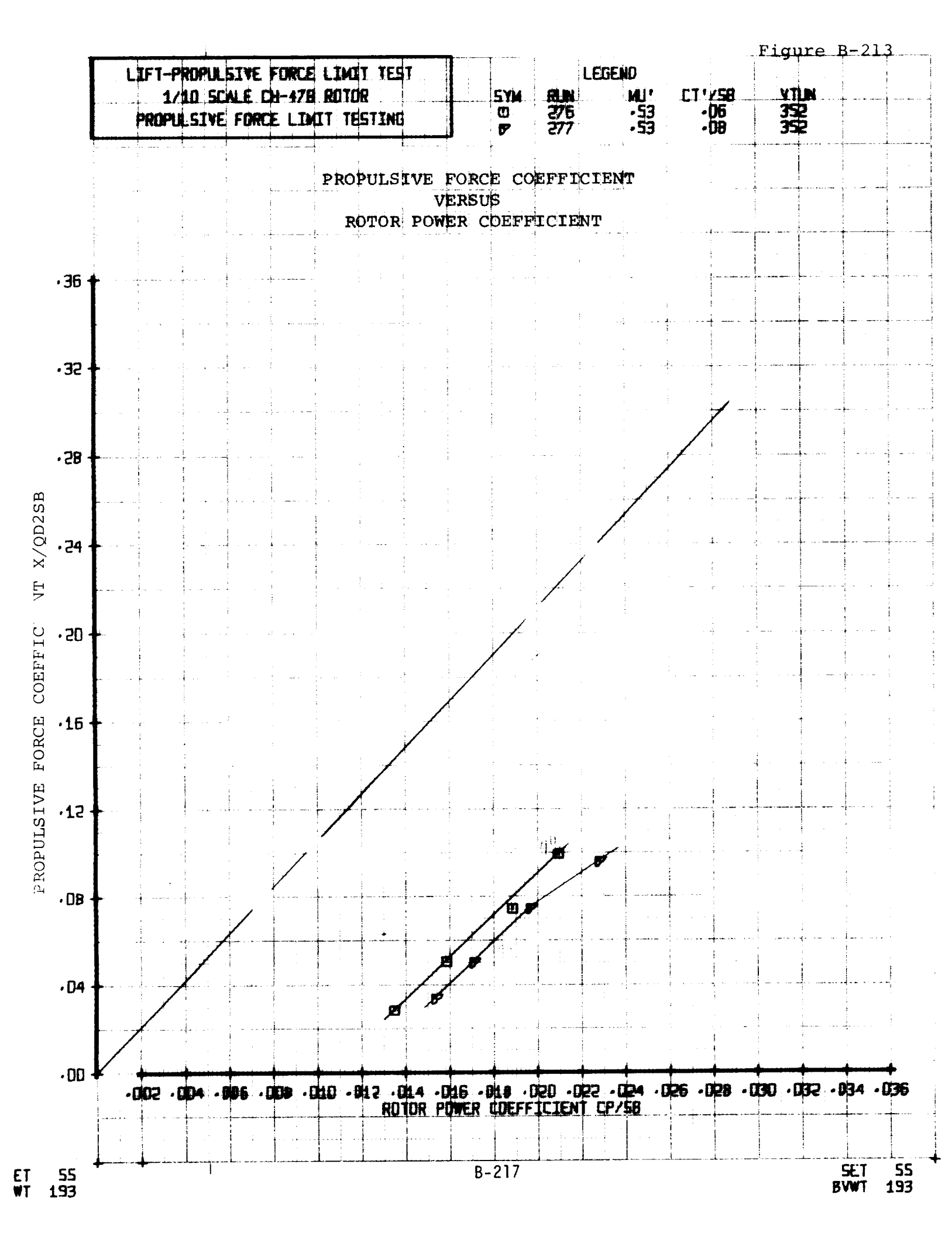
SET 55
BVWT 193

Figure B-213

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR POWER COEFFICIENT



ET 55
WT 193

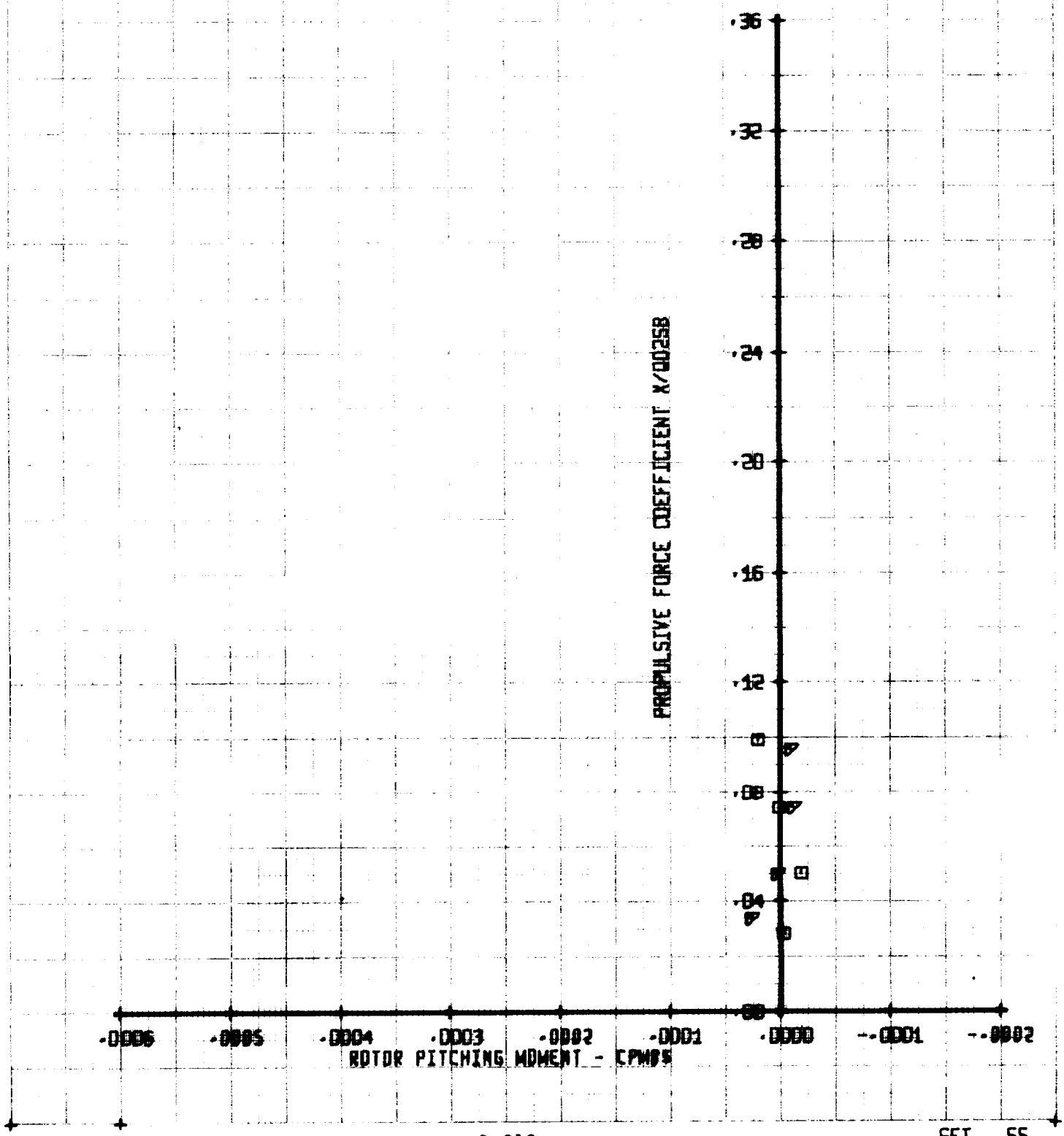
SET 55
BVWT 193

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR PITCHING MOMENT

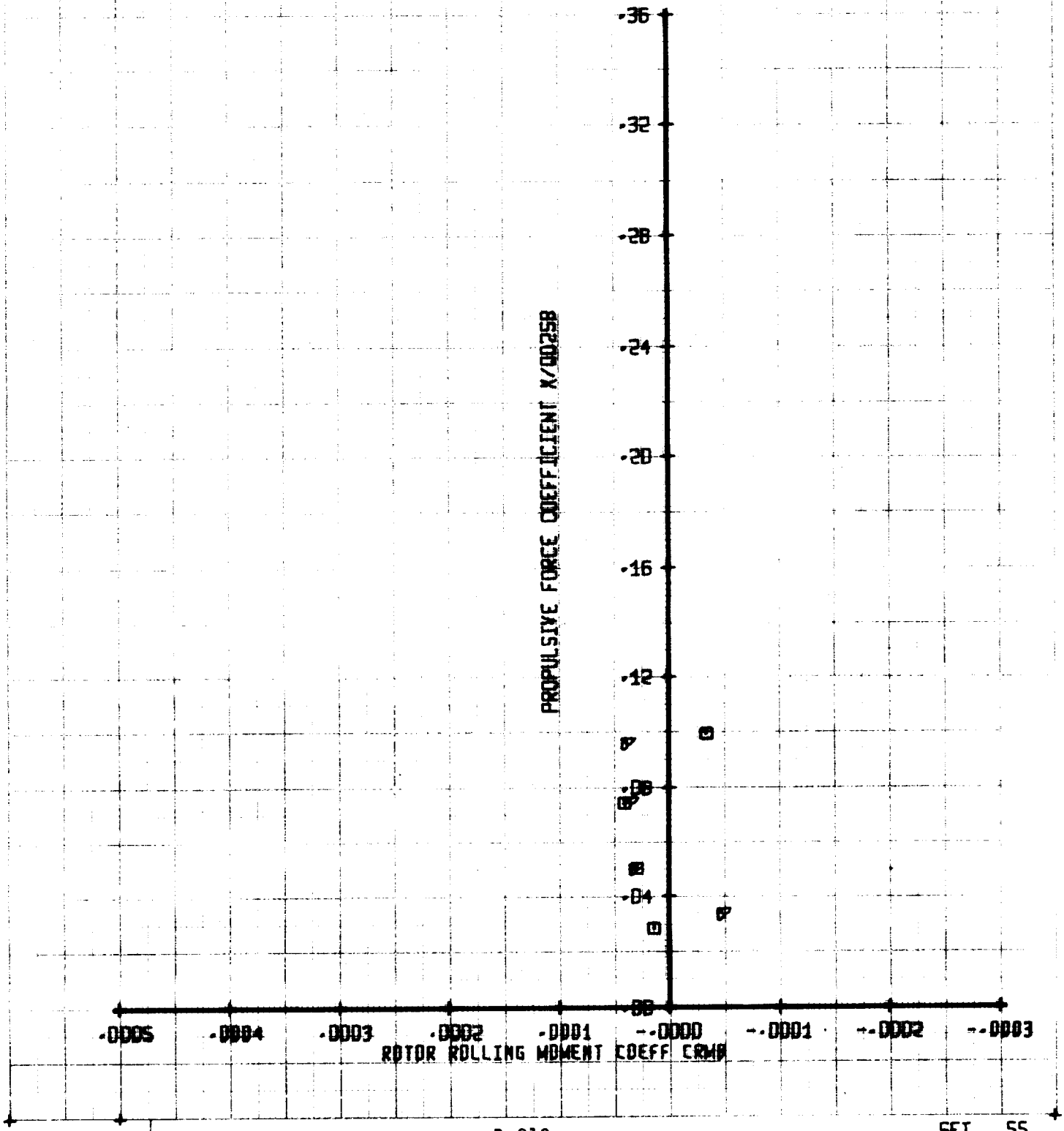


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR ROLLING MOMENT COEFFICIENT

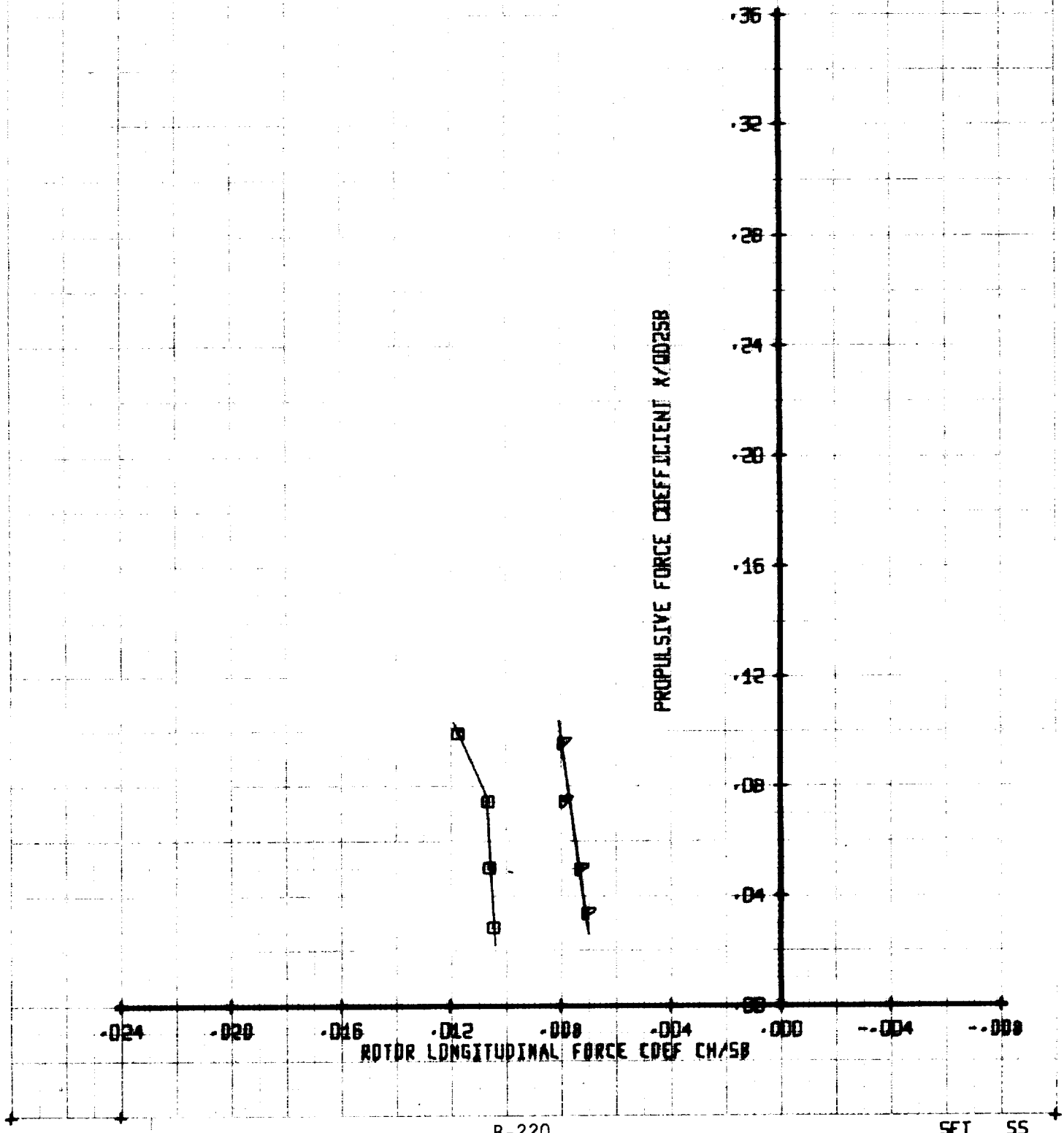


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▷	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR LONGITUDINAL FORCE COEFFICIENT



ET SS
WT 193

SET SS
BVWT 193

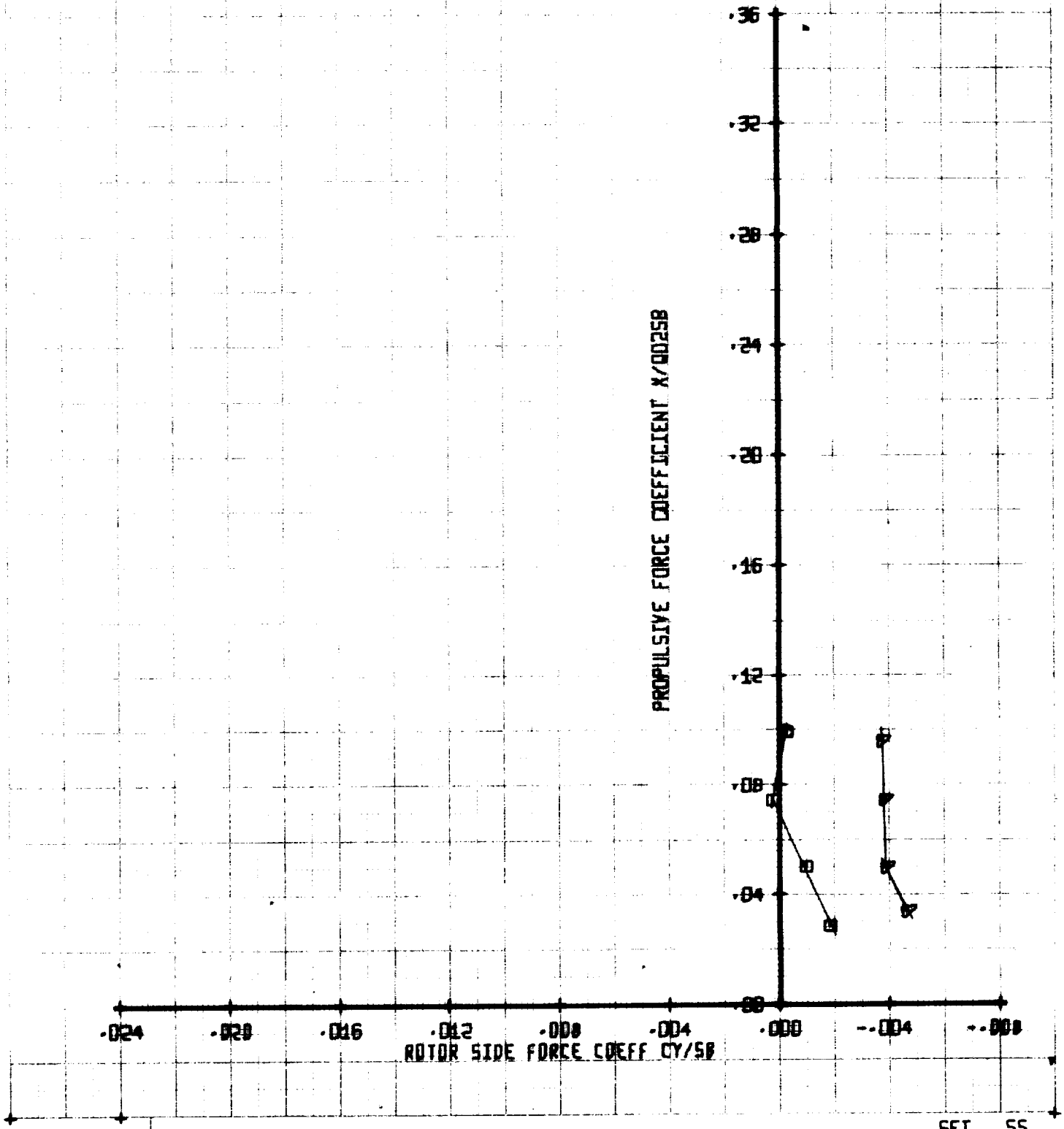
Figure B-217

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ROTOR SIDE FORCE COEFFICIENT



ET SS
WT 193

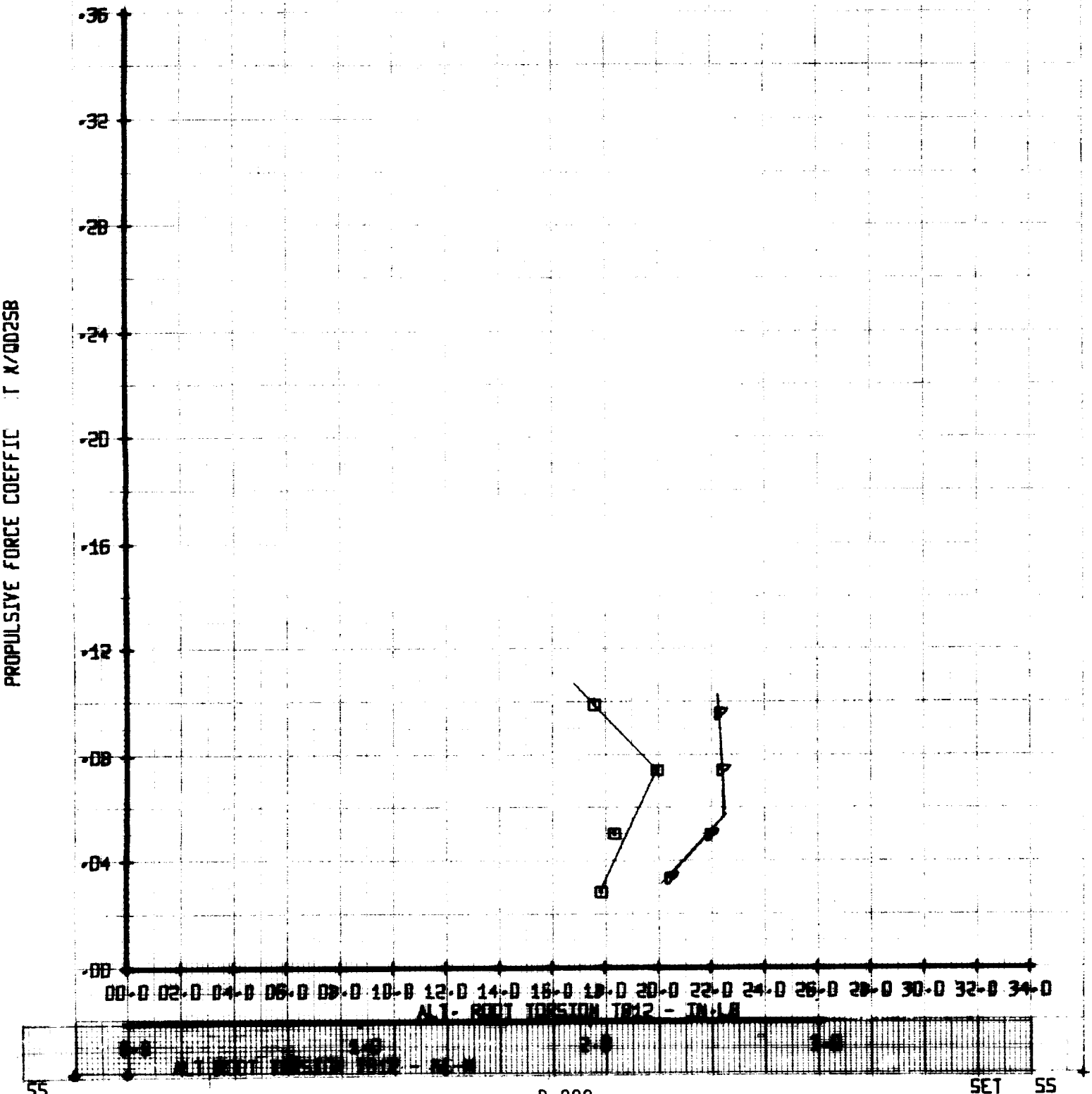
SET SS
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	276	.53	.06	352
⊽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT TORSION TB12



ET 55
WT 193

SET 55
BVWT 193

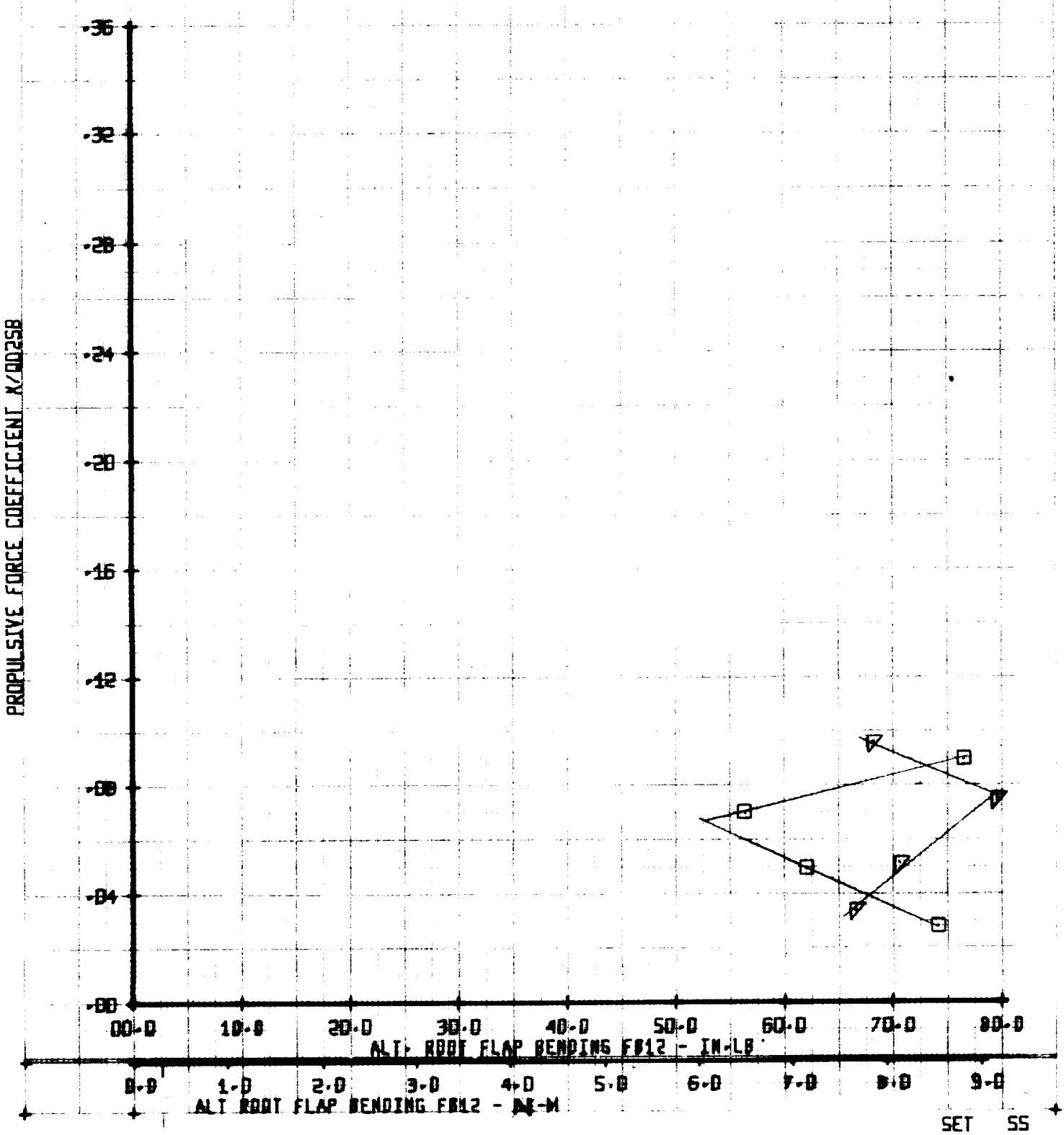
Figure B-219

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	VTUN
⊡	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING ROOT FLAP BENDING FB12



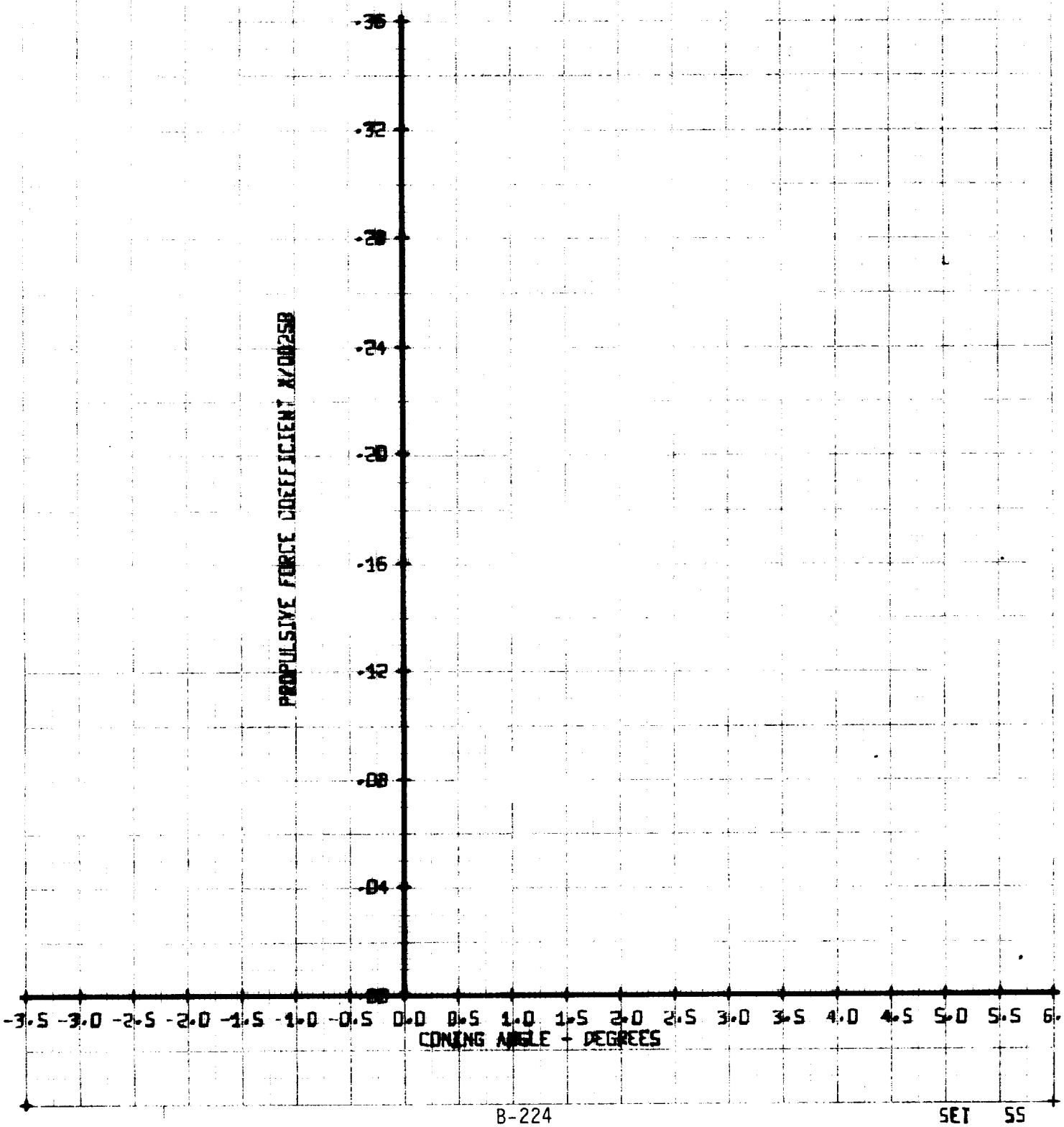
ET 55
WT 193

SET 55
BVWT 193

LEFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND				
SYM	RUN	MU'	CT'/SB	YTUN
⊡	276	.53	.06	352
⊡	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
CONING ANGLE



ET SS
WT 193

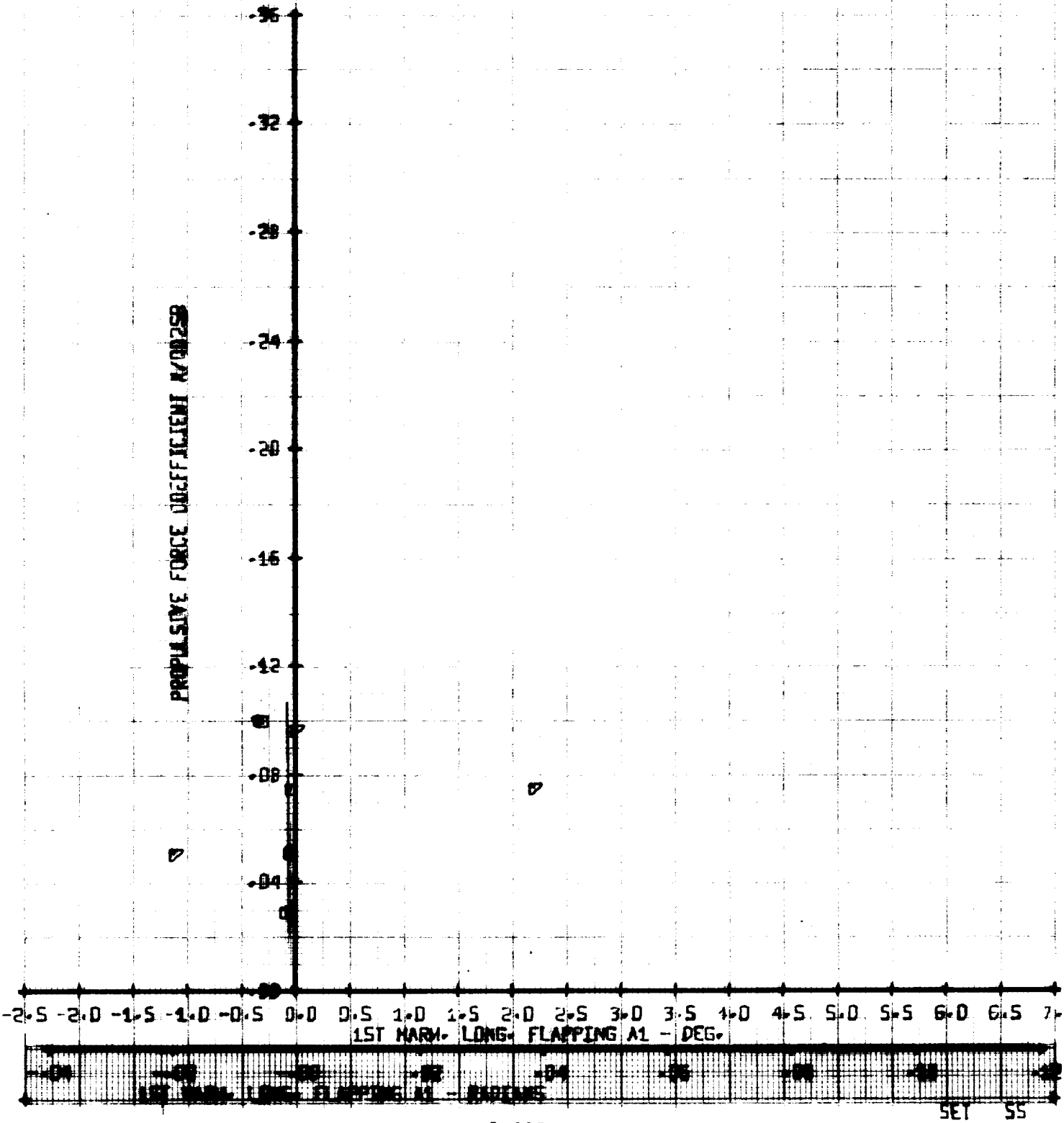
SET SS
BVWT 193

LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
◻	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LONGITUDINAL FLAPPING A1

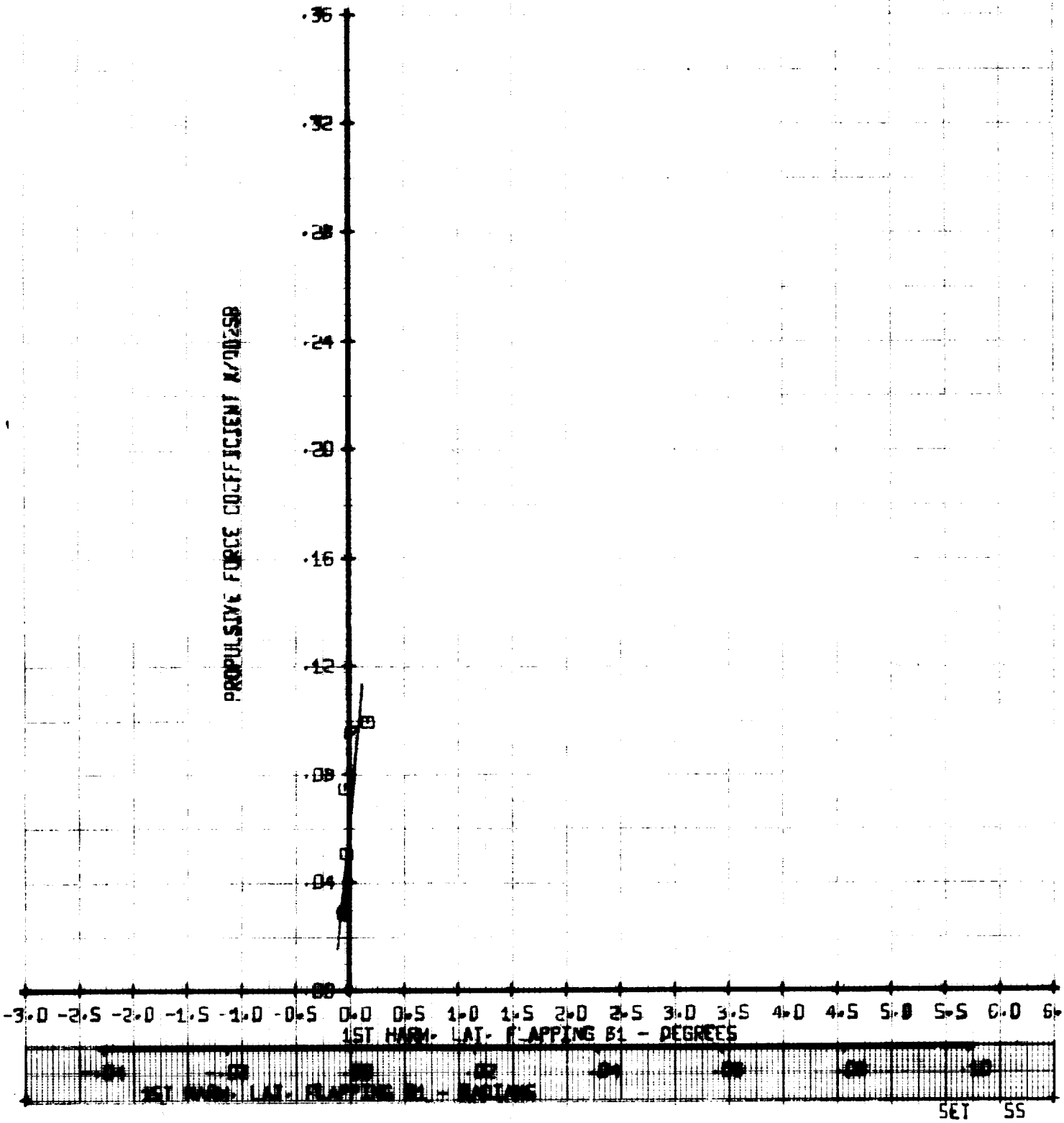


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU'	CT'/SB	YTUN
□	276	.53	.06	352
▽	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
1ST HARMONIC LATERAL FLAPPING B1

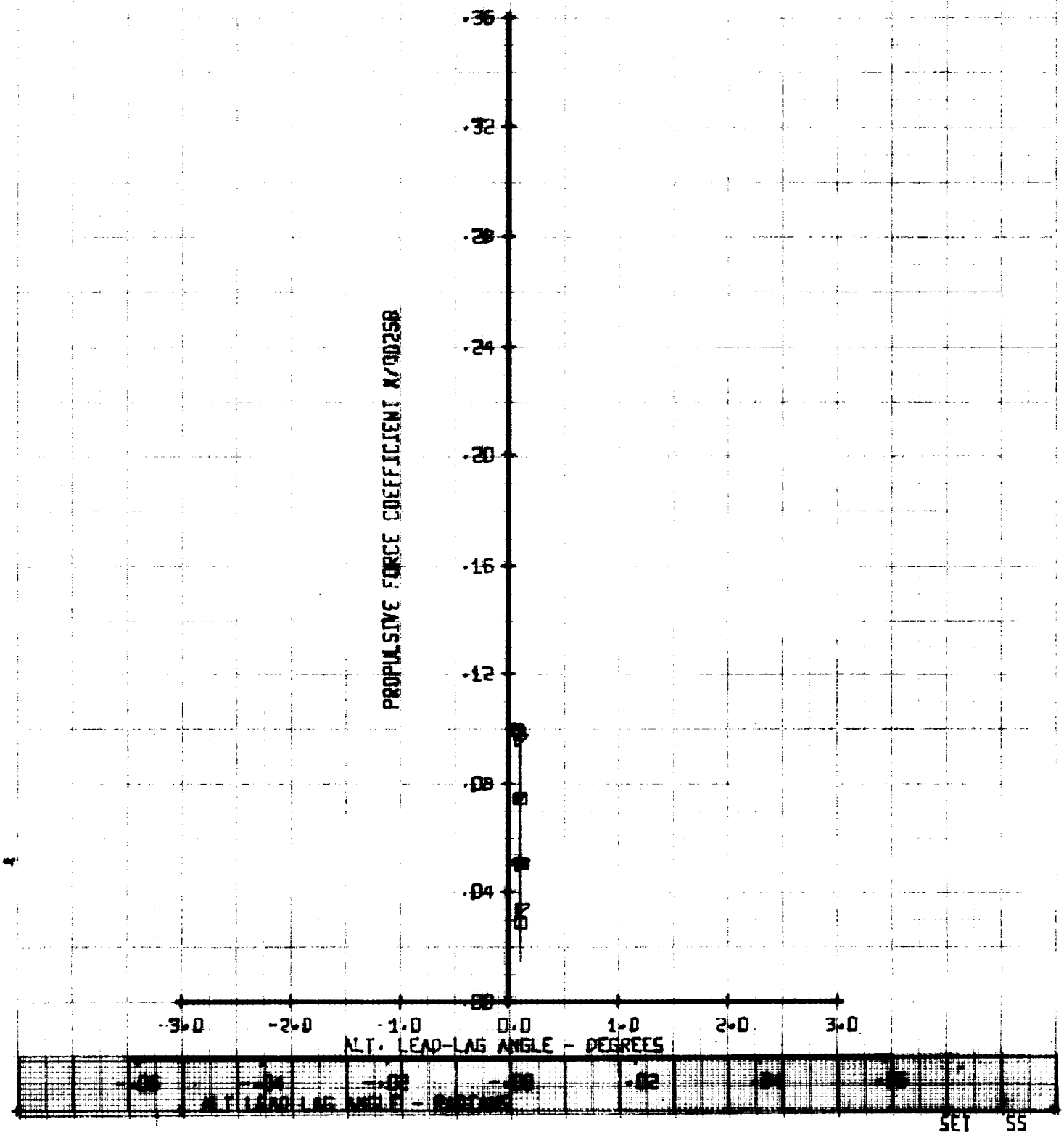


LIFT-PROPULSIVE FORCE LIMIT TEST
1/10 SCALE CH-47B ROTOR
PROPULSIVE FORCE LIMIT TESTING

LEGEND

SYM	RUN	MU	CT/SB	VTUN
⊡	276	.53	.06	352
⊙	277	.53	.08	352

PROPULSIVE FORCE COEFFICIENT
VERSUS
ALTERNATING LEAD-LAG ANGLE



ET 55
WT 193

SET 55
BVWT 193