

UNCLASSIFIED

AD NUMBER
ADB019637
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; JUL 1975. Other requests shall be referred to Air Force Armament Laboratory, ATTN: DLJC, Eglin AFB, FL 32542.
AUTHORITY
AFATL ltr dtd 31 Oct 1977

THIS PAGE IS UNCLASSIFIED

L

AD B019637

2



AFATL-TR-75-87, VOLUME II

**EXTERNAL STORE AIRLOADS
PREDICTION TECHNIQUE
VOLUME II. DETAILED DATA
BOOK 1. INITIAL AIRLOADS PREDICTION**

VOUGHT SYSTEMS DIVISION
LTV AEROSPACE CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

JULY 1975

DDC
RECEIVED
JUL 8 1975
D

FINAL REPORT: JANUARY 1973 - JUNE 1975

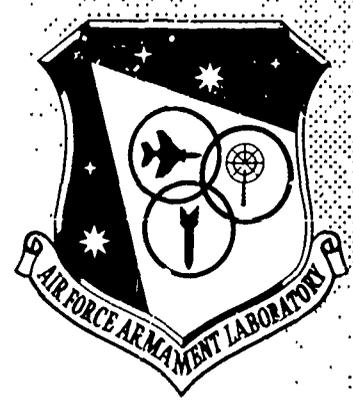
AD NO. _____
DDC FILE COPY

Distribution limited to U. S. Government agencies only; this report documents test and evaluation; distribution limitation applied July 1975. Other requests for this document must be referred to the Air Force Armament Laboratory (DLJC), Eglin Air Force Base, Florida 32542.

AIR FORCE ARMAMENT LABORATORY

AIR FORCE SYSTEMS COMMAND • UNITED STATES AIR FORCE

EGLIN AIR FORCE BASE, FLORIDA



19 REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER AFATL TR-75-87 - Volume II	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) EXTERNAL STORE AIRLOADS PREDICTION TECHNIQUE, Volume II. Detailed Data, Book 2.		5. TYPE OF REPORT & PERIOD COVERED Final Report, 8 Jan 1973-30 June 1975.	
7. AUTHOR(S) A. R. Rudnicki, Jr. E. G. Waggoner, Jr. C. T. Alexander R. D. Gallagher		6. PERFORMING ORG. REPORT NUMBER 2-57110/5R-3225-401-2-Bk-1	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Vought Systems Division LTV Aerospace Corporation PO Box 5907 Dallas, Texas		8. CONTRACT OR GRANT NUMBER(S) F08635-73-C-0070	
11. CONTROLLING OFFICE NAME AND ADDRESS Air Force Armament Laboratory Armament Development and Test Center Eglin Air Force Base, Florida 32542		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Project No. 165613 Task No. 1702 Work Unit No. 001	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE Jul 1975	
		13. NUMBER OF PAGES 1,209 121 p.	
		15. SECURITY CLASS. (of this report) Unclassified	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Distribution limited to U.S. Government agencies only; this report documents test and evaluation; distribution limitation applied July 1975. Other requests for this document must be referred to the Air Force Armament Laboratory (DLJC), Eglin Air Force Base, Florida 32542.			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES Available in DDC.			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Captive Store Airloads Predictions Single Store Carriage Multiple Store Carriage			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Presented is an empirical method to compute six-component captive store airloads for single and multiple carriage store configurations for an arbitrary aircraft. The method has the capability for computing the basic airload and the incremental airloads due to aircraft yaw and adjacent store interference. The single carriage method was developed for the Mach range 0.5 to 2.0 while the multiple carriage method is valid for the Mach range 0.5 to 1.6. Both single and multiple carriage methods were developed for the angle of attack range -4 to +12 degrees,			

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

20. (Concluded)

cont

and the aircraft yaw angle range $-8 + 8$ degrees. Comparisons between predicted and experimental data show generally good agreement. The report is presented in two volumes. Volume I is the technical summary report describing the program and approach used to develop the prediction technique. Volume II, the user's manual, consists of five books.



ADDITIONAL BY	
DDI	With Section <input type="checkbox"/>
DDC	With Section <input checked="" type="checkbox"/>
DDM	<input type="checkbox"/>
JUSTIFICATION	
BY	
DISTRIBUTION/AVAILABILITY CODES	
Dist.	AVAIL. CODE, or SPECIAL
B	

DDI
REC'D
JUL 10 1954
REC'D

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

SUMMARY

This report (Volume II) presents in handbook form a method to predict six-component captive store airloads for both single and multiple carriage configurations including the basic airload and the incremental airloads due to aircraft yaw and adjacent store interference.

The approach used to develop the prediction technique was an empirical correlation of a large experimentally derived data base and is discussed in detail in the technical summary report, Volume I of this document.

The handbook is organized as follows:

Initial Airloads Prediction-Section II	(Volume 2, Book 1)
Single Carriage-Section III	(Volume 2, Books 1-2)
MER Carriage-Section IV	(Volume 2, Books 3-5)
TER Carriage-Section V	(Volume 2, Book 5)
Other Configurations-Section VI	(Volume 2, Book 5)

Section II outlines the initial airloads prediction procedure for both single and multiple carriage configurations. Final captive store airloads predictions for single, MER, and TER configurations are presented in Sections III, IV, and V, respectively. Section VI contains recommendations for applying the results contained in this handbook to configurations for which the prediction methods do not directly apply and to configurations that may arise in the future due to new carriage rack designs.

The ranges of Mach numbers, angles of attack, and aircraft yaw angles over which the method is applicable are as follows.

	<u>Mach number</u>	<u>α, degrees</u>	<u>ψ, degrees</u>
Single Carriage	0.5 - 2.0	-4/12	-8/8
Multiple Carriage	0.5 - 1.6	-4/12	-8/8

PREFACE

This report was prepared under the sponsorship of the Air Force Armament Laboratory, Armament Development and Test Center, Eglin Air Force Base, Florida, under Contract Number F08635-73-C-0070 (Project No. FY7621-72-2G001). The cognizant Air Force technical monitors on the program were Messrs. Robert A. Hume Jr. and Charlie D. Turner, Jr. The work was performed by Vought Systems Division of LTV Aerospace Corporation, P. O. Box 5907, Dallas, Texas 75222. Principal investigator for this program was R. D. Callaher. Principal technical personnel were: A. R. Rudnicki, Jr, E. G. Waggoner, Jr., and C. T. Alexander. This effort was conducted during the periods from 8 January 1973 to 30 June 1975.

This report consists of two volumes. Volume I, the technical summary, describes the program and approach used to develop the prediction technique. Volume II, the user's manual, consists of five books. This is Volume II.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER


WILLIAM F. BROCKMAN, Colonel, USAF
Chief, Munitions Division

TABLE OF CONTENTS

Section	Title	Page
I.	INTRODUCTION	1
II.	INITIAL AIRLOADS PREDICTION	8
2.1	Aircraft Flow-Field Characteristics	10
2.2	Store Characteristics	14
2.2.1	Isolated Store Airloads Prediction	14
2.2.2	Store Planform Projected Area	16
2.3	Aircraft-Store Combination	21
2.3.1	Stores Airloads Coordinate System	21
2.3.1.1	Single Carriage	21
2.3.1.2	Multiple Carriage	24
2.3.2	Force Calculation Procedure	27
2.3.2.1	Example Computation-Single Carriage	35
2.3.2.2	Example Computation-Multiple Carriage	37
2.3.3	Moment Calculation Procedure	41
2.3.3.1	Example Computation-Single Carriage	44
2.3.3.2	Example Computation-Multiple Carriage	46
III.	SINGLE CARRIAGE AIRLOAD PREDICTION	49
3.1	Side Force	50
3.1.1	Basic Airload	50
3.1.1.1	Slope Prediction	50
3.1.1.2	Slope Mach Number Correction	56
3.1.1.3	Intercept Prediction	69
3.1.1.4	Intercept Mach Number Correction	73
3.1.2	Increment-Aircraft Yaw	81
3.1.2.1	Slope Prediction	81
3.1.2.2	Intercept Prediction	87
3.1.3	Increment-Adjacent Store Interference	92
3.1.3.1	Slope Prediction	94
3.1.3.2	Intercept Prediction	97
3.2	Yawing Moment	102
3.2.1	Basic Airload	102
3.2.1.1	Slope Prediction	102
3.2.1.2	Slope Mach Number Correction	106
3.2.1.3	Intercept Prediction	115
3.2.1.4	Intercept Mach Number Correction	119
3.2.2	Increment-Aircraft Yaw	127
3.2.2.1	Slope Prediction	127
3.2.2.2	Slope Mach Number Correction	132
3.2.2.3	Intercept Prediction	144
3.2.2.4	Intercept Mach Number Correction	148

TABLE OF CONTENTS (CONTINUED)

Section	Title	Page
3.2.3	Increment-Adjacent Store Interference	158
3.2.3.1	Slope Prediction	158
3.2.3.2	Intercept Prediction	160
3.2.3.3	Intercept Mach Number Correction	163
3.3	Normal Force	174
3.3.1	Basic Airload	174
3.3.1.1	Slope Prediction	174
3.3.1.2	Slope Mach Number Correction	182
3.3.1.3	Intercept Prediction	188
3.3.1.4	Intercept Mach Number Correction	193
3.3.2	Increment-Aircraft Yaw	199
3.3.2.1	Slope Prediction	199
3.3.2.2	Slope Mach Number Correction	203
3.3.2.3	Intercept Prediction	218
3.3.2.4	Intercept Mach Number Correction	222
3.3.3	Increment-Adjacent Store Interference	237
3.3.3.1	Slope Prediction	237
3.3.3.2	Slope Mach Number Correction	239
3.3.3.3	Intercept Prediction	247
3.3.3.4	Intercept Mach Number Correction	249
3.4	Pitching Moment	257
3.4.1	Basic Airload	257
3.4.1.1	Slope Prediction	257
3.4.1.2	Slope Mach Number Correction	262
3.4.1.3	Intercept Prediction	271
3.4.1.4	Intercept Mach Number Correction	274
3.4.2	Increment-Aircraft Yaw	283
3.4.2.1	Slope Prediction	283
3.4.2.2	Slope Mach Number Correction	288
3.4.2.3	Intercept Prediction	303
3.4.2.4	Intercept Mach Number Correction	307
3.4.3	Increment-Adjacent Store Interference	321
3.4.3.1	Slope Prediction	321
3.4.3.2	Slope Mach Number Correction	323
3.4.3.3	Intercept Prediction	331
3.4.3.4	Intercept Mach Number Correction	333
3.5	Axial Force	341
3.5.1	Basic Airload	341
3.5.1.1	Slope Prediction	341
3.5.1.2	Intercept Prediction	347
3.5.2	Increment-Aircraft Yaw	353
3.5.2.1	Slope Prediction	353
3.5.2.2	Intercept Prediction	356
3.5.3	Increment-Adjacent Store Interference	358
3.5.3.1	Slope Prediction	358
3.5.3.2	Intercept Prediction	358

TABLE OF CONTENTS (CONTINUED)

Section	Title	Page
3.6	Rolling Moment	365
3.6.1	Basic Airload	365
3.6.1.1	Slope Prediction	365
3.6.1.2	Intercept Prediction	369
3.6.2	Increment-Aircraft Yaw	375
3.6.2.1	Slope Prediction	375
3.6.2.2	Intercept Prediction	375
3.6.3	Increment-Adjacent Store Interference	379
3.6.3.1	Slope Prediction	379
3.6.3.2	Intercept Prediction	379
IV. MER CARRIAGE AIRLOAD PREDICTION		385
4.1	Side Force	387
4.1.1	Basic Airload	387
4.1.1.1	Slope Prediction	387
4.1.1.2	Slope Mach Number Correction	396
4.1.1.3	Intercept Prediction	414
4.1.1.4	Intercept Mach Number Correction	421
4.1.2	Increment-Aircraft Yaw	449
4.1.2.1	Slope Prediction	449
4.1.2.2	Intercept Prediction	467
4.1.3	Increment-Adjacent Store Interference	484
4.1.3.1	Slope Prediction	484
4.1.3.2	Intercept Prediction	504
4.2	Yawing Moment	523
4.2.1	Basic Airload	523
4.2.1.1	Slope Prediction	523
4.2.1.2	Slope Mach Number Correction	532
4.2.1.3	Intercept Prediction	551
4.2.1.4	Intercept Mach Number Correction	558
4.2.2	Increment-Aircraft Yaw	574
4.2.2.1	Slope Prediction	574
4.2.2.2	Intercept Prediction	592
4.2.3	Increment-Adjacent Store Interference	608
4.2.3.1	Slope Prediction	608
4.2.3.2	Intercept Prediction	630
4.3	Normal Force	653
4.3.1	Basic Airload	653
4.3.1.1	Slope Prediction	653
4.3.1.2	Slope Mach Number Correction	663
4.3.1.3	Intercept Prediction	685
4.3.1.4	Intercept Mach Number Correction	695
4.3.2	Increment-Aircraft Yaw	721
4.3.2.1	Slope Prediction	721
4.3.2.2	Intercept Prediction	739
4.3.3	Increment-Adjacent Store Interference	755
4.3.3.1	Slope Prediction	755
4.3.3.2	Intercept Prediction	778

TABLE OF CONTENTS (CONCLUDED)

Section	Title	Page
4.4	Pitching Moment	800
4.4.1	Basic Airload	800
4.4.1.1	Slope Prediction	800
4.4.1.2	Slope Mach Number Correction	809
4.4.1.3	Intercept Prediction	825
4.4.1.4	Intercept Mach Number Correction	833
4.4.2	Increment-Aircraft Yaw	853
4.4.2.1	Slope Prediction	853
4.4.2.2	Intercept Prediction	871
4.4.3	Increment-Adjacent Store Interference	887
4.4.3.1	Slope Prediction	887
4.4.3.2	Intercept Prediction	908
4.5	Axial Force	929
4.5.1	Basic Airload	929
4.5.1.1	Slope Prediction	929
4.5.1.2	Intercept Prediction	936
4.5.2	Increment-Aircraft Yaw	944
4.5.3	Increment-Adjacent Store Interference	945
4.6	Rolling Moment	946
4.6.1	Basic Airload	946
4.6.1.1	Slope Prediction	946
4.6.1.2	Slope Mach Number Correction	953
4.6.1.3	Intercept Prediction	978
4.6.1.4	Intercept Mach Number Correction	986
4.6.2	Increment-Aircraft Yaw	1011
4.6.2.1	Slope Prediction	1012
4.6.2.2	Intercept Prediction	1031
4.6.3	Increment-Adjacent Store Interference	1050
4.6.3.1	Slope Prediction	1050
4.6.3.2	Intercept Prediction	1070
V.	TER CARRIAGE AIRLOAD PREDICTION	1089
5.1	Slope Prediction	1091
5.2	Intercept Prediction	1105
VI.	OTHER CONFIGURATIONS	1118
6.1	Single Carriage Fuselage Centerline Prediction	1118
6.2	Multiple Carriage Additional Configurations	1123
6.2.1	MER Downloads (Partially Loaded Racks)	1123
6.2.2	New Multiple Carriage Rack Designs	1124
	REFERENCE	1126
	GLOSSARY	1127
	LIST OF SYMBOLS	1128

LIST OF FIGURES

Figure	Title	Page
1	Captive Airloads Prediction Procedure	6
2	Flowchart for Captive Airloads Prediction	7
3	Flow Angularity Definitions for an Aircraft/Store Combination	11
4	Variation of α_l with α for a 45° Swept Wing	12
5	Variation of σ with α for a 45° Swept Wing	13
6	Area Segments for a Typical Store	18
7	Exposed Side Projected Area for a Multiply Carried M117 Store	20
8	Single Carriage Store Airloads Coordinate System	23
9	Multiple Carriage Store Airloads Coordinate System for Rack Centerline Stores	25
10	Multiple Carriage Store Airloads Coordinate System	26
11	Typical Store Immersed in Aircraft Flow-Field	34
12	Moment Arms for Initial Airloads Prediction	43
13	Side Force Slope - Spanwise Correction	52
14	Side Force Slope - Fuselage Interference Correction	53
15	Side Force Slope - $K_{L/C}$ Correction	54
16	Side Force Slope - Pylon Height Correction	55
17	Side Force Slope - Generalized Mach Number Variation	56
18	Side Force Slope - Mach Number Break Points	62
19	Side Force Slope - K_{SLOPE} for Mach Break 1	63
20	Side Force Slope - F_{INTC} for Mach Break 1	63

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
21	Side Force Slope - K_{SLOPE_2} Spanwise Correction	64
22	Side Force Slope - K_{SLOPE} for Mach Break 2	64
23	Side Force Slope - K_{INTC_2} Spanwise Corre.	65
24	Side Force Slope - K_{INTC} for Mach Break	65
25	Side Force Slope - K_{SLOPE_3} Spanwise Correction	66
26	Side Force Slope - K_{SLOPE} for Mach Break 3	66
27	Side Force Slope - K_{INTC_3} Spanwise Correction	67
28	Side Force Slope - K_{INTC} for Mach Break 3	67
29	Side Force Slope - K_{SLOPE} for Mach Break 4	68
30	Side Force Slope - K_{INTC} for Mach Break 4	68
31	Side Force Intercept - Variation with Adjusted Fin Span	71
32	Side Force Intercept - K_{SLOPE} Fuselage Interference Correction	71
33	Side Force Intercept - K_{SLOPE} Chordwise Position Correction	71
34	Side Force Intercept - Value at Adjusted Fin SFA =0	72
35	Side Force Intercept - K_{INTC} Fuselage Interference Correction	72
36	Side Force Intercept - K_{INTC} Chordwise Position Correction	72
37	Side Force Intercept - Generalized Mach Number Variation	73
38	Side Force Intercept - Mach Number Break Points	76
39	Side Force Intercept - K_{SLOPE} for Mach Break 1	77

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
40	Side Force Intercept - K_{INTC} for Mach Break 1	77
41	Side Force Intercept - K_{SLOPE} for Mach Break 2	78
42	Side Force Intercept - K_{SLOPE} Fuselage Interference Correction	78
43	Side Force Intercept - K_{INTC} for Mach Break 2	79
44	Side Force Intercept - K_{INTC} Fuselage Interference Correction	79
45	Side Force Intercept - K_{SLOPE} for Mach Break 3	80
46	Side Force Intercept - K_{INTC} for Mach Break 3	80
47	Incremental Side Force Slope Due to Yaw - Variation with Adjusted SPA	84
48	Incremental Side Force Slope Due to Yaw - K_{SLOPE} Correction for Fuselage Interference	85
49	Incremental Side Force Slope Due to Yaw - Chordwise Correction	86
50	Incremental Side Force Slope Due to Yaw - K_{SLOPE} Chordwise Position Correction	86
51	Incremental Side Force Intercept Due to Yaw - Variation with Adjusted Nose SPA	89
52	Incremental Side Force Intercept Due to Yaw - Value at Adjusted nose SPA = 0	90
53	Incremental Side Force Intercept Due to Yaw - K_{INTC} Fuselage Interference Correction	91
54	Incremental Side Force Slope Due to Interference - Pictorial Description of Geometric Relations	93
55	Incremental Side Force Slope Due to Interference - K_{SLOPE_1} for Inboard and Outboard Interference	96
56	Incremental Side Force Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Interference	99

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
57	Incremental Side Force Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Interference	100
58	Incremental Side Force Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Interference	101
59	Yawing Moment Slope - Value at $C_{LOCAL} K_{A_1} = 0$	105
60	Yawing Moment Slope - K_{INTC} Fuselage Interference Correction	105
61	Yawing Moment Slope - Generalized Mach Number Variation	106
62	Yawing Moment Slope - Mach Number Break Points	110
63	Yawing Moment Slope - K_{SLOPE} for Mach Break 1	111
64	Yawing Moment Slope - K_{INTC} for Mach Break 1	111
65	Yawing Moment Slope - K_{SLOPE} for Mach Break 2	112
66	Yawing Moment Slope - K_{INTC} for Mach Break 2	112
67	Yawing Moment Slope - K_{SLOPE} for Mach Break 3	113
68	Yawing Moment Slope - K_{INTC} for Mach Break 3	113
69	Yawing Moment Slope - K_{SLOPE} for Mach Break 4	114
70	Yawing Moment Slope - K_{INTC} for Mach Break 4	114
71	Yawing Moment Intercept - Variation with α_{LE}	117
72	Yawing Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction	117
73	Yawing Moment Intercept - Value at $\alpha_{LE} = 0$	118
74	Yawing Moment Intercept - K_{INTC_1} Fuselage Interference Correction	118
75	Yawing Moment Intercept - Generalized Mach Number Variation	119

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
76	Yawing Moment Intercept - Mach Number Break Points	122
77	Yawing Moment Intercept - K_{SLOPE} for Mach Break 1	123
78	Yawing Moment Intercept - K_{INTC} for Mach Break 1	123
79	Yawing Moment Intercept - K_{SLOPE} for Mach Break 2	124
80	Yawing Moment Intercept - K_{SLOPE_2} Fuselage Interference Correction	124
81	Yawing Moment Intercept - K_{INTC} for Mach Break 2	125
82	Yawing Moment Intercept - K_{INTC_2} Fuselage Interference Correction	125
83	Yawing Moment Intercept - K_{SLOPE} for Mach Break 3	126
84	Yawing Moment Intercept - K_{INTC} for Mach Break 3	126
85	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE} for Positive and Negative Store Yaw	130
86	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	130
87	Incremental Yawing Moment Slope Due to Yaw - K_{INTC} for Positive and Negative Store Yaw	131
88	Incremental Yawing Moment Slope Due to Yaw - K_{INTC_1} Fuselage Interference Correction	131
89	Incremental Yawing Moment Slope Due to Yaw - Generalized Mach Number Variation	132
90	Incremental Yawing Moment Slope Due to Yaw - Mach Number Break Points for Positive Store Yaw	138
91	Incremental Yawing Moment Slope Due to Yaw - Mach Number Break Points for Negative Store Yaw	139
92	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 1	140
93	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	140

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
94	Incremental Yawing Moment Slope Due to Yaw - K_{INTC} for Mach Break 1	141
95	Incremental Yawing Moment Slope Due to Yaw - K_{INTC_1} Fuselage Interference Correction	141
96	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 2	142
97	Incremental Yawing Moment Slope Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	142
98	Incremental Yawing Moment Slope Due to Yaw - K_{INTC} for Mach Break 2	143
99	Incremental Yawing Moment Slope Due to Yaw - K_{INTC_2} Fuselage Interference Correction	143
100	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	146
101	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	146
102	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC_1} for Positive and Negative Store Yaw	147
103	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction	147
104	Incremental Yawing Moment Intercept Due to Yaw - Generalized Mach Number Variation	148
105	Incremental Yawing Moment Intercept Due to Yaw - Mach Number Break Points for Positive Store Yaw	152
106	Incremental Yawing Moment Intercept Due to Yaw - Mach Number Break Points for Negative Store Yaw	153
107	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE} for Mach Break 1	154
108	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	154
109	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC} for Mach Break 1	155

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
110	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction	155
111	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE_1} for Mach Break	156
112	Incremental Yawing Moment Intercept Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	156
113	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC} for Mach Break	157
114	Incremental Yawing Moment Intercept Due to Yaw - K_{INTC_2} Fuselage Interference Correction	157
115	Incremental Yawing Moment Slope Due to Interference - K_{SLOPE_1} for Inboard and Outboard Interference	159
116	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_1} for Inboard and Outboard Adjacent Store Interference	162
117	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_1} Spanwise Correction	162
118	Incremental Yawing Moment Intercept Due to Interference - Generalized Mach Number Variation	163
119	Incremental Yawing Moment Intercept Due to Interference - Mach Number Break Points for Inboard Interference	168
120	Incremental Yawing Moment Intercept Due to Interference - Mach Number Break Points for Outboard Interference	169
121	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Interference	170
122	Incremental Yawing Moment Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Interference	170
123	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_3} for Inboard and Outboard Interference	171

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
124	Incremental Yawing Moment Intercept Due to Interference - K_{INTC} for Inboard and Outboard Interference 3	171
125	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_5} for Inboard and Outboard Interference 5	172
126	Incremental Yawing Moment Intercept Due to Interference - K_{INTC} for Inboard and Outboard Interference 5	172
127	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_6} for Inboard and Outboard Interference 6	173
128	Incremental Yawing Moment Intercept Due to Interference - K_{INTC} for Inboard and Outboard Interference 6	173
129	Normal Force Slope - K_{SLOPE_1} for Mach Number 0.5	177
130	Normal Force Slope - K_{INTC_1} for Mach Number 0.5	178
131	Normal Force Slope - $K_{L/C}$ Correction	179
132	Normal Force Slope - Fuselage Interference Correction . .	180
133	Normal Force Slope - Interference Correction	181
134	Normal Force Slope - Mach Index = 0 Variation	184
135	Normal Force Slope - Spanwise Correction	185
136	Normal Force Slope - Incremental Coefficient at MI = 0.7.	186
137	Normal Force Slope - Mach Index Curve Shape Variation . .	187
138	Normal Force Intercept - Value at $l_{LE} = 0$	190
139	Normal Force Intercept - Pylon Height Correction	191
140	Normal Force Intercept - Chordwise Position Correction Factor	191
141	Normal Force Intercept - Chordwise Position Correction	192

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
142	Normal Force Intercept - Incremental Coefficient Variation	196
143	Normal Force Intercept - Store $L_{n/d}$ Correction	197
144	Normal Force Intercept - Store Fin Area Correction	197
145	Normal Force Intercept - Spanwise Correction	198
146	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} for Positive and Negative Store Yaw	201
147	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} Fuselage Interference Correction	201
148	Incremental Normal Force Slope Due to Yaw - K_{INTC} for Positive and Negative Store Yaw	202
149	Incremental Normal Force Slope Due to Yaw - K_{INTC} Fuselage Interference Correction	202
150	Incremental Normal Force Slope Due to Yaw - Generalized Mach Number Variation	203
151	Incremental Normal Force Slope Due to Yaw - Mach Number Break Points for Positive Store Yaw	208
152	Incremental Normal Force Slope Due to Yaw - Mach Number Break Points for Negative Store Yaw	209
153	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} for Mach Break 1	210
154	Incremental Normal Force Slope Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	210
155	Incremental Normal Force Slope Due to Yaw - K_{INTC} for Mach Break 1	211
156	Incremental Normal Force Slope Due to Yaw - K_{INTC_1} Fuselage Interference Correction	211
157	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} for Mach Break 2	212
158	Incremental Normal Force Slope Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	212

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
159	Incremental Normal Force Slope Due to Yaw - K_{INTC} for Mach Break 2	213
160	Incremental Normal Force Slope Due to Yaw - K_{INTC_2} Fuselage Interference Correction	213
161	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} for Mach Break 3	214
162	Incremental Normal Force Slope Due to Yaw - K_{SLOPE_3} Fuselage Interference Correction	214
163	Incremental Normal Force Slope Due to Yaw - K_{INTC} for Mach Break 3	215
164	Incremental Normal Force Slope Due to Yaw - K_{INTC_3} Fuselage Interference Correction	215
165	Incremental Normal Force Slope Due to Yaw - K_{SLOPE} for Mach Break 4	216
166	Incremental Normal Force Slope Due to Yaw - K_{SLOPE_4} Fuselage Interference Correction	216
167	Incremental Normal Force Slope Due to Yaw - K_{INTC} for Mach Break 4	217
168	Incremental Normal Force Slope Due to Yaw - K_{INTC_4} Fuselage Interference Correction	217
169	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	220
170	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_1} Spanwise Position Correction	220
171	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	220
172	Incremental Normal Force Intercept Due to Yaw - K_{INTC_1} for Positive and Negative Store Yaw	221
173	Incremental Normal Force Intercept Due to Yaw - K_{INTC_1} Spanwise Position Correction	221
174	Incremental Normal Force Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction	221

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
175	Incremental Normal Force Intercept Due to Yaw - Generalized Mach Number Variation.	222
176	Incremental Normal Force Intercept Due to Yaw - Mach Number Break Points for Positive Store Yaw	227
177	Incremental Normal Force Intercept Due to Yaw - Mach Number Break Points for Negative Store Yaw	228
178	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE} for Mach Break 1	229
179	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	229
180	Incremental Normal Force Intercept Due to Yaw - K_{INTC} for Mach Break 1	230
181	Incremental Normal Force Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction.	230
182	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE} for Mach Break 2	231
183	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	231
184	Incremental Normal Force Intercept Due to Yaw - K_{INTC} for Mach Break 2	232
185	Incremental Normal Force Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction.	232
186	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE} for Mach Break 3.	233
187	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_3} Fuselage Interference Correction	233
188	Incremental Normal Force Intercept Due to Yaw - K_{INTC} for Mach Break 3	234
189	Incremental Normal Force Intercept Due to Yaw - K_{INTC_3} Fuselage Interference Correction	234

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
190	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE} for Mach Break 4	235
191	Incremental Normal Force Intercept Due to Yaw - K_{SLOPE_4} Fuselage Interference Correction	235
192	Incremental Normal Force Intercept Due to Yaw - K_{INTC} for Mach Break 4	236
193	Incremental Normal Force Intercept Due to Yaw - K_{INTC_4} Fuselage Interference Correction	236
194	Incremental Normal Force Slope Due to Interference - K_{SLOPE_2} for Inboard and Outboard Interference $M=0.5$	238
195	Incremental Normal Force Slope Due to Interference - K_{INTC_2} for Inboard and Outboard Interference $M=0.5$	238
196	Incremental Normal Force Slope Due to Interference - Generalized Mach Number Variation	239
197	Incremental Normal Force Slope Due to Interference - Mach Number Break Points for Inboard and Outboard Interference	243
198	Incremental Normal Force Slope Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference	244
199	Incremental Normal Force Slope Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference	244
200	Incremental Normal Force Slope Due to Interference - K_{SLOPE_4} for Inboard and Outboard Adjacent Store Interference	245
201	Incremental Normal Force Slope Due to Interference - K_{INTC_4} for Inboard and Outboard Adjacent Store Interference	245
202	Incremental Normal Force Slope Due to Interference - K_{SLOPE_6} for Inboard and Outboard Adjacent Store Interference	246

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
203	Incremental Normal Force Slope Due to Interference - K_{INTC_6} for Inboard and Outboard Adjacent Store Interference	246
204	Incremental Normal Force Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference $M=0.5$	248
205	Incremental Normal Force Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference $M=0.5$	248
206	Incremental Normal Force Intercept Due to Interference - Generalized Mach Number Variation	249
207	Incremental Normal Force Intercept Due to Interference - Mach Number Break Points for Inboard and Outboard Interference	253
208	Incremental Normal Force Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference	254
209	Incremental Normal Force Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference	254
210	Incremental Normal Force Intercept Due to Interference - K_{SLOPE_4} for Inboard and Outboard Adjacent Store Interference	255
211	Incremental Normal Force Intercept Due to Interference - K_{INTC_4} for Inboard and Outboard Adjacent Store Interference	255
212	Incremental Normal Force Intercept Due to Interference - K_{SLOPE_6} for Inboard and Outboard Adjacent Store Interference	256
213	Incremental Normal Force Intercept Due to Interference - K_{INTC_6} for Inboard and Outboard Adjacent Store Interference	256

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
214	Pitching Moment Slope - K_{INTC_1} for Buoyancy Correction .	260
215	Pitching Moment Slope - Interference Correction	261
216	Pitching Moment Slope - Generalized Mach Number Variation	262
217	Pitching Moment Slope - Mach Number Break Points	266
218	Pitching Moment Slope - K_{SLOPE} for Mach Break 1	267
219	Pitching Moment Slope - K_{INTC} for Mach Break 1	267
220	Pitching Moment Slope - K_{INTC_1} Intercept Correction	268
221	Pitching Moment Slope - K_{SLOPE} for Mach Break 2	269
222	Pitching Moment Slope - K_{INTC} for Mach Break 2	269
223	Pitching Moment Slope - K_{SLOPE} for Mach Break 3	270
224	Pitching Moment Slope - K_{INTC} for Mach Break 3	270
225	Pitching Moment Intercept - Variation with l_{LE}	273
226	Pitching Moment Intercept - Value at $l_{LE} = 0$	273
227	Pitching Moment Intercept - Mach Number Break Points	278
228	Pitching Moment Intercept - K_{SLOPE} for Mach Break 1	279
229	Pitching Moment Intercept - K_{INTC} for Mach Break 1	279
230	Pitching Moment Intercept - K_{SLOPE} for Mach Break 2	280
231	Pitching Moment Intercept - K_{INTC} for Mach Break 2	280
232	Pitching Moment Intercept - K_{INTC} Spanwise Correction Factor	280
233	Pitching Moment Intercept - K_{SLOPE} for Mach Break 3	281
234	Pitching Moment Intercept - K_{INTC} for Mach Break 3	281
235	Pitching Moment Intercept - K_{SLOPE} for Mach Break 4	282

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
236	Pitching Moment Intercept - K_{INTC} for Mach Break 4 . . .	282
237	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	286
238	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	286
239	Incremental Pitching Moment Slope Due to Yaw - K_{INTC} for Positive and Negative Store Yaw	287
240	Incremental Pitching Moment Slope Due to Yaw - K_{INTC_1} Fuselage Interference Correction	287
241	Incremental Pitching Moment Slope Due to Yaw - Generalized Mach Number Variation	288
242	Incremental Pitching Moment Slope Due to Yaw - Mach Number Break Points for Positive and Negative Store Yaw	294
243	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 1	295
244	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	295
245	Incremental Pitching Moment Slope Due to Yaw - K_{INTC} for Mach Break 1	296
246	Incremental Pitching Moment Slope Due to Yaw - K_{INTC_1} Fuselage Interference Correction	296
247	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 2	297
248	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	297
249	Incremental Pitching Moment Slope Due to Yaw - K_{INTC} for Mach Break 2	298
250	Incremental Pitching Moment Slope Due to Yaw - K_{INTC_2} Fuselage Interference Correction	298

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
251	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 3	299
252	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_3} Fuselage Interference Correction	299
253	Incremental Pitching Moment Slope Due to Yaw - K_{INTC} for Mach Break 3	300
254	Incremental Pitching Moment Slope Due to Yaw - K_{INTC_3} Fuselage Interference Correction	300
255	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE} for Mach Break 4	301
256	Incremental Pitching Moment Slope Due to Yaw - K_{SLOPE_4} Fuselage Interference Correction	301
257	Incremental Pitching Moment Slope Due to Yaw - K_{INTC} for Mach Break 4	302
258	Incremental Pitching Moment Slope Due to Yaw - K_{INTC_4} Fuselage Interference Correction	302
259	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	305
260	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_1} for Fuselage Interference Correction	305
261	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_1} for Positive and Negative Store Yaw	306
262	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_1} Fuselage Interference Correction	306
263	Incremental Pitching Moment Intercept Due to Yaw - Generalized Mach Number Variation	307
264	Incremental Pitching Moment Intercept Due to Yaw - Mach Number Break Points for Positive and Negative Store Yaw	312
265	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE} for Mach Break 1	313

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
266	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction	313
267	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC} for Mach Break 1	314
268	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_1} for Fuselage Interference Correction	314
269	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE} for Mach Break 2	315
270	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_2} Fuselage Interference Correction	315
271	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC} for Mach Break 2	316
272	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_2} Fuselage Interference Correction	316
273	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE} for Mach Break 3	317
274	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_3} Fuselage Interference Correction	317
275	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC} for Mach Break 3	318
276	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_3} Fuselage Interference Correction	318
277	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC} for Mach Break 4	319
278	Incremental Pitching Moment Intercept Due to Yaw - K_{SLOPE_4} Fuselage Interference Correction	319
279	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC} for Mach Break 4	320
280	Incremental Pitching Moment Intercept Due to Yaw - K_{INTC_4} Fuselage Interference Correction	320
281	Incremental Pitching Moment Slope Due to Interference - K_{SLOPE_2} for Inboard and Outboard Interference $M=0.5$. . .	322

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
282	Incremental Pitching Moment Slope Due to Interference - K_{INTC_2} for Inboard and Outboard Interference $M=0.5$	322
283	Incremental Pitching Moment Slope Due to Interference - Generalized Mach Number Variation	323
284	Incremental Pitching Moment Slope Due to Interference - Mach Number Break Points for Inboard and Outboard Interference.	327
285	Incremental Pitching Moment Slope Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference.	328
286	Incremental Pitching Moment Slope Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference.	328
287	Incremental Pitching Moment Slope Due to Interference - K_{SLOPE_4} for Inboard and Outboard Adjacent Store Interference.	329
288	Incremental Pitching Moment Slope Due to Interference - K_{INTC_4} for Inboard and Outboard Adjacent Store Interference.	329
289	Incremental Pitching Moment Slope Due to Interference - K_{SLOPE_6} for Inboard and Outboard Adjacent Store Interference	330
290	Incremental Pitching Moment Slope Due to Interference - K_{INTC_6} for Inboard and Outboard Adjacent Store Interference.	330
291	Incremental Pitching Moment Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference $M=0.5$	332
292	Incremental Pitching Moment Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference $M=0.5$	332

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
293	Incremental Pitching Moment Intercept Due to Interference - Generalized Mach Number Variation.	333
294	Incremental Pitching Moment Intercept Due to Interference - Mach Number Break Points for Inboard and Outboard Interference	337
295	Incremental Pitching Moment Intercept Due to Interference - K_{SLOPE_2} for Inboard and Outboard Adjacent Store Interference	338
296	Incremental Pitching Moment Intercept Due to Interference - K_{INTC_2} for Inboard and Outboard Adjacent Store Interference	338
297	Incremental Pitching Moment Intercept Due to Interference - K_{SLOPE_4} for Inboard and Outboard Adjacent Store Interference	339
298	Incremental Pitching Moment Intercept Due to Interference - K_{INTC_4} for Inboard and Outboard Adjacent Store Interference	339
299	Incremental Pitching Moment Intercept Due to Interference - K_{SLOPE_6} for Inboard and Outboard Adjacent Store Interference	340
300	Incremental Pitching Moment Intercept Due to Interference - K_{INTC_6} for Inboard and Outboard Adjacent Store Interference	340
301	Axial Force Slope - Variation of Installed C_{A_α}	343
302	Axial Force Slope - Spanwise Correction $\eta=0$ to .4	344
303	Axial Force Slope - Spanwise Correction $\eta=.4$ to .8.	345
304	Axial Force Slope - Fuselage Interference Correction.	346
305	Axial Force Intercept - Incremental $C_{A_{\alpha=0}}$ Due to Installation.	349
306	Axial Force Intercept - Spanwise Correction $\eta=.2$ to .5.	350

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
307	Axial Force Intercept - Spanwise Correction $\eta=.4$ to $.7$	351
308	Axial Force Intercept - Fuselage Interference Correction.	352
309	Incremental Axial Force Slope Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	355
310	Incremental Axial Force Intercept Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	357
311	Incremental Axial Force Intercept Due to Interference - K_{SLOPE_1} for Inboard and Outboard Adjacent Store Interference.	361
312	Incremental Axial Force Intercept Due to Interference - K_{SLOPE_1} Spanwise Correction for Inboard and Outboard Adjacent Store Interference	362
313	Incremental Axial Force Intercept Due to Interference - K_{INTC_1} for Inboard and Outboard Adjacent Store Interference.	363
314	Incremental Axial Force Intercept Due to Interference - K_{INTC_1} Spanwise Correction for Inboard and Outboard Interference.	364
315	Incremental Axial Force Intercept Due to Interference - Correction for Inboard and Outboard Interference.	364
316	Symmetric and Unsymmetric Store Fin Configurations.	365
317	Rolling Moment Slope - K_{SLOPE_1} for Symmetric and Unsymmetric stores.	367
318	Rolling Moment Slope - K_{SLOPE_1} Fuselage Interference Correction.	368
319	Rolling Moment Intercept - Variation with FIN AREA $M=.5$ and $M=.7$	368
320	Rolling Moment Intercept - Variation with FIN AREA $M=.9$ and $M=1.05$	371

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
321	Rolling Moment Intercept - Variation with FIN AREA M=1.2 and M=1.6	372
322	Rolling Moment Intercept - Variation with FIN AREA M=2.0	373
323	Rolling Moment Intercept - Spanwise Correction.	374
324	Incremental Rolling Moment Intercept Due to Yaw - K_{SLOPE_1} for Positive and Negative Store Yaw	377
325	Incremental Rolling Moment Intercept Due to Yaw - K_{SLOPE_1} Fuselage Interference Correction.	378
326	Incremental Rolling Moment Intercept Due to Interference - K_{SLOPE_1} for Inboard and Outboard Adjacent Store Interference	381
327	Incremental Rolling Moment Intercept Due to Interference - K_{SLOPE_1} Store Diameter Correction.	382
328	Incremental Rolling Moment Intercept Due to Interference - K_{SLOPE_1} Spanwise Correction.	383
329	Incremental Rolling Moment Intercept Due to Interference - K_{SLOPE_1} Interference Correction.	384
330	Side Force Slope - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	391
331	Side Force Slope - Spanwise Correction for MER Stations 1 and 2	392
332	Side Force Slope - Chordwise Position Correction for MER Station 1	393
333	Side Force Slope - Pylon Height Correction for MER Station 1	393
334	Side Force Slope - Incremental Coefficient for MER Stations 3 and 4	394
335	Side Force Slope - Incremental Coefficient for MER Stations 5 and 6	395
336	Side Force Slope - Generalized Mach Number Variation.	397

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
337	Side Force Slope - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 3-6.	403
338	Side Force Slope - Mach Number Break Points for MER Stations 1 and 2	404
339	Side Force Slope - Mach Number Break Points for MER Stations 4 and 6	405
340	Side Force Slope - Mach Number Break Points for MER Stations 3 and 5	406
341	Side Force Slope - K_{SLOPE_1} for MER Stations 1 and 2 . . .	407
342	Side Force Slope - K_{SLOPE_1} Fuselage Interference Correction for MER Stations 2,4 and 6	408
343	Side Force Slope - K_{SLOPE_1} for MER Stations 4 and 6 . . .	409
344	Side Force Slope - Incremental Coefficient at Mach Break 1 for MER Stations 3 and 5	410
345	Side Force Slope K_{SLOPE_2} for MER Stations 1 and 2	411
346	Side Force Slope K_{SLOPE_2} for MER Stations 4 and 6	412
347	Side Force Slope - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	413
348	Side Force Intercept - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	418
349	Side Force Intercept - Incremental Coefficient for Wing Mounted Stores, MER Stations 1 and 2	419
350	Side Force Intercept - Incremental Coefficient for Wing Mounted Stores, MER Stations 3-6.	420
351	Side Force Intercept - Generalized Mach Number Variation	422
352	Side Force Intercept - Incremental Coefficient for Fuselage Centerline Mounted Stores, MER Stations 3-6. . .	430
353	Side Force Intercept - Mach Number Break Points for MER Stations 1 and 2	431

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
354	Side Force Intercept - Mach Number Break Points for MER Stations 4 and 6	432
355	Side Force Intercept - Mach Number Break Points for MER Stations 3 and 5	433
356	Side Force Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 1 and 2	434
357	Side Force Intercept - Chordwise Position Correction at Mach Break 1 for MER Station 1	435
358	Side Force Intercept - Fuselage Interference Correction at Mach Break 1 for MER Station 1.	435
359	Side Force Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 3 and 5	436
360	Side Force Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 4 and 6	437
361	Side Force Intercept - Fuselage Interference Correction at Mach Break 1 for MER Station 6.	438
362	Side Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 1 and 2	439
363	Side Force Intercept - Chordwise Position Correction at Mach Break 2 for MER Stations 1 and 2	440
364	Side Force Intercept - Fuselage Interference Correction at Mach Break 2 for MER Stations 1 and 2	440
365	Side Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	441
366	Side Force Intercept - Chordwise Position Correction at Mach Break 2 for MER Stations 3 and 5	442
367	Side Force Intercept - Fuselage Interference Correction at Mach Break 2 for MER Stations 3 and 5	442
368	Side Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 4 and 6	443
369	Side Force Intercept - Incremental Coefficient at Mach Break 3 for MER Station 2.	444

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
370	Side Force Intercept - Chordwise Position Correction at Mach Break 3 for MER Station 2	445
371	Side Force Intercept - Fuselage Interference Correction at Mach Break 3 for MER Station 2.	445
372	Side Force Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 4 and 6	446
373	Side Force Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 3 and 5	447
374	Side Force Intercept - Fuselage Interference Correction at Mach Break 3 for MER Stations 3 and 5	448
375	Incremental Side Force Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	453
376	Incremental Side Force Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	454
377	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	455
378	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	456
379	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5	457
380	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6	458
381	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	459
382	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6	460
383	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5	461
384	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6	462

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
385	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5	463
386	Incremental Side Force Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6	464
387	Incremental Side Force Slope Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	465
388	Incremental Side Force Slope Due to Yaw - Chordwise Correction Factor	466
389	Incremental Side Force Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	471
390	Incremental Side Force Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	472
391	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	473
392	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	474
393	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5	475
394	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6	476
395	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	477
396	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6	478
397	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5	479
398	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6	480
399	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5	481

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
400	Incremental Side Force Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6	482
401	Incremental Side Force Intercept Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	483
402	Incremental Side Force Slope Due to Interference - Adjacent Shoulder at M=0.7.	488
403	Incremental Side Force Slope Due to Interference - Adjacent Shoulder at M=0.9.	489
404	Incremental Side Force Slope Due to Interference - Adjacent Shoulder at M=1.05	490
405	Incremental Side Force Slope Due to Interference - Adjacent Shoulder at M=1.2.	491
406	Incremental Side Force Slope Due to Interference - Adjacent Shoulder at M=1.6.	492
407	Incremental Side Force Slope Due to Interference - Centerline Store at M=0.7	493
408	Incremental Side Force Slope Due to Interference - Centerline Store at M=0.9	494
409	Incremental Side Force Slope Due to Interference - Centerline Store at M=1.05.	495
410	Incremental Side Force Slope Due to Interference - Centerline Store at M=1.2	496
411	Incremental Side Force Slope Due to Interference - Centerline Store at M=1.6	497
412	Incremental Side Force Slope Due to Interference - Opposite Shoulder at M=0.7.	498
413	Incremental Side Force Slope Due to Interference - Opposite Shoulder at M=0.9.	499
414	Incremental Side Force Slope Due to Interference - Opposite Shoulder at M=1.05	500
415	Incremental Side Force Slope Due to Interference - Opposite Shoulder at M=1.2.	501

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
416	Incremental Side Force Slope Due to Interference - Opposite Shoulder at M=1.6.	502
417	Incremental Side Force Slope Due to Interference - K_{SLOPE} for combination Inboard and Outboard Interference.	503
418	Incremental Side Force Slope Due to Interference - K_{INTC} for Combination Inboard and Outboard Interference.	503
419	Incremental Side Force Intercept Due to Interference - Adjacent Shoulder at M=0.7.	507
420	Incremental Side Force Intercept Due to Interference - Adjacent Shoulder at M=0.9.	508
421	Incremental Side Force Intercept Due to Interference - Adjacent Shoulder at M=1.05	509
422	Incremental Side Force Intercept Due to Interference - Adjacent Shoulder at M=1.2	510
423	Incremental Side Force Intercept Due to Interference - Adjacent Shoulder at M=1.6	511
424	Incremental Side Force Intercept Due to Interference - Centerline Store at M=0.7	512
425	Incremental Side Force Intercept Due to Interference - Centerline Store at M=0.9	513
426	Incremental Side Force Intercept Due to Interference - Centerline Store at M=1.05	514
427	Incremental Side Force Intercept Due to Interference - Centerline Store at M=1.2	515
428	Incremental Side Force Intercept Due to Interference - Centerline Store at M=1.6	516
429	Incremental Side Force Intercept Due to Interference - Opposite Shoulder at M=0.7.	517
430	Incremental Side Force Intercept Due to Interference - Opposite Shoulder at M=0.9.	518

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
431	Incremental Side Force Intercept Due to Interference - Opposite Shoulder at M=1.05	519
432	Incremental Side Force Intercept Due to Interference - Opposite Shoulder at M=1.2.	520
433	Incremental Side Force Intercept Due to Interference - Opposite Shoulder at M=1.6.	521
434	Incremental Side Force Intercept Due to Interference - K_{SLOPE_2} for Combination Inboard and Outboard Interference.	522
435	Incremental Side Force Intercept Due to Interference - K_{INTC_2} for Combination Inboard and Outboard Interference.	522
436	Yawing Moment Slope - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	527
437	Yawing Moment Slope - Spanwise Correction for MER Stations 1 and 2	528
438	Yawing Moment Slope - Chordwise Position Correction for MER Station 2	529
439	Yawing Moment Slope - Pylon Height Correction for MER Station 1	529
440	Yawing Moment Slope - Incremental Coefficient for Wing Mounted Stores, MER Stations 3 and 5	530
441	Yawing Moment Slope - Incremental Coefficient for Wing Mounted Stores, MER Stations 4 and 6	531
442	Yawing Moment Slope - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 3-6.	537
443	Yawing Moment Slope - Mach Number Break Points for MER Stations 1 and 2	538
444	Yawing Moment Slope - Mach Number Break Points for MER Stations 4 and 6	539
445	Yawing Moment Slope - Mach Number Break Points for MER Stations 3 and 5	540

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
446	Yawing Moment Slope - K_{SLOPE_1} for MER Stations 1 and 2 .	541
447	Yawing Moment Slope - K_{SLOPE_1} for MER Stations 3 and 5 .	542
448	Yawing Moment Slope - K_{SLOPE_1} for MER Stations 4 and 6 .	543
449	Yawing Moment Slope - K_{SLOPE_2} for MER Stations 1 and 2 .	544
450	Yawing Moment Slope - K_{SLOPE_2} for MER Stations 3 and 5 .	545
451	Yawing Moment Slope - K_{SLOPE_2} for MER Stations 4 and 6 .	546
452	Yawing Moment Slope - K_{SLOPE_3} for MER Stations 1 and 2 .	547
453	Yawing Moment Slope - K_{SLOPE_3} for MER Stations 3 and 5 .	548
454	Yawing Moment Slope - K_{SLOPE_3} for MER Station 6	549
455	Yawing Moment Slope - Fuselage Interference Correction at Mach Break 3 for the Aft Cluster.	550
456	Yawing Moment Intercept - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	554
457	Yawing Moment Intercept - Incremental Coefficient for Wing Mounted Stores, MER Stations 1 and 2	555
458	Yawing Moment Intercept - Incremental Coefficient for Wing Mounted Stores, MER Stations 3 and 5	556
459	Yawing Moment Intercept - Incremental Coefficient for Wing Mounted Stores, MER Stations 4 and 6	557
460	Yawing Moment Intercept - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 3-6 .	562
461	Yawing Moment Intercept - Mach Number Break Points for MER Stations 1 and 2	563
462	Yawing Moment Intercept - Mach Number Break Points for MER Stations 3 and 5	564
463	Yawing Moment Intercept - Mach Number Break Points for MER Stations 4 and 6	565
464	Yawing Moment Intercept - K_{SLOPE_1} for MER Stations 1 and 2	566

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
465	Yawing Moment Intercept - K_{SLOPE_1} for MER Stations 3 and 5	567
466	Yawing Moment Intercept - K_{SLOPE_1} for MER Stations 4 and 6	568
467	Yawing Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction for MER Station 2.	569
468	Yawing Moment Intercept - K_{SLOPE_2} for MER Stations 1 and 2	570
469	Yawing Moment Intercept - K_{SLOPE_2} for MER Stations 3 and 5	571
470	Yawing Moment Intercept - K_{SLOPE_2} for MER Stations 4 and 6	572
471	Yawing Moment Intercept - K_{SLOPE_2} Pylon Height Correction for MER Station 4.	573
472	Incremental Yawing Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	578
473	Incremental Yawing Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	579
474	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	580
475	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	581
476	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5	582
477	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6	583
478	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	584

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
479	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at $M=1.05$ for MER Stations 2,4 and 6	585
480	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at $M=1.2$ for MER Stations 1,3 and 5	586
481	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at $M=1.2$ for MER Stations 2,4 and 6	587
482	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at $M=1.6$ for MER Stations 1,3 and 5	588
483	Incremental Yawing Moment Slope Due to Yaw - Spanwise Correction at $M=1.6$ for MER Stations 2,4 and 6	589
484	Incremental Yawing Moment Slope Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	590
485	Incremental Yawing Moment Slope Due to Yaw - Chordwise Correction Factor	591
486	Incremental Yawing Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline MER Stations 1,3 and 5	595
487	Incremental Yawing Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline MER Stations 2,4 and 6	596
488	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=0.7$ for MER Stations 1,3 and 5	597
489	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=0.7$ for MER Stations 2,4 and 6	598
490	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=0.9$ for MER Stations 1,3 and 5	599
491	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=0.9$ for MER Stations 2,4 and 6	600
492	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=1.05$ for MER Stations 1,3 and 5	601
493	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at $M=1.05$ for MER Stations 2,4 and 6	602

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
494	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5.	603
495	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6.	604
496	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5.	605
497	Incremental Yawing Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6.	606
498	Incremental Yawing Moment Intercept Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	607
499	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder at M=0.7	612
500	Incremental Yawing Moment Slope Due to Interference - Adjacent Shoulder at M=0.9.	613
501	Incremental Yawing Moment Slope Due to Interference - Adjacent Shoulder at M=1.05	614
502	Incremental Yawing Moment Slope Due to Interference - Adjacent Shoulder at M=1.2.	615
503	Incremental Yawing Moment Slope Due to Interference - Adjacent Shoulder at M=1.6.	616
504	Incremental Yawing Moment Slope Due to Interference - Centerline Store at M=0.7	617
505	Incremental Yawing Moment Slope Due to Interference - Centerline Store at M=0.9	618
506	Incremental Yawing Moment Slope Due to Interference - Centerline Store at M=1.05.	619
507	Incremental Yawing Moment Slope Due to Interference - Centerline Store at M=1.2	620
508	Incremental Yawing Moment Slope Due to Interference - Centerline Store at M=1.6	621
509	Incremental Yawing Moment Slope Due to Interference - Opposite Shoulder at M=0.7.	622

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
510	Incremental Yawing Moment Slope Due to Interference - Opposite Shoulder at M=0.9	623
511	Incremental Yawing Moment Slope Due to Interference - Opposite Shoulder at M=1.05	624
512	Incremental Yawing Moment Slope Due to Interference - Opposite Shoulder at M=1.2	625
513	Incremental Yawing Moment Slope Due to Interference - Opposite Shoulder at M=1.6	626
514	Incremental Yawing Moment Slope Due to Interference - Outboard to Inboard Interference Correction for the Forward Cluster	627
515	Incremental Yawing Moment Slope Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster	628
516	Incremental Yawing Moment Slope Due to Interference - K_{SLOPE_1} for Combination Inboard and Outboard Interference	629
517	Incremental Yawing Moment Slope Due to Interference - K_{INTC_1} for Combination Inboard and Outboard Interference	629
518	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder at M=0.7	634
519	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder M=0.9	635
520	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder at M=1.05	636
521	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder at M=1.2	637
522	Incremental Yawing Moment Intercept Due to Interference - Adjacent Shoulder at M=1.6	638
523	Incremental Yawing Moment Intercept Due to Interference - Centerline Store at M=0.7	639

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
524	Incremental Yawing Moment Intercept Due to Interference - Centerline Store at M=0.9	640
525	Incremental Yawing Moment Intercept Due to Interference - Centerline Store at M=1.05.	641
526	Incremental Yawing Moment Intercept Due to Interference - Centerline Store at M=1.2	642
527	Incremental Yawing Moment Intercept Due to Interference - Centerline Store at M=1.6	643
528	Incremental Yawing Moment Intercept Due to Interference - Opposite Shoulder at M=0.7.	644
529	Incremental Yawing Moment Intercept Due to Interference - Opposite Shoulder at M=0.9.	645
530	Incremental Yawing Moment Intercept Due to Interference - Opposite Shoulder at M=1.05	646
531	Incremental Yawing Moment Intercept Due to Interference - Opposite Shoulder at M=1.2.	647
532	Incremental Yawing Moment Intercept Due to Interference - Opposite Shoulder at M=1.6	648
533	Incremental Yawing Moment Intercept Due to Interference - Outboard to Inboard Interference Correction for the Forward Cluster	649
534	Incremental Yawing Moment Intercept Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster	650
535	Incremental Yawing Moment Intercept Due to Interference - K_{SLOPE_2} for Combination Inboard and Outboard Interference.	651
536	Incremental Yawing Moment Intercept Due to Interference - K_{INTC_2} for Combination Inboard and Outboard Interference.	651
537	Normal Force Slope - Stores Mounted on Fuselage Centerline, MER Stations 1 and 2	657

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
538	Normal Force Slope - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	658
539	Normal Force Slope - Buoyancy Correction for MER Stations 1 and 2	659
540	Normal Force Slope - Chordwise Position Correction for MER Stations 1 and 2	660
541	Normal Force Slope - Incremental Coefficient for MER Stations 3 and 5	661
542	Normal Force Slope - Incremental Coefficient for MER Stations 4 and 6	662
543	Normal Force Slope - Generalized Mach Number Variation.	664
544	Normal Force Slope - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 1-6.	670
545	Normal Force Slope - Mach Number Break Points for MER Stations 1 and 2	671
546	Normal Force Slope - Mach Number Break Points for MER Stations 4 and 6	672
547	Normal Force Slope - Mach Number Break Points for MER Stations 3 and 5	673
548	Normal Force Slope - Incremental Coefficient at Mach Break 1 for MER Stations 1 and 2	674
549	Normal Force Slope - Incremental Coefficient at Mach Break 1 for MER Stations 3 and 5	675
550	Normal Force Slope - Fuselage Interference Correction at Mach Break 1 for MER Stations 1,2,3 and 5	676
551	Normal Force Slope - Incremental Coefficient at Mach Break 1 for MER Stations 4 and 6	677
552	Normal Force Slope - Incremental Coefficient at Mach Break 2 for MER Stations 1 and 2	678
553	Normal Force Slope - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	679

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
554	Normal Force Slope - Fuselage Interference Correction at Mach Break 2 for MER Stations 1,2,3 and 5	680
555	Normal Force Slope - Incremental Coefficient at Mach Break 2 for MER Stations 4 and 6	681
556	Normal Force Slope - Incremental Coefficient at Mach Break 3 for MER Stations 1 and 2	682
557	Normal Force Slope - Incremental Coefficient at Mach Break 3 for MER Stations 3 and 5	683
558	Normal Force Slope - Fuselage Interference Correction at Mach Break 3 for MER Stations 1,2,3 and 5	684
559	Normal Force Intercept - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	688
560	Normal Force Intercept - Incremental Coefficient for MER Stations 1 and 2	689
561	Normal Force Intercept - Chordwise Position Correction for MER Stations 1 and 2	690
562	Normal Force Intercept - Fuselage Interference Correction for MER Stations 1 and 2	690
563	Normal Force Intercept - Incremental Coefficient for MER Stations 4 and 6	691
564	Normal Force Intercept - Chordwise Position Correction for MER Stations 4 and 6	692
565	Normal Force Intercept - Fuselage Interference Correction for MER Stations 4 and 6	692
566	Normal Force Intercept - Incremental Coefficient for MER Stations 3 and 5	693
567	Normal Force Intercept - Chordwise Position Correction for MER Stations 3 and 5.	694
568	Normal Force Intercept - Spanwise Correction for MER Stations 3 and 5	694
569	Normal Force Intercept - Generalized Mach Number Variation	696

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
570	Normal Force Intercept - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 1-6 .	703
571	Normal Force Intercept - Mach Number Break Points for MER Stations 1 and 2	704
572	Normal Force Intercept - Mach Number Break Points for MER Stations 4 and 6	705
573	Normal Force Intercept - Mach Number Break Points for MER Stations 3 and 5	706
574	Normal Force Intercept - Incremental Coefficient at Break 1 for MER Stations 1 and 2	707
575	Normal Force Intercept - Incremental Coefficient at Break 1 for MER Stations 3 and 5	708
576	Normal Force Intercept - Fuselage Interference Correction at Mach Break 1 for MER Stations 1,2,3 and 5 .	709
577	Normal Force Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 4 and 6	710
578	Normal Force Intercept - Chordwise Position Correction at Mach Break 1 for MER Stations 4 and 6	711
579	Normal Force Intercept - Fuselage Interference Correction at Mach Break 1 for MER Stations 4 and 6 . . .	711
580	Normal Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 1 and 2	712
581	Normal Force Intercept - Fuselage Interference Correction at Mach Break 2 for MER Stations 1 and 2 . . .	713
582	Normal Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	714
583	Normal Force Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 4 and 6	715
584	Normal Force Intercept - Chordwise Position Correction at Mach Break 2 for MER Stations 4 and 6	716
585	Normal Force Intercept - Fuselage Interference Correction at Mach Break 2 for MER Stations 4 and 6 . . .	716

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
586	Normal Force Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 1 and 2	717
587	Normal Force Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 3 and 5	718
588	Normal Force Intercept - Incremental Coefficient at Mach Break 3 for MER Station 4.	719
589	Normal Force Intercept - Chordwise Position Correction at Mach Break 3 for MER Station 4	720
590	Normal Force Intercept - Fuselage Interference Correction at Mach Break 3 for MER Station 4	720
591	Incremental Normal Force Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	725
592	Incremental Normal Force Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	726
593	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	727
594	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	728
595	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5.	729
596	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6	730
597	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	731
598	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6	732
599	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5	733
600	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6	734

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
601	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5	735
602	Incremental Normal Force Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6	736
603	Incremental Normal Force Slope Due to Yaw - Chordwise Correction Factor	737
604	Incremental Normal Force Slope Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	738
605	Incremental Normal Force Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5.	742
606	Incremental Normal Force Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	743
607	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5 .	744
608	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6 .	745
609	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5 .	746
610	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6 .	747
611	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5.	748
612	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6.	749
613	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5 .	750
614	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6 .	751
615	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5 .	752

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
616	Incremental Normal Force Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6 .	753
617	Incremental Normal Force Intercept Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	754
618	Incremental Normal Force Slope Due to Interference - Adjacent Shoulder at M=0.7.	760
619	Incremental Normal Force Slope Due to Interference - Adjacent Shoulder at M=0.9.	761
620	Incremental Normal Force Slope Due to Interference - Adjacent Shoulder at M=1.05	762
621	Incremental Normal Force Slope Due to Interference - Adjacent Shoulder at M=1.2.	763
622	Incremental Normal Force Slope Due to Interference - Adjacent Shoulder at M=1.6.	764
623	Incremental Normal Force Slope Due to Interference - Centerline Store at M=0.7	765
624	Incremental Normal Force Slope Due to Interference - Centerline Store at M=0.9	766
625	Incremental Normal Force Slope Due to Interference - Centerline Store at M=1.05.	767
626	Incremental Normal Force Slope Due to Interference - Centerline Store at M=1.2	768
627	Incremental Normal Force Slope Due to Interference - Centerline Store at M=1.6	769
628	Incremental Normal Force Slope Due to Interference - Opposite Shoulder at M=0.7.	770
629	Incremental Normal Force Slope Due to Interference - Opposite Shoulder at M=0.9.	771
630	Incremental Normal Force Slope Due to Interference - Opposite Shoulder at M=1.05	772
631	Incremental Normal Force Slope Due to Interference - Opposite Shoulder at M=1.2.	773

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
632	Incremental Normal Force Slope Due to Interference - Opposite Shoulder at M=1.6.	774
633	Incremental Normal Force Slope Due to Interference - Outboard to Inboard Interference Correction for the Forward Cluster	775
634	Incremental Normal Force Slope Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster	776
635	Incremental Normal Force Slope Due to Interference - K_{SLOPE_2} for Combination Inboard and Outboard Interference.	777
636	Incremental Normal Force Slope Due to Interference - K_{INTC_2} for Combination Inboard and Outboard Interference.	777
637	Incremental Normal Force Intercept Due to Interference - Adjacent Shoulder at M=0.7.	782
638	Incremental Normal Force Intercept Due to Interference - Adjacent Shoulder at M=0.9.	783
639	Incremental Normal Force Intercept Due to Interference - Adjacent Shoulder at M=1.05	784
640	Incremental Normal Force Intercept Due to Interference - Adjacent Shoulder at M=1.2.	785
641	Incremental Normal Force Intercept Due to Interference - Adjacent Shoulder at M=1.6.	786
642	Incremental Normal Force Intercept Due to Interference - Centerline Store at M=0.7	787
643	Incremental Normal Force Intercept Due to Interference - Centerline Store at M=0.9	788
644	Incremental Normal Force Intercept Due to Interference - Centerline Store at M=1.05.	789
645	Incremental Normal Force Intercept Due to Interference - Centerline Store at M=1.2	790

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
646	Incremental Normal Force Intercept Due to Interference - Centerline Store at M=1.6	791
647	Incremental Normal Force Intercept Due to Interference - Opposite Shoulder at M=0.7.	792
648	Incremental Normal Force Intercept Due to Interference - Opposite Shoulder at M=0.9.	793
649	Incremental Normal Force Intercept Due to Interference - Opposite Shoulder at M=1.05	794
650	Incremental Normal Force Intercept Due to Interference - Opposite Shoulder at M=1.2.	795
651	Incremental Normal Force Intercept Due to Interference - Opposite Shoulder at M=1.6.	796
652	Incremental Normal Force Intercept Due to Interference - Outboard to Inboard Interference Correction for the Forward Cluster	797
653	Incremental Normal Force Intercept Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster	798
654	Incremental Normal Force Intercept Due to Interference - K_{SLOPE} for Combination Inboard and Outboard Interference.	799
655	Incremental Normal Force Intercept Due to Interference - K_{INTC} for Combination Inboard and Outboard Interference.	799
656	Pitching Moment Slope - Stores Mounted on Fuselage Centerline, MER Stations 1 and 2.	803
657	Pitching Moment Slope - Stores Mounted on Fuselage Centerline, MER Stations 3-6.	804
658	Pitching Moment Slope - Buoyancy Correction for MER Stations 1 and 2.	805
659	Pitching Moment Slope - Buoyancy Chordwise Position Correction for MER Stations 1 and 2	806

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
660	Pitching Moment Slope - Incremental Coefficient for MER Stations 3 and 5	807
661	Pitching Moment Slope - Incremental Coefficient for MER Stations 4 and 6	808
662	Pitching Moment Slope - Mach Number Correction for Stores Mounted on Fuselage Centerline, MER Stations 1-6 .	812
663	Pitching Moment Slope - Mach Number Break Points for MER Stations 1 and 2	813
664	Pitching Moment Slope - Mach Number Break Points for MER Stations 3 and 5	814
665	Pitching Moment Slope - Mach Number Break Points for MER Stations 4 and 6	815
666	Pitching Moment Slope - Incremental Coefficient at Mach Break 1 for MER Stations 1 and 2	816
667	Pitching Moment Slope - Incremental Coefficient at Mach Break 1 for MER Stations 3 and 5	817
668	Pitching Moment Slope - Incremental Coefficient at Mach Break 1 for MER Stations 4 and 6	818
669	Pitching Moment Slope - Incremental Coefficient at Mach Break 2 for MER Stations 1 and 2	819
670	Pitching Moment Slope - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	820
671	Pitching Moment Slope - Incremental Coefficient at Mach Break 2 for MER Stations 4 and 6	821
672	Pitching Moment Slope - Incremental Coefficient at Mach Break 3 for MER Stations 1 and 2	822
673	Pitching Moment Slope - Incremental Coefficient at Mach Break 3 for MER Stations 3 and 5	823
674	Pitching Moment Slope - Incremental Coefficient at Mach Break 3 for MER Stations 4 and 6	824
675	Pitching Moment Intercept - Stores Mounted on Fuselage Centerline, MER Stations 1 and 2	827

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
676	Pitching Moment Intercept - Stores Mounted on Fuselage Centerline, MER Stations 3-6	828
677	Pitching Moment Intercept - Incremental Coefficient for MER Stations 1 and 2	829
678	Pitching Moment Intercept - Incremental Coefficient for MER Stations 4 and 6	830
679	Pitching Moment Intercept - Incremental Coefficient for MER Stations 3 and 5	831
680	Pitching Moment Intercept - Fuselage Interference Correction for MER Stations 1-6	832
681	Pitching Moment Intercept - Mach Number Corrections for Stores Mounted on Fuselage Centerline, MER Stations 1-6.	838
682	Pitching Moment Intercept - Mach Number Break Points for MER Stations 1 and 2	839
683	Pitching Moment Intercept - Mach Number Break Points for MER Stations 3 and 5	840
684	Pitching Moment Intercept - Mach Number Break Points for MER Stations 4 and 6	841
685	Pitching Moment Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 1 and 2	842
686	Pitching Moment Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 3 and 5	843
687	Pitching Moment Intercept - Incremental Coefficient at Mach Break 1 for MER Stations 4 and 6	844
688	Pitching Moment Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 1 and 2	845
689	Pitching Moment Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 3 and 5	846
690	Pitching Moment Intercept - Incremental Coefficient at Mach Break 2 for MER Stations 4 and 6	847

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
691	Pitching Moment Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 1 and 2	848
692	Pitching Moment Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 3 and 5	849
693	Pitching Moment Intercept - Incremental Coefficient at Mach Break 3 for MER Stations 4 and 6	850
694	Pitching Moment Intercept - Fuselage Interference Correction at Mach Break 2 for MER Stations 1-6	851
695	Pitching Moment Intercept - Fuselage Interference Correction at Mach Break 3 for MER Stations 1-6	851
696	Pitching Moment Intercept - Chordwise Position Correction for MER Station 4.	852
697	Pitching Moment Intercept - Chordwise Position Correction at Mach Break 3 for MER Stations 1,3 and 5	852
698	Incremental Pitching Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	857
699	Incremental Pitching Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	858
700	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	859
701	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	860
702	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5	861
703	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6.	862
704	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	863
705	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6	864

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
706	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5	865
707	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6	866
708	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5	867
709	Incremental Pitching Moment Slope Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6	868
710	Incremental Pitching Moment Slope Due to Yaw - Chordwise Correction Factor	869
711	Incremental Pitching Moment Slope Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	870
712	Incremental Pitching Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	874
713	Incremental Pitching Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	875
714	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5	876
715	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6	877
716	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5	878
717	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6	879
718	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	880
719	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6	881
720	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5	882

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
721	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6 .	883
722	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5 .	884
723	Incremental Pitching Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6 .	885
724	Incremental Pitching Moment Intercept Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	886
725	Incremental Pitching Moment Slope Due to Interference - Adjacent Shoulder at M=0.7.	891
726	Incremental Pitching Moment Slope Due to Interference - Adjacent Shoulder at M=0.9.	892
727	Incremental Pitching Moment Slope Due to Interference - Adjacent Shoulder at M=1.05	893
728	Incremental Pitching Moment Slope Due to Interference - Adjacent Shoulder at M=1.2.	894
729	Incremental Pitching Moment Slope Due to Interference - Adjacent Shoulder at M=1.6.	895
730	Incremental Pitching Moment Slope Due to Interference - Centerline Store at M=0.7	896
731	Incremental Pitching Moment Slope Due to Interference - Centerline Store at M=0.9	897
732	Incremental Pitching Moment Slope Due to Interference - Centerline Store at M=1.05.	898
733	Incremental Pitching Moment Slope Due to Interference - Centerline Store at M=1.2	899
734	Incremental Pitching Moment Slope Due to Interference - Centerline Store at M=1.6	900
735	Incremental Pitching Moment Slope Due to Interference - Opposite Shoulder at M=0.7.	901
736	Incremental Pitching Moment Slope Due to Interference - Opposite Shoulder at M=0.9	902

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
737	Incremental Pitching Moment Slope Due to Interference - Opposite Shoulder at M=1.05	903
738	Incremental Pitching Moment Slope Due to Interference - Opposite Shoulder at M=1.2	904
739	Incremental Pitching Moment Slope Due to Interference - Opposite Shoulder at M=1.6.	905
740	Incremental Pitching Moment Slope Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster	906
741	Incremental Pitching Moment Slope Due to Interference - K_{SLOPE_2} for Combination Inboard and Outboard Interference	907
742	Incremental Pitching Moment Slope Due to Interference - K_{INTC_2} for Combination Inboard and Outboard Interference	907
743	Incremental Pitching Moment Intercept Due to Interference - Adjacent Shoulder at M=0.7	912
744	Incremental Pitching Moment Intercept Due to Interference - Adjacent Shoulder at M=0.9	913
745	Incremental Pitching Moment Intercept Due to Interference - Adjacent Shoulder at M=1.05.	914
746	Incremental Pitching Moment Intercept Due to Interference - Adjacent Shoulder at M=1.2	915
747	Incremental Pitching Moment Intercept Due to Interference - Adjacent Shoulder at M=1.6	916
748	Incremental Pitching Moment Intercept Due to Interference - Centerline Store at M=0.7.	917
749	Incremental Pitching Moment Intercept Due to Interference - Centerline Store at M=0.9.	918
750	Incremental Pitching Moment Intercept Due to Interference - Centerline Store at M=1.05	919

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
751	Incremental Pitching Moment Intercept Due to Interference - Centerline Store at M=1.2.	920
752	Incremental Pitching Moment Intercept Due to Interference - Centerline Store at M=1.6.	921
753	Incremental Pitching Moment Intercept Due to Interference - Opposite Shoulder at M=0.7	922
754	Incremental Pitching Moment Intercept Due to Interference - Opposite Shoulder at M=0.9	923
755	Incremental Pitching Moment Intercept Due to Interference - Opposite Shoulder at M=1.05.	924
756	Incremental Pitching Moment Intercept Due to Interference - Opposite Shoulder at M=1.2	925
757	Incremental Pitching Moment Intercept Due to Interference - Opposite Shoulder at M=1.6	926
758	Incremental Pitching Moment Intercept Due to Interference - Outboard to Inboard Interference Correction for the Aft Cluster.	927
759	Incremental Pitching Moment Intercept Due to Interference - K_{SLOPE_1} for Combination Inboard and Outboard Interference ¹	928
760	Incremental Pitching Moment Intercept Due to Interference - K_{INTC_1} for Combination Inboard and Outboard Interference	928
761	Axial Force Slope - Installed Coefficient for MER Stations 2,4 and 6 on Fuselage Centerline	932
762	Axial Force Slope - Aft Cluster Correction.	933
763	Axial Force Slope - Installed Coefficient for MER Stations 2,4 and 6 for Wing Mounted Stores	934
764	Axial Force Slope - Spanwise Correction for MER Stations 2,4 and 6	935
765	Axial Force Slope - Fuselage Interference Correction for MER Stations 2,4 and 6	935

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
766	Axial Force Intercept - Installed Coefficient for MER Stations 2,4 and 6	940
767	Axial Force Intercept - Spanwise Correction for MER Stations 2,4 and 6	940
768	Axial Force Intercept - Mach Number Correction for MER Stations 2,4 and 6 on Fuselage Centerline	941
769	Axial Force Intercept - Aft Cluster Correction.	942
770	Axial Force Intercept - Mach Number Correction for MER Stations 2,4 and 6 for Wing Mounted Stores.	942
771	Rolling Moment Slope - Variation with Fin Area for MER Stations 1 and 2	949
772	Rolling Moment Slope - Variation with Fin Area for MER Stations 3 and 5	950
773	Rolling Moment Slope - Variation with Fin Area for MER Stations 4 and 6	951
774	Rolling Moment Slope - Fuselage Interference Correction for MER Stations 4 and 6	952
775	Rolling Moment Slope - Generalized Mach Number Variation	954
776	Rolling Moment Slope - Incremental Variation with Fin Area for MER Station 3.	959
777	Rolling Moment Slope - Incremental Variation with Fin Area for MER Station 4.	960
778	Rolling Moment Slope - Mach Number Break Points for MER Stations 1 and 2	961
779	Rolling Moment Slope - Mach Number Break Points for MER Stations 3 and 5	962
780	Rolling Moment Slope - Mach Number Break Points for MER Stations 4 and 6	963
781	Rolling Moment Slope - K_{SLOPE_1} for MER Stations 1 and 2 .	964

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
782	Rolling Moment Slope - K_{SLOPE_1} Fuselage Interference Correction for MER Stations 1 ¹ and 2 ¹	965
783	Rolling Moment Slope - K_{SLOPE_1} for MER Stations 3 and 5 .	966
784	Rolling Moment Slope - K_{SLOPE_1} for MER Stations 4 and 6 .	967
785	Rolling Moment Slope - K_{SLOPE_1} Fuselage Interference Correction for MER Stations 4 ¹ and 6	968
786	Rolling Moment Slope - K_{SLOPE_2} for MER Stations 1 and 2 .	969
787	Rolling Moment Slope - K_{SLOPE_2} Fuselage Interference Correction for MER Stations 1 ² and 2	970
788	Rolling Moment Slope - K_{SLOPE_2} for MER Stations 3 and 5 .	971
789	Rolling Moment Slope - K_{SLOPE_2} Fuselage Interference Correction for MER Stations 3 ² and 5	972
790	Rolling Moment Slope - K_{SLOPE_2} for MER Stations 4 and 6 .	973
791	Rolling Moment Slope - K_{SLOPE_2} Fuselage Interference Correction for MER Stations 4 ² and 6	975
792	Rolling Moment Slope - K_{SLOPE_3} for MER Stations 2 and 3 .	976
793	Rolling Moment Slope - K_{SLOPE_3} for MER Stations 4 and 6 .	977
794	Rolling Moment Slope - K_{SLOPE_3} Fuselage Interference Correction for MER Stations 4 ³ and 6	978
795	Rolling Moment Intercept - Variation with Fin Area for MER Stations 1 and 2	981
796	Rolling Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction for MER Station 2	982
797	Rolling Moment Intercept - Variation with Fin Area for MER Stations 3 and 5	983
798	Rolling Moment Intercept - Variation with Fin Area for MER Stations 4 and 6	984

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
799	Rolling Moment Intercept - K_{SLOPE} Fuselage Interference Correction for MER Stations 4 and 6	985
800	Rolling Moment Intercept - Generalized Mach Number Variation	987
801	Rolling Moment Intercept - Incremental Variation with Fin Area for MER Station 3	992
802	Rolling Moment Intercept - Incremental Variation with Fin Area for MER Station 4	993
803	Rolling Moment Intercept - Mach Number Break Points for MER Stations 1 and 2	994
804	Rolling Moment Intercept - Mach Number Break Points for MER Stations 3 and 5	995
805	Rolling Moment Intercept - Mach Number Break Points for MER Stations 4 and 6	996
806	Rolling Moment Intercept - K_{SLOPE_1} for MER Stations 1 and 2	997
807	Rolling Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction for MER Station 1.	998
808	Rolling Moment Intercept - K_{SLOPE_1} for MER Stations 3 and 5	999
809	Rolling Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction for MER Stations 3 and 5	1000
810	Rolling Moment Intercept - K_{SLOPE_1} for MER Stations 4 and 6	1001
811	Rolling Moment Intercept - K_{SLOPE_1} Fuselage Interference Correction for MER Stations 4 and 6	1002
812	Rolling Moment Intercept - K_{SLOPE_2} for MER Stations 1 and 2	1003

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
813	Rolling Moment Intercept - K_{SLOPE_2} Fuselage Interference Correction for MER Station 1.	1004
814	Rolling Moment Intercept - K_{SLOPE_2} for MER Stations 3 and 5	1005
815	Rolling Moment Intercept - K_{SLOPE_2} for MER Stations 4 and 6	1006
816	Rolling Moment Intercept - K_{SLOPE_2} Fuselage Interference Correction for MER Stations 4	1007
817	Rolling Moment Intercept - K_{SLOPE_3} for MER Stations 2 and 3	1008
818	Rolling Moment Intercept - K_{SLOPE_3} for MER Stations 4 and 6	1009
819	Rolling Moment Intercept - K_{SLOPE_3} Fuselage Interference Correction for MER Stations 4 and 6	1010
820	Incremental Rolling Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5	1016
821	Incremental Rolling Moment Slope Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6	1017
822	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 1,3 and 5.	1018
823	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at M=0.7 for MER Stations 2,4 and 6.	1019
824	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 1,3 and 5.	1020
825	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at M=0.9 for MER Stations 2,4 and 6.	1021
826	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5	1022

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
827	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at $M=1.05$ for MER Stations 2,4 and 6	1023
828	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at $M=1.2$ for MER Stations 1,3 and 5.	1024
829	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at $M=1.2$ for MER Stations 2,4 and 6.	1025
830	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at $M=1.6$ for MER Stations 1,3 and 5.	1026
831	Incremental Rolling Moment Slope Due to Yaw - Spanwise Correction at $M=1.6$ for MER Stations 2,4 and 6.	1027
832	Incremental Rolling Moment Slope Due to Yaw - Chordwise Correction Factor for the Forward Cluster	1028
833	Incremental Rolling Moment Slope Due to Yaw - Chordwise Correction Factor for the Aft Cluster	1028
834	Incremental Rolling Moment Slope Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	1029
835	Incremental Rolling Moment Slope Due to Yaw - Chordwise Correction for MER Stations 2,4 and 6	1030
836	Incremental Rolling Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 1,3 and 5.	1035
837	Incremental Rolling Moment Intercept Due to Yaw - Coefficient for Stores Mounted on Fuselage Centerline, MER Stations 2,4 and 6.	1036
838	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at $M=0.7$ for MER Stations 1,3 and 5	1037
839	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at $M=0.7$ for MER Stations 2,4 and 6	1038
840	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at $M=0.9$ for MER Stations 1,3 and 5	1039
841	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at $M=0.9$ for MER Stations 2,4 and 6	1040

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
842	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 1,3 and 5.	1041
843	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.05 for MER Stations 2,4 and 6.	1042
844	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 1,3 and 5.	1043
845	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.2 for MER Stations 2,4 and 6.	1044
846	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 1,3 and 5.	1045
847	Incremental Rolling Moment Intercept Due to Yaw - Spanwise Correction at M=1.6 for MER Stations 2,4 and 6.	1046
848	Incremental Rolling Moment Intercept Due to Yaw - Chordwise Correction Factor for the Forward Cluster . . .	1047
849	Incremental Rolling Moment Intercept Due to Yaw - Chordwise Correction Factor for the Aft Cluster	1047
850	Incremental Rolling Moment Intercept Due to Yaw - Chordwise Correction for MER Stations 2,4 and 6	1048
851	Incremental Rolling Moment Intercept Due to Yaw - Chordwise Correction for MER Stations 1,3 and 5	1049
852	Incremental Rolling Moment Slope Due to Interference - Adjacent Shoulder at M=0.7	1054
853	Incremental Rolling Moment Slope Due to Interference - Adjacent Shoulder at M=0.9	1055
854	Incremental Rolling Moment Slope Due to Interference - Adjacent Shoulder at M=1.05	1056
855	Incremental Rolling Moment Slope Due to Interference - Adjacent Shoulder at M=1.2	1057
856	Incremental Rolling Moment Slope Due to Interference - Adjacent Shoulder at M=1.6	1058
857	Incremental Rolling Moment Slope Due to Interference - Centerline Store at M=0.7	1059

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
858	Incremental Rolling Moment Slope Due to Interference - Centerline Store at M=0.9	1060
859	Incremental Rolling Moment Slope Due to Interference - Centerline Store at M=1.05	1061
860	Incremental Rolling Moment Slope Due to Interference - Centerline Store at M=1.2	1062
861	Incremental Rolling Moment Slope Due to Interference - Centerline Store at M=1.6	1063
862	Incremental Rolling Moment Slope Due to Interference - Opposite Shoulder at M=0.7	1064
863	Incremental Rolling Moment Slope Due to Interference - Opposite Shoulder at M=0.9	1065
864	Incremental Rolling Moment Slope Due to Interference - Opposite Shoulder at M=1.05	1066
865	Incremental Rolling Moment Slope Due to Interference - Opposite Shoulder at M=1.2	1067
866	Incremental Rolling Moment Slope Due to Interference - Opposite Shoulder at M=1.6	1068
867	Incremental Rolling Moment Slope Due to Interference - K_{SLOPE_2} for Combination Inboard and Outboard Interference	1069
868	Incremental Rolling Moment Slope Due to Interference - K_{INTC_2} for Combination Inboard and Outboard Interference	1069
869	Incremental Rolling Moment Intercept Due to Interference - Adjacent Shoulder at M=0.7	1073
870	Incremental Rolling Moment Intercept Due to Interference - Adjacent Shoulder at M=0.9	1074
871	Incremental Rolling Moment Intercept Due to Interference - Adjacent Shoulder at M=1.05	1075
872	Incremental Rolling Moment Intercept Due to Interference - Adjacent Shoulder M=1.2	1076

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
873	Incremental Rolling Moment Intercept Due to Interference - Adjacent Shoulder at M=1.6	1077
874	Incremental Rolling Moment Intercept Due to Interference - Centerline Store at M=0.7	1078
875	Incremental Rolling Moment Intercept Due to Interference - Centerline Store at M=0.9	1079
876	Incremental Rolling Moment Intercept Due to Interference - Centerline Store at M=1.05	1080
877	Incremental Rolling Moment Intercept Due to Interference - Centerline Store at M=1.2	1081
878	Incremental Rolling Moment Intercept Due to Interference - Centerline Store at M=1.6	1082
879	Incremental Rolling Moment Intercept Due to Interference - Opposite Shoulder at M=0.7	1083
880	Incremental Rolling Moment Intercept Due to Interference - Opposite Shoulder at M=0.9	1084
881	Incremental Rolling Moment Intercept Due to Interference - Opposite Shoulder at M=1.05	1085
882	Incremental Rolling Moment Intercept Due to Interference - Opposite Shoulder at M=1.2	1086
883	Incremental Rolling Moment Intercept Due to Interference - Opposite Shoulder at M=1.6	1087
884	Incremental Rolling Moment Intercept Due to Interference - K_{SLOPE_1} for Combination Inboard and Outboard Interference	1088
885	Incremental Rolling Moment Intercept Due to Interference - K_{INTC_1} for Combination Inboard and Outboard Interference	1088
886	Normal Force Slope - Incremental Coefficient for TER Carriage	1097
887	Pitching Moment Slope - Incremental Coefficient for TER Carriage	1097

LIST OF FIGURES (CONTINUED)

Figure	Title	Page
888	Side Force Slope - Incremental Coefficient for TER Carriage	1098
889	Yawing Moment Slope - Incremental Coefficient for TER Carriage	1098
890	Rolling Moment Slope - Incremental Coefficient for TER Carriage	1099
891	Normal Force Slope - Chordwise Position Correction for TER Carriage	1100
892	Pitching Moment Slope - Chordwise Position Correction for TER Carriage	1100
893	Side Force Slope - Chordwise Position Correction for TER Carriage	1101
894	Yawing Moment Slope - Chordwise Position Correction for TER Carriage	1101
895	Rolling Moment Slope - Chordwise Position Correction for TER Carriage	1102
896	TER Carriage Chordwise Position Correction Factor for Side Force, Yawing Moment, and Rolling Moment.	1103
897	TER Carriage Chordwise Position Correction Factor for Normal Force and Pitching Moment	1103
898	Axial Force Slope Correction for TER Carriage.	1104
899	Normal Force Intercept - Incremental Coefficient for TER Carriage	1111
900	Pitching Moment Intercept - Incremental Coefficient for TER Carriage	1111
901	Side Force Intercept - Incremental Coefficient for TER Carriage	1112
902	Yawing Moment Intercept - Incremental Coefficient for TER Carriage	1112
903	Rolling Moment Intercept - Incremental Coefficient for TER Carriage	1113

LIST OF FIGURES (CONCLUDED)

Figure	Title	Page
904	Normal Force Intercept - Chordwise Position Correction for TER Carriage	1114
905	Pitching Moment Intercept - Chordwise Position Correction for TER Carriage	1114
906	Side Force Intercept - Chordwise Position Correction for TER Carriage	1115
907	Yawing Moment Intercept - Chordwise Position Correction for TER Carriage	1115
908	Rolling Moment Intercept - Chordwise Position Correction for TER Carriage	1116
909	Axial Force Intercept Correction for TER Carriage	1117

LIST OF TABLES

Table	Title	Page
1	Area Segmentation for a 300-Gallon Tank	19
2	SPA and Exposed SPA for an M117 Store Carried on a Multiple Rack Centerline Position	20
3	Initial Side Force Slope Prediction Calculation for a 300-Gallon Tank on the A-7 Center Pylon	36
4	Initial Side Force Slope Prediction Calculation for an M117 at MER Station 2 on the A-7 Center Pylon	39
5	Initial Yawing Moment Slope Prediction Calculation for a 300-Gallon Tank on the A-7 Center Pylon	45
6	Initial Yawing Moment Slope Prediction Calculation for an M117 at MER Station 2 on the A-7 Center Pylon	47
7	Incremental Side Force Slope Coefficient Due to Yaw - Figure Location Guide	452
8	Incremental Side Force Intercept Coefficient Due to Yaw - Figure Location Guide	470
9	Incremental Side Force Slope Coefficient Due to Interference - Figure Location Guide	487
10	Incremental Side Force Intercept Coefficient Due to Interference - Figure Location Guide	506
11	Incremental Yawing Moment Slope Coefficient Due to Yaw - Figure Location Guide	577
12	Incremental Yawing Moment Intercept Coefficient Due to Yaw - Figure Location Guide	594
13	Incremental Yawing Moment Slope Coefficient Due to Interference - Figure Location Guide	611
14	Incremental Yawing Moment Intercept Coefficient Due to Interference - Figure Location Guide	633
15	Incremental Normal Force Slope Coefficient Due to Yaw - Figure Location Guide	724

LIST OF TABLES (CONCLUDED)

Table	Title	Page
16	Incremental Normal Force Intercept Coefficient Due to Yaw - Figure Location Guide	741
17	Incremental Normal Force Slope Coefficient Due to Interference - Figure Location Guide	759
18	Incremental Normal Force Intercept Coefficient Due to Interference - Figure Location Guide	781
19	Incremental Pitching Moment Slope Coefficient Due to Yaw - Figure Location Guide	856
20	Incremental Pitching Moment Intercept Coefficient Due to Yaw - Figure Location Guide	873
21	Incremental Pitching Moment Slope Coefficient Due to Interference - Figure Location Guide	890
22	Incremental Pitching Moment Intercept Coefficient Due to Interference - Figure Location Guide	911
23	Incremental Rolling Moment Slope Coefficient Due to Yaw - Figure Location Guide	1015
24	Incremental Rolling Moment Intercept Coefficient Due to Yaw - Figure Location Guide	1034
25	Incremental Rolling Moment Slope Coefficient Due to Interference - Figure Location Guide	1053
26	Incremental Rolling Moment Intercept Coefficient Due to Interference - Figure Location Guide	1072

SECTION I
INTRODUCTION

The purpose of this handbook is to provide the aerodynamicist, the armament design engineer, and others associated with aircraft/stores compatibility problems a technique for calculating captive airloads for individual stores carried singularly or in multiple arrangements over a broad range of flight conditions for a generalized aircraft/store configuration.

Because there are many parameters that affect captive store loads, any prediction technique capable of including even the dominant factors will be lengthy. The technique presented here provides data to include these dominant factors, but the procedure is outlined in a systematic manner to facilitate a simple step-by-step approach to predicting captive store airloads. A description of the derivation of this method is given in the technical summary report, Volume I.

The developed prediction method for single carriage configurations is valid over the Mach number range 0.5 to 2.0 while the method for multiple carriage covers the Mach number range 0.5 to 1.6. Both single and multiple carriage techniques apply over an angle of attack range of -4 to 12 degrees and for an aircraft yaw angle range of 18 degrees. Provisions are included in the prediction techniques for both single and multiple carriage stores to encompass the effects of store spanwise, chordwise, and vertical position beneath the subject aircraft wing. Parameters are also included to account for aircraft wing sweep angle (quarter-chord sweep angles of 30 to 60 degrees) and the interference effect of the aircraft fuselage for high wing aircraft. The single carriage prediction technique has been developed for wing-mounted stores due to the absence of sufficient single carriage data for fuselage-mounted stores; however, Section VI contains some suggestions for predicting the single carriage fuselage centerline case. The MER/TER prediction technique is based on a fully loaded rack for

similar reasons. Suggestions for predicting the airloads on other multiple configurations are included in Section VI. The techniques were developed predominately from a finned store data base and a degradation in accuracy for unfinned stores can be expected, particularly when computing moment terms.

Development of the prediction technique was approached as an empirical correlation of existing individual store airloads data combined with parametric-type wind tunnel data obtained through a test program specifically designed to compliment the existing airloads data. The data were combined to form the basis for the empirical correlation. The data forming the empirical base for the prediction technique were obtained with the stores in a 2° nose down attitude with respect to the aircraft wing chord plane. The accuracy of the predictions contained in this handbook will be affected if the store/wing relationship is significantly different (2° or more). Predictions contained in this handbook are based on aircraft waterline angle of attack.

Analysis of the data base indicated that each component could be satisfactorily approximated by a linear curve over a large range of aircraft angle of attack and yaw angle. As a result, the data base was linearized so that each airload component could be expressed as a slope (force or moment as a function of angle of attack) and an intercept at zero angle of attack. As a result of the linearized data base, all predictions are accomplished in the form of a predicted slope and intercept for each of the airload components. Because of increasing non-linearity at the larger aircraft angles of attack and yaw angles, significant errors are likely outside the range of applicability indicated for these variables.

The basic approach involves the concept that captive store airloads are the result of exposure to a flow field represented by free stream conditions plus the interference effect of the aircraft, suspension equipment, and other stores. In this way, work that has been previously accomplished in the area of free stream

aerodynamic predictions can be used as a base upon which to relate captive store aerodynamics. This permits the prediction procedure to be a summation process as indicated below.

Captive Store Airloads = Isolated Store Airloads + Interference Effects

In order to predict the captive airloads on the aircraft/store configuration, a starting point is required. The starting point is called the initial prediction. It is so called because it involves assuming the store is in the flow-field of a base wing (45° sweep) configuration at a specific spanwise, chordwise, and vertical location. The final prediction then applies empirical corrections to the initial prediction to compensate for differences between the subject aircraft configuration on the base wing as well as to account for the effect of the store being in the spanwise, chordwise, and vertical location of interest. Figure 1 illustrates this approach.

The initial prediction of the captive airload is always made at $M = 0.5$ by assuming the store is inserted into the flow-field of the base wing (45° sweep). The initial predictions of the slope for side force, yawing moment, normal force and pitching moment at $M = 0.5$ are the result of a summation procedure along the store length when placed in the wing flow-field. The details of this initial prediction procedure are presented in Section II. The axial force and rolling moment initial predictions are made using a different approach which is also discussed in Section II.

The summation procedure is used to make the initial prediction for the basic airload case (i.e., the captive store airload generated by a zero-yaw pitch excursion of the parent aircraft). The incremental captive airloads due to aircraft yaw and the effects of adjacent store interference are predicted as increments to be added to the basic airload. The effects of Mach number are treated as an increment to be added to the prediction at

M = 0.5. At a particular Mach number the total captive airload experienced by a store can be obtained from the following generalized coefficient expression:

$$C_{x \text{ TOTAL}} = C_{x \text{ BASIC}} + \Delta C_{x \beta} \cdot \beta + \Delta C_{x \text{ INTF}}$$

where:

x - y, n, N, m, A, l representing side force, yawing moment, normal force, pitching moment, axial force, and rolling moment, respectively.

$C_{x \text{ BASIC}}$ - Basic captive airload generated by a zero yaw pitch excursion of the parent aircraft.

$\Delta C_{x \beta}$ - Incremental airload due to aircraft yaw per degree store yaw angle, β .

β - Store yaw angle equal to $\psi_{A/C}$ for a right wing store installation and $-\psi_{A/C}$ for a left wing store installation.

$\Delta C_{x \text{ INTF}}$ - Incremental airload due to the effects of adjacent store interference.

Empirical corrections have been derived from the data base to account for the effects of spanwise, chordwise, and vertical position of the captive store. Corrections are also included for other variables. The final predictions resulting from the combination of the initial predictions (Section II) with the empirical corrections are presented in the sections listed below.

Single Carriage - Section III

MER Carriage - Section IV

TER Carriage - Section V.

Additionally, recommendations for treatment of configurations not conforming directly to the single/MER/TER rack designs outlined in detail in this handbook are presented in Section VI to provide additional versatility.

Figure 2 presents a guide in flow chart form which is to be followed when performing a computation for a desired store loading type.

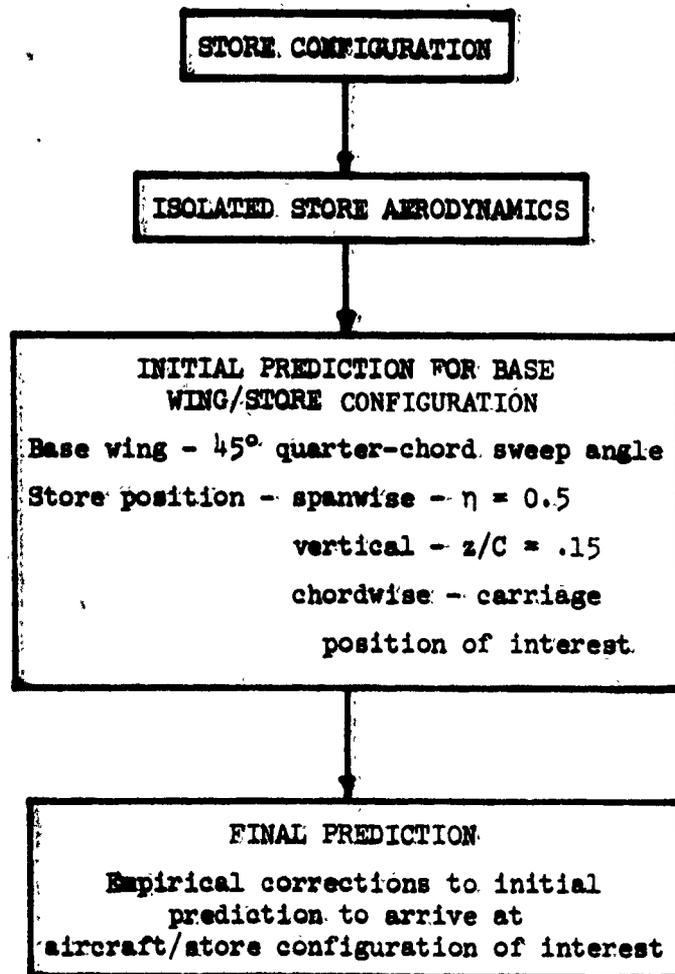


Figure 1. Captive Airloads Prediction Procedure

STORE CARRIAGE TYPES

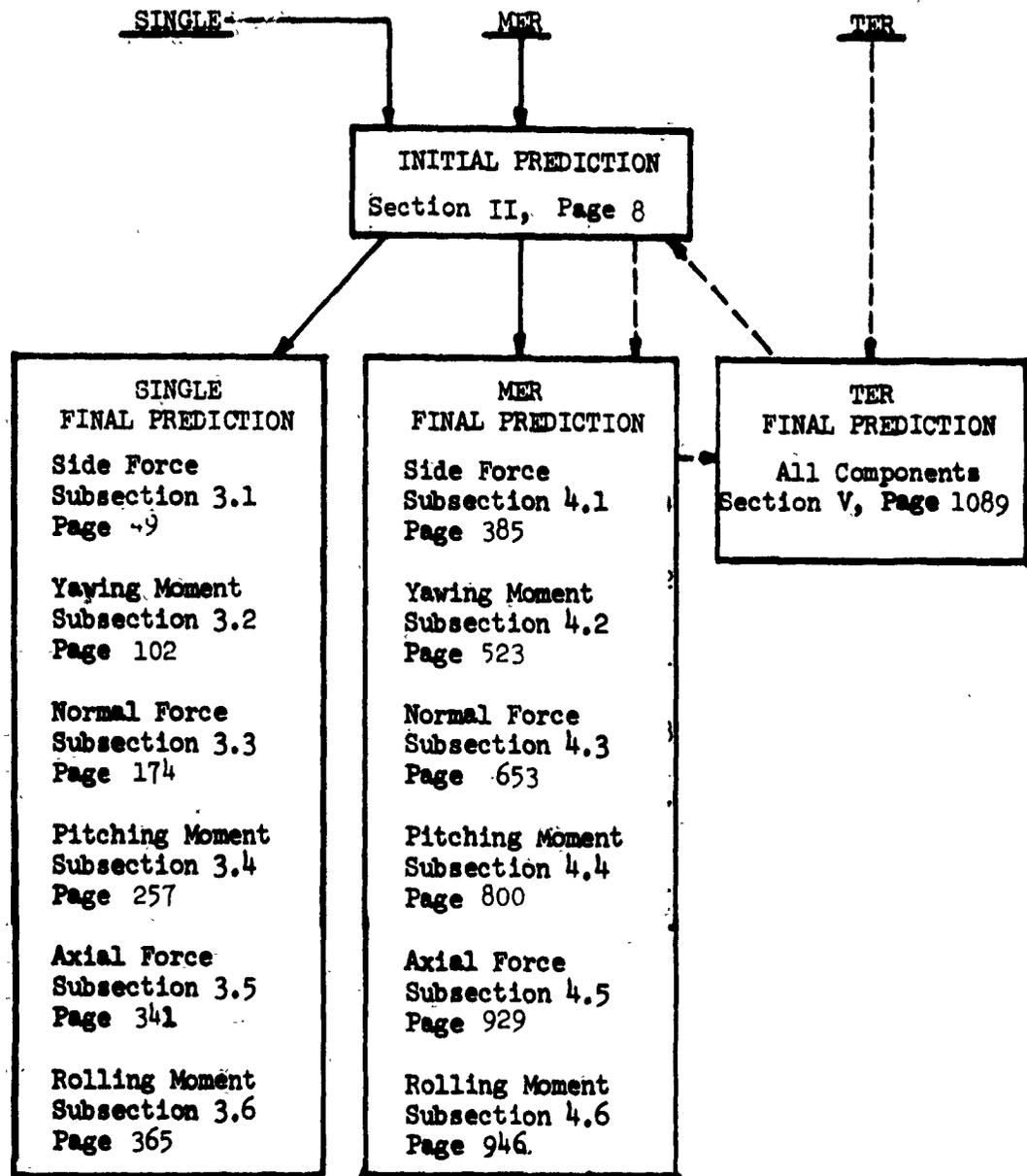


Figure 2. Flowchart for Captive Airloads Prediction

SECTION II

INITIAL AIRLOADS PREDICTION

The basic technique used in the prediction of individual store captive airloads involves an initial captive airloads prediction for the subject store. This initial prediction is then corrected for the influencing parameters of the store/aircraft configuration by various factors and increments, yielding the final airloads prediction. Detailed descriptions of the initial airloads prediction methods are included within this section.

The methods used for the initial predictions of the force and moment components acting on an installed store can be separated into three categories depending on the airload component being considered. These categories result because of the different basic approaches used in the correlation development for the initial airload predictions. The principal category encompasses the approach used for prediction of the variation in normal force, side force, pitching moment, and yawing moment with angle of attack. The two remaining categories include the separate approaches to the initial prediction of axial force and rolling moment components. Included in this section is a thorough discussion of each approach; however, an overview of each approach is presented before the technical details are discussed.

Initial predictions for captive normal force, side force, pitching moment, and yawing moment use isolated store characteristics as a base. These are predicted using Reference 1. This prediction method accurately predicts lift characteristics of wing/body combinations. Through this method, the aerodynamic characteristics of the individual components (wing, body, nose) of the store are predicted, including the mutual interference effects. Hence, it is possible to determine the relative lifting effectiveness of the store components as well as the lift characteristics of the total store in a uniform flow-field.

Once the isolated characteristics and relative lifting effectiveness of the store system have been determined, the initial captive airloads can be predicted. The subject store is then assumed to be

immersed in the flow-field of the base wing (45° sweep) at the mid-semispan location. Longitudinally, the store is placed in the same location as the actual captive store and the local wing chord is assumed to be the same length as the chord at the captive position. Knowing the flow-field characteristics of the base wing presented in Reference 4, and the relative lift effectiveness of the store components, a quasi-integration yields the initial prediction.

Throughout this report fin and wing are used interchangeably in reference to store lifting surfaces. When referring to aircraft wings, an attempt has been made to adequately distinguish the aircraft wing to avoid confusion.

Included in Reference 2 is a method which is used to predict isolated store drag characteristics. Through estimating store skin friction drag, wave drag, and base pressure drag a prediction of store axial force at zero store lift is made. Skin friction drag is estimated as a function of Mach number, Reynolds number, and store wetted area. Using the skin friction drag and the ratio of base diameter to maximum body diameter, an estimate of the base pressure drag is made. Body shape and Mach number are used to estimate wave drag. This prediction for the isolated store is used along with an interference increment due to installing the store in the captive location as an initial prediction of installed store axial force at $\alpha=0$.

Isolated store data are not used in the prediction of captive store rolling moment. Detailed examination of available captive store airloads data showed that captive rolling moment was primarily a function of the total fin area of the subject store. A technique was developed to initially predict rolling moment variation with angle of attack and the value at $\alpha=0$ using only fin area of the installed store.

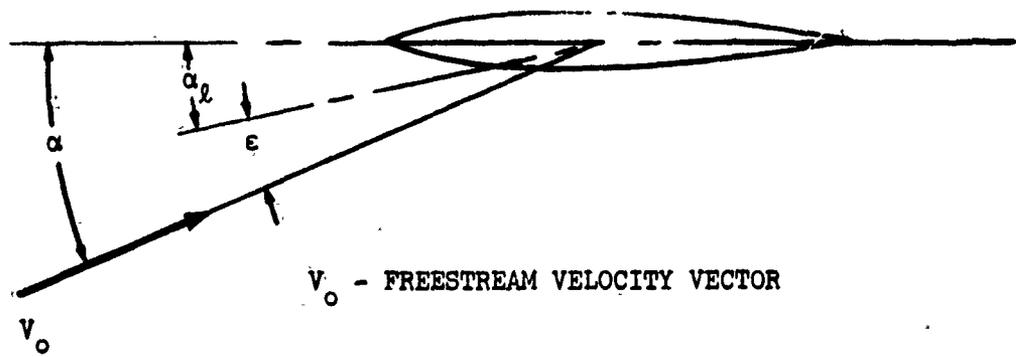
The following subsections delineate each of the parameters used in making the initial predictions for the force and moment components acting on an installed store. These include aircraft flow-field information, isolated store characteristics and geometric considerations, and the detailed force and moment calculation procedures.

2.1 AIRCRAFT FLOW-FIELD CHARACTERISTICS

The aircraft flow-field data used in the initial force and moment prediction were obtained from Reference 4. Experimental sidewash and downwash data at various angles of attack are presented as a function of chordwise position at constant spanwise locations and distances below the 45° swept wing. Before proceeding further, definitions of sidewash and local angle of attack, which are the primary flow ungenerality terms used in the prediction method, are necessary. Sidewash, σ , is defined as the difference between local sidewash angle, β_l , and sideslip angle, β , positive for outboard flow. Local angle of attack, α_l , is defined as the difference between wing geometric angle of attack, α , and local downwash, ϵ , positive for the wing chord plane leading edge deflected upward relative to the resultant flow ungenerality α_l (see Figure 3).

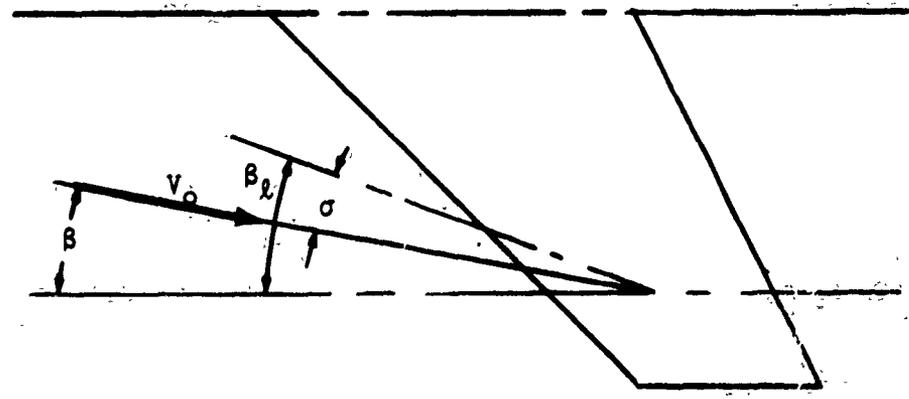
The data from Reference 4 were analyzed to determine the variation of α_l and σ with angle of attack. These data are presented as a function of local chord in Figures 4 and 5. Subsection 2.3 shows the manner in which these terms are used in the initial predictions. As these ungenerality data were used as a base for all the correlations, for consistency these data should also be used when attempting to use the method although more definitive data on the subject aircraft flow-field may be available.

WING LONGITUDINAL PLANE



V_o - FREESTREAM VELOCITY VECTOR

WING LATERAL PLANE



V_o - FREESTREAM VELOCITY VECTOR

Figure 3. Flow Angularity Definitions for an Aircraft/Store Combination

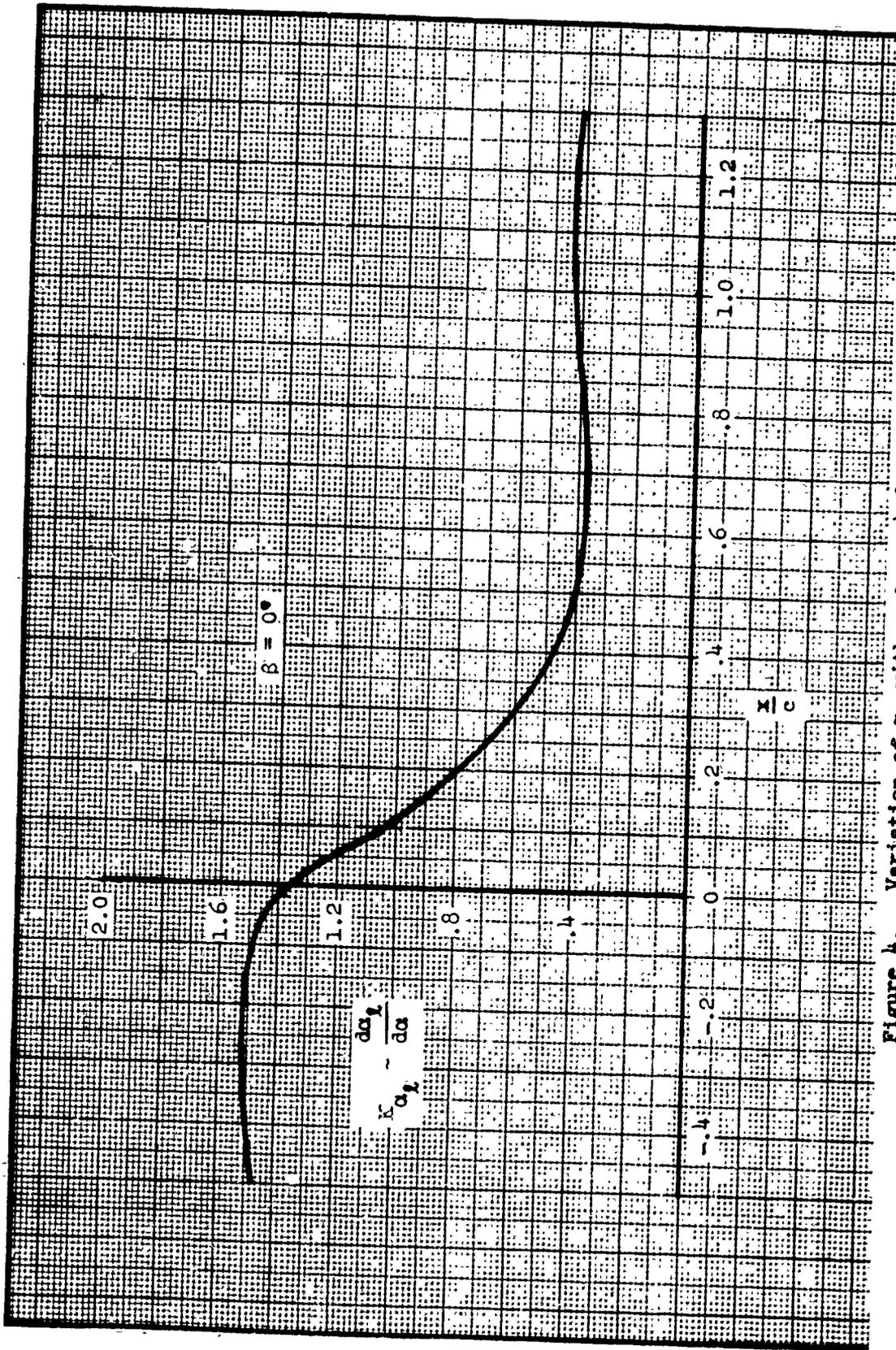


Figure 4. Variation of α_l with α for a 45° Swept Wing

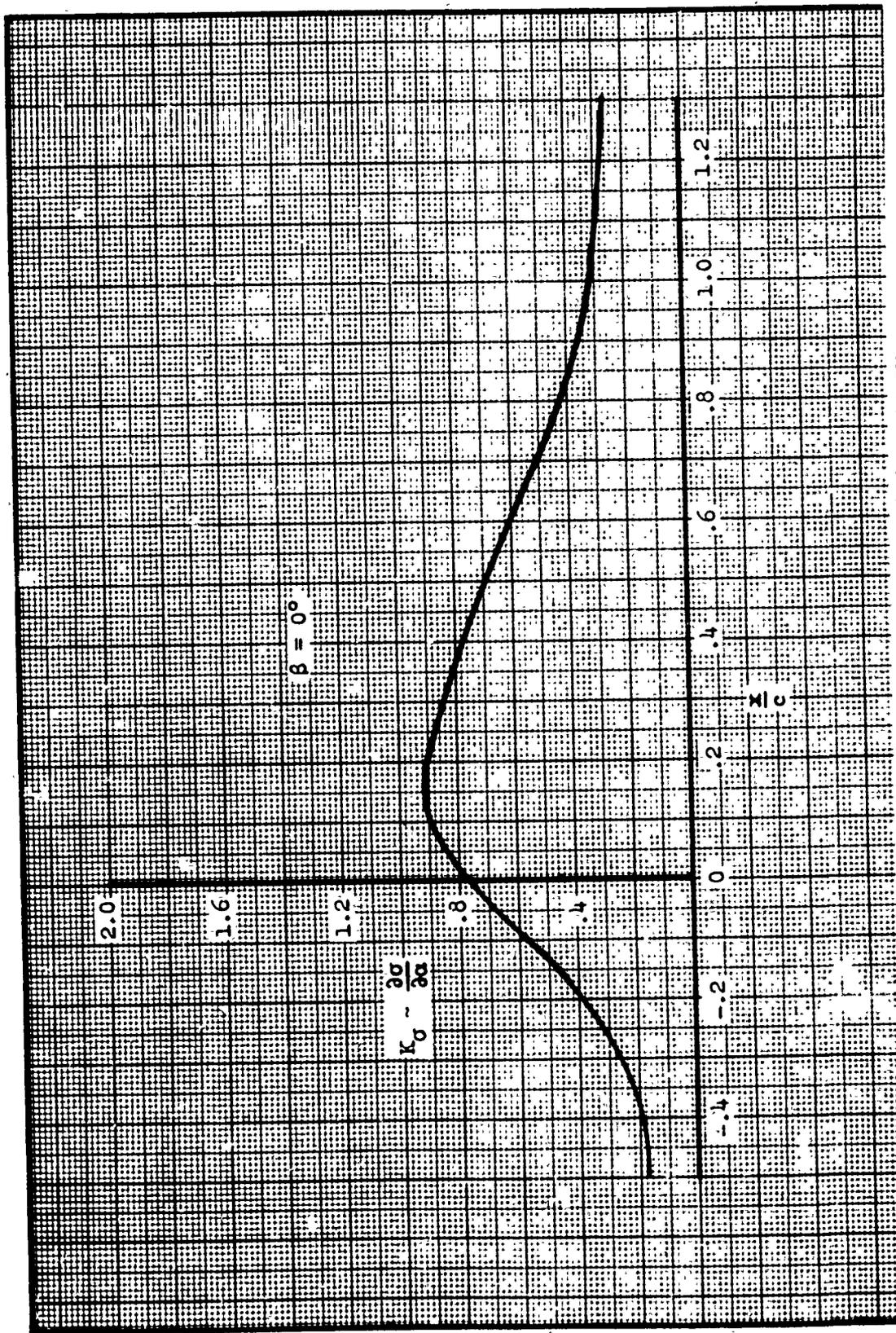


Figure 5. Variation of σ with α for a 45° Swept Wing

2.2 STORE CHARACTERISTICS

2.2.1 Isolated Store Airloads Prediction

Initial prediction of the captive store force and moment components are based on two isolated store airloads prediction techniques, Reference 1 and Reference 2. Although various isolated store prediction techniques are available, these two define parameters within the computational procedure which lend themselves to the calculation of store airloads in a non-uniform flow-field. The initial prediction of captive store, normal store, side force, pitching moment, and yawing moment is based on the isolated store airload prediction technique presented in Reference 1. Included in Reference 2 is a technique to predict drag at zero lift for an isolated store. This estimate is then used in the initial prediction of captive store axial force at $\alpha=0$. Each isolated store prediction technique is discussed in this section; however, a more detailed description of each method is included in References 1 and 2. The application of each of these methods to the initial prediction is presented in Subsection 2.3.

Presented in Reference 1 is a method for calculating lift and center of pressure characteristics of circular cylindrical bodies in combination with triangular, rectangular, or trapezoidal wings and/or tails. The method is valid through the subsonic, transonic, and supersonic speed ranges. Detailed geometric data and wing/fin lift characteristics are necessary inputs. For consistency, Reference 3 should be used to provide the isolated wing aerodynamic data inputs to Reference 1. The geometry of the wings for which Reference 3 is applicable is limited only to the extent that they must be symmetric about the root chord, have a straight quarter chord over the semispan and have no discontinuities in twist. Within Reference 1, factors are defined which are ratios of the lift of the various components of the store system (wing, body, nose) to the lift of the wing alone. These ratios, obtained primarily by slender-body theory, are used in establishing the wing-body interference. A method is also provided to account for wing-tail interference. A

simplified version of the total calculation procedure is presented in chart form in the referenced report which reduces the calculation to routine procedures. Experimental isolated store data may be used when available and are advisable when the store geometry differs considerably from geometry for which the calculation method was developed.

Reference 2 presents a method which may be used to calculate axial force at zero lift for a wing-body combination. This is basically a simplified method consisting of a summation of the individual drag contributions of the body, wings, and tails. Each drag contribution is composed of skin friction drag and wave drag. In addition, a term is added to account for base pressure drag on the body. Acceptable correlations of predicted data have been achieved for the Mach range over which this method is valid. However, isolated store experimental data are recommended for use if such data are available.

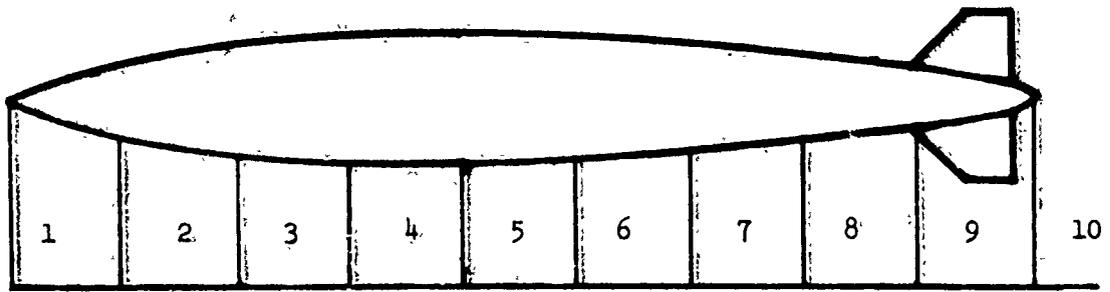
2.2.2 Store Planform Projected Area

The calculation procedure for determining the initial airloads acting on the captive store incorporates store area distribution as a primary factor. Definition of the store area distribution influence is achieved through a summation procedure in which the store is divided into various segments of constant length and the area distributions of these segments are calculated. In addition, the areas are separated into nose, body, and wing components. A sketch identifying the typical segmentation of a 300-gallon tank is shown in Figure 6, along with designations of the various area components. The calculation procedure is performed for the area distribution in one of two planes according to the airload component in question. The paragraphs below describe the area distribution calculation for single and multiple carriage in each of the two planes.

Plan projected area (PPA) is defined as the planform area of the installed store projected into the X_B , Y_B plane. In the initial prediction of both normal force and pitching moment, plan projected area is used in the summation procedure. It merits mentioning at this point that for stores whose wings are in an 'X' configuration some of the body area is shadowed or blocked out by the wings and should not be included. Both multiple and single carriage stores are calculated in a similar manner. Table 1 presents data on a 300-gallon tank installed on the A-7 center pylon. Note that the projected areas of each component (nose, body, wing) are calculated individually. These data are for area segments which are a constant 25 inches in length, as shown in Figure 6. Detailed information concerning the segmentation is provided in Subsection 2.3.2.

Side projected area (SPA) is defined as the planform area of the installed store projected into the X_B , Z_B plane. In the initial prediction of both side force and yawing moment, side projected area is used in the summation procedure. As in the case for plan projected area, some of the body area is shadowed

when the store is installed with wings in an 'X' configuration. For multiple stores, the rack centerline stores are used for the initial prediction for both centerline and shoulder stores. In this case, the exposed side projected area is used in the calculation. This area is defined as that part of the centerline store not shadowed in the X_B, Z_B plane by another store on the multiple installation (see Figure 7). A comparison of the side projected area and exposed side projected area for a M117 carried on a MER centerline position is presented in Table 2.



AREA SEGMENTS

- NCSE - 
- BODY - 
- WING - 

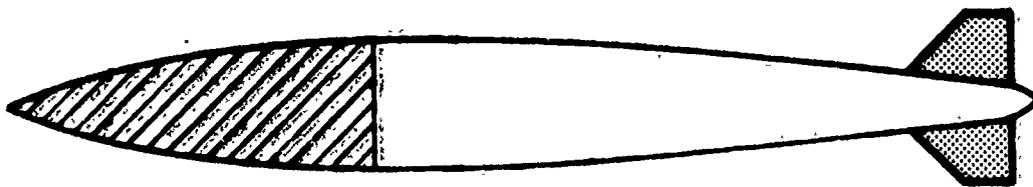


Figure 6. Area Segments for a Typical Store

TABLE 1. AREA SEGMENTATION FOR A 300-GALLON TANK

AREA SEGMENT	PPA or SPA (in. ²)
1N	292.0
2N	548.0
3N	648.0
4N	142.0
4B	520.0
5B	662.0
6B	620.0
7B	531.0
8B	393.0
8W	4.5
9B	203.0
9W	443.0
10B	0.6
TOTAL	5007.1

Note: For symmetric single carried stores, PPA = SPA.

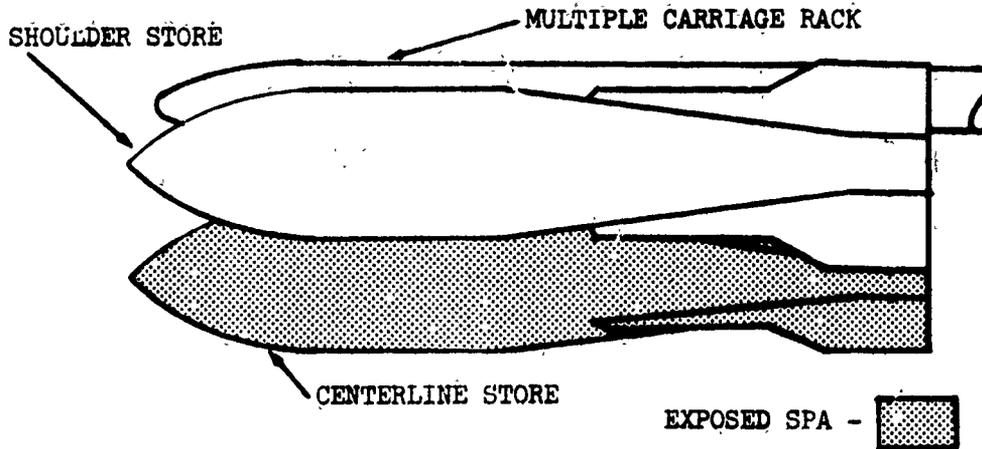


Figure 7. Exposed Side Projected Area for a Multiply Carried M17 Store

TABLE 2. SPA AND EXPOSED SPA FOR AN M17 STORE CARRIED ON A MULTIPLE RACK CENTERLINE POSITION

AREA SEGMENT	SPA-in ²	EXPOSED SPA-in ²
1N	209.3	181.8
2B	322.6	230.6
3B	272.2	221.4
3W	21.	10.5
4B	119.6	114.6
4W	134.8	69.8
5B	22.3	13.5
5W	98.5	49.3
TOTAL	1200.3	891.5
N - Nose		
B - Body		
W - Wing/Fin		
Note: Area Segments are 20 inches in length.		

2.3 AIRCRAFT-STORE COMBINATION

Prediction of the base aerodynamic loads experienced by a store due to installation on an aircraft is discussed in this section. After having developed the isolated store airloads through the procedures identified in Subsection 2.2, the base installed store airloads (initial prediction) can be determined by application of the general procedures outlined here. Final adjustment of the base installed store airloads to compensate for the precise flight conditions and loading arrangements desired are presented in detail in Sections III, IV, and V.

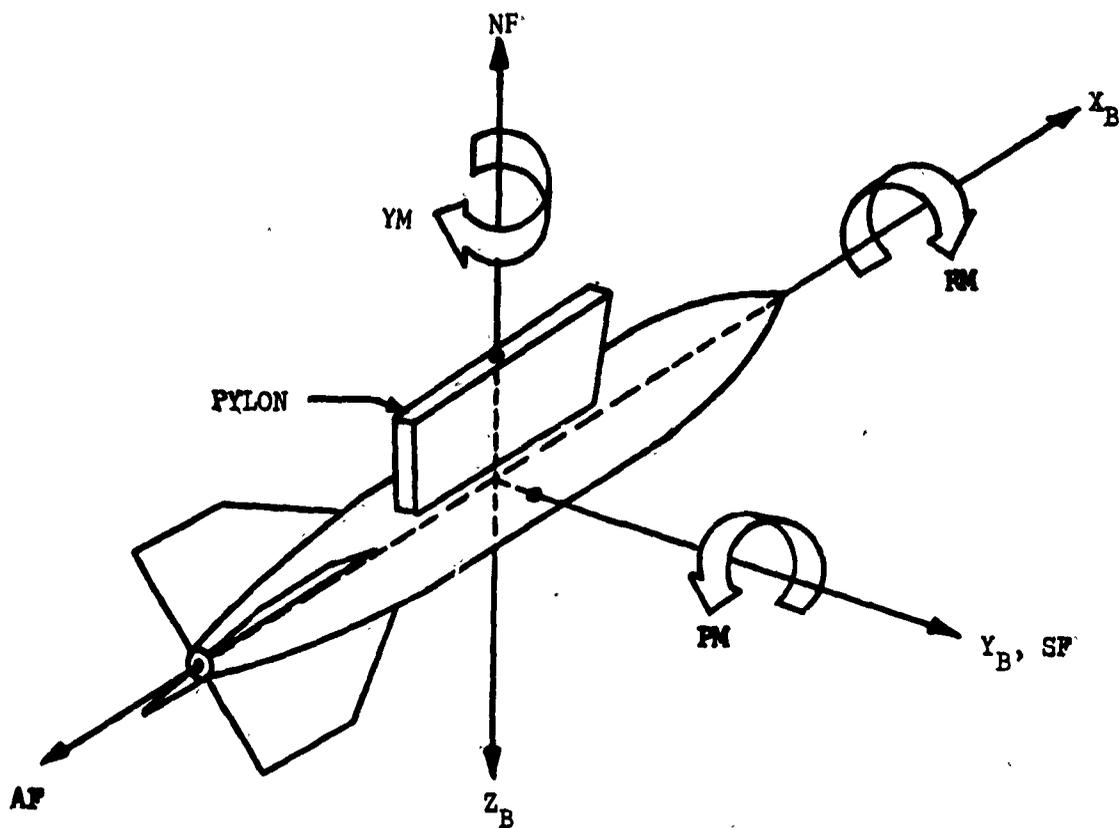
The primary information presented in this section includes the force and moment coordinate systems and the initial prediction force and moment calculation procedures. Example calculations are also included to improve understanding of the computation procedures. Procedures for predicting single and multiple store airloads are presented separately to simplify the procedure complexity.

2.3.1 Store Airloads Coordinate Systems

2.3.1.1 Single Carriage

The single carriage coordinate system and sign convention is presented in Figure 8. The system shown is a right-hand coordinate system with the positive sense of the moments being defined by the right-hand rule. The store coordinate system y body axis remains parallel to the aircraft y body axis regardless of the orientation of the wing pylon. All force and moment predictions contained in this handbook are referenced to this system. The airloads predictions contained herein assume that the subject wing-mounted store is carried on the right wing of the aircraft. To apply the predicted forces and moments to a left wing store installation, a similar but mirror-image system must be established. This will establish a left-hand coordinate system for the left wing with positive sense of the moments determined by the left-hand rule. By defining a left-hand coordinate system for a left

aircraft wing store installation, it is possible to apply the results of computation from this handbook without changing the sign of any force or moment.

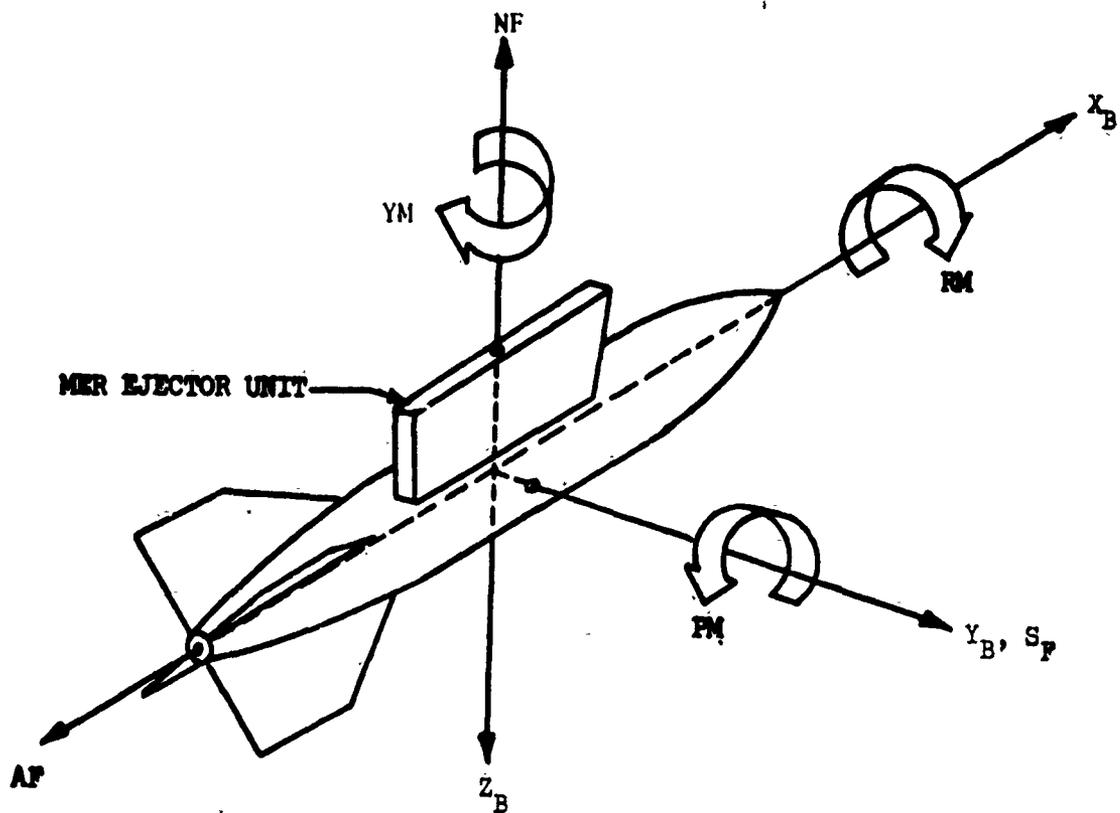


Note: Moment reference point is on the store longitudinal axis at the mid-lug point.

Figure 8. Single Carriage Store Airloads Coordinate System

2.3.1.2 Multiple Carriage

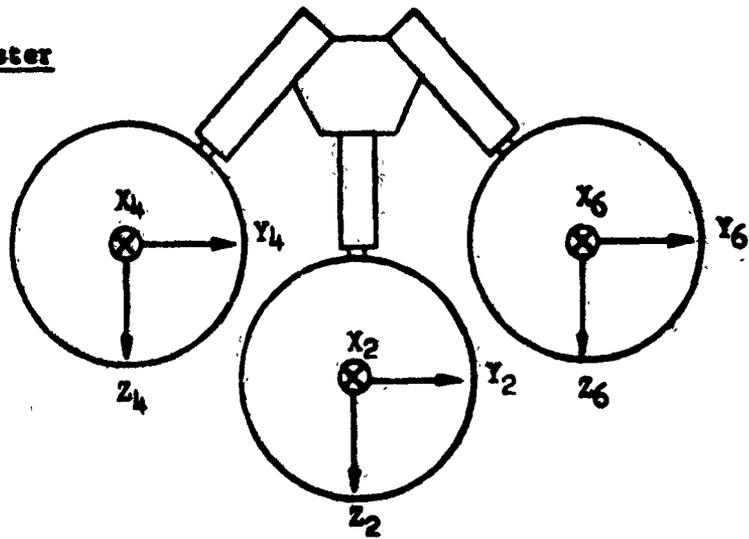
The coordinate system and sign convention for multiple carriage configurations is illustrated in Figure 9. Figure 9 depicts the coordinate system for multiple carriage centerline racks (MER STA 1, 2 or TER STA 1). The coordinate systems for shoulder stations are rotated so that they are parallel to the multiple rack centerline stations. This produces a system of parallel coordinate systems for all multiple stations as illustrated in Figure 10. As with the single carriage coordinate system, the multiple carriage system y-axis remains parallel to aircraft y-body axis regardless of the orientation of the wing pylon. The multiple carriage coordinate system is a set of right-hand coordinate systems with the positive sense of moments determined by the right-hand rule. Predictions contained in this handbook assume a right-wing installation for multiple carriage configurations. To apply the results obtained herein to a left-wing installation, a similar but mirror-image set of coordinate systems should be established for the left wing in the manner described in Subsection 2.3.1.1.



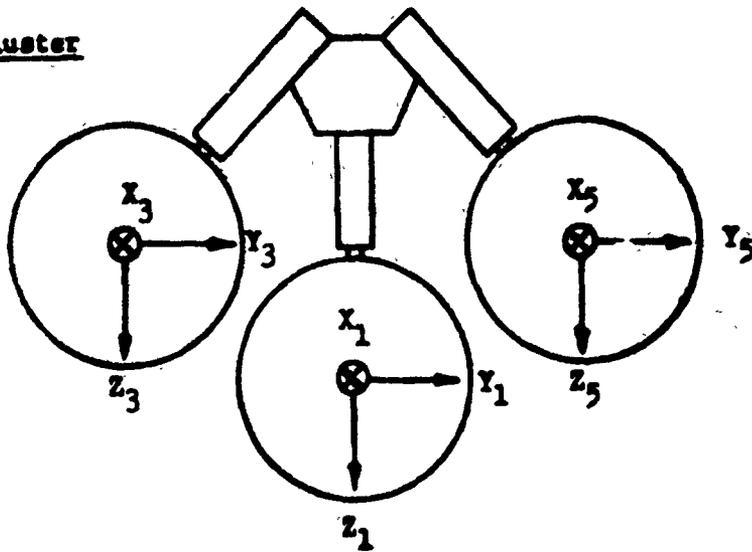
Note: Moment reference point is on the store longitudinal axis at the mid-lug point.

Figure 9. Multiple Carriage Store Airloads Coordinate System for Rack Centerline Stores

Pod Cluster



Aft Cluster



- Notes: 1. View shown with observer viewing from downstream.
2. Coordinate systems are numbered according to MER station location.

Figure 10. Multiple Carriage Store Airloads Coordinate System

2.3.2 Force Calculation Procedure

The initial prediction for the side force and normal force variation with angle of attack is presented in this section. The axial force prediction follows a different approach and requires only the isolated store prediction discussed in Subsection 2.2.1 along with the remainder of the prediction technique presented in Subsection 3.5. The rolling moment prediction is totally contained in Subsection 3.6.

The initial captive side force and normal force slope calculations begin by assuming the store is inserted into the flow-field of the base wing (45° sweep) at the mid-semispan ($\eta = 0.5$) position. Longitudinally the store is placed at the true captive position, and the local wing chord is assumed to be the same as the captive position for the subject aircraft wing. Procedures for side force and normal force slope calculations are the same; hence, the side force component will be discussed in detail.

The store is positioned in the aircraft flow-field as shown in Figure 11. The sidewash characteristics of the base wing are known from an analysis of flow-field data as discussed in Subsection 2.1. The wing flow-field term used in the initial side force slope prediction is $\frac{dg}{d\alpha}$, the rate of change of sidewash angle, σ , with respect to angle of attack α . The term $\frac{dg}{d\alpha}$ is known as a function of x/c for the base wing (Figure 5, Subsection 2.1). With a knowledge of the store geometric and isolated aerodynamic characteristics, a summation procedure is performed along the store in the aircraft flow-field to obtain an initial prediction of side force slope.

In order to perform the summation procedure, several definitions concerning the store geometric and aerodynamic characteristics must be made. Several of the required geometric definitions were made in Subsection 2.2.2 but will be restated here for clarity. The reader is referred to Figure 6 for the following discussion.

The total store planform area is divided into nose area, body area, and wing area. The distinction in planform areas is required since aerodynamically, the nose and wing are more efficient producing lift than the store body. Because of this efficiency distinction, factors have been defined using Reference 1 for the store nose, K_{NOSE} , and wing(s), K_{WING} , to weight their respective planform areas in relation to the store body planform area. The weighting factors are defined for three store types by the following relationships.

Case 1. Store with Wing at Aft End of Body:

$$K_{NOSE} = K_{N/B} \left(\frac{BODY\ AREA}{NOSE\ AREA} \right)$$

where:

$$K_{N/B} = \frac{K_N}{K_{B(W)}}$$

K_N - Ratio of lift of body nose to lift of wing alone.
See line 80, Table 1, page 38 of Reference 1.

$K_{B(W)}$ - Ratio of the body lift in the presence of the wing to lift of wing alone. See line 48, Table 1, page 36 of Reference 1.

BODY AREA - Body planform area, in²., Subsection 2.2.2.

NOSE AREA - Nose planform area, in²., Subsection 2.2.2.

$$K_{WING} = K_{W/B} \left(\frac{BODY\ AREA + NOSE\ AREA}{WING\ AREA} \right)$$

where,

$$K_{W/B} = \frac{K_{W(B)}}{K_{B(W)} + K_N}$$

$K_{W(B)}$ - Ratio of lift of wing in the presence of the body to lift of wing alone. See line 47, Table 1, page 38 of Reference 1.

WING AREA - Wing planform area, in²., Subsection 2.2.2.

Case 2. Store with Wing on Forward Body and Tail at Aft End

$$K_{NOSE} = K_{N/B} \frac{\text{BODY AREA}}{\text{NOSE AREA}}$$

where:

$$K_{N/B} = \frac{K_N C_{L\alpha(W)}}{K_{B(W)} C_{L\alpha(W)} + K_{B(T)} C_{L\alpha(T)}}$$

$$K_{TAIL} = K_{T/B} \frac{\text{BODY AREA} + \text{NOSE AREA}}{\text{TAIL AREA}}$$

where:

TAIL AREA - Tail planform area, in²., defined identical to wing area, Subsection 2.2.2.

$$K_{T/B} = \frac{K_{T(B)} C_{L\alpha(T)}}{(K_{B(W)} + K_N) C_{L\alpha(W)} + K_{B(T)} C_{L\alpha(T)}}$$

where:

$K_{T(B)}$ - Ratio of lift of tail in the presence of the body to lift of tail alone. See line 63, Table 1, page 38 of Reference 1.

$C_{L\alpha(T)}$ - Isolated tail lift curve slope as determined by the methods outlined in Subsection 2.2.1.

$K_{B(W)}$ - Ratio of the lift of the body in the presence of the wing to lift of wing alone. See line 48, Table 1, page 38 of Reference 1.

K_N - Ratio of lift of body nose to lift of wing alone.
See line 80, Table 1, page 38 of Reference 1.

$C_{L\alpha(W)}$ - Isolated wing lift curve slope as determined by the methods outlined in Subsection 2.2.1.

$K_{B(T)}$ - Ratio of the lift of the body in the presence of the tail to lift of tail alone. See line 64, Table 1, page 38 of Reference 1.

$$K_{WING} = K_{W/B} \left(\frac{\text{BODY AREA} + \text{NOSE AREA}}{\text{WING AREA}} \right)$$

where:

$$K_{W/B} = \frac{K_{W(B)} C_{L\alpha(W)}}{(K_{B(W)} + K_N) C_{L\alpha(W)} + K_{B(T)} C_{L\alpha(T)}}$$

$K_{W(B)}$ - Ratio of the lift of the wing in the presence of the body to lift of wing alone. See line 47, Table 1, page 38 of Reference 1.

For this case, a factor has been defined to account for the interference effect of the wing on the tail lift. This factor should be multiplied times K_{TAIL} (defined above) and is given by the following relationship:

$$K = 1 - \frac{C_{L\alpha(WBT)INTF} - C_{L\alpha(WBT)W/OINTF}}{C_{L\alpha(T)}}$$

where:

$C_{L\alpha(WBT)INTF}$ - Lift curve slope of wing/body/tail accounting for interference of wing on tail. See line 88, Table 1, page 38 of Reference 1.

$C_{L\alpha}(WBT)_{W/O INTF}$ - Lift curve slope of wing/body/tail without interference effect of wing on tail. See line 124, Table 1, page 38 of Reference 1.

Case 3: Unfinned Store

For an unfinned store, K_{NOSE} is the only additional parameter which must be defined.

$$K_{NOSE} = 2.0$$

The planform area of the store is projected into the X_B, Z_B plane and is defined as side projected area, SPA. The store is divided into constant length segments from nose to tail. The SPA is computed for each of the segments with distinction made as to nose, body, or wing areas. The area segments for a 300-gallon tank are tabulated in Table 1 and will be referred to in the example to follow in Subsection 2.3.2.1. With the segmented side projected areas defined and the store inserted into flow-field of the base wing, the summation procedure is given by the following relationship.

$$ADJUSTED SPA = \sum_{n=1}^m K_{\sigma_n} K_{NOSE_n} K_{WING(TAIL)_n} K_{INTF_n} SPA_n$$

where:

m - Number of constant length area segments as computed from store nose to tail.

K_{σ} - Rate of sidewash variation with angle of attack, $\frac{d\sigma}{d\alpha}$, Figure 5.

K_{NOSE} - Store nose lift effectiveness as defined by Case 1, 2, or 3 equations presented above.

$K_{WING(TAIL)}$ - Store wing or tail lift effectiveness as defined by Case 1, 2, or 3 equations presented above.

K_{INTF} - Tail lift interference factor. Applicable only to Case 2 above. All other cases, $K_{INTF} = 1$.

SPA - Store side projected area, in².

then:

$$K_{C_{SF}} = \frac{\text{ADJUSTED SPA}}{\text{SPA}_{\text{TOTAL}}}$$

where:

ADJUSTED SPA - Adjusted side projected area of the store as given by the summation equation above.

$\text{SPA}_{\text{TOTAL}}$ - Total side projected area of the store. The sum of nose, body, and wing side projected areas.

The initial side force slope prediction is given by the following equation.

$$\frac{d\left(\frac{SF}{q}\right)}{d\alpha_{\text{INITIAL PRED.}}} = K_{C_{SF}} \frac{d\left(\frac{SF}{q}\right)}{d\psi_{\text{ISO}}}$$

where:

$\frac{d\left(\frac{SF}{q}\right)}{d\psi_{\text{ISO}}}$ - Isolated aerodynamic characteristics of the subject store. Equal to $C_{L_{\alpha_{\text{ISO}}}} S_{\text{REF}} \frac{ft^2}{deg}$. Computed from the method of Reference 1.

It should be noted that if experimental isolated store characteristics are used in the above equation, the user must still perform most of the computations of Reference 1 since many of the terms of the computation are used in defining the store nose and wing weighting factors presented in Cases 1 and 2 previously discussed.

The initial normal force slope prediction follows a similar procedure and is given by the following relationships.

$$\text{ADJUSTED PPA} = \sum_{n=1}^m K_{\alpha_{\ell n}} K_{\text{NOSE } n} K_{\text{WING } n(\text{FIN})} K_{\text{INTF } n} \text{PPA}_n$$

where

$K_{\alpha_{\ell}}$ - Rate of local angle of attack variation with aircraft angle of attack, $\frac{d\alpha_{\ell}}{d\alpha}$, Figure 4.

PPA - Store planform projected area, in². (Same as SPA for a symmetrical store.)

$$K_{C_{NF}} = \frac{\text{ADJUSTED PPA}}{\text{PPA}_{\text{TOT}}}$$

where ADJUSTED PPA - Adjusted planform projected area of the store as given by the summation equation above.

$\text{PPA}_{\text{TOTAL}}$ - Total planform projected area of the store. The sum of nose, body, and wing planform projected areas.

$$\frac{d\left(\frac{NF}{c}\right)}{d\alpha}_{\text{INITIAL PREP}} = K_{C_{NF}} \frac{d\left(\frac{NF}{q}\right)}{d\alpha}_{\text{ISO}}$$

where

$\frac{d\left(\frac{NF}{q}\right)}{d\alpha}_{\text{ISO}}$ - Isolated aerodynamic characteristics of the subject store. Equal to $C_{L_{\alpha_{\text{ISO}}}} \cdot S_{\text{REF}} \frac{ft^2}{deg}$.
Computed from the method of Reference 1.

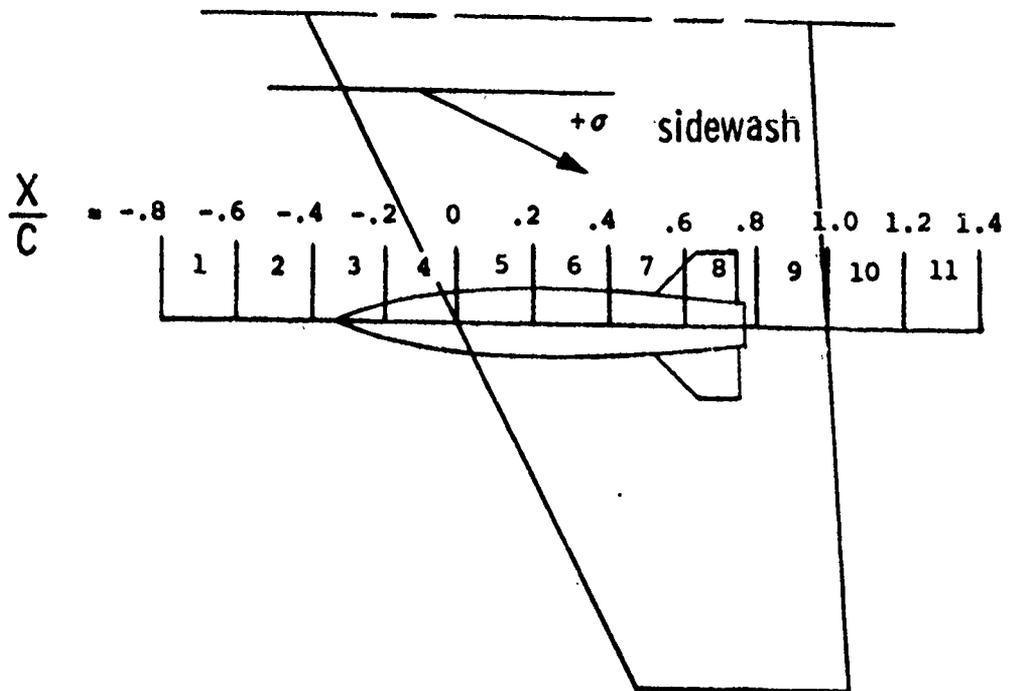


Figure 11. Typical Store Immersed in Aircraft Flow-Field

2.3.2.1 Computational Example-Single Carriage

Application of the prediction equations in Section 2.3.2 is illustrated by initial prediction of side force variation with angle of attack, $\left(\frac{SF}{q}\right)_{\text{INITIAL}}^{\text{PRED}}$, for a 300-gallon tank on the A-7 center pylon at $M = 0.5$.

Required for Computation:

$$C_{\text{LOCAL}} = 127.6 \text{ in.}$$

$$l_{\text{LE}} = 75.1 \text{ in.}$$

K_{σ} from Figure 5

$$K_{\text{WING}} = 7.12, \text{ Case 1 computation, Subsection 2.3.2.}$$

$$K_{\text{NOSE}} = 4.46, \text{ Case 1 computation, Subsection 2.3.2.}$$

$$K_{\text{INTF}} = 1.0, \text{ Case 2 for definition, Subsection 2.3.2.}$$

SPA from Table 1 (in 25-in. segments)

$$\frac{d\left(\frac{SF}{q}\right)}{d\psi}_{\text{ISO}} = .262 \frac{\text{ft}^2}{\text{deg}}$$

Table 3 is used to demonstrate the computation as shown below where N represents nose SPA, B body SPA, and W wing SPA. The control point for applying the sidewash term, K_{σ} , is the midpoint of each 25-in. length segment.

The store nose/wing leading edge relationship is given by

$$X_{\text{NOSE}} = -l_{\text{LE}} = -75.1 \text{ in.}$$

The first control point for the store is

$$X_{\text{MID-POINT}} = X_{\text{NOSE}} + \frac{25}{2} = -75.1 + 12.5 = -62.6 \text{ in.}$$

TABLE 3. INITIAL SIDE FORCE SLOPE PREDICTION CALCULATION FOR A 300-GALLON TANK ON THE A-7 CENTER PYLON

AREA SEG.	X _{MID} POINT in.	X/C _{MID} POINT	K _C	K _{WING}	K _{NOSE}	SPA _{TOT} in ² .	ADJ. SPA in ² .
1N	-62.6	-.491	0.175	1.0	4.46	292	228
2N	-37.6	-.295	0.275	1.0	4.46	548	672
3N	-12.6	-.099	0.57	1.0	4.46	648	1647
4N	12.4	.097	0.89	1.0	4.46	142	565
4B	12.4	.097	0.89	1.0	1.0	520	463
5B	37.4	.293	0.84	1.0	1.0	662	558
6B	62.4	.489	0.69	1.0	1.0	620	428
7B	87.4	.685	0.52	1.0	1.0	531	276
8B	112.4	.881	0.38	1.0	1.0	393	149
8W	112.4	.881	0.38	7.12	1.0	4.5	12.2
9B	137.4	1.077	0.31	1.0	1.0	203	63.1
9W	137.4	1.077	0.31	7.12	1.0	443	978
10B	162.4	1.273	0.265	1.0	1.0	.6	.2
						<u>5007.1</u>	<u>6039.5</u>

$$K_{C_{SF}} = \frac{ADJ. SPA}{SPA_{TOT.}} = \frac{6039.5}{5007.1} = 1.206$$

$$\frac{d\left(\frac{SF}{q}\right)}{d\alpha}_{INITIAL PRED.} = K_{C_{SF}} \frac{d\left(\frac{SF}{q}\right)}{d\psi}_{ISO}$$

$$= 1.206(.262)$$

$$= .316 \frac{ft^2}{deg}$$

2.3.2.2 Example Computation-Multiple Carriage

This section presents an example computation illustrating the application of the prediction equations developed in Subsection 2.3.2. The initial prediction equations are similar to those presented in Subsection 2.3.2 but due to slight differences in the definition of certain terms, they are presented again below for the multiple case initial side force slope prediction.

$$\text{ADJUSTED SPA} = \sum_{n=1}^m K_G K_{NOSE_n} K_{WING_n} K_{INTF_n} \text{SPA}_n$$

This summation equation is applied only to the two MER centerline rack stations (MER STATIONS 1, 2). The shoulder stations are predicted as an increment added to MER STATIONS 1 and 2. The only difference in the above equation and the one presented in the previous section is the interpretation of the side projected area term, SPA, for the initial side force slope prediction. The store side projected area used in the computation of ADJUSTED SPA is the exposed side projected area as defined in Subsection 2.2.2.

$$K_{C_{SF}} = \frac{\text{ADJUSTED SPA}}{\text{SPA}_{TOTAL}}$$

where

ADJUSTED SPA - Adjusted side projected area given by the above equation, in².

SPA_{TOTAL} - Total store side projected area (not the exposed SPA), in².

The initial side force slope prediction is given by the following equation.

$$\frac{d\left(\frac{SF}{q}\right)}{d\alpha_{INITIAL PRED.}} = K_{C_{SF}} \frac{d\left(\frac{SF}{q}\right)}{d\psi_{ISO}}$$

where

$$\frac{d\left(\frac{SF}{q}\right)}{d\psi} \text{ ISO} = \text{Isolated aerodynamic characteristics of the subject store. Equal to } C_{L\alpha} \cdot S_{REF} \cdot \frac{ft^2}{deg}$$

Computed from Reference 1.

The normal force initial slope prediction makes use of the same set of equations presented above except that side projected area is replaced by planform projected area, PPA, and K_O is replaced by K_{α} . It should be noted that the exposed PPA is the same as the total PPA.

The nose and wing lift efficiency factors should be computed in the manner described in Subsection 2.3.2 for Cases 1, 2, or 3. The nose lift efficiency factor, K_{NOSE} , is set equal to 1.0 for all store types on the MER aft centerline station (MER STATION 1) due to the blockage effect of the MER forward cluster.

Example: Compute the initial prediction of side force variation with angle of attack, $\left(\frac{SF}{q}\right)_{\alpha_{INITIAL} \text{ PRED.}}$, for an M117 store on MER STATION 2 (forward centerline) of a fully loaded MER on the A-7 center pylon at $M = 0.5$.

Required for Computation:

$$C_{LOCAL} = 127.6 \text{ in.}$$

$$l_{LE} = 59.3 \text{ in.}$$

K_O from Figure 5.

$$K_{WING} = 2.98; \text{ Case 1 Computation, Subsection 2.3.2.}$$

$$K_{NOSE} = 13.25; \text{ Case 1 Computation, Subsection 2.3.2.}$$

$$K_{INTF} = 1.0; \text{ See Case 2 definition, Subsection 2.3.2.}$$

SPA from Table 2 (in 20-in. segments)

$$SPA_{TOTAL} = 1200 \text{ in}^2.$$

$$\frac{d\left(\frac{SF}{q}\right)}{d\psi}_{ISO} = .114 \frac{\text{ft}^2}{\text{deg}}$$

Table 4 demonstrates the computation as shown below where N represents nose SPA, B body SPA, and W wing SPA. The control point for applying the sidewash term, K_{σ} , is the mid-point of each 20-in. length area segment.

The store nose/wing leading edge relationship is given by

$$X_{NOSE} = -\ell_{LE} = -59.3 \text{ in.}$$

The first control point for the store is

$$X_{MID-POINT} = X_{NOSE} + \frac{20}{2} = -59.3 + 10 = -49.3 \text{ in.}$$

TABLE 4. INITIAL SIDE FORCE SLOPE PREDICTION CALCULATION FOR AN M117 AT MER STATION 2 ON THE A-7 CENTER PYLON

AREA SEG.	X_{MID} PC i.	X/C_{MID} POINT	K_{σ}	K_{WING}	K_{NOSE}	SPA (EXPOSED) in. ²	ADJ.SPA in. ²
1N	-49.3	-.387	0.21	1.0	13.25	181.8	505.5
2B	-29.3	-.23	0.33	1.0	1.0	230.6	75.6
3B	-9.3	-.071	0.66	1.0	1.0	221.4	146.4
3W	-9.3	-.071	0.66	2.98	1.0	10.5	20.4
4B	10.7	.084	0.89	1.0	1.0	114.6	101.5
4W	10.7	.084	0.89	2.98	1.0	69.8	185.0
5B	30.7	.241	0.865	1.0	1.0	13.5	11.4
5W	30.7	.241	0.865	2.98	1.0	49.3	127.0
							<hr/> 1172.8

$$K_{C_{SF}} = \frac{ADJ.SPA}{SPA_{TOT.}} = \frac{1172.8}{1200} = .976$$

$$\frac{d\left(\frac{SF}{q}\right)}{d\alpha_{INITIAL}} = K_{C_{SF}} \frac{d\left(\frac{SF}{q}\right)}{d\psi_{ISO}}$$

PRED

$$= (.976)(.114) = .111 \frac{ft^2}{deg}$$

2.3.3 Moment Calculation Procedure

The initial moment calculation follows essentially the same procedure outlined in Subsection 2.3.2 for the initial force calculation. The only difference is that a moment arm term has been added to the equation for adjusted side projected area to weight each area segment according to its distance from the store moment reference point (MRP). The moment arm used is the distance from the store MRP to the mid-point of each respective area segment. The store MRP for all computations from this handbook is located on the store longitudinal axis at the mid-lug point. The moment arm definition is illustrated in Figure 12. An equation is included in the figure for computing the moment arms.

The equation for computing the initial prediction of yawing moment slope is presented below.

$$\frac{d\left(\frac{YM}{q}\right)}{d\alpha} \text{ INITIAL PRED} = K_{C_{YM}} \frac{d\left(\frac{SF}{q}\right)}{d\psi} \text{ ISO}$$

where

$$K_{C_{YM}} = \frac{\sum_{n=1}^m [(\text{ADJ.SPA})_n X_{\text{MOM } n} - (\text{WING ADJ.SPA})_n X_{\text{MOM } n}]}{\text{SPA}_{\text{TOTAL}}}$$

where

- m - Number of constant length area segments as computed from store nose to tail.
- $(\text{ADJ. SPA})_n$ - Adjusted side projected area of area segment n , in^2 .
- $X_{\text{MOM } n}$ - Distance from store MRP to area segment n mid-point, ft., see Figure 12.
- (WING ADJ. SPA) - Adjusted store wing side projected area, in^2 . (for wing at aft end of store only).
- $\text{SPA}_{\text{TOTAL}}$ - Defined in Subsection 2.3.2.
- $\frac{d\left(\frac{\text{SF}}{q}\right)}{d\psi_{\text{ISO}}}$ - Defined in Subsection 2.3.2.

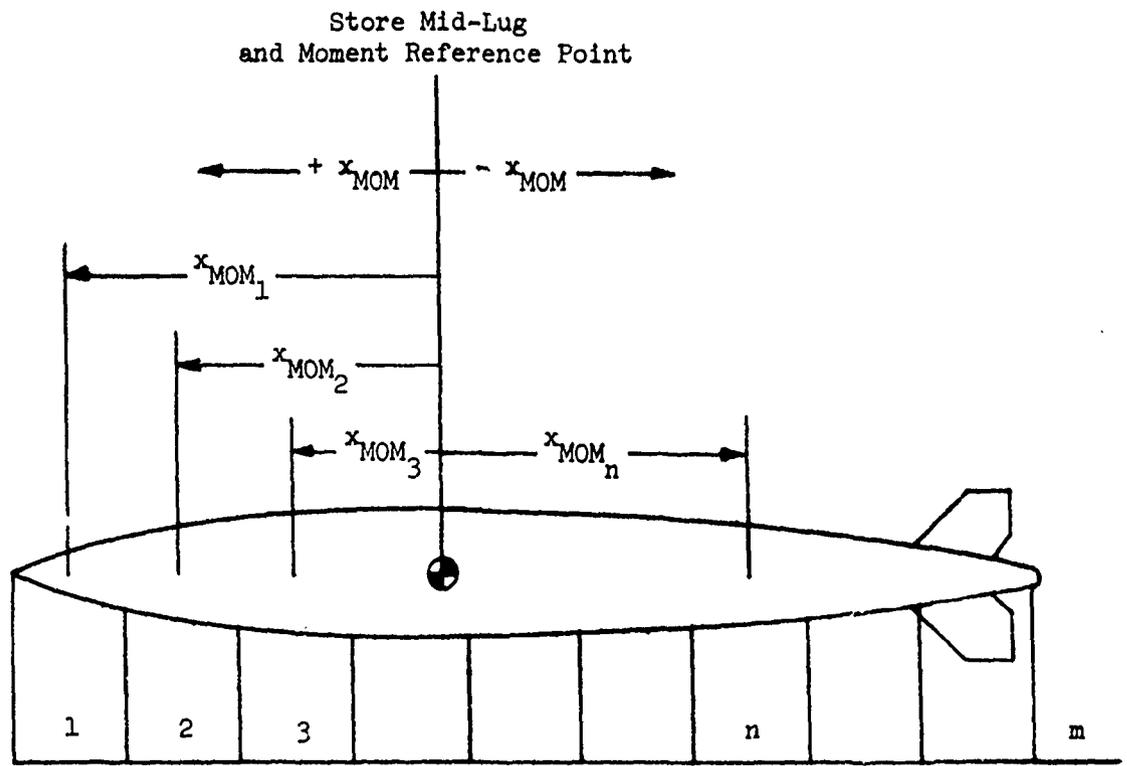
The equation for computing the initial prediction of pitching moment slope is presented below.

$$\frac{d\left(\frac{\text{PM}}{q}\right)}{d\alpha_{\text{INITIAL PRED.}}} = K_{C_{\text{PM}}} \frac{d\left(\frac{\text{NF}}{q}\right)}{d\alpha_{\text{ISO}}}$$

where

$$K_{C_{\text{PM}}} = \frac{\sum_{n=1}^m (\text{ADJ. PPA})_n X_{\text{MOM } n}}{\text{PPA}_{\text{TOTAL}}}$$

where all terms are defined above or in Subsection 2.3.2.



AREA
SEGMENT

$$x_{MOM_n} = x_{M.L.} + \sum_{i=1}^n x_{SEGMENT LENGTH} - x_{SEGMENT LENGTH (n-1)}$$

where:

$n = 1, 2, 3, \dots, m$ segments

$x_{M.L.}$ - Distance from store nose to mid-lug point (positive)

$x_{SEGMENT LENGTH}$ - Constant length of each area segment measured along the store longitudinal axis (positive). Assigned by the user.

Figure 12. Moment Arms for Initial Airloads Prediction

2.3.3.1 Example Computation-Single Carriage

Application of the prediction equations in Subsection 2.3.3 is illustrated by the initial prediction of yawing moment variation with angle of attack, $\left(\frac{YM}{q}\right)_{\text{INITIAL PRED.}}$, for a 300-gallon tank on the A-7 center pylon at $M = 0.5$.

Given: All items given in the example of Subsection 2.3.2.1.

Store mid-lug = 95.5 in. aft of store nose

The initial moment arm is

$$X_{\text{MOM}_1} = X_{\text{M.L.}} - \frac{25}{2} \text{ (for 25 in. area segments)}$$

$$= \frac{95.5 - 12.5}{12} = 6.91 \text{ ft.}$$

Each successive moment arm is 25 in. aft of the previous one from area segment 1 through the total number of segments. For this example the values of X_{MOM} are tabulated below in Table 5.

Table 5 is used to present the example summation. Values of ADJ. SPA in the table are extracted from Table 3 in Subsection 2.3.2.1.

TABLE 5. INITIAL YAWING MOMENT SLOPE PREDICTION CALCULATION FOR A 300-GALLON TANK ON THE A-7 CENTER PYLON

AREA SEG.	ADJ. SPA in ²	X _{MOM} ft.	(ADJ. SPA)X _{MOM} in ² .-ft.
1N	228	6.91	1572
2N	672	4.83	3250
3N	1647	2.75	4530
4N	565	.67	379
4B	463	.67	310
5B	558	-1.42	-790
6B	428	-3.5	-1500
7B	276	-5.58	-1540
8B	149	-7.66	-1143
8W	12.2	-7.66	-94
9B	63.1	-9.76	-615
9W	978	-9.76	-9540
10B	.2	-11.84	-2
			-5183

$$K_{C_{YM}} = \frac{\sum_{n=1}^m [(ADJ. SPA)_n X_{MOM_n} - (WING ADJ. SPA)_n X_{MOM_n}]}{SPA_{TOTAL}}$$

$$K_{C_{YM}} = \frac{-5183 - (-94 - 9540)}{5007.1}$$

$$= .889 \text{ ft.}$$

then

$$\frac{d\left(\frac{YM}{q}\right)}{d\alpha_{INITIAL PRED}} = K_{C_{YM}} \frac{d\left(\frac{SF}{q}\right)}{d\psi_{ISO}}$$

$$= (.889)(.262)$$

$$= .233 \frac{ft^3}{deg}$$

2.3.3.2 Example Computation-Multiple Carriage

The equations of Subsection 2.3.3.1 apply to the multiple carriage case with the exception of $K_{C_{YM}}$ which is redefined below.

$$K_{C_{YM}} = \frac{\sum_{n=1}^m (\text{ADJ.SPA})_n X_{MOM_n}}{\text{SPA}_{TOTAL}}$$

where all terms have been defined in Subsections 2.3.2 and 2.3.3.

Example: Compute the initial prediction of yawing moment variation with angle of attack, $\left(\frac{YM}{q}\right)_\alpha$, for an M17 store on MER STATION 2 INITIAL PRED. (forward centerline) of a fully loaded MER on the A-7 center pylon at $M = 0.5$.

Given: All terms and results in the example in Subsection 2.3.3.1. X_{MOM} is defined in the manner discussed in Subsection 2.3.3.1.

The computation is presented in Table 6 below in the same manner as the previous example in Subsection 2.3.3.1.

TABLE 6. INITIAL YAWING MOMENT SLOPE PREDICTION CALCULATION FOR AN M117 AT MER STATION 2 ON THE A-7 CENTER PYLON

AREA SEG	ADJ. SPA in ² .	X _{MOM} ft.	(ADJ.SPA)X _{MOM} in ² .-ft.
1N	582	1.74	879.6
2B	106	.075	5.7
3B	180	-1.59	-232.8
3W	41	-1.59	-32.4
4B	106	-3.26	-330.9
4W	357	-3.26	-603.1
5B	19	-4.42	-50.4
5W	254	-4.42	-561.0
			<hr/> -925.3

$$K_{C_{YM}} = \frac{\sum_{n=1}^m (\text{ADJ. SPA})_n X_{\text{MOM}_n}}{\text{SPA}_{\text{TOT}}}$$

$$\frac{925.3}{1200} = -.771 \text{ ft.}$$

then

$$\frac{d\left(\frac{YM}{q}\right)}{dc_{\text{INITIAL PRED.}}} = K_{C_{YM}} \frac{d\left(\frac{SE}{q}\right)}{d\psi_{\text{ISO}}}$$

$$= (-.771)(.114) = -.088 \frac{\text{ft}^3}{\text{deg}}$$