AD-A037 203 DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 1/3
GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG.(U)
SEP 67 J F TALBOT, J OTTENSOSER

UNCLASSIFIED AERO-1141 DTNSRDC-C-2622 NL

| OF |
AD
A037203

END
DATE
FILMED
4-77

ADA037203

Report C-2622

UNCLASSIFIED

[redacted]

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

WASHINGTON, D.C. 20007

GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U)

by

John F. Talbot and Jonah Ottensoser

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

1473

"This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Section 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law."

In addition to security requirements which apply to this document and must be met, each transmittal outside the agencies of the U. S. Government must have prior approval of Commander, Naval Air Systems Command (5301)

AERODYNAMICS LABORATORY

RESEARCH AND DEVELOPMENT REPORT

DDC
RECEIVED
MAR 21 1977
A

DOWNGRADED AT 12-YEAR INTERVALS
NOT AUTOMATICALLY DECLASSIFIED
DOD DIR 5200.10

September 1967

UNCLASSIFIED

Report C-2622

GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U)

COPY AVAILABLE TO DDC DOES NOT PERMIT FULLY LEGIBLE PRODUCTION

The Naval Ship Research and Development Center is a U.S. Navy center for laboratory effort directed at achieving improved sea and air vehicles. It was formed in March 1967 by merging the David Taylor Model Basin at Carderock, Maryland and the Marine Engineering Laboratory at Annapolis, Maryland.

Naval Ship Research and Development Center
Washington, D. C. 20007

[redacted]

UNCLASSIFIED

SYMBOLS

C_D	drag coefficient $\left(\frac{\text{drag}}{q\,S_w}\right)$
C_L	lift coefficient $\left(\frac{\text{lift}}{q\,S_w}\right)$
C_m	pitching moment coefficient $\left(\frac{\text{pitching moment}}{q\,S_w\,\bar{c}}\right)$
$\bar{c}$	aircraft mean aerodynamic chord, in inches
ΔD	full-scale incremental drag, in pounds (difference between drag of clean aircraft and bomb mounted configurations, extrapolated to full scale)
M	free-stream Mach number
q	free-stream dynamic pressure, lb/ft^2
S_w	aircraft wing planform area 25° sweep - 2.05 ft^2 50° sweep - 2.11 ft^2
α	angle of attack, in deg

UNCLASSIFIED

[redacted]

NDW-NSRDC-5511/2

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CONFIDENTIAL

Aero Report 1141
September 1967

GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG

by

John F. Talbot and Jonah Ottensoser

SUMMARY

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90.

In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. The magnitude of the incremental drag from fuselage mounted stores does not appear to be hidden when it is measured on a high drag airplane model, nor does it appear to be magnified when measured on a low drag airplane model.

CONFIDENTIAL

INTRODUCTION

An investigation into the effect of fuselage mounted stores on the drag of aircraft cruising at high subsonic speeds was initiated at the Naval Ship Research and Development Center early in 1966. An earlier report (Reference 1) describes the results of a preliminary investigation of this problem and suggested areas of more detailed testing. Some of these areas have been explored and the results are presented in this report.

A basic body was tested with a high and low wing. Both the high and low wings were run with 25° and 50° sweeps. Various store loadings and positions were investigated, using Mk 81 and Mk 82 bombs with Snakeye tails. In addition, a ramp type shield forward of the stores was investigated. Tests were conducted at Mach numbers of 0.60, 0.70, 0.80, 0.85, and 0.90.

This study was initiated in response to widespread interest in possible practical application of fuselage mounted store suspension and launch systems, such as outlined in Reference 2.

MODELS

The wing-body model consists of a rectangular cross-section fuselage rounded at the corners and faired to a point at the nose. The wing has an NACA 64A008 airfoil section with a 25° or 50° leading edge sweep. Details of the wing-body configurations are shown in Figures 1 and 2. A plot of the area distributions is shown in Figure 3.

The external stores tested were 0.10-scale models of the Mk 81 and Mk 82 bombs with Snakeye tails. Figure 4 gives pertinent information about these bombs; and Figure 5 shows some of the configurations tested. Configuration designations are noted in Table 1. The wing mounted configurations were installed on pylons similar to those described in Reference 3 and suspended from the mid-semispan wing station. Details of these configurations, along with a description of the ramp type shield, are shown in Figure 6. In all cases, stores were mounted parallel to the wing-body center line.

TESTS AND MEASUREMENTS

The tests were conducted in the NSRDC 7- by 10-Foot Transonic Wind Tunnel, described in detail in Reference 4, at a tunnel stagnation pressure of one atmosphere corresponding to a Reynolds number of approximately 3×10^6 per foot.

All aircraft models were mounted on a cantilevered sting support system through a six component internal strain gage balance. Data were recorded and reduced to coefficient form, but only the three longitudinal components are presented.

Four basic aircraft models were tested; high wing with 50° wing sweep (HW 50°), low wing with 50° wing sweep (LW 50°), high wing with 25° wing sweep (HW 25°), and low wing with 25° wing sweep (LW 25°). Configurations on these four basic models included full and partial loads of Mk 81 and Mk 82 bombs tangentially mounted under the fuselage and Mk 81 bombs on multiple ejection racks (MER) pylon mounted under the wings.

The LW 25° model was used to determine the effect of fuselage mounted stores in various position and spacing arrangements. Also, a wedge shaped shield located forward of the first row of stores was tested on this model.

Test conditions included Mach numbers of 0.60, 0.70, 0.80, 0.85, and 0.90 and an angle of attack range of -2° to 6°. Transition was fixed on the aircraft wing at 10 percent of the chord and on the stores and fuselage at 10 percent of their lengths with 1/8-inch-wide strips of number 90 carborundum grit.

CORRECTIONS AND ACCURACY

Angles of attack have been corrected for deflection of the model support system and balance and are within ±0.1°. Lift, drag, and pitching moment coefficients have an accuracy of ±0.004, ±0.0005, and ±0.001, respectively, at Mach number 0.80. The Mach numbers reported are within

±0.003; and since the blockage of the model is less than 0.5 percent of the test section area, no corrections have been made for wall effects. Drag data have been corrected for base pressure effects on the aircraft model.

RESULTS AND DISCUSSIONS

The study of incremental drag from fuselage mounted stores discussed initially in Reference 1 has continued and some of the more important results of the second phase are presented herein.

The configurations investigated include variation of aircraft wing position; aircraft wing sweep; and number, type, and position of bomb load.

The longitudinal characteristics of the major configurations investigated are shown in Figure 7. The majority of the results of the tests of partial store loads are not presented or discussed here but will be covered in subsequent papers. For information purposes, however, the list in Table 1 contains all of the configurations tested during this phase.

The aircraft alone configuration, with the wing leading edge swept at 25°, has a drag rise starting at a Mach number of about 0.8, but when the wing is swept to 50° this drag rise is delayed to a Mach number in excess of 0.9 (Figure 8). In view of this, the 50° wing configurations can be considered to represent an aerodynamically clean vehicle when compared with the 25° configurations (an observation supported by a comparison of the area distribution of models with both wing sweeps as shown in Figure 3). With this in mind and an examination of Figure 9, it would appear reasonable to state that the magnitude of the incremental drag from the various store configurations is not appreciably masked by the high drag configuration.

A comparison of incremental drag due to nine Mk 82 bombs on the simulated high and low wing aircraft (Figure 9) indicates that the high wing aircraft would pay less of a drag penalty. When configured with twelve Mk 81 bombs, the drag penalty for both wing positions is about the same though the incremental drag for the twelve Mk 81 bombs is less than that for nine Mk 82 bombs. From this same figure, it appears that effect of wing sweep on incremental drag follows no consistent pattern.

The effect of bomb longitudinal spacing was investigated to a limited extent and found to be detrimental. The three rows of Mk 81 bombs were separated such that the space between nose and tail of the bombs was 24 percent of the length of the bomb compared to the standard spacing of 0.3 percent. Results of this spacing are compared with the standard array in Figure 10 and show an increase in incremental drag. Conversely, lateral spacing of bombs had little effect. The columns of Mk 82 bombs were separated laterally such that the space between bombs was 30 percent of the bomb diameter as opposed to a standard spacing of 2.3 percent. This array is compared with the standard array in Figure 10 and shows little change in incremental drag.

Staggering the center of gravity position of bombs from the standard pattern was also investigated. The two columns of Mk 81 bombs nearest the aircraft center line were moved forward to form a V pattern. The incremental drag from this array differed little from that of standard array as shown in Figure 11. The aircraft model fuselage was not long enough to stagger a full load of nine Mk 82 bombs, so a comparison of six bombs in standard and staggered array is given in Figure 11. Again the incremental drag from the two configurations is approximately equivalent.

Intuitively, it would appear that a shield forward of the front row of bombs would improve the flow characteristics around the bomb array and thereby decrease the drag penalty. The results of this investigation show, in Figure 12, that there is no significant reduction in incremental drag with the shield installed.

For comparative purposes the various wing body configurations were tested with an MER loaded with six Mk 81 bombs, pylon mounted under each wing. The incremental drag from these wing mounted stores is three to four times that from a comparable load of twelve Mk 81 bombs carried tangent to the fuselage undersurface as shown in Figure 13.

CONCLUSIONS

Based on the data obtained during the series of tests the following conclusions are drawn:

1. The magnitude of the incremental drag from fuselage mounted stores is not greatly affected by drag of the basic aircraft configuration.

2. A high wing airplane would pay a lesser drag penalty than a low wing airplane when carrying external stores under the fuselage.

3. The minimum drag increment is obtained when the stores are as close together as possible.

Aerodynamics Laboratory
Naval Ship Research and Development Center
Washington, D. C. 20007
September 1967

Table 1

Configuration Description

Configuration	Wing, Sweep, and Position		Type of Store	Total	Number of Stores Forward	Center	Aft	Graphs in Figure 7	Remarks
HW50	50°	Hi	--	0	0	0	0	(a)	
HW50 3-82			Mk 82	3	3	0	0	NP	
HW50 6-82				6	3	3	0	NP	
HW50 9-82				9	3	3	3	(b)	
HW50 4-81			Mk 81	4	4	0	0	NP	
HW50 8-81				8	4	4	0	NP	
HW50 12-81				12	4	4	4	(c)	
HW50 MER				12	0	0	0	(m)	See Note 3
HW25	25°		--	0	0	0	0	(d)	
HW25 3-82			Mk 82	3	3	0	0	NP	
HW25 6-82				6	3	3	0	NP	
HW25 9-82				9	3	3	3	(e)	
HW25 4-81			Mk 81	4	4	0	0	NP	
HW25 8-81				8	4	4	0	NP	
HW25 12-81				12	4	4	4	(f)	
HW25 MER				12	0	0	0	(n)	See Note 3
LW25		Lo	--	0	0	0	0	(g)	
LW25 MER			Mk 81	12	0	0	0	(o)	See Note 3
LW25 3-82			Mk 82	3	3	0	0	NP	
LW25 6-82				6	3	3	0	(s)	
LW25 9-82				9	3	3	3	(h)	

Table 1 (Continued)

Configuration	Wing, Sweep, and Position	Type of Store	Total	Number of Stores Forward	Center	Aft	Graphs in Figure 7	Remarks
LW25 4-81	25^o Lo	Mk 81	4	4	0	0	NP	
LW25 8-81			8	4	4	0	NP	
LW25 12-81			12	4	4	4	(i)	
LW50 MER	50^o		12	0	0	0	(p)	See Note 3
LW50		- -	0	0	0	0	(j)	
LW50 3-82		Mk 82	3	3	0	0	NP	
LW50 6-82			6	3	3	0	NP	
LW50 9-82			9	3	3	3	(k)	
LW50 4-81		Mk 81	4	4	0	0	NP	
LW50 8-81			8	4	4	0	NP	
LW50 12-81			12	4	4	4	(l)	
LW25 12-81 MER	25^o		24	4	4	4	NP	Standard + see Note 3
LW25 12-81 SP			12	4	4	4	(q)	Longitudinal spacing
LW25 8-81 SP			8	4	4	0	NP	" "
LW25 4-81			4	4	0	0		" "
LW25 1-81			1	1	0	0		
LW25 2-81			2	1	1	0		
LW25 3-81			3	1	1	1		
LW25 1-81 SP			1	1	0	0		Longitudinal spacing
LW25 2-81 SP			2	1	1	0		" "
LW25 3-81 SP			3	1	1	1		" "

Table 1 (Concluded)

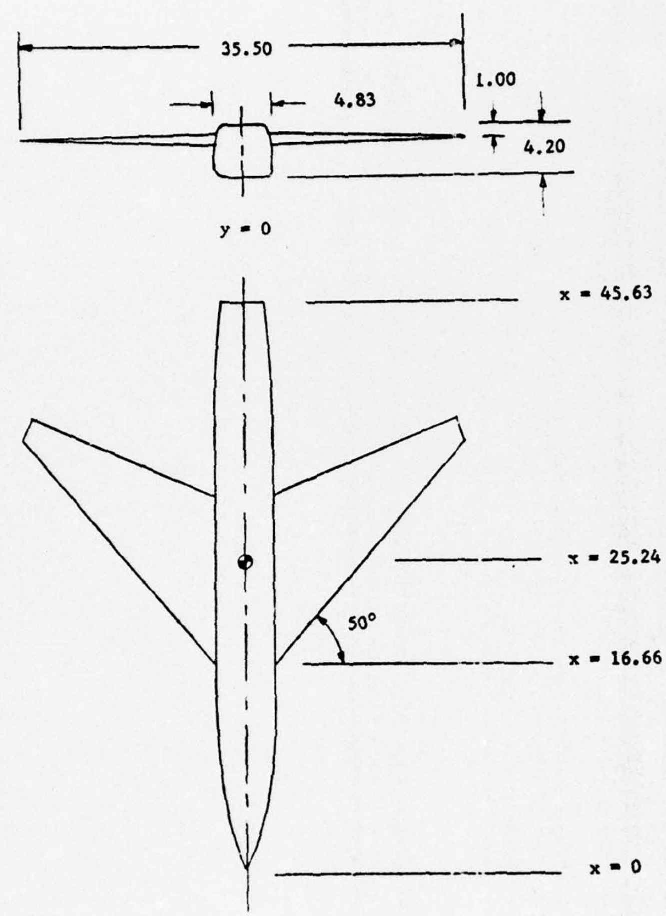
Configuration	Wing, Sweep, and Position	Type of Store	Total	Number of Stores Forward	Center	Aft	Graphs in Figure 7	Remarks
LW25 4-81	25° Lo	Mk 81	4	4	0	0	NP	Staggered
LW25 8-81	│	↓	8	4	4	0	NP	"
LW25 12-81	│	↓	12	4	4	4	(r)	"
LW25 1-82	│	Mk 82	1	1	0	0	NP	
LW25 2-82	│	↓	2	1	1	0	↓	
LW25 3-82	│	↓	3	1	1	1	↓	
LW25 3-82 SP	│	↓	3	3	0	0	↓	Lateral spacing
LW25 6-82 SP	│	↓	6	3	3	0	↓	" "
LW25 9-82 SP	│	↓	9	3	3	3	(t)	" "
LW25 9-82 MER	│	Mk 81,Mk 82	21	3	3	3	NP	Standard + see Note 3
LW25 3-82 ST	│	Mk 82	3	3	0	0	NP	Staggered
LW25 6-82 ST	│	↓	6	3	3	0	(u)	"
LW25 9-82 SH	│	↓	9	3	3	3	(v)	Shielded stores
LW25 6-82 SH	│	↓	6	3	3	0	NP	" "
LW25 3-82 SH	│	↓	3	3	0	0	NP	" "
LW25 SH	│	--	0	0	0	0	NP	Shield alone

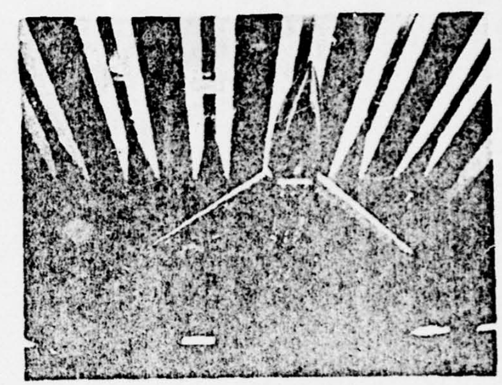
Note 1: Unless indicated otherwise, all stores are tangent mounted on the fuselage in a standard arrangement as described in Figure 5.

Note 2: Data for runs marked "NP" are not presented in this report but will be presented in a later report.

Note 3: Six MK81 on each of two wing mounted MER's.

Note: All dimensions are in inches model scale.





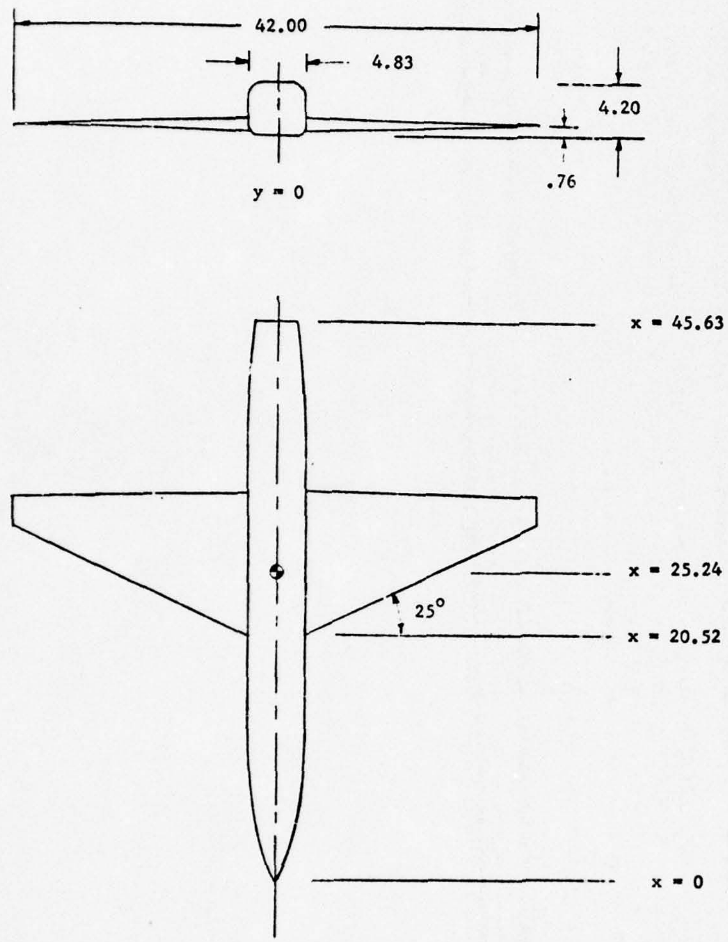
HW 50° Model Mounted in Tunnel

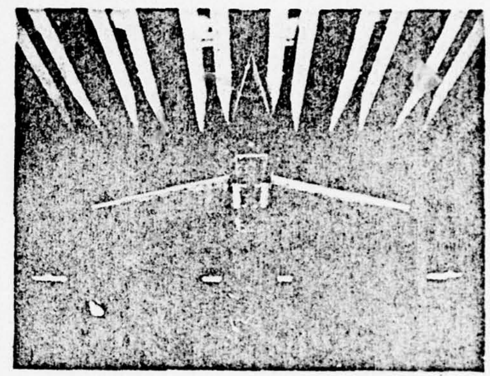
Airfoil (section as 25° wing)	NACA 64A008
Mean Aerodynamic Chord	10.30
Tip Chord	2.36
Taper Ratio	0.15
Aspect Ratio	4.10
Area (Square Feet)	2.11
Incidence	0°
Dihedral	0°

Figure 1 - Geometric Details of the High Wing 50° Model

CONFIDENTIAL

Note: All dimensions are in inches model scale.





LW 25° Model Mounted in Tunnel

Airfoil	NACA 64A008
Mean Aerodynamic Chord	8.30
Tip Chord	1.85
Taper Ratio	0.15
Aspect Ratio	6.00
Area (Square Feet)	2.05
Incidence	0°
Dihedral	0°

Figure 2 - Geometric Details of the Low Wing 25° Model

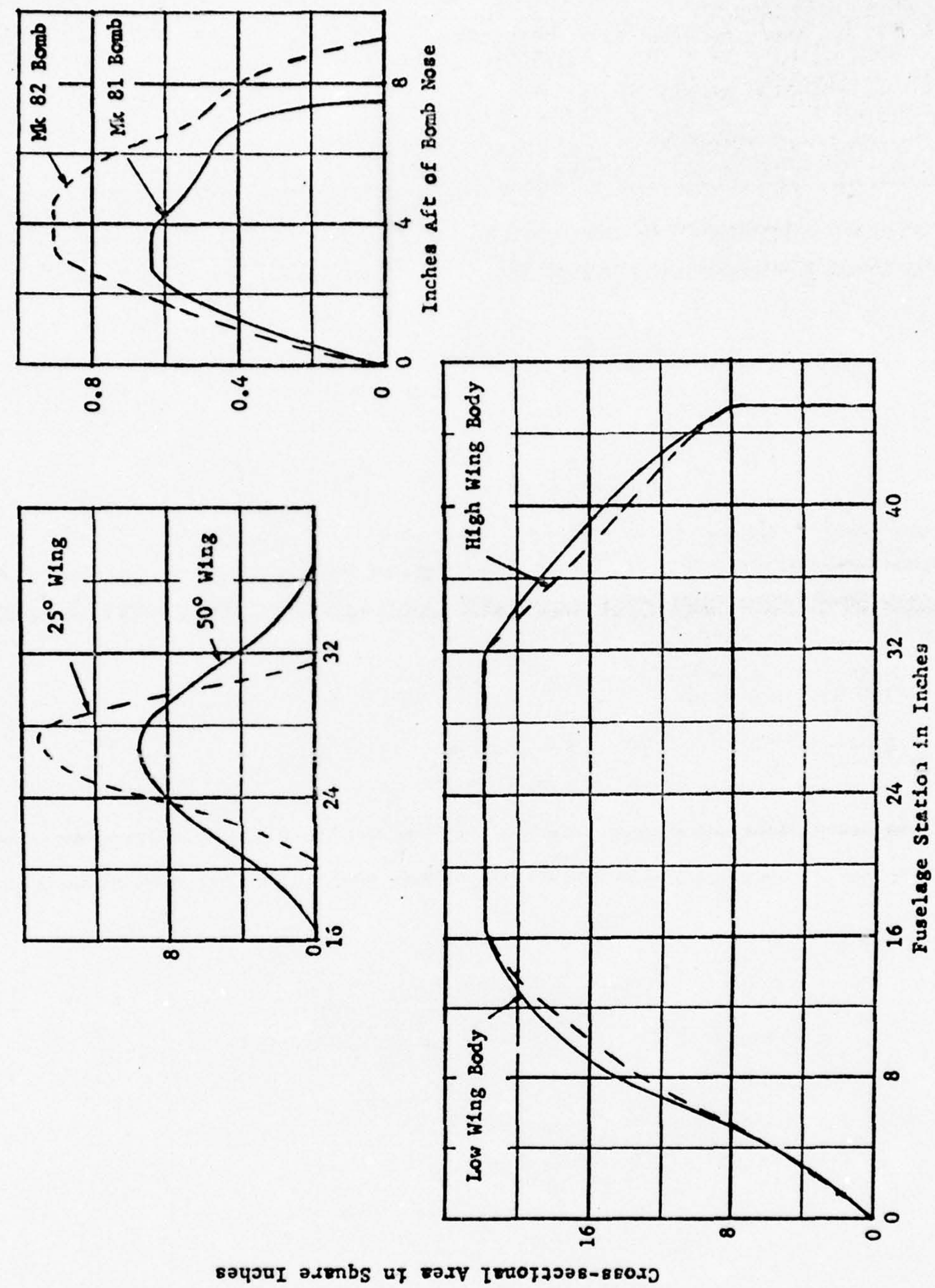
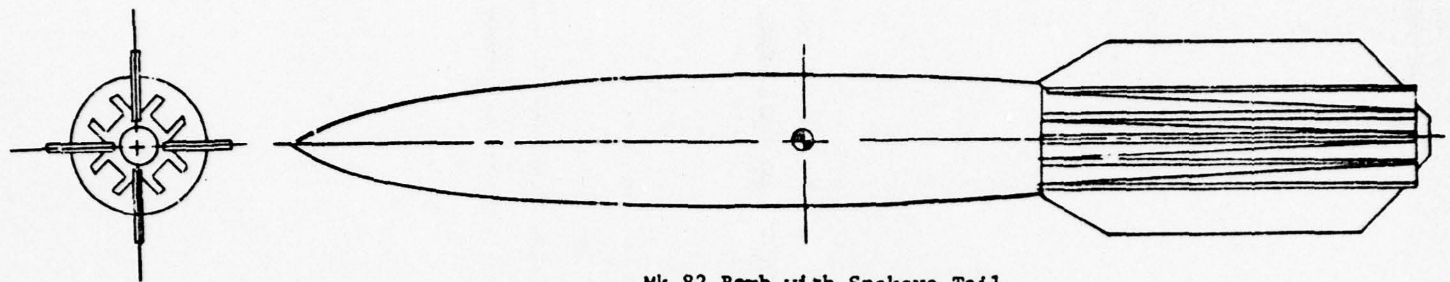
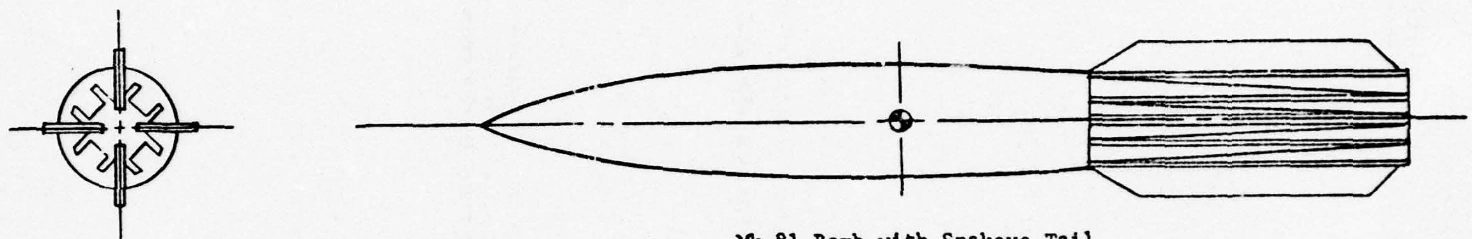


Figure 3 - Area Distribution of Models and Stores



Mk 82 Bomb with Snakeye Tail



Mk 81 Bomb with Snakeye Tail

	Mk 82	Mk81
Length (in)	9.260	7.506
Diameter (in)	1.075	0.900
Fineness Ratio	8.614	8.340
Max Area (sq ft)	0.00631	0.00442

Figure 4 - Geometric Characteristics of Mk 82 and Mk 81 Bombs with Snakeye Tails

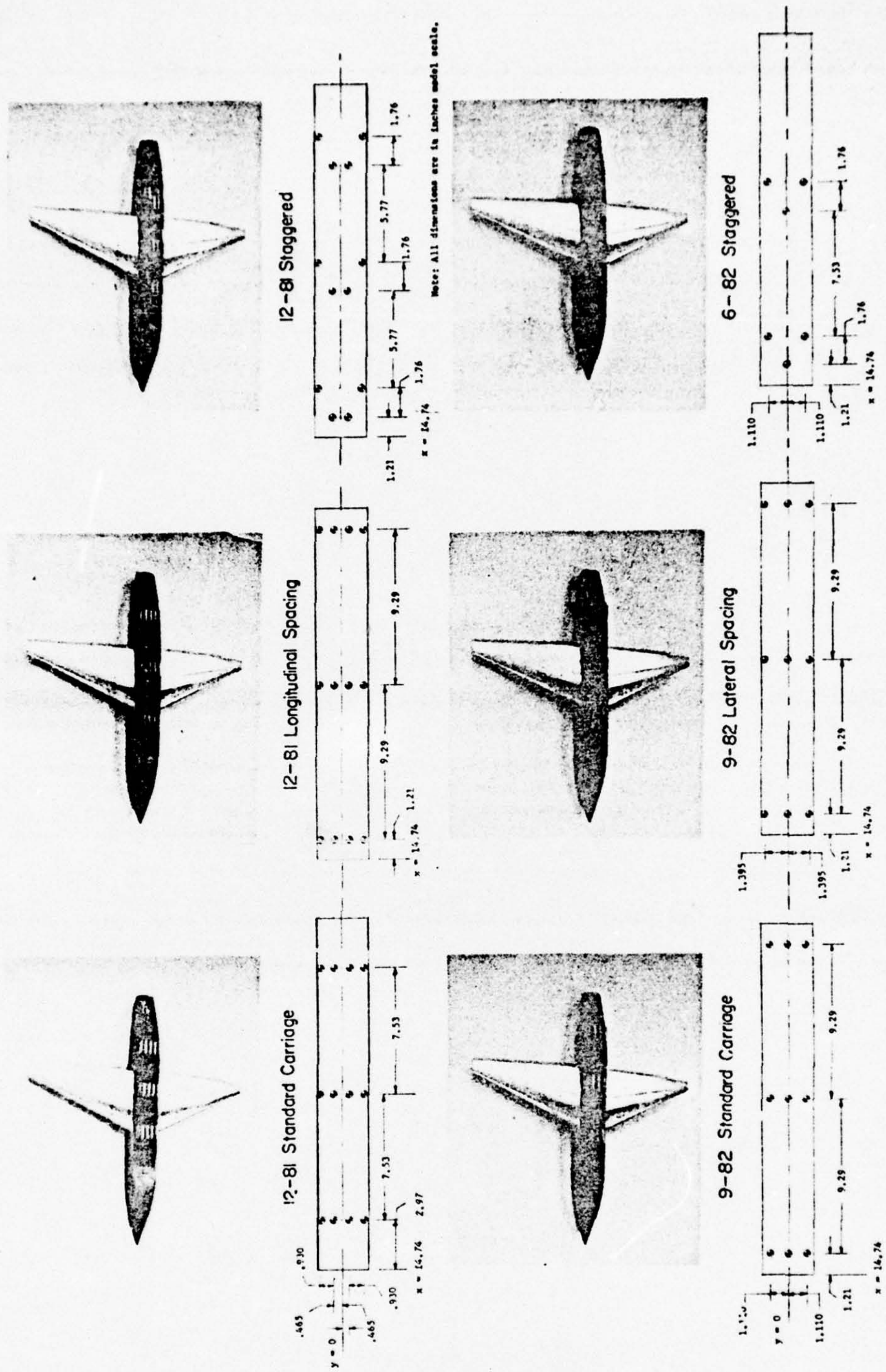
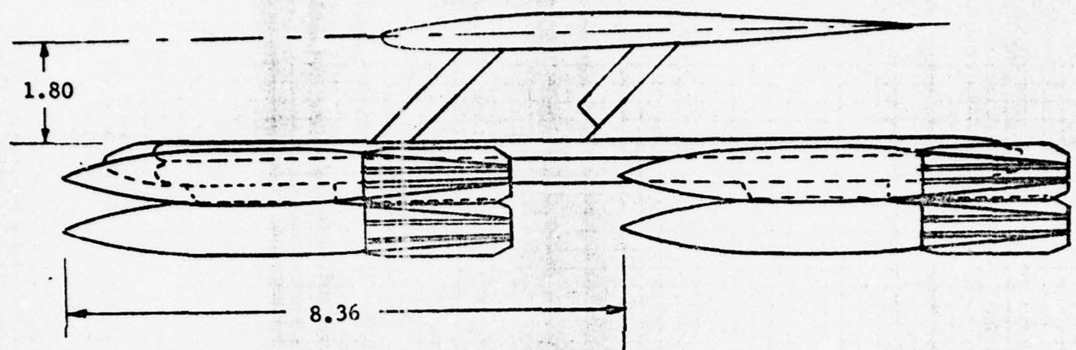


Figure 5 - Typical Store Configurations

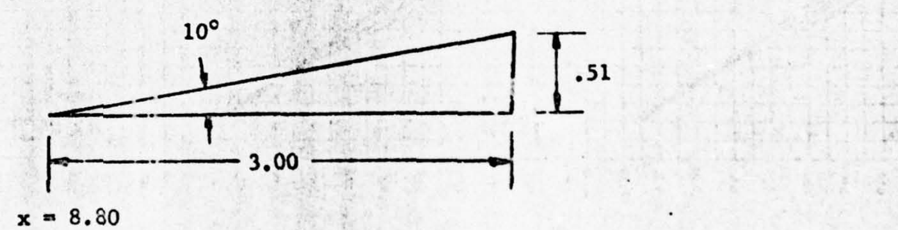


x = {16.12 for the 25° Sweep; 16.38 for the 50° Sweep}

y (measured from centerline of pylon) = {6.30 for the 25° Sweep; 6.59 for the 50° Sweep}

6 Mk81 Bombs Mounted on a Multiple Ejector Rack

Note: All dimensions are in inches model scale.



Ramp Type Shield

Figure 6 - Geometric Details of Wing Mounted Store Configuration and Ramp Type Shield

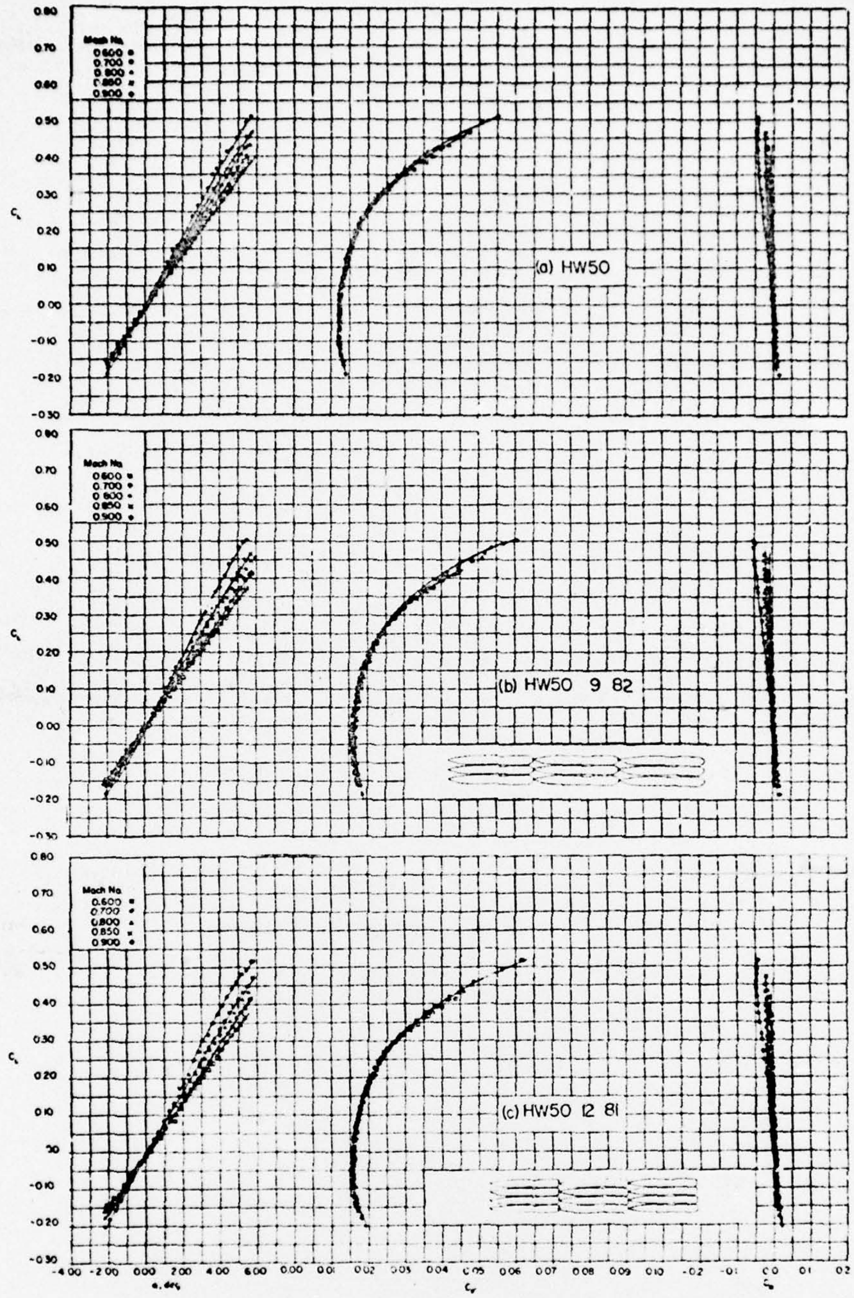


Figure 7 - Longitudinal Characteristics of Wing Body Models

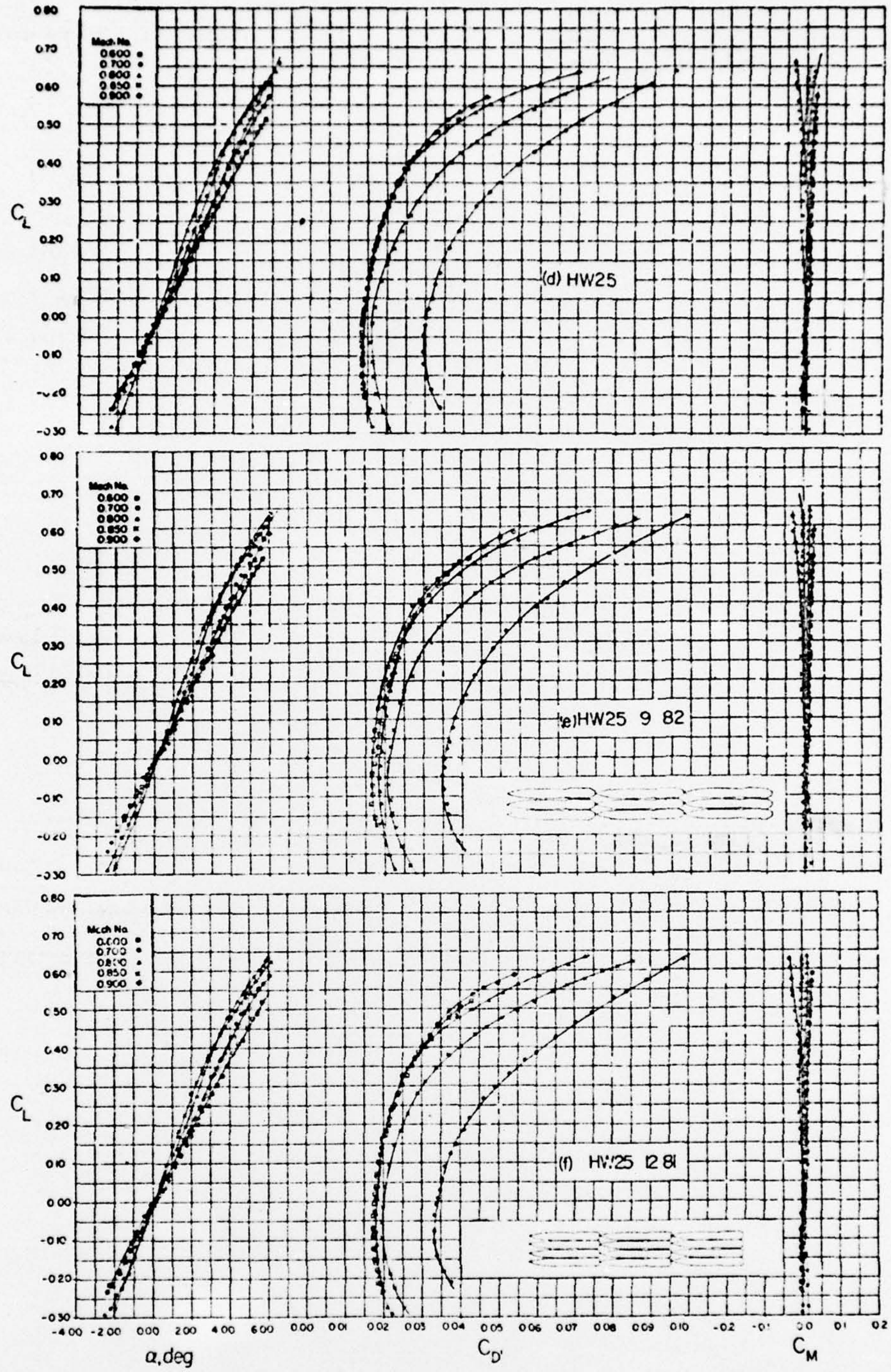


Figure 7 (Continued)

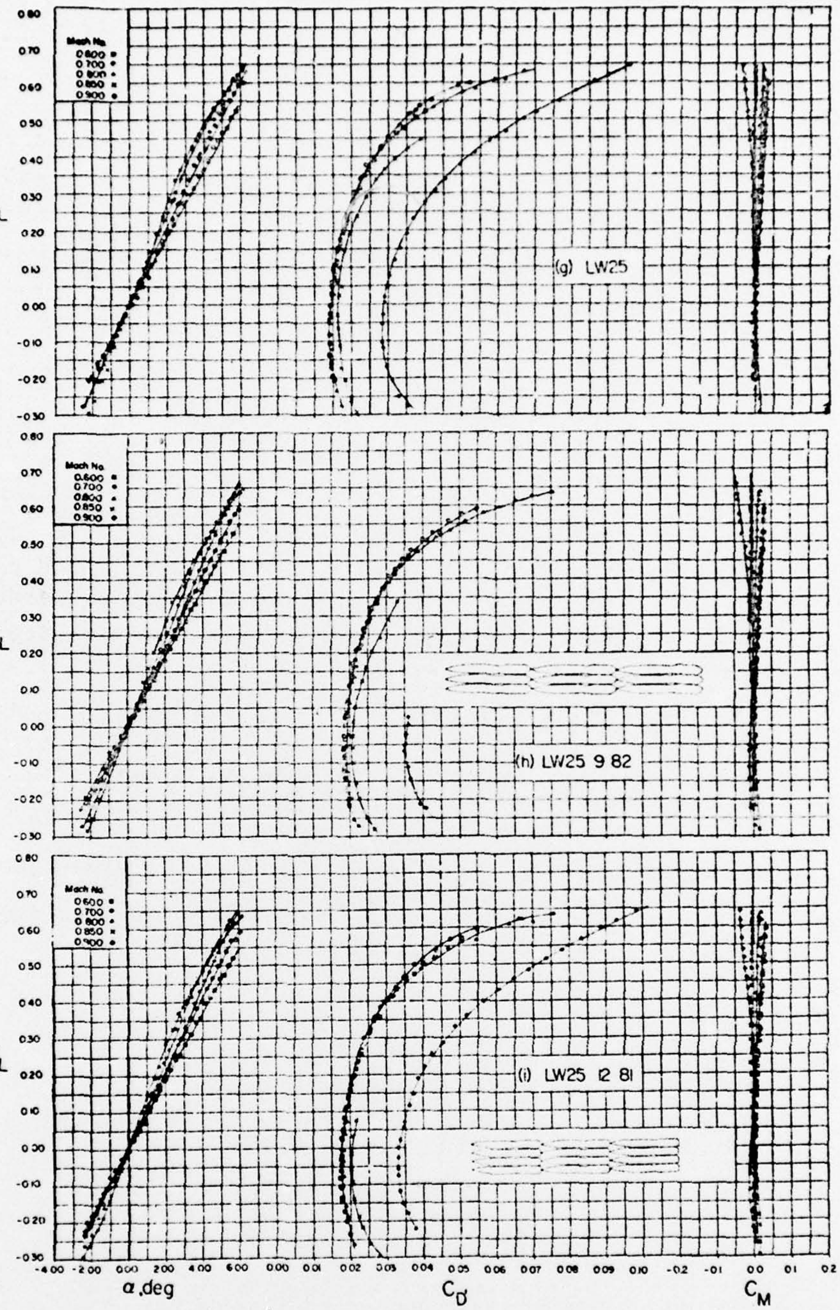


Figure 7 (Continued)

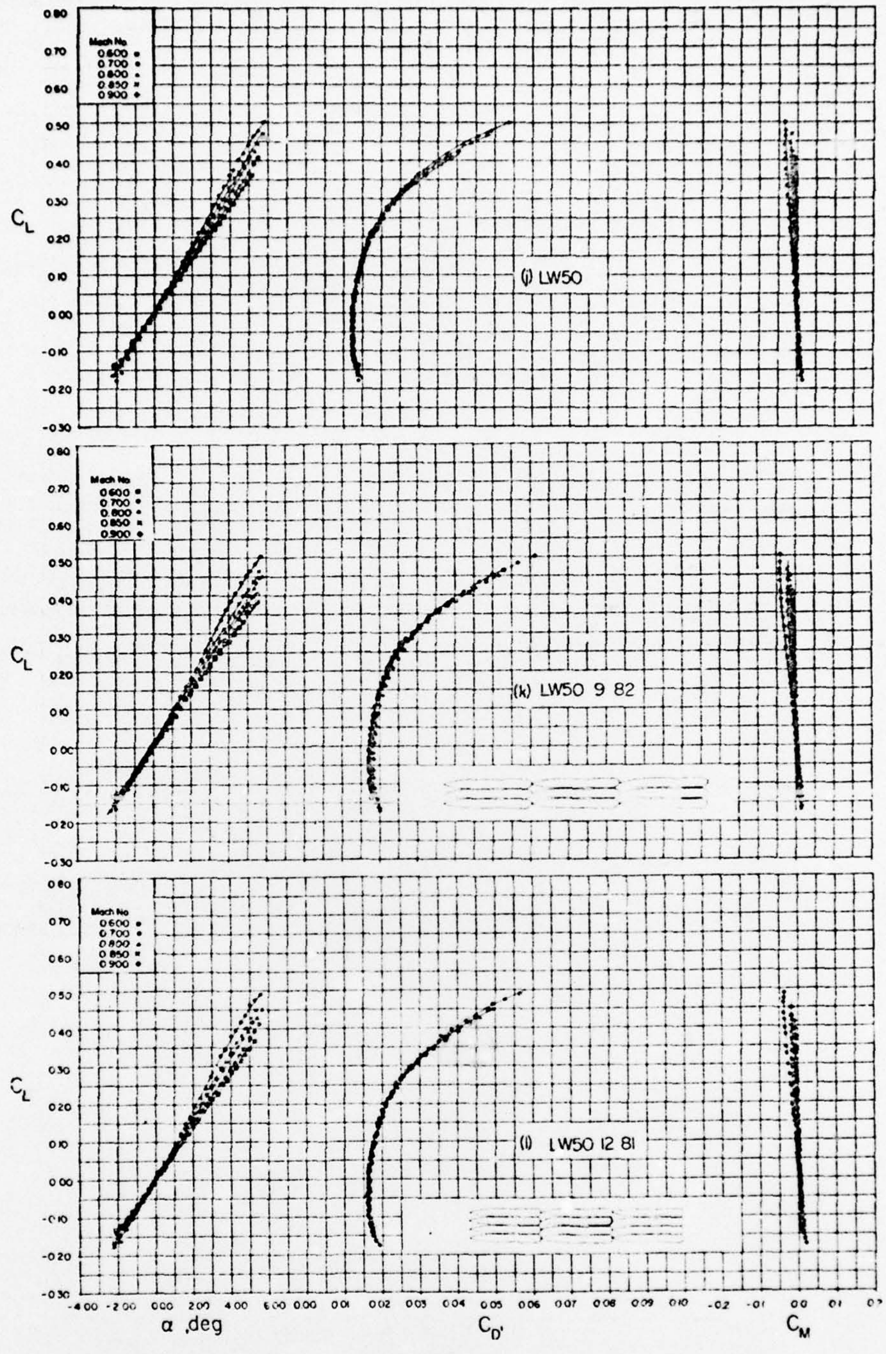


Figure 7 (Continued)

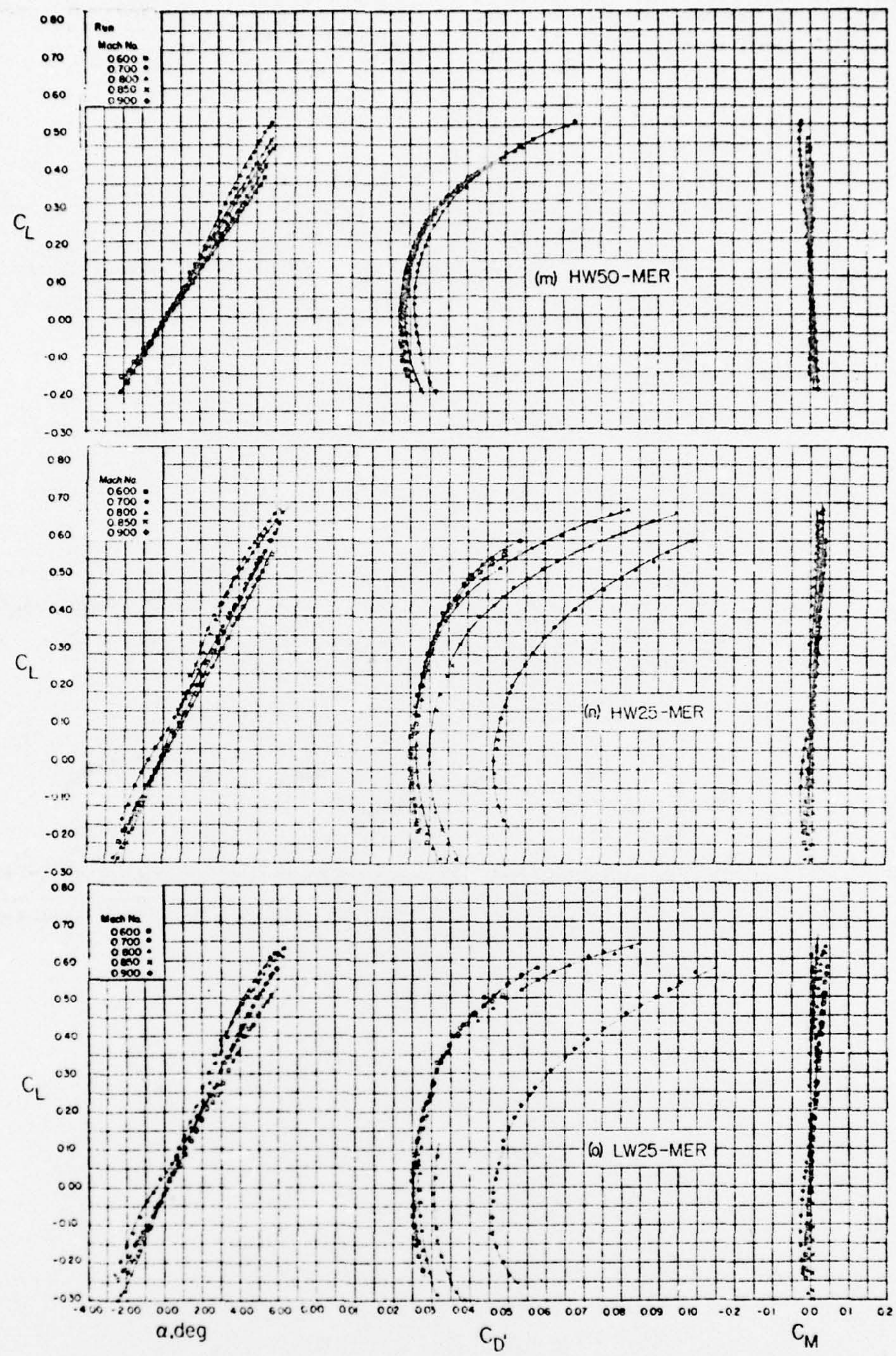


Figure 7 (Continued)

CONFIDENTIAL

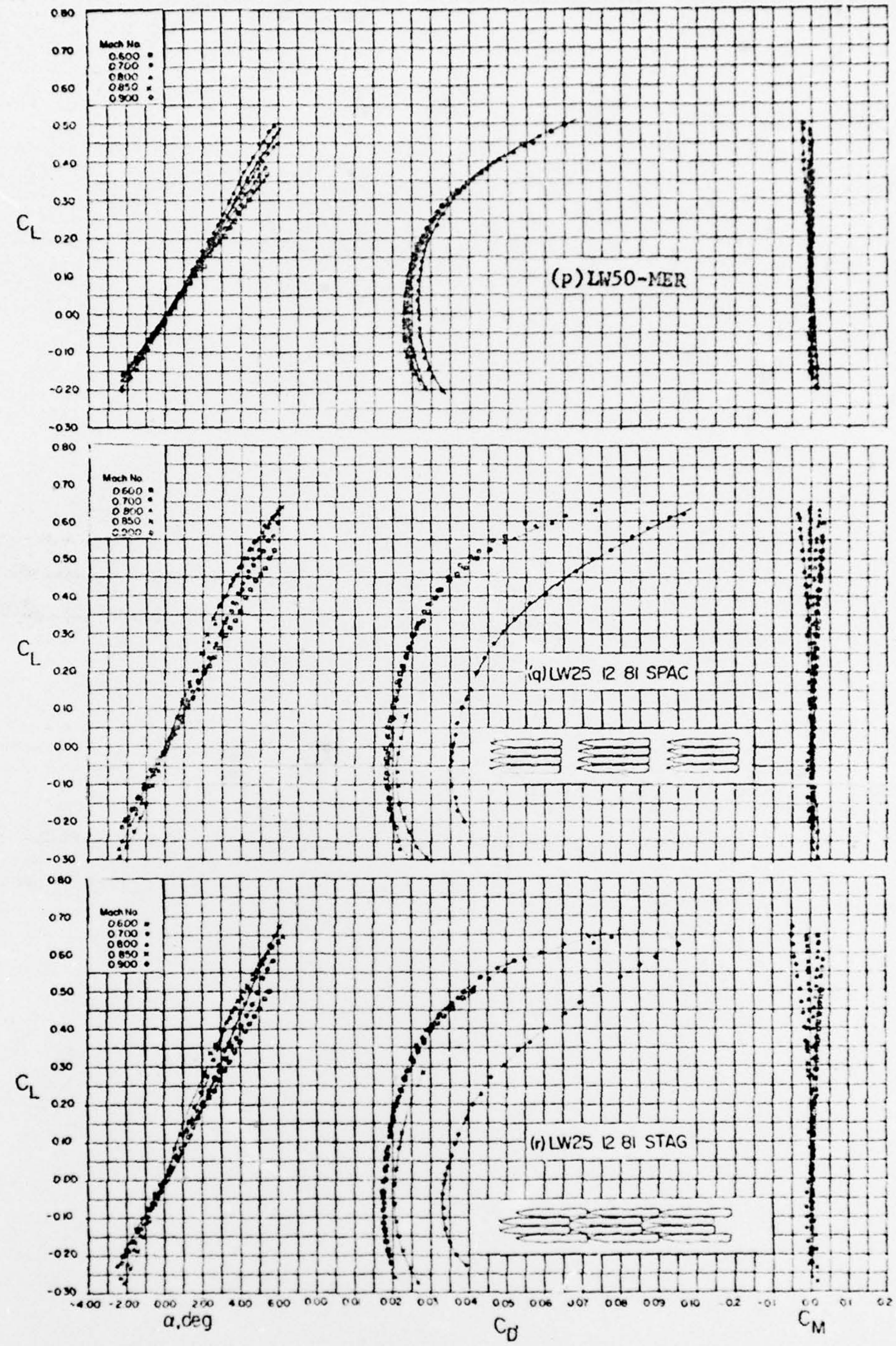


Figure 7 (Continued)

CONFIDENTIAL

NDW-NSRDC-5511/2

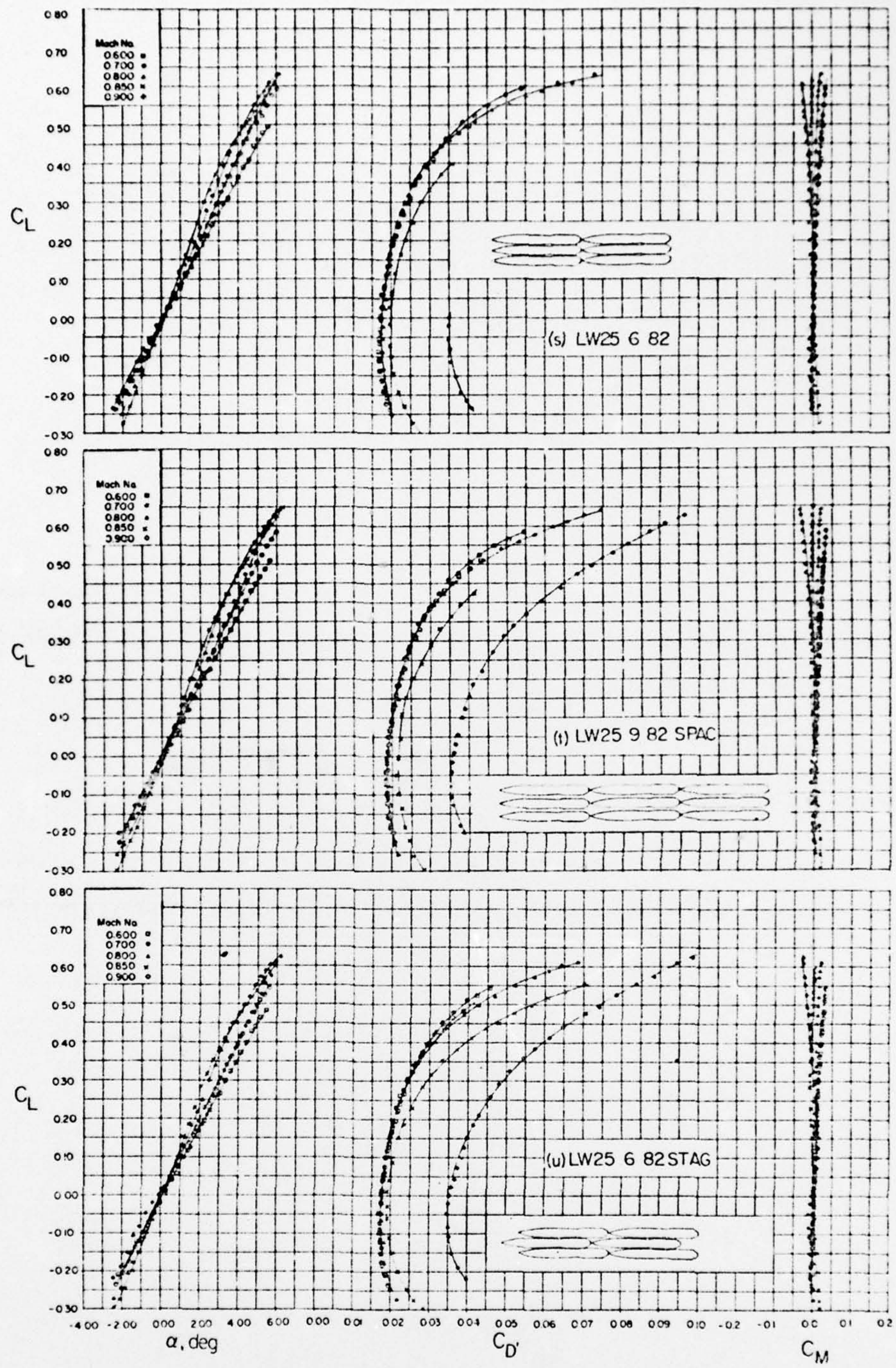


Figure 7 (Continued)

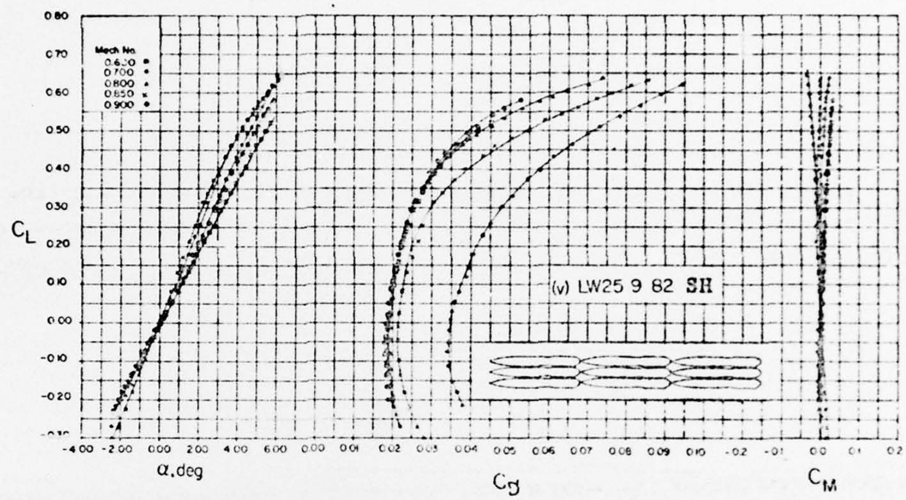
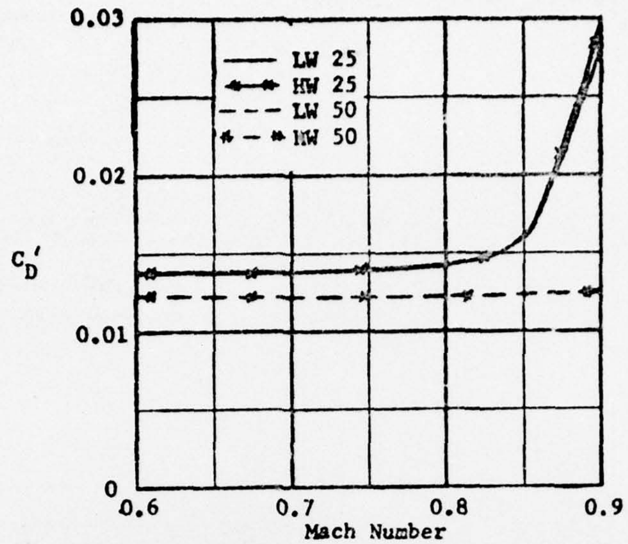
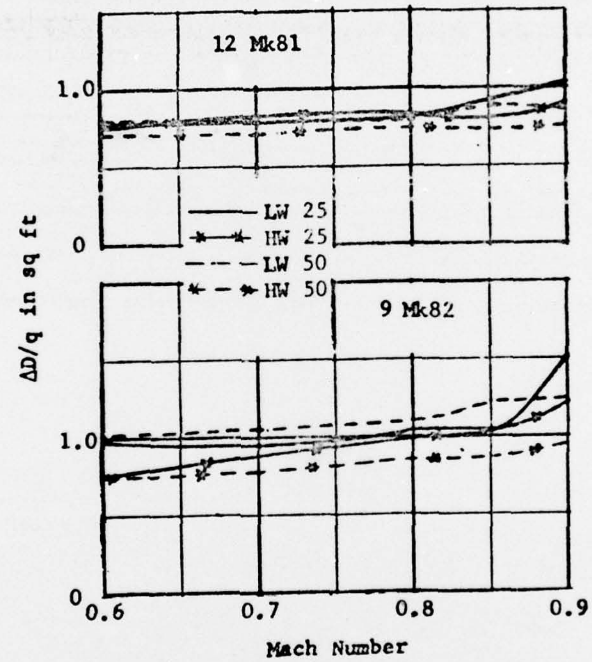


Figure 7 (Concluded)



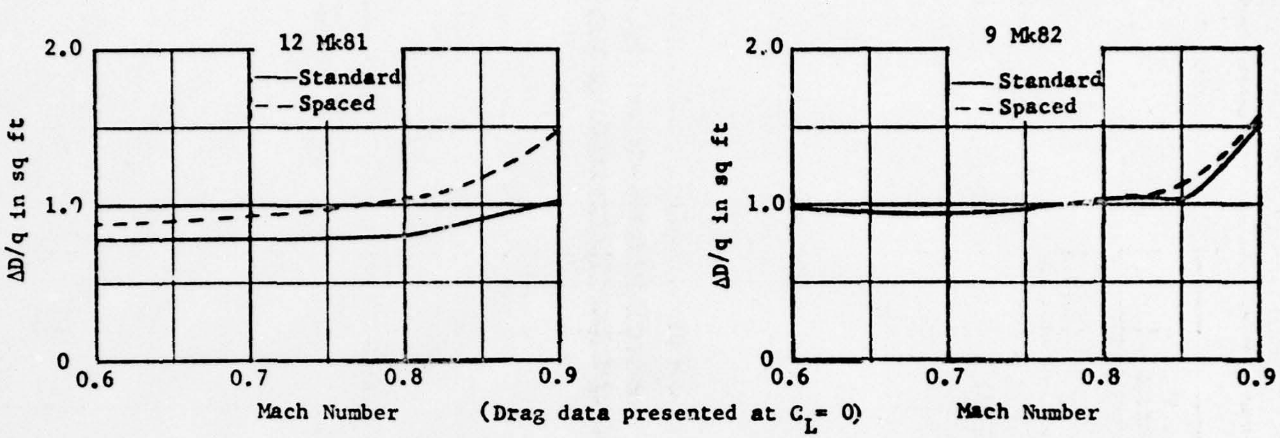
(Drag data presented at $C_L = 0$)

Figure 8 - Effect of Wing Position and Sweep on Drag of Basic Airplane



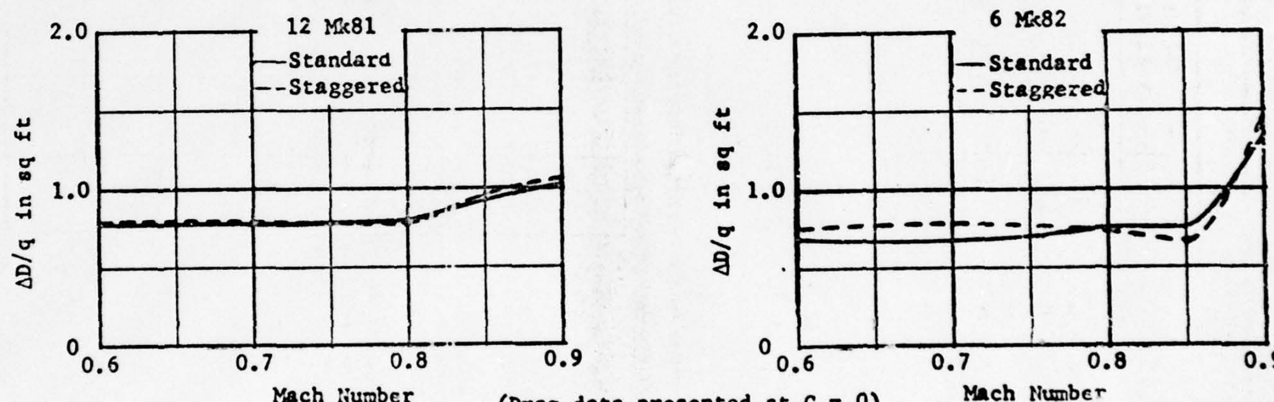
(Drag data presented at $C_L = 0$)

Figure 9 - Effect of Wing Position and Sweep on Incremental Drag Due to 9 Mk82 or 12 Mk81 Bombs



(Drag data presented at $C_L = 0$)

Figure 10 - Effect of Spacing on Incremental Drag



(Drag data presented at $C_L = 0$)

Figure 11 - Effect of Staggering on Incremental Drag

(Drag data presented at $C_L = 0$)

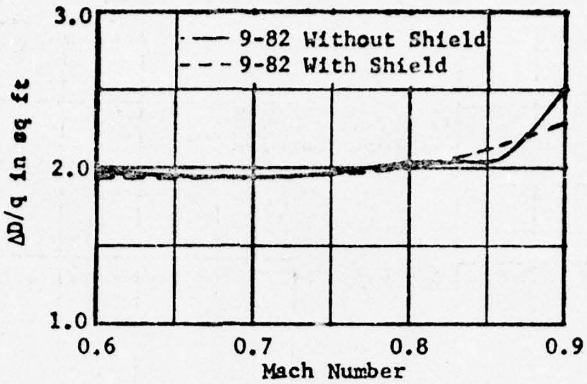


Figure 12 - Effect of Shield on Incremental Drag.

(Drag data presented at $C_L = 0$)

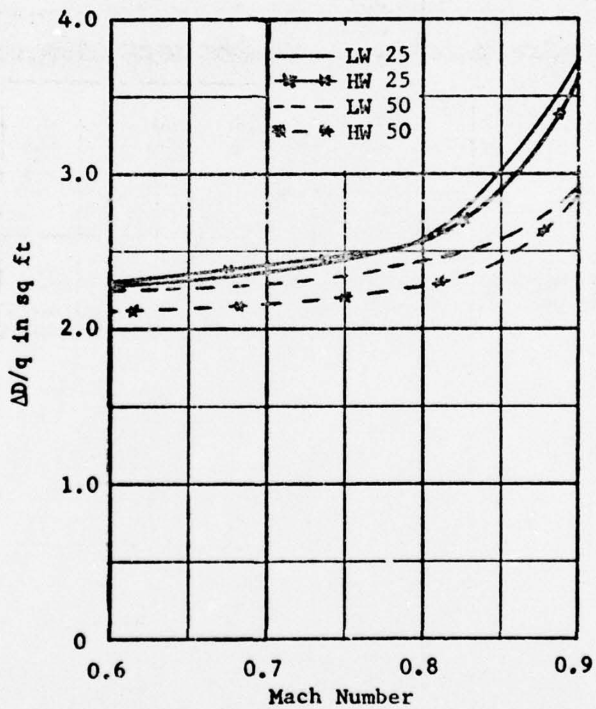


Figure 13 - Incremental Drag of Two Wing Mounted Multiple Ejection Racks with 6 Mk81 Bombs on [redacted]

UNCLASSIFIED

CONFIDENTIAL

Security Classification

DOCUMENT CONTROL DATA - R & D

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

1. ORIGINATING ACTIVITY (Corporate author)
Aerodynamics Laboratory
Naval Ship Research and Development Center
Washington, D. C. 20007

2a. REPORT SECURITY CLASSIFICATION
[redacted]

2b. GROUP
[redacted]

3. REPORT TITLE
(6) GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG. (U)

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
(9) Research and development rept.

5. AUTHOR(S) (First name, middle initial, last name)
(10) John F. Talbot [redacted] Jonah Ottensoser

6. REPORT DATE
(11) Sep[redacted] 1967

7a. TOTAL NO. OF PAGES
29

7b. NO. OF REFS
4

8a. CONTRACT OR GRANT NO.
AIRTASK A 32 530001/440-1/F012-01-06

b. PROJECT NO.
TASK 10103 (16) F01201

c. NSRDC 646-220

d. (17) WF0120106

9a. ORIGINATOR'S REPORT NUMBER(S)
(18) DTNSRDC (19) Report C-2622

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
(14) Aero [redacted]-1141

10. DISTRIBUTION STATEMENT
In addition to security requirements which apply to this document and must be met each transmittal outside the agencies of the U. S. Government must have prior approval of Commander, Naval Air Systems Command (5301)

11. SUPPLEMENTARY NOTES
(12) 32p.

12. SPONSORING MILITARY ACTIVITY
Commander Naval Air Systems Command
Department of the Navy
Washington, D. C. 20360

13. ABSTRACT

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90.

In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. The magnitude of the incremental drag from fuselage mounted stores does not appear to be hidden when it is measured on a high drag airplane model, nor does it appear to be magnified when measured on a low drag airplane model. (U)

UNCLASSIFIED

DD FORM 1 NOV 65 1473 (PAGE 1)

S/N 0101-807-6801

[redacted]

Security Classification

387695

LB

UNCLASSIFIED

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Incremental Drag						
Fuselage-Mounted Stores						
Store Drag						
Mk 81 Bomb						
Mk 82 Bomb						
Variation of Store Spacing and Loading						
Variation of Wing Sweep and Wing Position						
Store Shielding						

UNCLASSIFIED

Naval Ship Research & Development Center. Rpt. C-2622
GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U), by John F. Talbot and Jonah Ottensoser. Wash., Sep 1967. ii,27p. incl. illus. 4 refs. (Aerodynamics Laboratory. Aero Report 1141. Aero Problem 646-220) (AIRTASK A 32 530001/440-1/F012-01-06 Task 10103)

[redacted] REPORT Gp. 3

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90. In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. (U)

DRAG--INCREMENTAL
WING-BODY COMBINATNS--DRAG
AIRPLANES,MULTIMISSN--DRAG
EXTERNAL STORES(FUSELAGE)
EXTERNAL STORES--
DRAG, INCREMENTAL
EXTERNAL STORES--LOCATION
EXTERNAL STORES--
EFFECT OF AIRCRAFT
MONOPLANES,HIGH-WING--DRAG
MONOPLANES,LOW-WING--DRAG
WINGS, SWEPTBACK--DRAG
BOMBS (MK.81)--DRAG
BOMBS (MK.82)--DRAG
BOMBS (SNAKEYE)--DRAG
BOMB RACKS, EJECTOR (MER)
ANGLE OF ATTACK
MACH NO. EFFECT
EXTERNAL STORE SHIELDS
WIND TUNNEL TESTS,TRANSON

Talbot, John F.
Ottensoser, Jonah
NSRDC Aero Rpt 1141
NSRDC Aero Test C-220
NASC Proj F012-0106

UNCLASSIFIED CARD

Naval Ship Research & Development Center. Rpt. C-2622
GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U), by John F. Talbot and Jonah Ottensoser. Wash., Sep 1967. ii,27p. incl. illus. 4 refs. (Aerodynamics Laboratory. Aero Report 1141. Aero Problem 646-220) (AIRTASK A 32 530001/440-1/F012-01-06 Task 10103)

[redacted] Gp. 3

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90. In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. (U)

DRAG--INCREMENTAL
WING-BODY COMBINATNS--DRAG
AIRPLANES,MULTIMISSN--DRAG
EXTERNAL STORES(FUSELAGE)
EXTERNAL STORES--
DRAG, INCREMENTAL
EXTERNAL STORES--LOCATION
EXTERNAL STORES--
EFFECT OF AIRCRAFT
MONOPLANES,HIGH-WING--DRAG
MONOPLANES,LOW-WING--DRAG
WINGS, SWEPTBACK--DRAG
BOMBS (MK.81)--DRAG
BOMBS (MK.82)--DRAG
BOMBS (SNAKEYE)--DRAG
BOMB RACKS, EJECTOR (MER)
ANGLE OF ATTACK
MACH NO. EFFECT
EXTERNAL STORE SHIELDS
WIND TUNNEL TESTS,TRANSON

Talbot, John F.
Ottensoser, Jonah
NSRDC Aero Rpt 1141
NSRDC Aero Test C-220
NASC Proj F012-0106

UNCLASSIFIED CARD

Naval Ship Research & Development Center. Rpt. C-2622
GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U), by John F. Talbot and Jonah Ottensoser. Wash., Sep 1967. ii,27p. incl. illus. 4 refs. (Aerodynamics Laboratory. Aero Report 1141. Aero Problem 646-220) (AIRTASK A 32 530001/440-1/F012-01-06 Task 10103)

[redacted] REPORT Gp. 3

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90. In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. (U)

DRAG--INCREMENTAL
WING-BODY COMBINATNS--DRAG
AIRPLANES,MULTIMISSN--DRAG
EXTERNAL STORES(FUSELAGE)
EXTERNAL STORES--
DRAG, INCREMENTAL
EXTERNAL STORES--LOCATION
EXTERNAL STORES--
EFFECT OF AIRCRAFT
MONOPLANES,HIGH-WING--DRAG
MONOPLANES,LOW-WING--DRAG
WINGS, SWEPTBACK--DRAG
BOMBS (MK.81)--DRAG
BOMBS (MK.82)--DRAG
BOMBS (SNAKEYE)--DRAG
BOMB RACKS, EJECTOR (MER)
ANGLE OF ATTACK
MACH NO. EFFECT
EXTERNAL STORE SHIELDS
WIND TUNNEL TESTS,TRANSON

Talbot, John F.
Ottensoser, Jonah
NSRDC Aero Rpt 1141
NSRDC Aero Test C-220
NASC Proj F012-0106

UNCLASSIFIED CARD

Naval Ship Research & Development Center. Rpt. C-2622
GEOMETRIC EFFECTS ON FUSELAGE MOUNTED STORE DRAG (U), by John F. Talbot and Jonah Ottensoser. Wash., Sep 1967. ii,27p. incl. illus. 4 refs. (Aerodynamics Laboratory. Aero Report 1141. Aero Problem 646-220) (AIRTASK A 32 530001/440-1/F012-01-06 Task 10103)

[redacted] REPORT Gp. 3

The second in a series of scale-model wind tunnel tests to determine the effect of fuselage mounted stores on the drag of an attack aircraft is reported. Variations of wing position, wing sweep, and store loadings were investigated over an angle of attack range of -2° to 6° and a Mach number range of 0.60 to 0.90. In general, the high wing configuration had lower incremental drag than the low wing and variation of wing sweep had negligible effect. Increasing the longitudinal spacing between stores tended to increase the incremental drag due to the stores. Staggering the store load, increasing the lateral spacing, or shielding the forward row of bombs had little effect on the incremental drag. (U)

DRAG--INCREMENTAL
WING-BODY COMBINATNS--DRAG
AIRPLANES,MULTIMISSN--DRAG
EXTERNAL STORES(FUSELAGE)
EXTERNAL STORES--
DRAG, INCREMENTAL
EXTERNAL STORES--LOCATION
EXTERNAL STORES--
EFFECT OF AIRCRAFT
MONOPLANES,HIGH-WING--DRAG
MONOPLANES,LOW-WING--DRAG
WINGS, SWEPTBACK--DRAG
BOMBS (MK.81)--DRAG
BOMBS (MK.82)--DRAG
BOMBS (SNAKEYE)--DRAG
BOMB RACKS, EJECTOR (MER)
ANGLE OF ATTACK
MACH NO. EFFECT
EXTERNAL STORE SHIELDS
WIND TUNNEL TESTS,TRANSON

Talbot, John F.
Ottensoser, Jonah
NSRDC Aero Rpt 1141
NSRDC Aero Test C-220
NASC Proj F012-0106

UNCLASSIFIED CARD

UNCLASSIFIED

UNCLASSIFIED