AD 701 004

PROTOTYPE CLUSTER-PARACHUTE RECOVERY SYSTEM FOR A 50,000-PCUND UNIT LOAD. VOLUME I. DESIGN STUDY

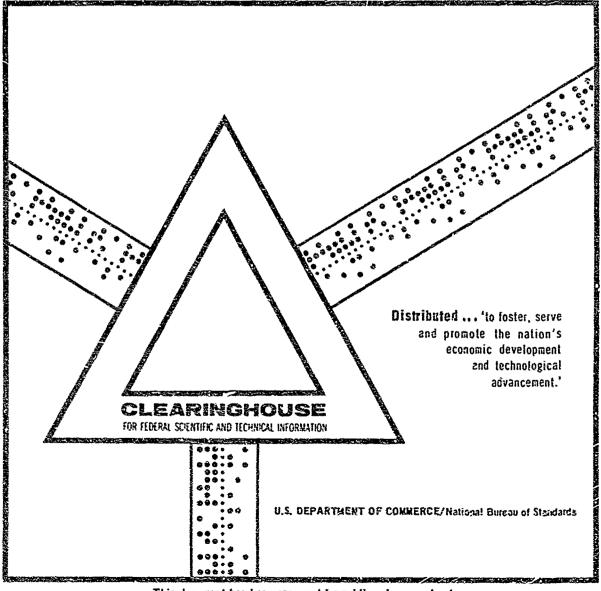
Royce A. Toni, et al

Pioneer Parachute Company, Incorporated Manchester, Connecticut

January 1969

. .

. .



This document has been approved for public release and sale.

This document has been approved for public release and sale; its distribution is unlimited.

3

È

and an and the sub- with the second sec

计目标或评

AD____

TECHNICAL REPORT 69-82-AD

PROTOTYPE CLUSTER-PARACHUTE RECOVERY SYSTEM FOR A 50,000-1b UNIT LOAD VOLUME I - DESIGN STUDY

by

Royce A. Tcni, Wolfgang R. Mueller, Milan M. Knor, Marcia G. Wood

Pioneer Parachute Company, Inc. Pioneer Industrial Park Manchester, Connecticut 06040

Contract No. DAAG17-68-0142

Project Reference: 1F162203D195

January 1969

Airdrop Engineering Laboratory U. S. ARMY NATICK LABORATORIES Natick, Massachusetts 01760

FOREWORD

This work was initiated in an effort toward the design and fabrication of a prototype recovery parachute assembly to enable the airdrop, by use of parachutes in a cluster, of a 50,000-lb unit load. The first phase of this study was concerned solely with the design aspects; the second phase dealt with fabrication.

Volume I contains the results of a study to determine the most suitable parachute assembly design. This study, i.e. Volume II, establishes the basis for the direct design effort.

This work was conducted under U.S. Army Project 1F162203D-195, Exploratory Development of Airdrop Systems, by Pioneer Parachute Company, Manchester, Connecticut, under contract No. DAAG17-68-0142.

The project engineer was Mr. Royce A. Toni of the contracting agency. The work was performed under the direction of Mr. Arthur W. Claridge, the project engineer for the U.S. Army Natick Laboratories.

ま

The George

TABLE OF CONTENTS

....

, , ,

5

ŧ

1

.

:

<u>ب</u> ۲

:

.

Sec	tion	Page
	Foreword	i 11
	Abstract	vi
1.	INTRODUCTION	1
2.	SYMBOLS	1
3.	SYSTEM REQUIREMENTS	3
4.	DESIGN-STUDY OBJECTIVES	4
5.	STEADY-STATE DRAG	5
	a. El Centrc, Calif., Full-scale Drop Tests	5
	b. Wind-tunnel Tests	35
6.	DEPLOYMENT	37
7.	INFLATION	41
8.	WEIGHT, STRENGTH, AND COST OF CANDIDATE MATERIALS FOR PARACHUTE ASSEMBLY	41
9.	SIZING THE PARACHUTE ASSEMBLY	90
10.	PERFORMANCE	105
	a. Effective Drag History	105
	b. Maximum Cluster Loads	145
	c. Maximum Load Experienced by Any Single Parachute	149
	d. Reliability with Regard to Maximum Rate of Descent	154
11.	PRELIMINARY DESIGN	154
	a. Maximum Canopy Stress for a Vent-pulldown Parachute	155
	(1) G-11A Cargo Parachute	155
	(2) Prototype Parachute Assembly ($D_{,} = 135$ ft)	159

۱

Parat of a dist is

¥ 310,00000000000000000000

I STREET ADDR. THE Y I ST

;

ł,

.

And the state of the

iv

Sect	tion		Page
	Ъ.	Selection of Material for the Prototype Parachute Assembly (D _o = 135 ft)	160
		(1) Canopy	160
		(2) Suspension Lines	160
		(3) Riser, Riser Extension, and Center Line	161
	с.	Consideration of Center Line as Primary Load-carrying Member	162
12.	CON	ICLUSIONS AND RECOMMENDATIONS	163
13.	ACK	NOWLEDGMENTS	167
14.	REF	FERENCES	167
APPI	ENDI	X	
		DEFFICIENT, INFLATION CHARACTERISTICS AND CLUSTE MANCE OF MODIFIED G-11A PARACHUTE MODELS	R

×

7

ŝ

ŝ

1. 101 .

المكافق عروده والالال والال والالر والالالا لإلارا

1. 16.51-16. 10 La La

and the second

and the state of the

ł.

۰.

ABSTRACT

This report covers a two-phase, 7-month research and development program to design and fabricate a prototype cargo-recovery parachute assembly for airdropping heavy unit loads in the order of 50,000-lb. The design study covers the trade-off analysis and cost effectiveness aspects for a complete parachute assembly. From these studies, a design analysis and a complete detailed design were made based on the specified performance and design requirements.

Use of data reduction on full-scale cargo drops with G-llA parachutes with vent-pull down configuration, scale model wind tunnel tests and parametric studies determined that it is feasible to use a cargo parachute of 135 ft. diam. with a vent-pull down in a cluster of six to recover a load unit of 50,000-lb.

ž

3

1. INTRODUCTION

Ł

With the advent of super-cargo aircraft, such as the Air Force's C-5A, there is a need for developing an operational 50,000-lb-capacity airdrop system. Owing to the relatively high payload weight, it is obvious that such a system must be comprised of a group of parachutes forming a cluster.

The problems associated with clustered-parachute operation are reviewed extensively (2, 3, 4). The primary problem of cluster-parachute operation can be attributed to the fact that they do not follow a synchronous and repeatable inflation pattern. As a result, one or more parachutes carry excessive loads and, therefore, all must be designed stronger and heavier. In addition, the possibility exists that the lagging parachutes may be blanketed so severely that one or more either fail to inflate at all, or are so tardy in inflating that steadystate descent is attained only after an excessive loss in altitude.

In general, the problems in the heavy-supply drop of a 50,000-lb payload are those common to the performance of clusters of large parachutes, except that in this particular case they are accentuated by the extremely high payload weight which directly affects the size and number of parachutes.

The intent here is to optimize state-of-the-art techniques to enhance the cluster-parachute performance, thereby enabling its design to be as efficient as possible in terms of weight, volume, and cost. The purpose of this report is to present the results of a study conducted to determine the most suitable design for a prototype recovery parachute assembly to enable the airdrop, by use of parachutes in a cluster, of a 50,000-lb unit load.

2. SYMBOLS

c Factor related to suspension-line convergence angle; dimensionless

- C_{p} Drag coefficient, dimensionless
- D Diameter, ft
- e Factor related to strength loss by abrasion, dimensionless

F Force, 1b

H Altitude above terrain, ft

- h Bag-strip distance, ft
- j Safety factor, dimensionless
- k Factor related to strength loss by fatigue, dimensionless
- L Length, ft

- M Mass, slugs
- N Number of gores, dimensionless
- o Factor related to strength loss in material from water and water-vapor absorption, dimensionless
- q Aerodynamic pressure, 1b/ft²
- R Radius, ft
- r Range, ft
- R/D Rate of descent associated with El Centro drop data, ft/sec
- S Total cloth area of canopy, ft²
- t Time, sec
- u Factor involving strength loss at connection of the suspension line and the drag-producing surface of riser, dimensionless
- V Velocity, ft/sec
- W Payload weight, 1b
- Y Path angle, deg
- p Atmospheric density, slugs/ft³

Subscripts

- A/C Aircraft
- b Bag containing folded parachute

and the second second

C Center line

c Conveying body or payload

CL Cluster

t

ext Extraction system

g Gore

i-n ith chute of cluster comprised of n chutes

o At t = 0

R Reefed state

S Suspension line

s Stripped material from containing bag

ST Standard or unmodified

3. SYSTEM REQUIREMENTS

A program was initiated to design a complete parachute recovery assembly consisting of parachute canopy, reefing system, risers, riser extensions, deployment system, and other necessary components and related hardware to enable the airdrop, by use of parachutes in a cluster, of a 50,000-1b unit load. Since the purpose is to determine the most suitable design for the parachute recovery system, it is important that the final design meet the following requirements:

(a) Performance

(1) Gross rigged weight: 50,000 lb.

(2) Deployment speed: 130 to 150 KEAS.

(3) Vertical impact velocity: not to exceed 28.5
 ft/sec from sea level to 5000 ft for temperatures between
 -65 and +100°F.

(4) Drop altitude: minimum attainable, but not to exceed 1500 ft above the drop-zone terrain.

(5) Maximum force applied to cargo-parachute release assembly: not to exceed 2.5 times gross rigged weight.

(b) Physical

(1) Type of canopy: solid-flat circular.

(2) Cluster: comprised of not fewer than four nor more than eight parachute recovery systems.

(3) Reefing: skirt reefing to control parachute forces within acceptable limits.

(4) Opening and performance aids: a permanent vent-control center line to be attached between the apex of the canopy and the confluence point of the canopysuspension system to effect a permanent pulldown of the vent of the canopy to the vicinity of the canopy skirt.

(5) Deployment system: a full deployment bag similar to that employed with the G-llA cargo parachute.

(6) Risers and riser extensions: appropriate length so as to attain optimum parachute-cluster performance.

(7) Canopy color: olive green, shade no. 106.

(8) Safety factors: 2.0 for the textile components of the parachute recovery system; 1.75 for its metal components.

4. DESIGN-STUDY OBJECTIVES

The primary objectives of this design study, in pursuit of the most suitable design for the parachute recovery system, are listed as follows.

(a) To determine the size of the parachute assembly.

(b) To determine the number of parachute assemblies in the cluster.

(c) To determine the lengths and strength requirements of

(1) the suspension lines,

(2) the risers,

(3) the riser extensions, and

(4) the center line.

(d) To determine opening characteristics associated with the cluster.

(e) To determine the maximum load imposed upon a parachute assembly.

(f) To determine allowable reefing-cutter tolerances.

(g) To determine the strength requirements of the main seam.

The attainment of these objectives was aided corsiderably by data from the U.S. Army Natick Laboratories concerning full-scale drop test of 100-ft-diam. G-llA cargo parachutes. These drops ranged from single parachutes to clusters of five, and all the cluster drops utilized the vent-pulldown technique. The data from these drops proved most beneficial.

since the drops were conducted in the operational environment nearly identical to that expected of the system under study; the parachutes used in these drops were of a size on the order of those under study; and finally, since the parachutes were a solid-flat circular type with vent pull-down as are those expected in this system.

To better achieve the previously cited objectives, a limited wind tunnel program was conducted by Dr. H. G. Heinrich of the University of Minnesota. The primary purpose of this tunnel effort was to determine the effect of certain parameters (such as suspension-line lengths, centerline lengths, and number of chutes in clusters) on the aerodynamic characteristics of clustered, vent-pulldown parachutes.

5. STEADY-STATE DRAG

a. El Centro, Calif., Full-scale Drop Tests

Preliminary indications of extensive full-scale drop tests conducted at El Centro, Calif., point toward an increase in drag afficiency obtainable by modifying the parachute to use a vent pulldown. Table 1 lists a few of these drops which produced the available data. Figures 1 through 25 present the reduced data from which an average steadystate vertical rate of descent can be derived. Use of this vertical rate of descent enables the calculation of the drag coefficient of a parachute cluster during its steady-state mode of operation.

Scrutiny of Figs. 1 through 25 discloses certain relationships, primarily the effect of vent pulldown on drag and the effect of the number of parachutes in a cluster on the cluster drag. These relationships are clearly illustrated in Figs. 26 and 27.

Figure 26 reveals the ratio of the steady-state drag coefficient of a modified (vent pulldown or use of a center line) single G-llA cargo parachute to the drag coefficient of a standard configuration as a function of the ratio of center-line length to parachute diameter. Although this figure is limited to only one suspension-line length (that is, 0.95D), it does show that the drag increase of the modified configuration is of the order of 20% over that of standard, and that this 20% increase occurs when the vent is pulled down at or immediately above the vicinity of the skirt.

Drop no. & date	L _c , ft	n	W, lb	V, ft/sec	(c _{Do}) _{CL}	Comments
2421F67 18 Nov 67	None	1	5,410	25.6	0.91	Standard
2422F67 22 Nov 67	None	1	5,410	26.1	0.88	Standerd
2181F67 30 Nov 67	None	1	5,410	23.9	1.05	Standard High (C _{Do}) _{CL}
0622F67 6 Apr 67	76	1	5,000	21.9	1.15	L _c not known
0051F67 20 Jan 67	90	1	4,580	20.8	1.17	L _c not known
1208F67 3 Jul 67	96	1	4,980	19.7	1,42	High
1619F67 12 Sep 67	95	1	5,410	23.5	1.08	Good data
0404F67 7 Mar 67	94	1	4,580	20.4	1.22	L _c not known
0405F67 9 Mar 67	96	l	4,580	22.0	1.05	Gooá data
0520F67 30 Mar 67	94	1	6,000	16.5	2.44	L _c not known High (C _{Do}) _{CL}
2431F66 18 Oct 66	102	1	4,580	25.5	0.78	L _c not known
2464F66 24 Oct 66	102	1	4,580	24.1	0.87	L not known
1781F67 4 Oct 67	95	2	10,650	24.6	0.97	
1783F67 6 Oct 67	95	2	10,650	21.9	1.23	High
1782F67 9 Oct 67	95	2	10,650	24,7	0.97	
1990F67 11 Oct 67	95	2	10,650	24.9	0.95	

.

 TABLE 1 EL CENTRO DROP TESTS OF VARIOUS G-11A CONFIGURATIONS

(continued)

б

TABLE 1 (cont'a)

Drop nc. & date	L _c , ft	n	W, lb	V, ft/sec	(c ^{D°}) ^{CT}	Comments
2005F67 13 Oct 67	95	2	10,650	24.5	0.98	
2014F67 23 Oct 67	95	3	16,000	24.2	1.01	
2015F67 27 Oct 67	95	3	16,000	21.3	1.30	High
2139F67 1 Nov 67	95	3	16,000	22.3	1.19	High
2013F67 16 Nov 67	95	3	16,000	24.2	1.01	
2140F67 20 Nov 67	95	3	16,000	24,6	0.98	
2401F67 5 Jan 68	95	5	26,400	25.9	0.87	
2490F67 10 Jan 68	95	5	26,400	25.2	0.92	
0078F68 19 Jan 68	95	5	26,400	27.1	0.80	Low

1

-5

444						THE L								4		++++	+1			THE P		+114	+++-I	111			
	#	1	-17		1.23			<u></u>		. n	1	1-1		- ++				1	17	<u></u>	• <u> </u>		1	****	<u></u>		Ē
閠				Щ.]			-11		朣		Ŧ	E	Ŧ		<u>#</u> E			ŧī	==	<u></u>		Ш	-14	μH		-14 14	i-l
Ŧ			H.			<u>sm</u>	F -			ΞĻ	II.	ШЩ П	H			H				Ш.	1			Ŧ	-	H	1
						i				1.11	1.1.	1										T	.		F	<u>iii</u>	FII I
					<u>111</u>	1444 1	<u></u>							n: uu		11 • • • •		.11-		•+		1111 			ΕŦ		H
Ŧ	HН	ini.			H.		1		- 1																		臣
	£∰			171	<u></u>			÷н					<u></u>	41		<u> </u>	<u>= =</u>				<u>+</u> ++++		•		1	ΕŦ	Œ
鄀	H1									曲	H	罡		- 11		, ,,,,	1			亜		111			Ξ.	開	田
1,1	1	211			료 건 건		-14	11.1			Tir	T.			ΗŪ		r•1	1	1÷r	11						11.	
	11+-					1.1				1,44	7722	T		_===						.		- 11			an:		Ē
- -							L.; ;			-1++						· · · · ·	 111									1	Ħ
		111				1111	-1:1			+++					:.: ¹				ļ•	**-							
E			:15	Ξ.,		111	t				ш.	1		1		.tr: 11			Ŀ	ΞΞ						<u> </u>	E
쁡	Ŧ		E:	ΞŸ.			, E		1		н <u>т</u>	<u></u>		<u>.</u>	i-			<u>=</u>	1:			里			Į.	53	
	H					:	· 🖂					•	1				ı÷.								<u>1</u>		
	1112											Q									-117	111	-				
	-1		212						-	1		1	17.1									***		E	<u> </u>		E
	1:					.			••••						6	5			<u> </u>				Шŗ.		· - · ·	1.81	Ē
<u>.</u>			Ne		1				7771	Θ	43	1:	:			<u>.</u>	·	= :		•			===	: :		i hu	Ē
田	: -			ΞĒ		-					:: : :	Ð.		-		1			E -	E.		÷			謹	R	E
Ξ		. 5	1024	IN.	:11:		-		ΞŦ.			<u>ا: ا</u>	(P									==	4		R	Ē
	il.	147	10C	1964							9			i =						-11-			1772		Ŧ	R	Ē
	-5	3	D									0				<u> </u>	=		Ē			<u> </u>			Ē	E	Ē
	2	111-	1.									-1-		<u> </u>					<u>[.</u> ::-		1				à	5	
ifl		5.	R	121		i li i						<u>1.</u>	₽.::	<u></u> _;			• =	<u> </u>	<u>[</u>	-		<u>=</u> =	<u> </u>	. <u></u>	<u>n =</u>		E
F1	Ś	- 5	-31			i i				Ο,			ŀ		1		Ē		12		: <u>.</u>		E	三	臣		臣
		3	15	-		-				Ч.	<u> </u>	÷Ľ"				.n.		-17	F	·		7.7			臣		Ē
		5											00					i to	10								E
	-4	11 ⁺ -	1:24: 		- 1						a dealer a		10					N	2.200								F
				<u> </u>					··· `	2	<u>ii:</u> .	Ľ,		=		Ľ.		Ś	<u>FN</u>				17.		N-		<u> ::</u>
=			<u>;;</u>	!!						-		μ.	₽÷ <u>;</u>				-	5	-2		; <u> ;</u>					Ēr.	E
ŀ.									[;				n						10.00	17	<u> </u>	= :			H	==!	
	1									<u> </u>	E							E	1.34	145	H						E
							= =				1		<u></u>												₿ <u></u>		巨
<u>ь</u>	H L		<u> </u>				HE.				1: -4	;,,		<u> </u>				0	1:50	1.1.1	;					田	₽
	<u>.</u>	<u>.</u>	-tr		<u>H</u>		11. 	<u>.</u>	• •			1.1						- Si	8		ΞË.		E	<u>: </u> #	<u> </u>	圕	E
	,		(Ξ.	1.						13		F#		111	άų	# <u>]</u>	二]	F S		IΞ		崖	i E	<u>.</u> :	Ш	
_		1Ē	1		***		1	1. T			<u> - E</u>		1:1E	1	P		1		1						im	1 titt	Ŧ

8

الهلاس فكباب بالمعادكما الط

H HIHHH 锢 ŧ Ŧ + 門間 雨 010 THE 田 1.12 Fil 0 ÷ 1 醋雪 1 0 Π. 0 <u>f-</u> 111 E Ŧ - -Eilit 115 Ŧ, 34 1= -1 ĽŦ 13 -ii ÷... 1 -117] H -Ŧ -.HUE -----H . . -H ĒŤ -1-3 - - 1 Ш 田 G 07 -4 . . × 4-Ъй Ħ N. H 17 #**#** Ħ -------**i**----油 ==== **....** 11 11 TT 1

2

ky

10

the second s

मा 詽 <u>Hilli</u> :hi 扫描 朝 **H** TT. 司里 T Ħ ₩ -++++ Щī Ŧ ΗH 昰 44 H. Ц ЦГ ΗŦ **F**F Ŧ Ч<u>ң</u>Ші: # Ŧ H fill: H ų: Ŧ Ħ कंपन 1 -司出 44 违 117 u. in. 4 - iteri 늰 H -111 ĒĽ 計算 17# \mathcal{C} 1 11 1-2-1 4 0 --------14-4 . ,**;;**-...... H E 'E1 **#** 谨 (Thin -12 titl m EFI ÷, <u>E</u> π., <u>i</u>... - , ΗĽ ::: -Θ -----hΠ. 1 111 -15 Ŧ H 7 1 1 <u>.</u> T.L. ÷ **'** 1 H 1-**;**‡‡ H.-Ē •...•Q ÷-=-**3**173 ----i E E ΞŦ •... 1.--15 131 Θ 0 H 11 ····· 141 ÷ -O---------. ., 1 - ---φ. _____ -----. -... 거 . **H** . . -뇌 -Fi ; Ċ 11 Ь ΞĿ, · · · · · 77.2 Ŧ ------.... de Est ын НН 11 -----**21**-1 11 = 13 I <u>.</u> · 0 ----1. **H F F F** ** ::-; Ħ۵. . . ! 6 D - 1 ΠĒ. 1---..... 1. HILH È. ŗĮ. -13 11-51 . . -12 ----i -----1:0 -..... 1 244 -57 H 1..... _1 <u>.</u>.. • [] . ij. -+ 14 111 -----..... ΞĒ *** 副正 -----٠. H E 121 크급 ŧ.] Ŧ ÷ Ħ. -----L E E Fri ΞĒ F -1 ΪË ...t 11: Ħ 11 NENER 12-1 1 -H # 1 H H. ţ. -----++. 1. 11 1 13 aiy #**1** 20112200 11 1.1 - 44 747777 rinit. TE 74 22 10 110 2012 de 譁 1 iЩ

Ŧ 5741125-2 2007 00-00-074 2*47057*90 x 40 - 777/07 F.F.

and a second of the second of

12

L.E

Ż

. 7

	ŧ≡#ſ		h				.	Π.Ŧ.	<u>.</u>				Éii	. .		HF.			i-j-		Π.					
	뒘			#	1	ER		h H		Hi	H	Ŧ			11	E	H-	11-				11			H	
							Ē	H.L.	ĒĦ			i.	÷										# -		<u>c</u> i	
						-											-									
			14		****					+					-		H					Щ <u>н</u>	<u> </u>			
	凹				Ŧ		1.1	1 .::				=	Ģ			†		##					<u>1</u>		Ē	1-1
				뀨		- 11	55	'ıĒ		<u>.</u>				Ē	tu		F-	- <u></u>							μĦ	僵
			Ē	1	Ξ		77.	1 1	3	- L	 	÷	. •		ñ		Ē		H					王	11	罡
			īц	ΞŢ		<u>ir.</u> ;		H			:• :						÷	Ö.							11	
				ΞĽ			<u>.</u>	-11		<u>.</u>		Ξ				- Ξ	Ð	Ŧ	-						HT.	
						₽.Ħ	îri.		H	:n:	-			O	.		1		-ri					F		
									==		1114 1114				.0		Ŧ-									
													;				1.:	- =							Ξi	
									· L·								+	- 75	1 1 1 1	••••				<u>} -</u>		5-11
										: 11 							<u>+</u>	-6						J	- <u>·</u> ··	
										-	- <u>-</u>		÷11-		:=:		ŧ.			0			<u> </u>	<u>i⊷i</u> 		
	14		11		- H		5-1			: 			<u></u>	<u></u>	:.:: 		Ø						ūt.	11. 	÷h	1
								1.2			7.	•÷ <u>-</u> ••			=	{(4 -			•••				1.1	Ξ .Ε	
		54	5					,			1:		-		-		‡ . 	Θ								
	5	2	200	Ŧ		11	ΠĘ		-	+					<u>-1</u> F.		<u>1-</u>	1	2		1: ¹ .				10	
		S.	Ę	E.				5						<u>_</u>			÷.			==				ΞĽ,	ý.	
		3	-24	• • •							#:			<u> </u>			Ŧ.									
			ñ				<u>и</u> 1	2								C	L			-1				E		
	3	Ř										· · · · · ·		Ō			Ť.	==-		-	÷.				-11-	
		X		ill.			<u>.</u>	N.		1				===					2-					11		
							3	N	 	-					<u>- C</u>		3							111		
				****	111		5			<u></u>					÷ *		<u>L</u>					127			<u></u>	
11415-1			21	.711				14			<u></u>	1	Ξ				<u> </u>									
								Ϋ́.			<u> </u>						I +		a	•	***	33	7.E			
				<u>}</u>		<u> </u>	Q.:	Ų.			团			-			;		С С		-			1	Ŧ	
	2-		-11	70			Ş.	N			: 1		!	<u> </u>	<u> </u>	,				==				Ţ.	21.1	TH
1.1						1	5.	¥.		<u>+-</u>					<u>.</u>					<u></u>					Ŧ	
							N.,	XI.					ir-				.÷.,			•		-11			-	F
										НĒ,		=			•										-1.	
	2				4 -+++	+			++							-++				+ - +	- +	1 ++ 7		55		0
																		,								
									<u></u>				2				<u>. </u>				¥			- 11		
						-											1.11									
	閆			1.F					臣																	
		瞱		1		Ŧ	-1		=				Ŧ	- =			<u>+</u>	÷				411				
	E:	野				H	ΗH	ΞZ	11.		1	÷D.	25		23	ac.	-162	жi	ra	74	ir:		H			
Hillar.	1	HT.		圳	町						1	7	ŻŻ	H H	an i		a i	777	2	œ/		33			:	
							11			44		Ħ					-	·=	#						#	
									H	#			E.					= =		-						
	11111	± 10	1	**!!	112	utti		н і .			14 3	ttit	477.J	r rén	بن ب	ti niti	المتتما		rtat		tti i		::::!	uti.	:#13	 ()

NAMES OF TAXABLE PARTY.

「「「「「「」」」

i.

ł

i i

13

- 11 ÷Ц Fi 11 r. ī. ΞĒ Ęn Ŧ ,h 1.1 -E Ш 1 1 -----4 L I I I 7 un di . ------. 0 24 Lr 11 1 <u>t...</u>, 0 HH HH F E. Ö 1 _, I . d 1 Ę 9 ÷. ٠. ž ĒĒ . 10 中市-EL E ti A <u>OT</u> -----o. 7 'ri T 11 ------..... ÷ į:... 12 - -- EE -1 14 713 -‡: . • 9 ñ <u>]</u>------†=r -..... _____ i. .,. ÷ 2270 æ 31/2/2144 iii -=279777 127 27 17 218 4 Ē E ₩È 臝 Į. Ē.

1 . 444

4

14

84449-4844	114	II	m	 .		ŧ	TT		भःसः	a de s				1127		nar	11.1.7	ar III	<u></u>	1111	1 mm	100	1/12	17	
	Щ	Щ	暳	H	H .H	Ltr	ŧ÷	#			1H	i titu	h.	÷	11			μĪ	11		詽			Ħ	틁
		E		h		Ц.	4 4,				冊	4	Æ	F	1.12			T.	HP.	H		H	即		Ш
	n E		#	hii	1-1				i i i i			i.			<u>In</u>			i.	μi	111			扫	i.	
			<u>.itt</u>							##:			2.5		1			1.11	1.1	ŧ#	ĮЩ	H,	112	#	44
		H .		НH	μų					E.	ι <u>π</u>		H.		H.		1.	13	<u>II</u> :	<u>#</u> 2	Ħ	H,	H		
	11-11		-				i.	H.	1.	1.F			E.	目	FT	100	tit E			用印	ЦĦ	Ħ	ĊП	11	ÌЩ.
	<u>+++++</u>		41.11	+ -	1=		₩						<u>.</u>	1	-	$\mathbf{F}_{\mathbf{r}}$		F				E			11
				Ē.		E	H	<u>1</u> н				ΠĒ	12-	Ë -	E		1		μÆ	H	HT.	Ħ	讎	Ť,₩	
		5.1	1		Ē	F.	11.	13	Ξ.	12	H			1	1	1.E		PII	-	E		H.		ЦĒ	III.
					=	E	1	-				Ē	ŧΞ	H.	Ē			1					H.	Ē	
			<u></u>					<u>t i i i i i i i i i i i i i i i i i i i</u>		1.	1.1				<u>UH</u>	-	=	<u> </u>	1		1111	E	<u>م</u>	11	世
	1.1			- <u></u>	E.		E	<u> </u> ,	μĒ	E			F	E	Qŕ	<u> </u>	<u> </u>		1 =				2=	F-	H-
	HHT:				13	-	E	E	E F		1==		E	X	14	1		-		HE.	=	T :	È H	₿₽.	hÈ
			***												ģ.ļ	-	1	łΞ	Ш					HH	₽.#
11111111-1	==	<u></u>				=	1 -		-		1		<u></u>	F .	br	=	E.H	1	H	H	<u> </u>			E.	
	-			. :	1.1=	亖	<u> </u>	Ē	1=	=		: =	12.7			h.	₽Ξ	罪				EΞ			
	E				1712	ξ	1.7		E	ÈE	Ē	₩₽	11.	Ē		5.			田					Ē	Ш
				Ë		<u></u>	13		Ē	<u>1 =</u>			<u></u>		Ë.			11	1111				L'u	-11,	1
	==	=			-				Ē	E	Ŧ	E-	<u>-</u>	₽≡	III.	1-2	1- <u>H</u>		==		1151	17			
	-	===	H.				E-	E	Ξ	h=		E		=	E-1	12	-				-	1.			1
								=	i ii	=		=	-		ĻĘ										
	1		<u> </u>	***		Ξ	EE			E		1 ::	<u> </u>		Li	<u>0</u>			E -					毌	
	逐						F		Ē		7-	1			=	O.					=			1	
		-15-	1			7. 2	112				<u> </u>		Ξ		<u> H</u>	Ð					11		T.I		
	2	9					12	=_1		<u> </u>		<u> </u>			E.	<u> </u>	5=	***	ΞΞ.	.	<u> </u>				
	Þ£						d,	-			.	-	-		1.7									X	
	10		-	11					==		Ξ					-E	-2	::			H			1	
	ĽŠ																						-		
		- <u>N</u>					- 5							• • • •										35	
11111111111111111111111111111111111111	FR	N	_			4	LN.		ŀ.			P	-		F		E				÷E,		57	ΞĦ	
	34			=:			Ş			<u>.</u>			9			 .		-17.							
	-29		-		** * - ** ** *		-43					-		0								*+++			
	12					3	Υ.	•	<u></u>					E	FL				<u>;</u>	ŦĦ					
			=			5	B			Er	H		11		0						H			H	
5. 12 3 22:	F		-	-		- h	2							= 1	5+										
	<u> </u>]	= +	_				- 1		••••		* **	• •		<u></u>	4	=		• •••				•••••		1.11	11
	=	53	•===			-	-2							-==	Ē		5	-		==	=		-11		
=====			<u>.</u>]			\$		=:			-		-						:=	===	5:1		H		
						\$	K					<u> </u>										-5			
	=					1	À	=		-	<u> </u>		-	• •			2		<u></u>	<u></u>	<u> </u>	н <u>.</u> :	1:E	<u></u>	HH
	EE			33		Ś	Ň	•		-	Ę.			Ľ.,	#				==	5					<u>ял</u>
			Ξ				•	-										-						1	
AL TALLET IT.								_			-							-			_		<u> </u>		ĿĨ
			- 1																						r
						≓- -	:		-3.	:#*			: 1	- <u>-</u>	• .		- 1	- 33			-		3		m
				-	-				-3.	:#*						- 1	-								5
				-	-			1111	-3.	:#*						- 1		-							0
					- 5																				
					- 5																				
					2																				

Contractor 1	2-1									01 1					1.11								-			
		Ŧ	1			.	·			L	·- ‡	-17					虛		F	-11		i.	Πî	田		
		Ηr.			нт.• ЦЦТ			ΗĘ		Π.	÷.,	2					Ē	·++		ЦТ:			Ш		归	围
		- H			i.	E.	1					-		: 							H		H	- <u>-</u>		H.
			1.7				-			; ;;;	1-11 []			Ξ.		<u>- 11</u>			ΠĒ		Ŧ	F.			ur.	Ħ
	1112		4 to 1				<u>.</u>		411		111							•		ū. 1	11				77	
		THE R				1111		<u>+</u>													·,		::::			
				****									÷.,				0									
					-1-1						117		<u>,</u>			о.										Ē
		1-1-									· ·					<u>::-0</u>	<u> </u>				:			<u>}</u>		
			H	1.1		:::::		1					: 			<u>9</u> ' -							<u> </u>			
	<u>v</u>										, 												<u>.</u>		_	
			1		:						5.		:		h	<u>.</u>	-	•	<u>;</u> ;;;;		Ξ	÷		-7		
													·•••	Ħ	0				- :		•	Ŧ.				
	E)		. :: :	-:-:										O		: :					Ξ			h	• .:	
														•••	Q	:-=							Ξ.			
											;;			€	P:		:·	713								
		5					•							::	0							_			e	
		1/2					: <u>-</u>										2							<u> </u>	à.	
	K.		12	. F	1::::										0										1	
	1	Ľ.		-	<u> </u>	;;;;		N.				<u> </u>		9	<u></u>	<u> </u>		. ::::					·			· ·
	53		-3			Ξ.			•				- 0	5								-	-1.7		×.	
	民	联	3	ΗΞ				Q						<u>.</u> :	Ð:		- 1				-	=	Ξ,		1	
	Ę	5	ĥ					1		:::		=	· · · ·		÷ -,	Ð.		Т.			1			N		
	3	E.	Ē		F		5	Ř		·			:		р:			1-1		17		=				
	5	S					1.3	3		- <u>-</u>			e,	** <u>-</u>							:					
	1	1.1					-3	Ň					G									,			; ;;;`1	
							5	N.			<u>.</u>													N	==	::=
	-	F	=				X	10			<u> </u>	<u>)</u>			<u> </u>	<u></u>			<u> </u>							
		:+					-7	13	1			<u> </u>	.		l-e										:=:	
		<u> ::</u>	7				<u> </u>	يخا	<u> </u>	<u> </u>	Ŀ		L-	Ó.	<u> </u>	<u> </u>		<u>.</u>	<u> </u>		<u> </u>					-
		Į		<u> </u>			:	12		::-		Ŀ	· .	•		;,		: '	Ŀ		<u></u>	<u> </u>	-			ĒĒ
	<u>l. Ë</u>		15			-	i Çi	2	[]			<u>.</u>		-	Ĺ	[]:-		-		<u> </u>				Ŋ.		
Elici	6.4	 					N.	13	-			ŧĘ.				-	• •		·		11	:	7	••••	: :	1
	::	• .:			:::	1:	- I				<u> : .</u>			•		1		2	7						H.,	-
		:					÷	ŀ		<u> </u>	 ,	:		•		1.			:			L	::-		1	
F		÷. :					[-	<u> </u> ,	<u> </u>	*****	<u> </u>		<u>.</u>	2:.	<u></u>	<u> </u>			<u> </u>	• • •				b	:::::	5
						1		÷	þ				. -			<u> </u>	2 N		<u>р</u>		8					
		<u> : .:</u>		 	<u></u>			<u> </u>	<u>-</u>	<u> :-</u>	•••		<u> </u>			ŧ -										3
							<u> </u>		ļ	ŀ					<u> </u>				r.		_					
				.		·	<u> </u>							:	<u> </u>		<u></u> :	-		-						Y
	:						[7.	R.	ررح	17	22				<i>G</i> i			2.7,	Yr.		1			
H: ral			-			• •	•		2	75	11	<u>ئە ب</u>	11/3	2.7	71	7. y	0	71	à	2	Z					
					·:			ļ	•	!			· .	5.			1	.	a		2		i i i			Hilli
		***		: · :	f												1				朣				1.1	雷
					لنتتك		L		<u> </u>	1	<u>.</u>	<u>t</u>	أتسبا	أستتسرأ	+•	1		لتتبتها		<u> </u>	t			.	لتسبيها	لنثثن

•

Ξ,

16

itmanda beta

* ** *

tant fer an franke for an franke for and for an for an for an for a for
This is a second s
5 MAZLAT 275-7 2511 5224234
5-24-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2
5-2112521AT 275-2 23AT 22242214
5-2012521AT 5-5-2 2315 572917
The second s
-35/24 11/25 39 40 7298 314 -35/24 11/25 39 40 7298 307

7 5 齳 H. 33 F, 耳耳 Щ. Ħ L 詽 12:5 ī. 11. Ę 9 -.... --1H L, ų. E 1-1 ----田 ÷. • --+ 上的中 ıÖ 5 ш 1 -1-TTT 343 E. Ŧ Ŧ 0 -1 Ŧ Ħ Ξ 112 -----77 H. i i i -------i. . . 11 i.T 1 .±. 27 -**[**] i q :12 1.... -- E 1 11 Ð 三提 Ē. 4 ΤĒ 1111 1..... 11 Ŧ Цí Ŧ - 18 -----H -臣 臣 5717272 Nr 172 72574 J 2 Mr 22 ШH П 1 Η रो म्र = F H 121 2 42 17 in hickor . . -13 귀 Ħ 4

18

the second

								Er T	<u> </u>	: ::		ΨĘ,		-	Ţ							圃
b ultimit				H	4	-	13 ,	:11	+	÷.,	;;;; ; [r.								囯
						1																
											t I	- - 11								i i		
						11'- 1-1-			· · ·													
				<u>N</u>		1	1 ¹				1			1							H.	Щ
						77			•••			ii.		<u>-</u> ##	****		ΠÞ.	<u>E</u>	<u></u>		1	Щ
			- 5	臣			<u> </u>	_						Тţ.			मा	1 ¹ F	#			Ⅲ
			1.1	12			- 				: 1					<u>, -</u>		ĮΞ.				围
				E.	in i				-		:	:: <u>-</u> :			= :		-	Ξ.,		1	ji	
				F.L.					-	:: -	•	Ŧ.,	-13				1			FT		副
				13										:11						-1-1		
- 1-1-1				R		•••1											===	HE.				
			1.5			***							7	3						<u> </u>		罰
			÷\$	语					+ +		*	C								11:		目
			-1.8	Ę						e								ĒĒ		1	<u> </u>	H
				. <u>.</u> .		• <u>•</u> •• ⁻⁷			Ω		::4		12-	- <u>-</u>	-		1	i-F				
					=			=		Ö	-:				1: <u></u>	_			Ξ,			
	S	EL	<u>.</u>	1±	-			O.	: -			<u> </u>				-	=	E,	11.2			四
				H.				24	÷	: ¹		7				r	•		Ŧ	55		
						0	Ξ.	$\overline{}$	<u> </u>	-			<u>.</u>	=	T						S	
			-						•		: :				<u>.</u>						R.	
						5:						- 							HH		Т	
	<u>-</u>			Ð.											-				1 <u>1</u> 1		<u>S</u>	
					-112		<u> </u>	÷					- 22							F		
														1	· · · ·			a name				
	1					<u>.</u>		0			_		<u>21.</u>		÷				ii.			Ħ
	\$ 5							0														
								0							· [•] •] •] •							
											0											
									Ö		U U											
									φ													
									Ó III													
									Ф. Ш. П.													
						:										.:						
			6	I 13		:										.:						
			Ş						1					. a		.:						
			Ş						1					. a				1				
			Ş						1					. a				1				<u> Č</u>
			Ş						1					. a				1				<u> Č</u>
			Ş						1					. a				1				
			Ş						1									1				
			5						1													

.

21 तम 1 H1 臿 1----7 <u>e hir</u> 1. Ŧ THE STREET 171- 161 22 245 1 1 -H --<u>.</u> 0. H ------1 E -H . -7440 (2002-02067) -7440 (2002-02067) - 26604 (2002-02067) - 268 (2017-2016) ġ <u>u</u> Ъъ 34 Ē ©.,, 1.2 ----<u>.</u> 11 11-15-15-11 . Ø D Ē Ξ. e -----Ē Э ĒË lõ Ē . . III <u>.</u> -----F b Ē G : . 00 1: E. 5 . <u>...</u> FF ----. -21 0 Q ... F . -----7 ÷. -Ę, q 1 -Ξ --.: -Г -गः • 1. :. 1 -..... 7 ----: -_=== -1 127 1.141 -: 11: 1 --1 m ----ū: iE R. 4... Ŧ ΗĒ -+-311 ÷ には 5747 1.100 ŧ¥. 23 775775 718 da Ē ÷ Ê - -- ------in.T *** 141 # . 玉

The second

	Sec. 11	The	HI			E		<u></u>	TT.	1:11	<u></u>	HT.	E.		FE			 ;	m	Щ	H		ΠH	1ii Ii	E III
			i#	ШĦ			1	н.												H		H		鬥	
			朣			Ē₩		ΗH		Ш		<u>1_</u> 1	-		F			-4		Щ	Ш				
		<u> </u>								圕	27				Ë - 3	. n		,	ĻΨ	#	₩F	ji i	Ŧ		
				÷.			щ,		#				-	1		<u> </u>			i II	Ħ	Ш	212	Lili	掛	
			μ <u>π</u>			ĒT,			ĒĘ	H.	. I.				1				1		盙.			ĒB	
				H #										===	1.1						<u>111</u>			Hi:	进
			<u></u>		1.1				111		1-		<u> </u>	-1		·				15-11					
			迂	н <u>т</u>	25		-	Hi:		ĽΞ	<u>r</u> r	<u></u>	11.	-•	1	臣	<u>_ 1</u>			臣	曲		=	臣	Ē
開開			囲	E					-	1						ιĘ.	- 1	; -		22		1			μ
			121.		F			-			1				15				÷.;				ř.	HE	H
								:=	127				<u>.</u>		:23			3.2	LIFE.	F				F	
								Ξ					<u>.</u>	-				Ē				i.	L H		
			=		==	-==	=						ĿQ	<u>[</u>	Ē	罡									
		<u> 1</u>	=					Ε.		<u></u>	<u> </u>	0	<u></u>	<u>;</u>	134	<u> </u>			••••		HH:	1	1-	Œ	
		1					E			E	Θ		-		F	<u> </u>			li <u>i</u> ff		E I	E	F		
						-=			.			프 (ŧ		E.							12		1
	I.N.		==		=		3.3				=		5	<u></u>	-		.i.			E		h.		<u>-</u>	
									<u></u>					:=									==		
		Č				•																			H 1
				=	-			ŝ			-					-				1				h.	E
		5 13			Ŧ		-li	<u>.</u>		=				<u> </u>			1	<u>=':</u>	22				iiii;	5	
				Ħ	H		-9	ĒĒ			F.::			<u>;</u> ;=_(=			1721	-4	麠	锊	
	12	SE S	÷					TE.					(1				:: : :	111		-		X	
		EQ	=			-in		-33						t-c		: 7			1.1			. 1	5	Ň.	
目望	22	2				7	10	-Li						Ø			• • •							1.1	
	Ŀ	21-55				2.1	- <u>V</u>	-1						÷C				1 					1	1	
	- ST-	N	-			:12	Ъ,	: <u>R</u>						<u>.</u>	0		* <u>*</u> ** *		-				-11-		
	n.		=			- 13	-7	<u>. N</u>		•		1		巴	<u>D:</u>	:::-			_				1=-	1-11	
		Ŧ				-37	:10	-N				EC.	2:	5		E .:				-				Щ.	
						=₹	1			Ξ.				0	•••			-	•,	- 11			Ξ	ΠĒ	
				1.5		2	9	Ц.				•			<u>.</u> .		1.1	÷					117		
			E.			:10	Ř	13						÷		5.	·		 						
						÷	÷\$	-3							1								}		
						1	12 U	÷.		<u> </u>						<u> </u>						<u> </u>			
								. M	;	l : ;	11.1			<u>, </u>	•••	<u>1</u> 4 - 1		** * *		: 5		, H		별	dff.
			E						,							۰ ۰	.:::			.			-		
						: -	÷.::								14	ц.: : :			<u>.</u>					24	
in the							1.9											••				ΞŦ			歐
				f i ii	E.N	E		ų —	i f	5		5		¥:≟ 9 :_	÷				bi				1	H	
			1111									-		1					••• • •						-3
													••••	•					•••					<u>h</u>	3
and a state							15.1		1		11			÷.					. • .	•11	, 11	÷	: <u>.</u>	•	7
		*****						1• iii	1	447	1.77	1		1	1	12	أنتبر	أشرا	10		•			27	
				.		317	122	33		r.r.	- 14	22		11 6	20	استعاد	- 1					1		I	
						37	17			2 2	2.2	2		5	5 1 1 1 1		19		17	×					
							14						9 <u>5</u> 1	5											

ALC: NO. OF THE OWNER.

1 17												<u></u>					· · · · ·				~~~~						
	12									<u> </u>						- 	1			.±-,	12		111	1.,			
	11	- F		E	91	坦			E				Ē.	17		· ·	120	1.1		1	1						E.
Ē	ų,I		÷			Ξ			1.		F.		E			-	1	 ,							1.		
	12		-1-		- 1-						ii-	Ē				1.7		<u> = </u>	1.	1-1							
			- L.						+				1-	+	122			<u> </u>	16		ļ.,						1127
1	14	E				_				4			1		<u> </u> _						1	E		-		Ē	144
	Ē	13				212	- 1-	13			<u> </u> -		-	1				Ĩ,			 	E		ŧ.	i iii	忭單	
- []				72	-			I.			<u> </u>		=			; .		1	13	177				НЦ.			
		:5						¥ :			1		F.				5.87		Į,	1						. :	
	-		-	HE		=		12	.=						1.		Ż	15	R.		1: :				6		
11:		13.					1::-					E		+		<u> </u>	T	13	- V								
		- <u> </u>			Ē								<u> </u>		<u>_ ::</u>				1			-	1.1	1	-		
		-	111	-		1	1	<u>.</u>	1-				1	Þ		1	Ð	. \	- g		<u> </u>		=	13	E	E	圔
	ļΞ	1	1-1	=					1		<u> </u>	(<u>) </u>	-	<u>+</u>			-3	é, c			=			5		Ħ
E	Ľ,	1	1	. <u> </u> =	=		:1=		<u></u>		-{	<u>0:</u> :				E.	嵌	1	1 N	1:1				12	9		
			E				Ξ		E		T -		ਸ਼		1		1.3	I.N	1.5	1			=			-11	
朣		1	F_			- 1			Ξ	1	·		ĿĽ	₽≘			12	1.54.72	5								
II.	堙	Ϊŝ	i =	i.	4		E	E			-		Ϊİ.	1=-	1-1-	1	13	-5	-J	=							
	E	絔	ال ه.			÷	+					. 7	<u>с</u> Л	-				5	15						2==		日
		±8	Ŕ			-							-1-	ŀ				<u> </u>								R	
HE	5	НĘ	ЦŘ	1.Š								-	4	<u> </u>	<u> </u>		<u></u>	<u> </u>			7					59:	
		H.			<u> </u>	1	151				Ξ	••••	5_	Ξ		-		[:	Ξ	.		Ē	E	ΞĒ		婜	国
臣		Ę		Å	H	E					<u> </u>		Γ _i (Ð .	ī	:	<u></u>					==				3	国
圓	E.	10	į									•	O.	E.		-	. ::						=				
		<u>-</u>	Ъ,	5	三		E		=		÷ .	-		Þ						.1.:			1.22			1	
		8	ŝ				1		=				 (P	-		:				-						
		长		<u> </u>										Q.	1 :			-		<u> </u>	• 1-		= =				
					1			<u> :</u>	1. :	711	:		-		0					<u> </u>			===		5		
			1=	-		Ξ.			<u> </u>	·	=				1=	0		• • • •									
<u>.</u>	<u> </u>				1:1				<u> </u>					<u> </u>			, N	-			EE						
:.*:				[::==			·	<u> </u> -		22			:-			:. <u>;</u>	;			1			-	Ξ:			
			į.,	-		÷			+ . :			.:	•••••			•						1.11			-4		
				1				=					Ξ			<u> </u>								=		1	
			<u>f</u>	<u> </u>										+	<u> </u>			5			Ē					킔	
		Ē				1				<u></u>					•		<u> </u>	- 51			<u>'</u>					픨	
				<u> </u>					1 ===				<u> </u>		****	::::						_				<u> </u>	, 1
			<u> </u>			<u> </u>										-	::.;								E	劃	2
F 7.		-	-					<u>)</u>	- 0		- 1	=			;			5-1	- 1	<u>i</u>	,						
)						!		2 <u>:</u>	긔	<u>.</u>			-		4-4				翻
	H		F. 1	iri.			• ••					-			=	=											
E		T			F===					20. 57			1.					井									
E	H			12	Ē	2.		71			Ħ													-			
臣						5		7.52	//// 	204	₩ 	<u> </u>	A	0	<u>, </u>	24		2		2	74						〓
開					14- 1-			74	23	5/4		-	9	2		7.31	a: [22	2	-	9	<u>=</u> "	ΞĒ			**	
		ΞĘ		Ē		<u></u>	.	-			ĿŦ				劃	27	F		Ξ #			F	.		Щ		
E-				H			Ē	<u> </u>	ĒĦ		₩ŀ.	ЦŤ	Ŧ			EEL	琞	÷1	-	i-t							
													_	فسيعت	لنمب		تلتنه	سن	T	تلعلك	ωT		, TIT			77717	

·

	******	mш		- T		<u></u>	rt a		1	cur)	r: F:F:FI		1				r (a T				H.H.			नतन
							Ŀп		tiu in=	14	Ea		1.H							ΗЩ					
					<u></u>	↓	ĦĦ	벺		HH	T t		正			i pt									ΞĒ
					Ŧ	Ę,		17	 ,	围	Ŧ.	<u>.</u>	i i i i i i i i i i i i i i i i i i i		1*	Шī	<u>111</u>	<u>п.</u>							
				Шщ	4	# .	₩ *			<u>1</u>	۰. 	F .							#		11	里			
			1.1			Ť			: - 1	Ш.				4 -1				Π.		<u> </u>	世				
								-					: F		11 11	1			- 24	畫	÷.			瞒	
													H						1.5						
			11				1.7	<u></u>	<u> </u>				. <u></u>	<u> </u>					14		Т.				
			ΞĻ		#							-	Ŧ		•_•	<u><u> </u></u>		X	1						
					il.		-447 -11	i, i		Ē	-		н Н					5	л¥					朣	#
						<u>.</u>	Ē	<u>.</u>	Fi		[=	5					- 5	-1	- 51						Ē
			1				-					_	Ŧ				- Q	18	ΞÂ,						
	-				H			- (N 1							11			ĘŶ						
											÷ ±		c				- 73		- 61	1					
			1				- (-)		-		Ē						5	- 353	1		- 4				
		Ш,								b				*			<u>.</u>	ž	14 1		11	-			
		Ξ	37							Ŧ	1-0	<u>p</u>			12	4	1	<u> </u>	. Q			=	- 14		
		=					- 6	b≣	.				Ξ.	Т.			\$	1			-11				
		11					11	-			Θ			==	=		-50	K.						-	
	28	1			· <u></u>			-	O		Ξ.	- 1	Ξ	53		ī.Ē:	-	ų.	12	• •	11				
	च छेर्	5								0	Ē			1-											
	1155										CT.	_									, E	F a			
1113213	N N	3		111			50																		
											ř											-		11	
HLLE!	13					r			ā				Ŧ			-						÷			EE
	2.2				****			Ξ.		ΞΞ			n				·	-			F				ŤΞ
	S					-					F.	Э			Ŧ								4		
	-	23		=			-		-		5		÷Ē	Τ.		. =					¥7	2.2	V=	1.1	
	-			- 1											<u>O</u>							,			- 4
							· · ·					-	9	111- 111-										1	
		-																		<u>)</u> .					
			: <u></u>												·						<u>نب :</u>				
												-	<u></u>								-	÷: `			
	-					1	-		:: :				-					۰ <u>۳</u>		2	<u></u>			<u> </u>	크
	-		<u> </u>			:-::	, · ::			:-:				••					1		••••				
	-						÷			1														Ĩ	2
					. 17	5			Ξ.,		-							-							मि
			1.			3=		0		N -		1		13	1					1					
								<u></u>		3		1			;				-						KABLY RE
		1						-				<u></u>			وي تيا د در										-9
							-21	Ľ.							f 4 4			1							N
	E		34			3	Ϋ́,	22	24	2.	22	- 1	2	2	24	7.1	77	72	23	74			-		
						1. IV	2	24	12	2	¢.#	20	-	2	10	3	ZP	7	Ô.	2	• • • •				
									11.							E.		1.1.							
		1.			.=						5.11										-		-];		
	<u></u>	1	<u>.</u>			<u>L.</u> ::	Ľ	1																	لتتنب

ا دانگر سود مردهان د

فاحتمعه فكمالا ومركا للطفنات أسلطته فعما تعاديته وتبليد فللبلغ

منافع الدالي المنافع المالية المالية المالية المالية المنافعة عند المستقدة والمنافع المنافقة المنافقة المنافعة المنافعة المنافعة المنافعة المنافعة المنافعة المنافعة المنافعة المنافعة والمنافعة المنافعة المنافعة والمنافعة والمنفعة والمنفعة والمنافعة والمنافع

ł

	- Tilli															ni sa			0.70				IIII		
	t	+1		<u>⊞</u>	<u>1</u>	; <u>.</u> ,		•			:.t:					lin				<u>+</u>		Шł	iH		
				里			4	ΞĽ	щ.	<u> </u>	<u></u>	1 - 1 1 - 1	14 - 1 - 1	•		11.4	-i.,	'n,				Ŧ	FE		
					ιĽ	<u></u>					Ē		1	-1	• •			÷.,		믵		Ŧ	i_H	₩#	
				H		11 11	-	i i ii	- 11	F	Ξn					÷ĸ	-	÷,•	цщ	ЦН.			π [‡]		
				5.1	1	F		: 1!	÷.,	. . .	7		-			Î.		4	H	Ξü		H S			44
	12			T.							<u> </u>	:				-5		E.H			- 1			ΕĒ	ii i
					.µ1				-	· ř			÷.		5. 2. 2.	X									
		H				1.1										- <u>-</u>	11						- 1		
										 				5	ie Vern	205,345							54-1 1-17		
			1 IÌ	Ш					:-1:		• ==		= :	- 4	Ě		• #*1		.111	1			1-1-1		
								Ξ			b-			105.2.24	-21	Sete								-11	
				<u></u>				:	- (b :		•		-27	ų	12		i	i ·	<u>.</u>	•-;•	<u>4</u> 4	<u></u>	11	
			Ŧ								Ð		`	Ŀ	1475	<u>-</u> N:			-		; <u> </u>	Ś	5		
	詽			.:-		•••		::::	:		L-FC			. K.	. Т.	ų.	ĒĒ			<u> </u>				i	
					<u></u>			:		Q				3	Ř	τς.					-			•	
S		: :	•	: - -					0	9	Ŧ	Ţ		S	5	2		· · ·						.H	#
	N.		_ i					···.		Ö	Ŧ	-,,		. 8	Ū	-51		•	F	1	•••				1
							-				1	:O			- 1			: <u>.</u> .						N.	33
	T&			· · · · · · · · · · · · · · · · · · ·							-F-	.	b _		l			=							
		129.6									1	þ-	::::			-						iii.	<u>.</u>		
	16				=					1	Ē	0						=						5	
		22										_	•				<u></u>						<u></u>	2	:::::
K to Z	12	5	1				k ier	-			-10		<u> </u>					-: - 			1		1:22	S	
	15	35	==	<u></u>	<u></u>		 >	<u> </u>	: .				- · ·	<u>:-:</u> :					<u> </u>			1			
			<u>.</u>					•			<u> </u>		÷.,		-						Ē				
			-	::::		: ::			.			C	b	- ·			· · ·	:							
			<u>.</u>	i				.: <u>.</u>		1.11			0	÷				<u></u> :			. <u> </u>	i i i	1.3		
		: :					·		-		: .:		p.		· F	Ì'				. 1.	:-;	::==			
	E			•		•		-	; :.							12			Î		-				=
		··· -						-						÷.				<u> </u>		::::				===	
			••••			••	·			: ·				:	· ·:										
	.	••••				 :				<u> </u>			'									: :.		<u></u>	
	- 		÷	 :			ŀ-		<u>.</u>											•					
1	+			<u> </u>			<u> </u>							<u> </u>											7
				•				*				<u></u>		 		1 1		:			-		<u></u>		17
							. 0		·`\	9			: ;	. .	2			þ.		5					
		-				1:	11-	9.			· ::					••••			_			1			7
						-				-					•			-							-51
							-	-1- 				 .				.1.		-			-,				R
						57	ü	2		1	27	5 5	7	Ż	7.0	7.	ØS	9	23	À				I	
E		5	F		::		1	c/	2.9	12	w -=	25	52		4.		57	-7	1	e					=
			L 🗝 🔤	- T.			1. 1. 3	~					F 65	anger A											
						1.	1.											::						==	
	4					1											_					=			

ì

ĩ

-

.....

, , . , ...

HIEI	<u></u>			H.		E			FE				E-F-		1.71		192		••••		1-12		1				Ē
	1					ΞĒ					• • •		<u> </u>	Ę		*								1121 			
Ш	ΗB	#			74		11. 11.	==			#		EE	1	Ē	·•••		2-	-			Ē				<u></u>	Ē
盟	ΞÜ	ΗĦ	4-+								H.	1	Ξ,			-		-			=				-	E	HE.
臣		211	1		34	1.		.17	11.3		.	115 115	-	===							1	-			ŢΠ	Ē	
		H								117	111		-	-	. :+				1			5.				Ē	117
	1111 The						1 14																	••••••			
Ш		1					<u></u>			<u> </u>	1									=				11			
		t:	1							÷.	, .	, T		- ::		1-1		-				-		H		μ <u>μ</u>	
	ΞĦ				T													L.				-=:	-==	2			1=
	-										<u> </u>					-							E	1	5 =		HE.
												==	=											1	.=		
E .				* * *				<u></u>					Ē	F	<u> </u>	:11											
	-	HI.							•:5	·			01	==										-			
臣	긐	H	1	ΗĒ					=		1:2		5	<u> </u>										=1			
E	73	Ξï											F						<u></u>		<u>i</u>	=	==,	=	1 Ei		<u> a</u>
	1								-				-	Þ						-	[-				
		R											Ö l														
		2										·	Ø							E.					ΗΞ		
		2	X.				=-	Ξ			••••				0			=	k			-					i i i
Hone of the second seco	īΞ	ľ.	1					÷					- 1	D.					튽	=							
			2				Ξ	=			****	Ξ-	E (þ :					-R			: =					5
E		.N	iù,	3							1.	l-e	╞═┽			2			• 6						11=		
	2	15						-	- 1			0	-		-			<u>-</u> 6,	3.								
	$\mathbf{\tilde{z}}$	Z.	2	Š		=			-		-		-7	-0)		• =	-7	5								1
E	1	5	. <u>`</u>										6	P	==		3.5	\mathbf{x}	2				-		٩.		T.t
F	25		đ	1					Ξ.		È	Q					1		- 0			ΞΞ					
		16	N.								::		-	<u> </u>	$\left \right\rangle$		5								-		===
	<u> </u>	0	2											0			505										=
		K		<u></u>			=		-			=		-(2-		1		ЦŶ.	-							
臣	: 🗄	_													===		5	<u>t</u>	- à'						<u>E1</u>	Ξ	
		E							Ξ		2			-			- 3	2				=			=		1
														5				ŝ	÷9,	-	-11			121			2
			-	<u> </u>				:==				::.:				7.44	4.%	- 10	Ţ.						****		
=	<u> </u>	-12								1.1	'			Ē			- C	3	10								
					<u>:</u>		= -		<u>. </u>								5	L.S.	3								
E	117	17:			- 1		-::	•			Ξ		1				- 3	<u>.</u> 77	đ								
	::	<u>;</u> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			1	•			÷		-	-	1	Ē										Ξ			1
							1.		•		I.	2. 1		1	•==										-	Ŧ	[h
							- s						-	<u> </u>							÷						Ň
							Ē	R	· · · ·		-			<u></u>				<u> </u>		1						5	-4-
-	· .			-			-	<u>:</u> ۱		<u> </u>		14.2		Ŋ		14 - 1		-								[T	1.10
				1.							÷							<u>.</u>	Ξ.			11				E	语
ii.			IE.	Ĕr	<u>.</u>	-		Ŧ			17-	- 		li-			-			::::		ΞĒ	Ξ.		=		5
	÷					-			-	1		in		in the						ie-		1.0			E		<u>ح</u>
		È T											<u></u>	E				E-	2			2					
Ë		<u>u:</u>	E E						<u>.</u>	ورمي	1	7	H¥.	-		ų,	70		2.0	2		đ			14.]4. 14.]4.		1
	الدفغما		ب و	1:1:1:	1711	1:2:2	1:	1.11	1.1.	H =				1	1	1 1		£: .]	44		£-±	1				r 1	1
	·-1:					<u><u> </u></u>				1	1		H		E_		1		_		t	÷			تببتنا	<u> </u>	

L

Ħ 1 Ŀ. . -11 -----H ---------宇田 ΠĤ ΞE a ii ▦ -... 1 +++ Ē 51 23/27 + 4 WELVER - WE BOARD 1 Ξ, -<u>----</u> <u>.</u> 1 , 1975, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 197 -1 ----0 0 -----Ð -1-1 I; ; ; 11102020 Ħ Ť HH H •• 讍 -...... Ē 1. 11. -21 -----..... 199 5 :::<u>r</u> Ŧ 同 -No. 1 盟 7 17 2749722 1200 H 030033 Se U 275711 ------1 -5/3 -19 7 1.11τ. F 1 1 -

in the second second	710	11:11	0000		i line	00.27			1	T . T .		1.1.							****	10711		~~~		****		
			IШ				E		Ŧ	F	₽ .⊟	ŀ∄	H		Ħ				Щ					瞄	趙璋	龖
		ШĦ	Шİ								!	#	<u>г</u> п	E.		11		İЩ.	133	11					ΠĨ.	Ħ
		:::: :		di i					<u>+</u>		H			<u>.</u>				111		Ш					王田	
							F .	<u>1</u> -=	田	1.#	ŧ₩i		Ŧ	世	1#			ШЩ	<u>III</u>	###		H.	<u> </u>	÷Ξ	囲	鬥
		iiii		14		-	=		H	Π.	11 1							扫描	.	H.			li ii	⊞		HHH.
											<u> </u>	Ē		1									1.1.5	H		HH.
				tiii				FII.				E	-				1.1	117			-	1 44	التلة	i∰	THE P	田田
		ПЩ					li i		E.	H	17.	E.				1					illi			III.	郉	围
									ΗC			Fi7	+	<u>.</u>				1							Ħ	
			12		₩±		H	÷	1.1.			E	17 ⁴	1.			1 <u>.</u>					F里	H	E	<u>HF</u>	E H
	H								Ë.	<u>ال</u>	ŧΞ	ιĒ	=		E.			<u> </u>	1.7	国	-	t i	::::		扫描	
mie	11	i trit	† 7		1:1-						=	n.		.					<u>.</u>	<u>i</u>]					T=	
							E	1				Fr a		=		<u>.</u>	-	<u> </u>		1			H	<u>+++</u> +	E.,	<u></u>
			KΞ	11		14	E.	E	133	<u> </u>	1.7	<u></u>		<u>j==</u>		F=		Ē.	. <u>.</u>		117			-	F	F=
	-1=					1			Ŀ		1	<u>.:</u>	E-	<u>.</u>	-1	: =						=	==	1.::-	E	
									=		==	E	1	=	<u> </u>						=;					
	1				E	<u>.</u> =	1				=	Ð	EE	<u></u>	= =	1	些.			l⊒≓	Ē	Line 1			프트	HH
	:				÷÷,	!		12.22		÷	=	E.C	1			<u>E</u> +	13			22	=			11		
	-		212	1=	-			in.	Ē			E	E				E		* •			<u></u>	÷		i	
	===			<u>₽</u> ⊒	1	1	<u>+</u>		Ξ		ŧΞ	1.7	İä	·		h				-		-1				
E E			Ē	Ē	Ē		<u>E</u> =	1=		E			₽Ĕ	13					***	1				=	L H H	
2.7.3		H ≓E		É	hir	=			-	=						-					2					
					-		=-			-			10			1	===							Ē		
			ŤΞ	E	<u></u>		=	ĒŦ				<u></u> :	==	O I	- 1	13	F_							田	1717	
	:1÷	I.S.	Ē	Ľ:	E		=-	Ē.Ē		=			==	T	-							H				
	-125	150	12					<u>₽</u>	2	<u> </u>				E	<u> </u>	<u> </u>	-							=	Ř	
	-	12			Î			14	- 3		F###		=	Ā	+	-	<u>-</u> =	ΞΞ			=			Ħ	S	
III III	耳袋				-			2													Ξŧ					
		12	Ē			==			R	Ē		**		-		-										#3
HIR	12	X	13¢				=		74	1										-5	1:1			E	<u>ڪ</u>	###
22		E						R									<u>111</u>			-=	± .	Ξ.Ξ	-14			
E AN	H-R		R		Ξ.	8	. 21	-9	-3						-			-	-							
		S						E)							Ξ.				- 1		Ħ		***	=		
	13		E.	Ē			-57		÷¥	**		÷.				Θ		- <u>-</u>			***					Ħ
		==		1	I <u></u>		X	•							-		-01	-	=	211		=	ШÌ		3.3	;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
	1-			=	Ē				\mathbf{x}	F 7						-				=					<u>=</u>	<u> </u>
			ا ، ، ، ، ا				Z	-31	X						<u>.</u>			끸	-	=	금	<u> </u>		#	轠	
		E			L -		}.		-ter	=								-	=	=_		Ξ .	:==			
	13-	1.				::::			-Su						-					<u> </u>	=			-	=	=
		1					Ę.		- N			-						÷1					- 5	211	21	
	1	1					Ň	5	-5				-							=	曰	<u>-</u>	Ξħ	87	鬪	
	1:12	1:=;				==	\$	3	N	==				.=				Ħ			=			Ħ		
	1	<u></u>					-		<u>. U</u>		1.		-	_		-									=	二
	14					-		- "-	-	-		-		Ξ	= ;			<u> </u>				-		Ξł		F-1
						22				<u> </u>	<u> </u>	_ :							4						詽	3
		1.1																								Ъ́я
	-					- 5	<u></u>		9	<u> </u>		- 5	4-	<u> </u>)	<u> </u>		=3		- *		En		誧	詽	EE
E III	1 ,=			Ē			!==			24		<u>-</u> -[म् च	[Ē			L.F.			= 1	H	Ħ	詽	BH
	-					-=-													- 1		Ħ	<u> </u>				選
	 	<u>1</u>								=					끸							=I	: #	#	鍿	出
							=		<u> </u>					=	픧	-	1		E					70	Fill H	
	F R							.E	300	أوتغ	. alt	-31	园			200	1 22		-		-				.#	Ē
							==		Ê	59			H	-		<u> </u>			-	<u>u 1 7</u>	-			≞	538	田
	(HE	HH	14.	÷.		=		-		7.1	A.	с.H	T.r.	\Box	23	ص	ઝ		e	778	f:_j			÷		1 51
					ΞŪ				<u>1</u> -1				=	ĒĻ		Ħ	=1		Ξļ		- 1			.		田
																		ΞÌ						鍿	曲日	
H	8			<u></u>			<u>#1</u>		<u>= -</u>	ШH	= f		H	#	ΞI				÷		-		H.	÷Щ		邗

1 = Η ШЩ ŦF **E** ÷ 11 HI Щ. Τ, H ::: -----钿 174 mil ÷. Цī 21 ΠĦ i⊞-i 圕 1 1 E -----:1:11 -; ₩ 47 -----<u> -</u> 14111 **3**.1 -11. Ti - 1 - Fi ---titll - lo ------..... = 0::: -÷ 1332 `... ----₽. -E Ē 1 111 57.02 ţ... ÷ ------÷ --------: : **. P** 1. -----0 -**⊞**#⊞ -Q Q 17.12.2 2.2 2.2 1 ----..... -== 1 -1-D '<u>--</u>] ₹ bi 0 == ---------<u>.</u> Ð **B** B --5 3 = ----____ Ø ____ ÷ === Ē ---------÷ H Ξł -=== n=E Т.F O • • • -ΞQ! ----....ŧ ----4 . . 11 0 .11: -.... -..... 2.21 : : ---------÷e **F**.1 6 1------7. HT HT ---------== Eulia E -----4 . ------時日日 ----13 ----5.----- N II.I Ξ 3 -..... 11 T.EF. ΞÌ <u>.</u> r. 11 -1-1 1-1 -Ì 臣 4. 225 2 d28922 **r**-STUTIER 5740 2.5 70 16 252 1 1.257 210 誰 15175 *** ١. E Ē H Ŧ ++++ -1 -----

1

A Service Land -世界 -4 Ē <u>---</u> - -Ð 9 Ħ: Ð -r-末 0 ÷. Q. İ --.... :11 Ť Ē -..... ** -Ŧ TI. HF. l'H -Ŧ === ÷ ----91== + 8-.] -==== THE PARTY 11:11 7..... **41.** 21 242 629 1 27 ž 10/2 7/3°-11 10 Ę, 75 52 코 1 Щ. 4 ΞŦΠ: FH Hilt

Sama da Maria da Maria Mara Co

Ŧ H H-Ħ 긢 Ŧ Ħ. -----6 - Q ----11 • ÷ Ŧ ----T. Ì _ -15 7 - - -41 4 111 ħŋ 13 ----ų ==== STEAL E Dec .c 2 Ļΰ 22 271 29 72572531129635 -11-11-1 72 包約 ir i + T: Ξ

	11	<u>85</u>	-			EII	ШП	Ent	[;	F	<u>11 1</u>	F.	<u> </u>	F EI	HT	114	HE	HŤi	E		HH.	<u>E iii</u>	fille	ERI	1	HIII	ĦĦ
	曲				HH I	曲		11		Į		1	ΕĦ	1	HII!	Ē₩	t+1		<u>ŧ</u> :			ĽЩ	111	雦	Ш		
	##	##	HH	Hiti	Щ		ŧĦŧ	Ħ	Hi:	HH:	詽戸	西	фЩ ^и	1-12	17	1	₽Ŧ	<u>μ</u>	ŧΞ	E#	1=	HH.			H		
	Ħ	Ш					FII		E	EH:	ΗĒΙ	I:II	III:		Hir:	1111	<u>les</u>	₽₩	Ēμ			Ē∄					
	Ш	Hi				111	# 1	Щ.	h#	ĽШ	H.	Ε÷		<u>E</u> .E	芭田	E	Ē:	£	HT.		ËΗ		抽曲			1511	###
	Ħ	Щ	. #	H	₩₩	F .4	F	-1	ti_	Ħđ	<u>hin</u>	<u>田</u> 二	IL I	##	₩Ľ	E.	E H	₩.*	Ë., Ĩ	ĒΠ	t; H	₩₩	ш	詽珥	Щ	ΠĤ	ŧ⊞
		ΠĦ			HH.		8											Hit								囲	
		⊞			٥Ŀ			<u>111</u>			E	E#			Ē			E C	Ë	HE.	H.			Ħ	îШ	H,H	##
	H	##	#		H	₩Ë	‡,⊒	Hif.		11-	144	Ħ	1.1	1:==	₽	!₩	HE	12	₩₩	HH	HE:	I ⊞i	Πı	####		H	H
					EH		H.			F	Ē	E	Ē		<u> </u>		FF	F.S							HE.		
		##	H#	Шİ	⊧ ∰		1	Er-	<u> </u>	E	±±	=	Ξ.	=	1	==	1	E.	1	±	<u> </u>	Ш	Щ	t H	日	Ш:	Щ
	Ħ	ΠÌ	h##	[::::		Æ	<u>fiir</u>	F ∃.	LT:	high			1	ĒŦ			5	III III	HH:	i 	15	111	FΠ		1±	EE	T
									- 11			-		<u> </u>		E R		-8,	=	=							抽
HE HE	#	14		睵	₩¥	11	HH -	111 .	11	1.1	ĽΞ	Ξ.	1=	=	113	-	₽¥;	ΗÐ	Ë.		E-T;		111		Щ.	ЩH	
LE!	53	Ē		H.	₽Ħ	.		<u>-</u>		t.;;		Ē	۲.	ŧŦ	H.	-5	- E	HE.	Ε	-144	ΠĦ				田田		HΠ
	-		h	H.		1		1	EŦ	·		₽7	++-	1-1-	14	-ST	1×	EN	F I		÷. +	==	語		₩ ₩	Ľ₩	昁
	-				Hi:						<u> </u>	ΕĘ	9	E.		-*	14	Щ.			===	Æ3	HH:	t HI	HΗ		鼺
E S		<u></u>						-		<u> -</u>	(b l		 	1	13	[[]	ŦΞ	F#	<u> </u>	11	<u>1</u>		E			団
	=	1.5			===			÷.÷.		===	F		n.		1	-51	-tu	R	=	30	-111	Hi H		譁	1	1.4	龖
					=			=						F	E			₽¥.	i.		F 11-	r⊞	IIII;			田	田
EF.	3	ΞŲ.	***				Ħ.		ĒĒ	1	<u> </u>		Y	ŀ⊞	ΙΞ		The second second second second second second second second second second second second second second second se	F-W					Ē	H		Ш÷	曲
	Ħ									F E	EE			1 : : :	144	1.		HR1		:r_:				田	1 H	ΠĦ	
		\mathbf{T}		-							p	ļ						15						EE			
1=144	#	15	ΞĒ		₩		=			E.	н.: :	O		-=	12.3	ACCENTER .	丧	1 K		-	ΞŦ	鬥	世	H	Υ⊞	H	₩Ħ
		RY.	÷.	-	L IF	Ē					Q,	++1				19		IS.			<u></u>			E.T.			t iii
124	=	1	54	1.2												12	-1			++++	·····				HH		
		Ŧ.	3	-\$	27	5 ==	13				+		Ξ	<u> </u> -		~~~	-45	5	-1-				Шi	ĽΞ		5	
HHE.	a	Ŧ		Ξ.			- 1-			E :			L									=	ΗĦ				
目指			3						***			F										₽₩					
	21	i di		1					2:15			E	Da	··-							**=		世出				
	ΞI	<u>A</u> J	ΞŲ-		==		HE			E.F	-		Ð	== ;			<u> </u>		드극		-						
	-	Π	-57	1.2									Ø		-				E				i di				
	al	34	-9	-12									le-				-						HΞ	4			
田 坦			-	=	==		1.1.1			1.5				= -	m			5.3			111	T		ΗH	1		
		<u>ب</u>	==								-					ö						-11					Ħ
	3		****		<u></u>			-								5											
	H	田					•••••	==						E	r <u>=</u>				<u> </u>			51	Ë		₩±	Ш	
E.L.	Ξ	Ŧ				* * *		1				=	E		.=.					; 	H			111		Ξ.	
	-																										
11.11					:==				-			-			<u> </u>	-				-					17.22		
		=		三三		.	ΡΞ	••	· · ·				1		-=			三	=	-12	1771 1771			日日	μĦ	TH I	は田
	-							-					÷							-							
	프			<u> </u>		÷	1	· · ·		.						-= -			=		====	<u>41</u>	Ξ				ЩЩ
					E								=	-	- 1					Ħ			H		1		
				Ξ			1		-			=	=				===				Ħ	111	111			1.12	IIII
								<u>.</u>					1		~~~			-									Eed
	-					<u></u>		-					in i	-								ΞŤ	HΞ				N.
Hinh.	-	7.7		Ξ	- · -		E-N			-	Ξ,				15						<u>=</u> 11			ΞŢ,			2*
	#			E			=	t						y		ŧ≣						t		t		H	₩₩
		Ē		E			È.F	1			-				<u> </u>											Шļ	\mathbf{H}^{t}
		F	1	Ē	Ē	<u> </u> ==							==	1.3	H :::		T			<u>Hi</u>	Щ. Ц			HT.		讍	
				Ē	-								Ē				Ē							朣			
EE			H		t ==		11		<u> </u>		1		1			++-		ŧ=	μŦ					H			
EF	1	4.		₽₩	-	Ē	Ē	57	27	÷Ī.	i.	- 5	Шŕ	Þ	55	730	45	27	bär		1	瞱	μĦ				ШĤ
			1.1					Ē				z.		<u>.</u>							7						
		Щ					壨		142	P/	47	[<u></u>	12	<u>uni</u>	24	ЩĽ.		141	1	1	^a		F.	<u>E</u>	H.H	<u>uu</u>	
			ΗĒ			E	H		F.	2 67		1 <u>-</u>		ΠË	臣	E	₩.				if-i						臣王
E	. 4	<u></u>	-									E		<u>Hiii</u>	臣	H.		E.								ŧΞ	E
THE PARTY OF			E.	T de la	II::	HII	1	H.H.		Ett	E.	E÷.	<u> </u>	E-	17	E:	É	T-				111	ЩĦ	1111	<u></u>	4+4	HH

÷.

ł

Iret Fil ĦĦ Ξ E φ. -E +4 苣 ΞĒ **H** ÷1 F-th -15 = 1 1 **1** ŧ - --ŧ H ** 579992444 745 X 2240 23947 935722 2039520 39 2480 1 Pro-7/2 2 Ξ = -

11-4						# ⊒₽	14 m	. H	- 1	11 22	*[++_ <u>+</u>]]]]	明日	- THE S	de pla
			-Th	111 11	94. 4		Heili	Ì- É	計量	声曲	1-11-	:1¥∏∏		7
						1 1 1 1 1	PLE P		- E	<u>k</u> #1		-	Hind.	3790
-424											1-=	₽₽₽	494	
	1 1	Hinu.	## <u>11</u>	=F_1	出版			7.] 2 1.]	- <u> </u> -			H iz'ii	i i i	
	1 H	7444		1 7					Letter-		1			
11 I. I.I.			-					# ÷-			1-11	1.11		.1336.1
	-				1 11 2		r Lij. u		1-1	1+++;	1		42.1	
		tr.	-+++	+1			41		+ -	1				
			- 14 1				백별	÷		F -				
		.			-	<u>iliir</u>	-		E-			-		
			1 271-				-#-71-5		<u>+ :</u>		Ľ:•⊞			
4	173			+#	·-]].#	ſ l ≡±	3-34			T THE				
		1			512		-				1-i-in			
	•!	172	=		1	E			t i					
4			2	-		* *		1.35	<u>+</u>					
				-		17	=		A-1-			l.		
				1 = E		TE		E=	FINE					
5	16							1						
8 = +	†	⋕ ==	17	1		1	書手	1-1-1	<u>h i</u>					
			1-1-	1=	# 15	247 E		X - 6	2. V .:	1.10	R and	1= 4=		
	-	==			il B	PAX.			17.57		77.00	1		
	<u>#1</u> -	4 -	1 =								14173			
	in a	1										1		
	1 =	-				븓르		ŧ	<u></u>					
2 Q.		<u> </u>	<u> </u>					± ==						
- XI		1 -			++=	:= =	1 ==							
	1	<u></u>		1.20		<u> </u>								
	15			126	- 2	<u>1</u> 2	1	F	E-ma	7.5				
3 I	14	111			1									
		建量		≢≂		1 =								
		1	+-=				1. 1				12 4 <u>4 4</u>			
			E	T	- 1 -∃∓_:	+ #		F==		- de la	11111			
				17	4	H=								
							<u>= =</u>							
			1 == 1				<u> </u>							
				# F.	4.4	<u>t - : .</u>		1-5-	十十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十					
				1	* *		HT .	12			1.52.7			
							-==							
	10. E					<u> </u>								
		1 = -			F7		7-1-5							
		EH-	十五			<u> - 1995</u>								
					1-1-				in the second second					
		1												
					1			1						
					1			r	- - -					
				2		<u>u</u> =								
		1.50	1	10	1	- 77						1 - 1		
		-cz	Pin_	CAH .	2 2.9		144	LAR	1EZ	1.1				
	11.		- 4	9 t2	175	LAA		Z A	AF 4	54577	22.54			
						11. que ,	1	-			-			
							<u> </u>			infor a				
								<u> </u>	· · · · · ·					
 67.2	16		14	2 22	110	OF.	S. A.	777	3771	SCE V	6.60			
	- 33	- PC	EAT.	11.3	147	CE A	2505	1.530	0 6	Just.				
		- 23	123.0	20.5		20.7 A	7 1	A P M		202				
				No.	- 25	100	<u>6</u> _6	74.54	- A 2 -	127	-	-		
		Eff		23	現金	- A.F.	13	संदर्ध	751	<i>5</i> 1		-	L amí	
	L. 2	-10	29 F.P	7.7	17.7.7	8 7	PER!	AFT	1-34	17.214	i kozli		<u>ett</u> i	
Eliza Hal			CT 11-4-4					1747.7	F. 3.4	HE.D	CIOCE			
			5	ALCONT.	4 2 21									
1 4.		- 144	A.L.	555	t t Ki	£ : r 1	22 I	368	Č.		<u> </u>			
		- 144	27 573	555	1 1 - 1			368						
		- 144	A.L.	555	1 1 - 1				===	451				
		- 144	A.L.	555	1 1-1					451				
		- 144	A.L.	555	1 1 - 1				===	451				
		- 144	A.L.	555	1 1 - 1				===	451				

	<u>nn 6</u>
	躢
	I
	₽₽
	1 II
	围
	鬪
	5 <u>88</u>
	E .3
	La la
	▦
ANNALS OF CHATES IN CLASSES	
THE SETTO OF STEADY STATE DESS	
A STARY STARY STARY STARY STARY	8
	#
The state of the s	Ħ
CONFRIENT (CAL = 0.89) of a state of	
CONFERENCE (C. DONDA STREET HAMADIATED CONFERENCESTICAL STREET 10 BARDO DA EL CENTRO XUDI STREET	
LANNOOLSTER CONFIGURATION THE CONFIGURATION	#
	#
ANNALOTED CONFIGURATION OF DUTY THE STATES	1
	=
	Ħ

ŧ

ので見たるいと思いなどのたちのでは

į

۱

fattalline and

Figure 27 reveals the ratio of the steady-state drag coefficient of a cluster comprised of modified G-llA cargo parachutes to the drag coefficient of a single, standard configuration as a function of the number of chutes in the cluster. Again, this figure is limited to only one suspension-line length, namely 0.95D; however, it does show that, for a cluster of six chutes employing a vent pulldown at the skirt, the parachute-cluster steadystate drag becomes of the order of 95% of that of a single, standard configuration. Hence, the loss in drag for a parachute cluster comprised of vent-pulldown parachutes is limited when compared with the drag of the same parachute used in its standard configuration in a single mode of operation.

Normally it becomes extremely difficult to analyze the deviations (from drop to drop) in the vertical rates of descent that are associated with a parachute recovery system. It is felt that, with a cluster-parachute system, the deviations are somewhat reduced because, primarily, the system's motion is relatively more perpendicular to the horizon than that of a single chute. Figure 28 expresses (for a series of drops) the approximate ratio of the deviation in the steady-state vertical rates of descent (from drop to drop) to the deviation of a single, standard configuration as a function of the number of chutes in a cluster. From this curve, it can be seen that the deviation in rates of descent of the single modified chute is double that of the single standard chute. For a cluster of six modified chutes (vent pulleá down to skirt), the curve reveals that the deviation in vertical rates of descent is reduced to about 35% greater than that of a single standard chute.

b. Wind-tunnel Tests

Figures 29 and 30 are part of the wind-tunnel testing whose purpose was to establish the effect of suspensionline and center-line lengths on the steady-state drag of a vent-pulldown parachute. This information is based on wind-tunnel studies of single-canopy-configuration model parachutes representative of the G-llA cargo parachute.

Figure 29 shows that, for a parachute with the vent pulled down to the skirt, the drag increases as the suspension-line length increases. This figure indicates a maximum 20% increase in drag for the modified parachute over that of the standard rangebute.

			ELSE F		
				1	
			1==1==	E Plate	
		1 12 12 12 12 12	- 2 - 2		
			£9192 = 1	6.1.7	
127					
	FEF-F	4,4-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-			
			0		
1					
			X		
		HUMBLE OF	CH TTES	18 1.103	
tereter antereter an et antere aber antereter					
	E 28 - 7	12-45-57	THE A	C PTATON	Y IN THE
	072 97		A A A A A A A A A A A A A A A A A A A	SECTION A	/ //t
		57426 272	C tir Lill	ALGAT I	r. 6
		E COMPRISE	v or mo	10164.5	-122
		212 3 10 18	CAR STATI	Chi Ist	
	- the A Sh	46225 - 64885 X74	DHALD I	Com As We	327284
		AT# 15 6432	204 6	CANTA	
	SCARE.	OKGA TESTS			
		the second of th			
					and a second s

									71117-1	r . 1 1		-H H				PP-III I	
													- 1		-		<u> </u>
		1 <u>1</u> Fal															
			14					-m_3		·							
				144444			-1-		2122		- 1- 1			EEE -			
						2.1	FIE			#			3				
					THE T										- 19		
								·····						<u> </u>		NE	ET 1
				1.110					-		<u> </u>					12	
							1 - 5:		.				<u>ل</u> ور کر	<u> </u>		22 S	
			=]=						- 1 1			51. 	<u> </u>	2	ΞŶ.	Q.S.	
			<u> </u>				<u> </u>			PPE-				0		2.0	S
	1									.	- :	53			Ę	.	
						- 11-	- 11					Siz-1		N	- 53	25	
												¥		137.1		12.12	
		-1-1-										<u></u>				÷	
	<u></u>													<u>.</u>		7 3	
	E		==										-7-	iga	- 3	301.51	
								1-1-1				51	\mathcal{H}_{1}				
						-				<u> </u>	-		<u> </u>	<u>к</u>		1.15	
								_	1. °					<u>.</u>		1015	25-7
							1.1.1		-							18. e.	
															Ξġ	Š Š	S
					1 3 3								212	<u> </u>	E≡ A	121.5	
	***								E1					1.1		5.5	
					F= ==				- L					18 -	ER	医安	
						- 1 -			- ñ.			1 . P = 1		2 =	E. 6	12 L	
				1 1	<u></u>									1551	E É	$\mathfrak{Q},\mathfrak{Z}$	S
	1								- t					2			
														in the			13 III
															= i	10.2	
										1	F ==	===		123 12	EK	1.5	<u> </u>
					<u>+</u>	i	· ···.				E-F-	, 1		13.2	E F	الدينك	
								_						1 33		R.C.	14
									P E	11			F.	Rin	1		13
														1		1210	ALI
						1								B C			
											1		9. 53	5.2		10.10	
			27						F		1		- 13-	33			
				1-2-		ł	₽₽₽Ę		= = = =		<u>A-</u>			<u>13 N</u>		S. A	N C
				-	18-C -=				2 7					-			5.4
				1				-			FI =	EE		29	X	TQ E	S.
					<u>+</u>				1	<u></u>	TT		SE	1			
						<u></u>	ΞŇ	2	£		-+						TSINE.
							1		1		1 0					1213	
	-						1	1 = 1 =							Ē	1	172
		1	<u>+</u>	-	\$3. ·				.	1 4			PR-			122	64.65
	.				K		4		5 h			5.	5				
				1	V						× - '						
			1	_	1	<u></u>		t==		1							
									1-1-		1 = =		巨田				
											त् <u>.</u> च. — —	T <u></u> -		1-1-			
	#	1 ff	£.	2/532	7#71	6-21	1742	9.11	510	X A	4			1-1-	1		
			49	40	₹¥Y	191	227	12	ZYE Y	XACH				- F*		ŧ.	
			572	122	111	1207	38.	1 41	107	27 ÷	50731	162	1=		1		1.3#s
	42				1						++		1=		1	1_1	
										EF					1		
(ALL DE LE	- <u>-</u>		1		*	<u></u>	1.1	3		1.7.8	-	1	+	1			

Figure 30 reveals the effect of center-line length (location of the vent with respect to the skirt) on drag for three parachute configurations each having different suspension-line lengths. This figure shows that, for each suspension-line length, the maximum increase in drag occurred when the vent was pulled down to a point immediately above the skirt.

It can be concluded from Fig. 30 that for a suspension-line length of 1,5D and a center-line length of 1.6D, the increase in drag is some 25% over that of the same parachute in a standard configuration. For a suspension-line length of 1.15D and a center-line length of 1.25D, this increase in drag is reduced to about 14%. It should be noted that, for the latter case, the reduction of the El Centro data indicates a 19% increase in drag (Fig. 26). Hence, the indications resulting from full-scale drop tests and wind-tunnel model tests are consistent.

Wind-tunnel tests are currently being carried out on cluster groupings to determine the variation in steadystate cluster drag with riser-extension length (riserextension length being defined as the length of the portion of the riser between the individual parachute confluence and the confluence of the cluster). The models being used are representative of the G-llA. As of this writing, no data are available. However, indications are that the drag is maximized for a riser-length-to-parachute-diameter ratio of approximately 1.0.

6. DEPLOYMENT

Although this study is not responsible for the extraction system, it was believed important to have an idea as to the dynamics of the parachute recovery system from the time it left the aircraft (on board the payload) to the time of line stretch. This period of time is referred to as "bag strip," and the entire operation of bag strip is a direct function of the size of the extraction-parachute system.

Figure 31 illustrates the assumed dynamic behavior of the bag-stripping process at some time, t. The following occurs, leading up to t. The extraction system (cluster comprised of three 28- or 35-ft-diam. ringslots) pulls the 50,000-lb-gross rigged weight from the aircraft. Once this payload leaves the aircraft, the force of the extraction system is transferred to the bags containing the main recovery system. This force causes the bags to separate from the eayload, whence the bag-stripping process gets under way.

THE CONTRACTOR				e norse nicht	TC						
					1.42.2		[1.4]				
	间的重节			-	長事.	计主	-1		ST-1		
	findade.		E. 110 E	-		Fire L	T	- 14-	N.1-1		
								E-Pink-1			
	2							7	1 = 1		
						1			FXE-		
				- and -	hiller.	17			1.7		likqi. ⊧
			R. O			E tr				STEEL ST	
			15g=-1,		Lait,					S.	176-1-1
				₩÷.					Film		
	En En E			- Q -	E						
								- 15			
			S		₩e‡e			- Hei=,		Y	
								- 15-1			1/3
			0 0	S							
Full Hard R.									[This		d <u>s</u> ela
				-				- 9 <i>i</i> ,	= 11.7		
E F. # 17.64	- 3 € + -	1 +				E E		- 1947			
		EJIL T						- 14-1			
									1.1		
		4					+			Q	I SI
	7 - 14				E 1						
		14.4 4.5		1							
										102	
	<u><u><u> </u></u></u>										
				F							
									- N		
						:21: ==					
57-19111	k						-				
	ul.				in the set						
		77-1-1-									
	- 78										
	7										
	- 1 1		14-14-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1					- 1			
				1	the state						i Sin
				1			1111			K	
				1							12.27
							- Telu-				
	in h				1					N 17 1	
				1	1 211-2		- 1	- + 13-			
			FT-L-Z	1							iisa t
				1-1-1	Ê	in jui					
	<u></u>										
	EEL			1 =							15139
	15.E =									M	
		l i fille de			2		-				
				Statistics		E E					
a se deserter	1.1		r: i		+ = =						
					212		, t. 2427				1
	55.2	12.2.2.2.2.2.12	7.51.1926	GTOT L	2112	0.297,6	Stor I =		EEE		¥###
		(1912) 276 (7) 1912	202.2	arnia Arae		1977Z	247	705	111		1 _111
		Can Hall	1 4 1 3 1 27	APJC.	1.407	RET P		200	1		
		1.11 cl - t - t									1.11
									- 15-1		
1	175-18 11 11 11		1	====d=t	1	1	transfer 1	1. 11	12271224		

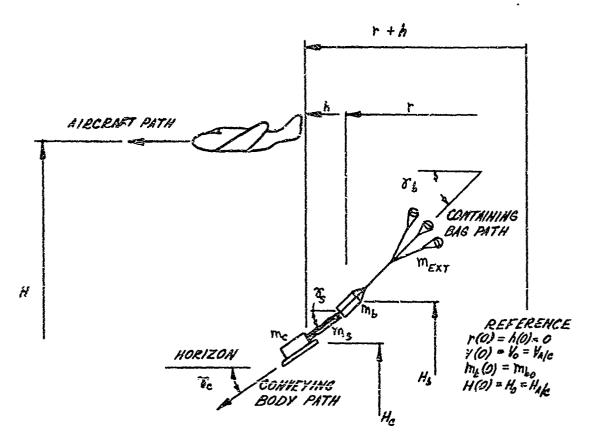


FIGURE 31 - ASSOMED DYNAMIC BEHAVIOR FOR BAG STRIP AT SOME TIME 6.

_ - - - - -

٩

Figures 32 through 55 and Figs. 56 through 79 are the results of a parametric computer study of the system's trajectory during the bag-strip process. The first group of figures is for an extraction system comprised of three 28-ft-diam. ringslot parachutes; the second group is for an extraction system of three 35-ft-diam. ringslot chutes. In each case, it can be seen that the primary parameters are the mass of the main recovery system and the velocicy at which the aircraft is moving at the time the payload leaves it.

For illustrative purposes, assume that the extraction system is comprised of three 28-ft-diam. ringslots. Also assume that the speed of the aircraft is 150 knots upon release of the 50,000-1b-gross rigged payload weight at an altitude of 1500 ft above the terrain. Conclude that the main recovery system, when stretched out but not inflated, measures some 314 ft from the payload to the top of the canopies. In addition, the weight of the main recovery system plus the weight of the bags is approximately 1850 lb. Reference to Fig. 34 reveals that the time for complete bag strip is approximately 1.65 sec after the payload leaves the aircraft. This is also shown in Fig. 42. Reference to Fig. 48 reveals that, at 1.65 sec, the bags (which have just emptied themselves completely of their contents) are at an altitude of 1477 ft. At the same time, the payload is at an altitude of 1457 ft. This means that, during the bagstripping process, the bags lost come 23 ft in altitude and the payload lost some 43 ft in altitude. This information is now taken to describe initial conditions for computing trajectories for the main recovery system.

The deployment or "bag-strip" dynamic study, then, should provide some basis for an indication of the system's altitude loss between the time it exists the aircraft and the time it inflates.

7. INFLATION

Wind-tunnel tests were conducted on the vent-pulldown parachute (using small models representative of the G-llA parachute) to determine whether an internal parachute assists inflation. The data indicate that the internal parachute is of no help.

8. WEIGHT, STRENGTH, AND COST OF CANDIDATE MATERIALS FOR PARACHUTE ASSEMBLY

This section presents the weight, strength, and relative cost of various candidate materials for use in the parachute

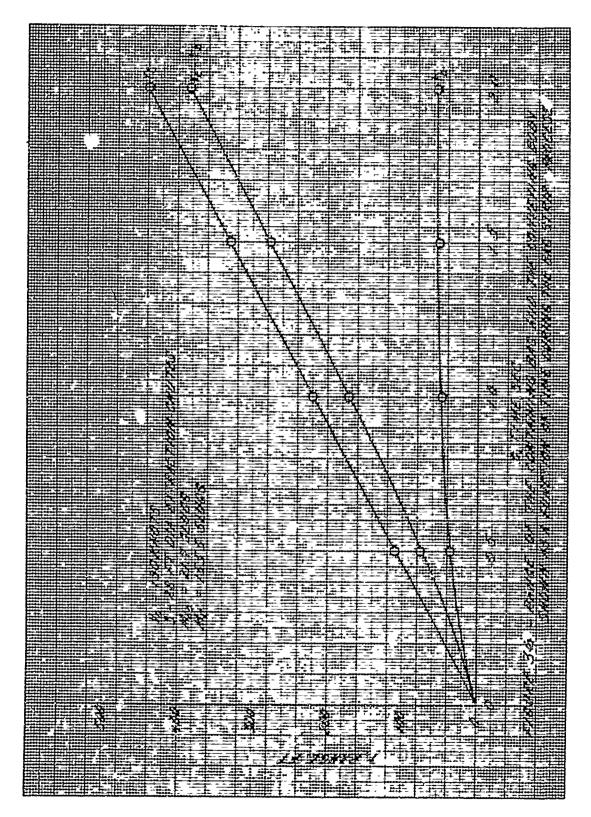
	<u>1910</u>		H TTP	177			11-11		T	-31. H.H			1	*******	TFALLA
					£-₽				il.fill						
					HOE .							12+ · 5++ 1- 1+1++	1 1. Har		
РЩ і			11. de 11		15	1.18		494			E ++	1-15	THEN. P		
			lind				十十				<u> <u> </u></u>	r #-	1 Shill		n#1#1
	1		<u> 1110</u> 11,	王代	in the		11	1. 1.			5.17 ÷	₽ ∎	IIIX F		i anig
				1 H	<u></u>							h.t.			
H T					is E	1	1- 1-			1-1-1-1	F FFF	l-Ini			
									Ŧ.			1 ##			
				3						aria a		4r. 4	5		
	ЩЩ										13E	<u>r</u> _p	HT HT	E	FIFI
		ΓĦ				<u>X.505</u>		1 47 -	FE	. T	1 ###		F., 1991		
			in him		<u>tiilii</u>	130	b +.₽	出生	1	1					14151
	E P Si		11.11	- 1 -			X		1						
						1	- A -	E 111	<u>.</u>		1-1-				
			thi af			<u></u>		1				1		- 23	
						D.F.	18	5	E- 11.2				E TE	1 1 1	
		EZ 1	F-1121			L E		1 - 1	- <u>1</u> -1-1-1						
			<u> </u>	EE		1			==				F F F - 1		
						$= \chi$	IT IL	1.2	-	PELE			F ## 4		
						fert-Y	È=≓≓		十連	t III					
1			EE:	= =			<u>A</u>	BIN							
							+ - -	₽¥÷		EEE					5
				- 1.1				h	<u>1</u>				Enter .	- 26	
ШШ						i⊒.+'`.	11				= =	F - E - F		- 12 2	
						t = E						글궤		, in the second s	
								14 A	私市						
		- 10						- 3	1-w-1			Ê Har			
									0	0	*****			544 (C.)	
									£ 1	-					
						11		111-1	Δ					N	
									1	E	t the			N Y	
						± 1- 5	L#,	1 .Ŧ	- N.	1.1.5					RE
						E F 3							THUR	74 (<u>-</u>	
				7			1-1- 1-1-1-		t⊒≣≓		1				
										1 1					
										1		<u>in hui</u>	, -+ <u> </u>	- 1	
			ç,			1. reite				⊑ -"#	₩ 4 ⁻		F-414	門房	
		N. 19	Si.			E 28-1	時幕	12.3122		1					
		5	1.11	<u>-1</u>				F. 1.4	1713	- <u>-</u>					
		£ 53	Ш				21.1		lein.		9-04				
				=							- <u>F</u> -	1			
			<u> 1</u>				1111 <u>1</u> - 1	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	+. 1== +			re tri. Tituu			
		<u>کا کا</u>						<u> </u>	h -1 -1			<u>14</u>			
		<u>∎</u> ∎¥			h	4.4			-					153	
	ŧ£1		5				E11		12			(11 -	le i inte		Sei Li
	13							Fill				「田	<u></u>		
all r									<u>E</u>		n Hill	a titi			
					1				Þ.E.					₩Q+	3
	TH.			+			11. j				<u> </u>			- 5	
	14				<u></u>										
	里;				- St			k = 1	Г. <u>Е</u>	3					
₩ F								i-≓	-11						
1	<u> </u>						H	L ., ;;				同学 4			
	E				Luiz I				TTN OT						
				regr 1		C-17(5/			1	The "		177			
H.	17						₽ <u></u>								
1.	##	ग्म≓	247							E		-1-1	= 1,1		
						he								بالبشار دهمه	لفيقماهمه

の学校に見ていた。

			THEFT	FIFT			स ् वन्द्र
							44
	9						-
							F
						IT III II	
				- Litter In			
	P. In the second second						ΞE
				<u>1</u>			
		,					
				4= 4 - 1e.			E I
	· · · · · · · · · · · · · · · · · · ·						
					3-13-		
					71-11-1		
					ST III.		
S Departure 9							
		1 126	13/12 4/3	24 447	F U		
					- Fo. [1.3]		R.

			4. 王曰:"曰:'曰:'曰:'
		in her in the second rest of the	
S			
	HARREN WE		

				1.1.1			<u> </u>	·		F =	Carrier I	E E	1			
		-									1-1-1-					
							<u> </u>	1 ===								
								175	<u> </u>	1 -		112				
						1.71			====	F-3-E				5.K5=51		
	4		0	0	<u> </u>	<u></u>	E=	<u></u>	, mit	•				-	****	
		<u></u>		- 7-			44 . 40	+		1		1 - 12				
			X.	HHA.	F 12-		[-14,		E= -	1-1m	<u> </u>	<u>i – E</u>		E. []]		
		1		$\lambda = 3$	CTE-		F-1-7								- X I	
			- 15-	- X =	<u>}</u>			<u> </u>	-							
				E	- <u>}</u>											
				634	- X -				<u></u>	F				EHH	- 15	
		1		Χ.	1-1			1.15			T E E	1-12	13		E	
					<u> </u>	<u> </u>	<u> </u>	1 125		<u> </u>						
					<u> </u>	1			2 P.4							
			<u> </u>		<u>\</u>	1-3,	E-1-1	- 2	3 5	1	• _1•-±				1125	
				::		1=1=	= ;= .		2.5	- =		- # 7			- 31	
				≡∓∃	$=\chi$	1. 1	1 1 1		20			<u>l= i</u> =-				2466
								58.55	<u> </u>		- 7			<u>- 89</u>		
	162					X . F	3==	-14	2.2	· · · · ·	Ľ			E-388		
E	- Here				FEE	17:3	-1-	1		ı →		<u> </u>	FE		- 384	
						- X -	X-V		<i></i>	1					and site	
				= = _											<u>t.X</u> :	
							<u> </u>	1							- 51	
	1-1					EE I			-						1.7 X	
							Xî	3 1 .			= ::					
		-										نيته جيا				
							· · ·	$\tilde{\mathbf{x}} = \tilde{\mathbf{x}}$	¥.							
		-	5	-			:	- <u>1</u>	3=						-	
	-		16 - 2- 						3.3	- :::			= =		Sile i	
			13. <u> </u>						00						::::::::::::::::::::::::::::::::::::::	
		I												the second second second second		
			Q			-				,					G	
															AND THE FEEL	
														n (na mina) An An An An An An An An An An An An An A		
			and shared by a strategy of the strategy of the strategy of the strategy of the strategy of the strategy of the													
			an an an an an an an an an an an an an a												SALE REPARTS	
			איניין הייניין איזייניאיז איזייער איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזירי ראש אינער דאיזיין דאראניביאנערביאנער איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזיין איזי													
											-		£			
											-		£			
													£			
													£			
															1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	
															1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	
															1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	



. Ī 5.7 ------12 - 15 5 =t: 1 N ÷., ----------4 11 pr Ξ 15 <u>.</u> -----_____ -1.... -5 --T1 -E • • Ē -----1 ÷ 47 -1-\$. 2 1 -t F ۹. By Š. Ŧ 677 A 4 E H 1-1-1

			- A MARTIN			
		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
		V F F F				
		3				
		- 1				
		+-1=	V E			
			h			
			¥			
			- 3 3			
	li i i i i i i i i i i i i i i i i i i			X -		
				$\chi = \chi = =$		
		9 <u>1</u>				
		20				5
) - Q - 1 6	Social Sector
	X S					

		N=====				
	dannesseneten. das 5 di					
						2
<u> </u>						5
						<u> </u>
	1		4		1	

いいぞうたいで

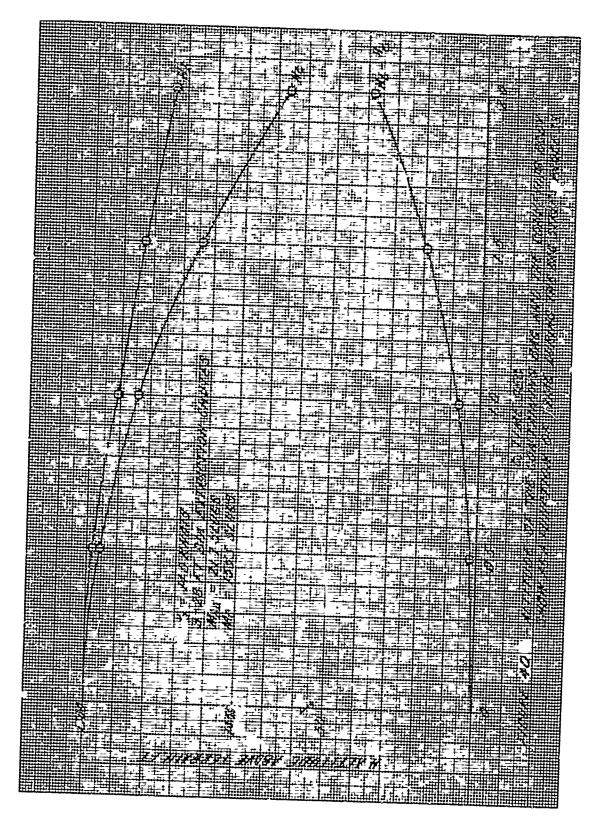
INTERNATION PROPERTY

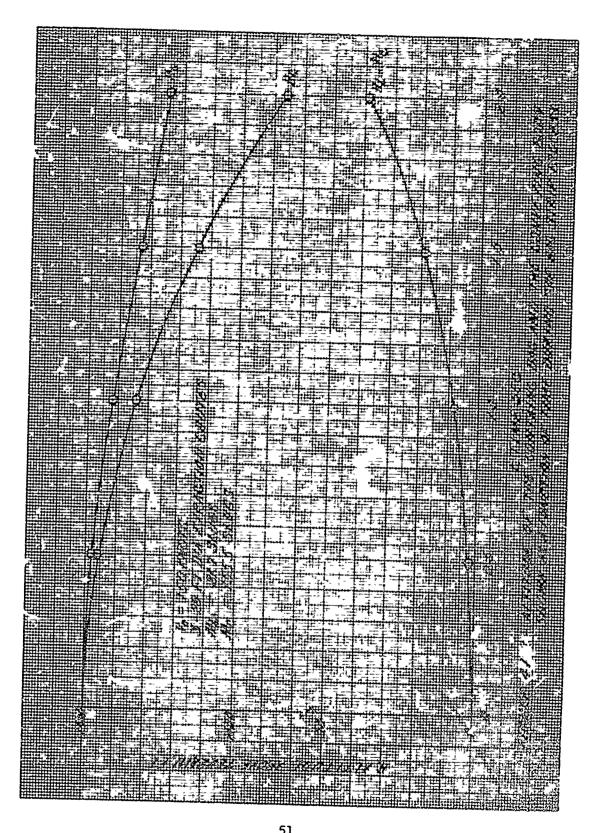
9		9	
	A NOT		
	NR2D		
	tr cy		
	4782272 2200		
English and the second second second			

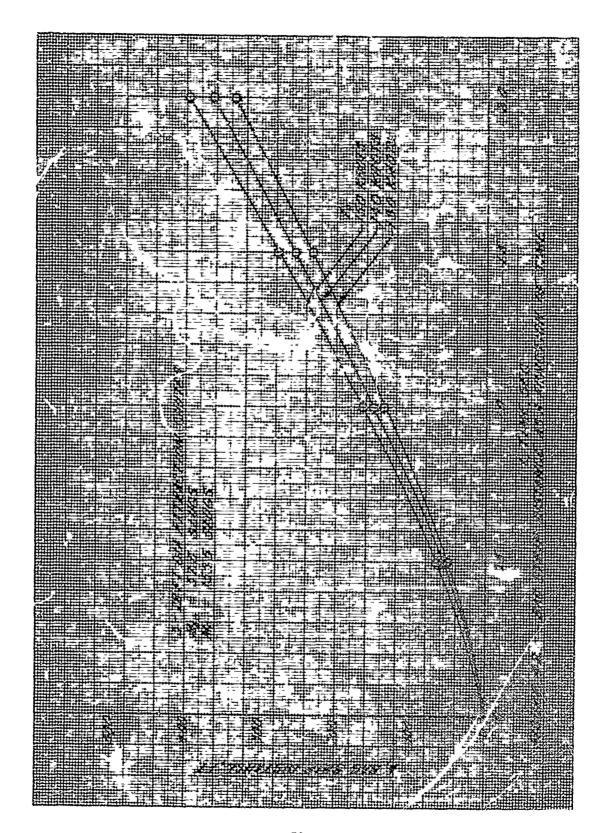
and the second second

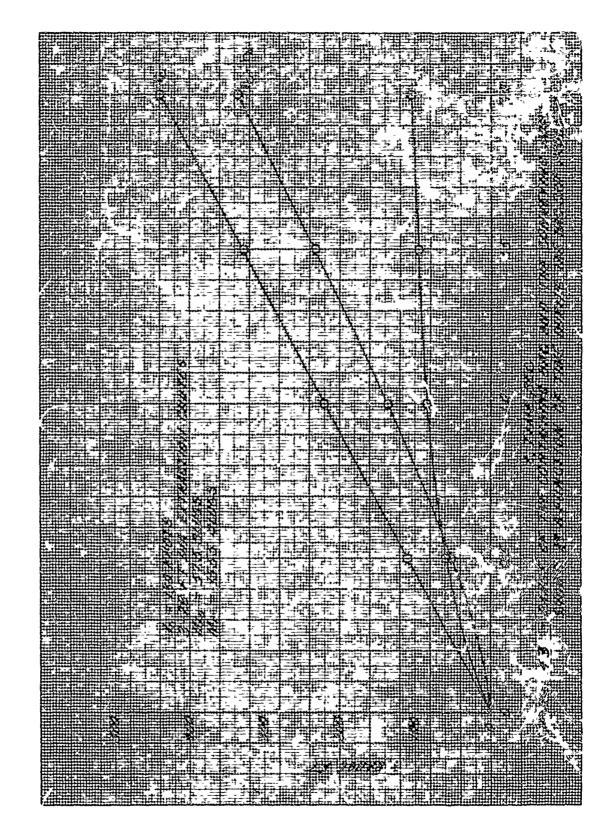
ALC: NO.

WHEN YANG MARKED



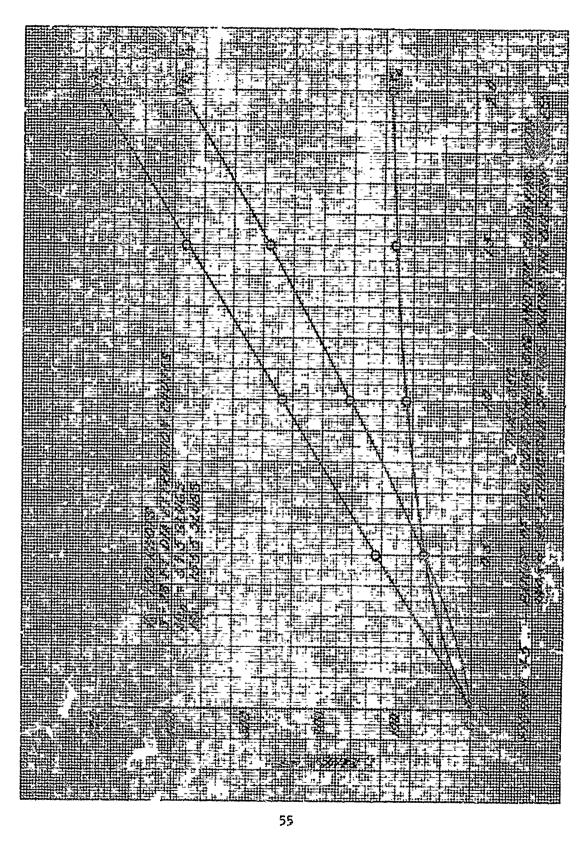






<image><image><image><image><image><image><image>

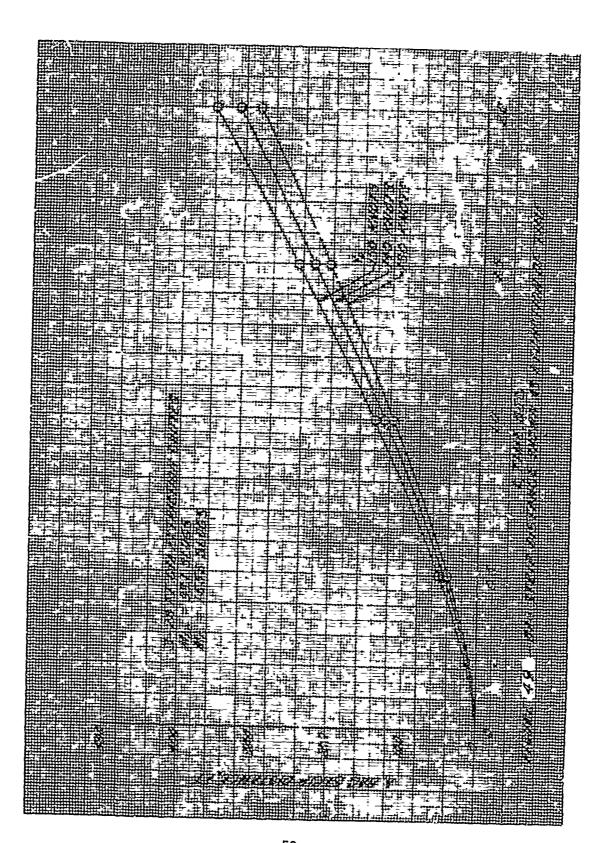
Lat - a Visti in in



W (3) Ψ, œ, ŦŦ Щ<u>Б</u>

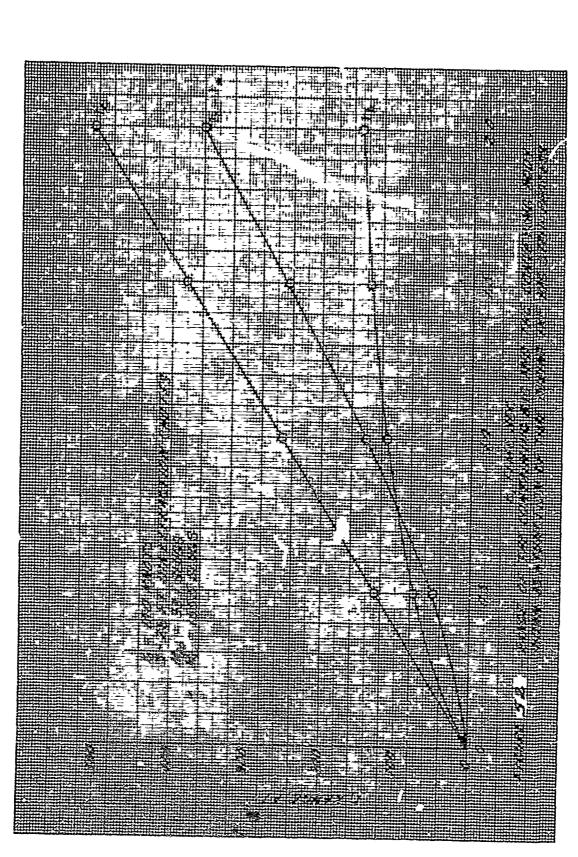
4 Ŧ <u>e p</u> JF.H 113 .f <u>-</u> ЩĒ -----1.16 41.3 -=== X X t TE = 5.01

<image><image><image><image><image><image>



" Attender Manual and

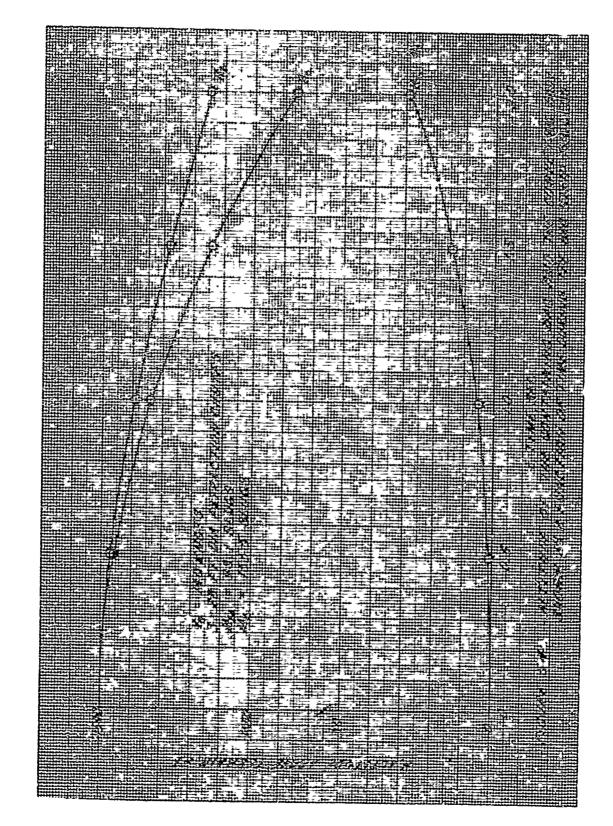
an ebethelesetete bert fort fort fort fort fort fort fort fo



South States

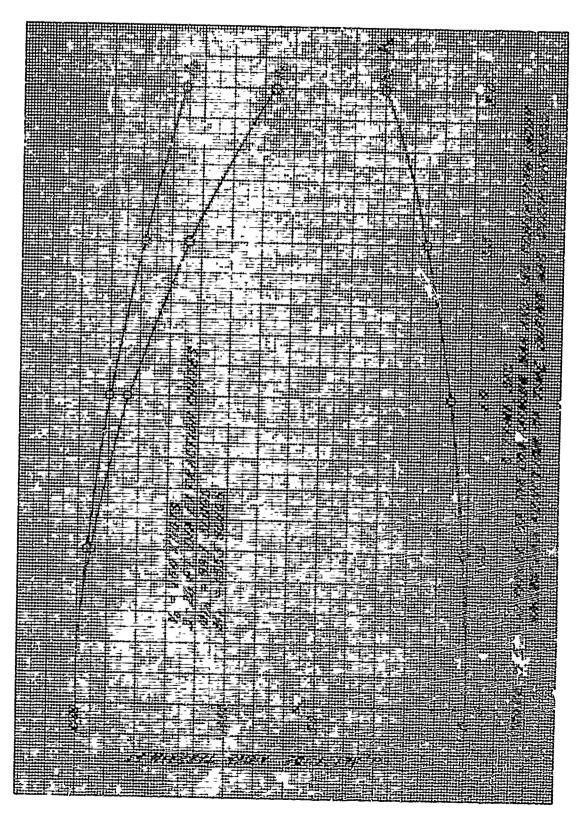
t

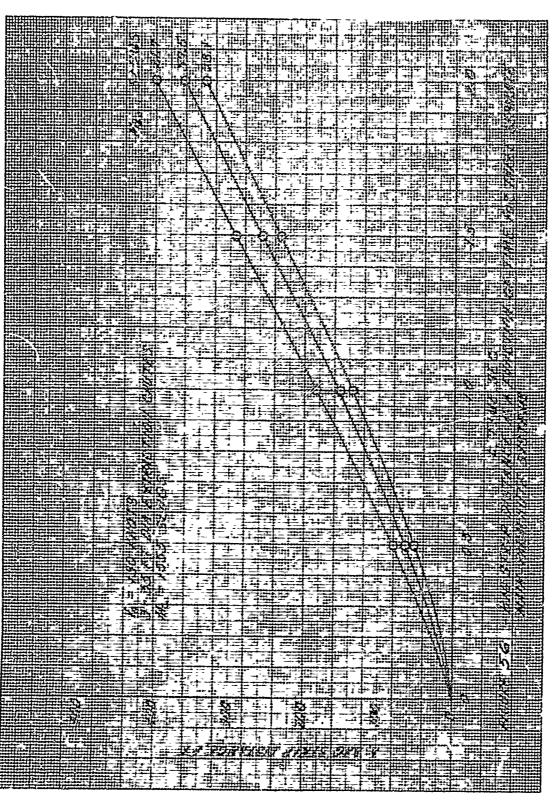
- <u>- -</u> ŧ. -----ती न 7. 1. 1 -Ŧ Ę. , it is the 12.57 122 1 17 **1** 1 -----222 Εŧ



and the second sec

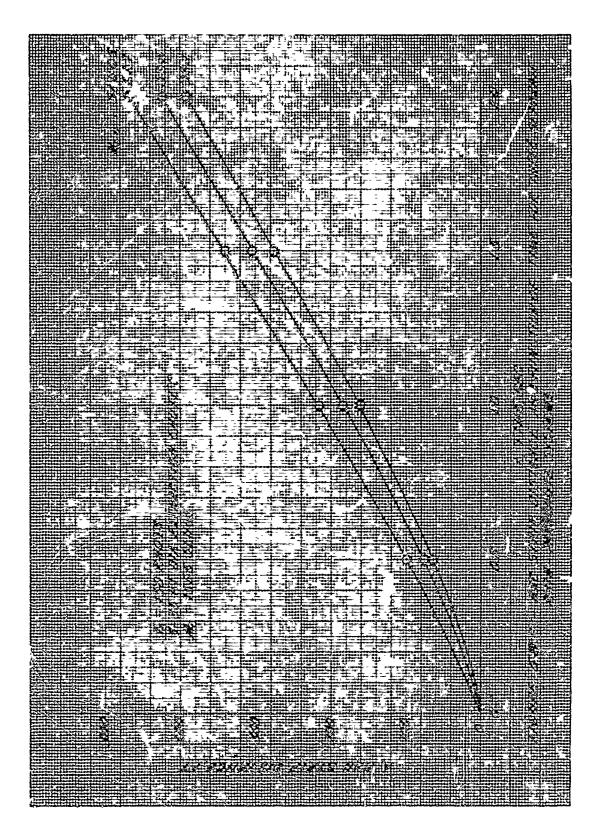
18.920





for the second and the stip with the second second and the second

(HE **#** #-13 1.: -1_ F F 1 1 ÷. . 2



	alingli ngga angagasi a		
		05 10 1	
	0.0		
	★ ■ 1		
	主 目論		
	; = <u>=</u> = <u>=</u> ,		
#7 化四醇			

REPORT N

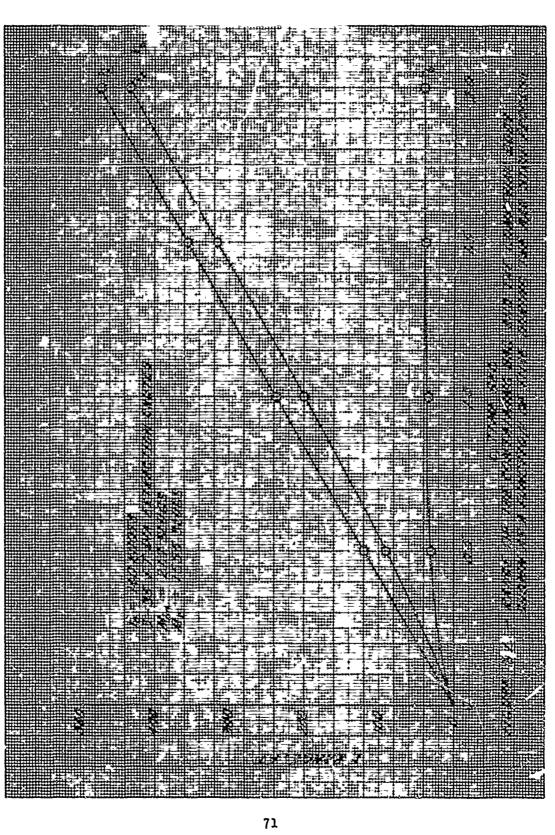
1

<image><image><image><image><image><image><image>

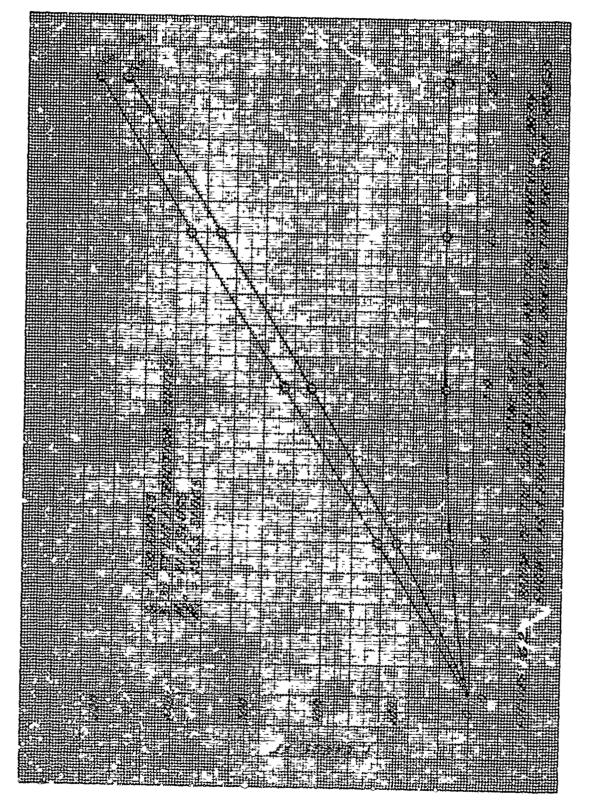
بالشلاء محمد مع

ين. مريد

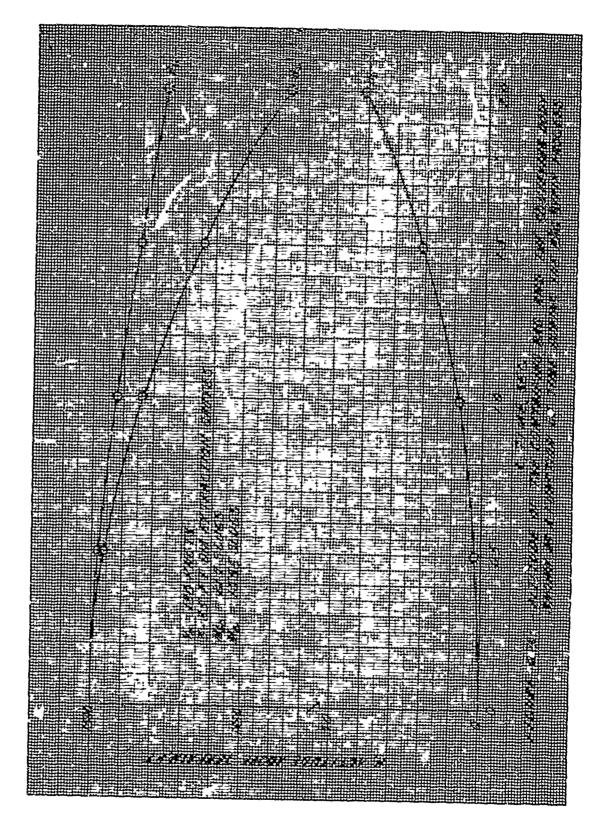
Š



A STATE OF THE STA



and the state of the



	in the fact					
			H: Fait			
					计正计子	
	LE FE					× S
		-/				
	P P					
					L.	
	世社中	W. L. P. P.	군고(中민주)			
	17 -					
			<u></u>	· · · · · · · · · · · · · · · · · · ·		
			'= <u>, ri</u> H			
		S				
		R R				
		K NG	-]-[=]=			
	1115					
	╶╴╴				1 1	
			86 D.C.	22.178 2		
				建设 1 是		
Program (1995) and the state of	*** =					

۱

¥

Automotion of the second

.

1 # 5

74

÷

<image><image><image><image><image><image><image>

111 <u>+ F</u> 開耳 # ; <u>F</u>, I PERMIX 1 ui ui (The second second second second second second second second second second second second second second second s 1 Ŧ 1. <u>|</u>____ ⁱⁿsi FΑ 1 145 **H**F: -Ē # 4 큑 1. 킐 1::: H <u>= =</u> -<u> - - - -</u> ÷ Ē ____F__ 111 - 15 ----÷# Ē 76 8

الموأية الإلايات المراب

S . 1 . 1 . 1.

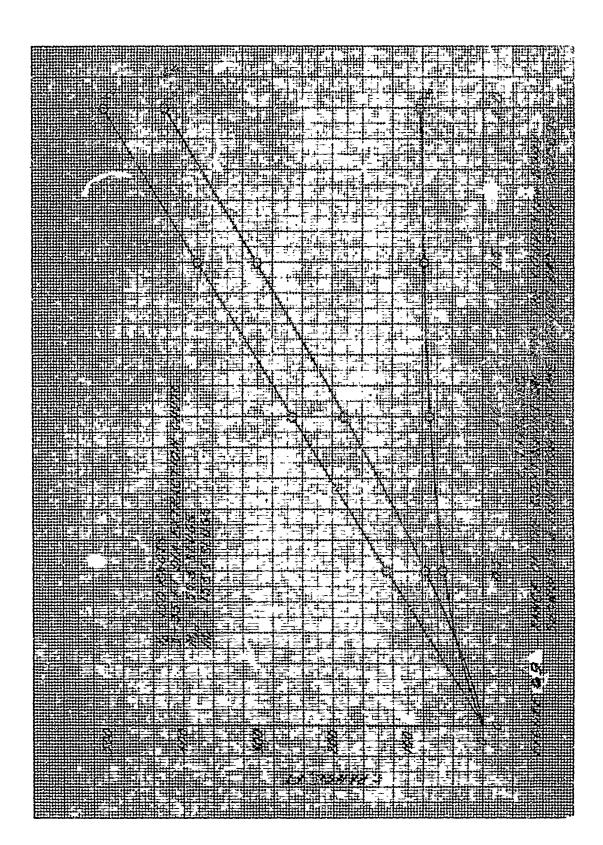
田 <image><image><image> # # 1 -

to the horsely devise with the she

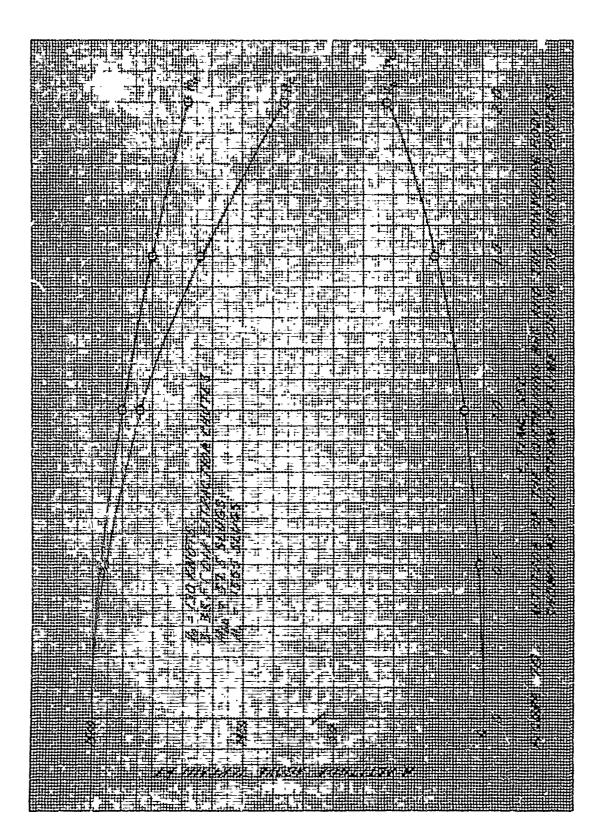
\$

78

Lund Martin



;



ى مەسىلەر يۇدىرى<u>ى ئۇ</u>ر

			1.4777.1.1-1	i: #1 + 5		
			н <u>п</u> -1-			
			1-1 1 1 1 T			- 25
				+ V		
			1	A.H		
					innin Lieff	
		-/				
				122, 10		
					1	
			H		R.	531
				-1-1-14	1	
			- 			
	9	_ 4 _ + , = = = + - ;				
				±		
		liance		······································		
		카네를 두는				
	R 14			***		
S						
		X X				
						¥- ,

			1			
		A PACE OF COS	70 0 7 1	77 <u>(71.</u>		
				**		

 			~~~~		
	11.1.1.1				
	14				
			Y-11-11		
			Lity stat		S.G
	T - I - I - I - I - I - I - I - I - I -	+:4 <u>1:1</u> -1	- <b>1</b> - <b>1</b>		
			1446	-12 21	
	10. m. 1 - 1 - 1 - 1	F BILLE	·	<b></b>	
				-11	
<b>Q</b>				Quita	
				1	
			m-E-		
		と 担子			
		( - F-			
		E			
XXL.			12		
×	·····		JE- TIC		
- NUT					
- n - n - n			-		
Sold States					
	<b>K H</b>				
E F F F F					
<u> 時間上上地</u>					

*

and a standard and a standard and a standard and a standard and a standard and a standard and a standard and a

a a start a start a start a start a start a start a start a start a start a start a start a start a start a st

The second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the second states of the secon

۱

t: 1, 4, ¥

3**4**/2 (

聖 10 4 117 # FIN. 41-ΠŢ. 王 11月1日 학급 Tir uddi. E D Ŧ 11; 1 Ŧ -1 Ŧ 44, - 11 di H =Æ 244 Ŧ 51 -12 - --Ŧ. ÷+--+---12 1.... , **i** i 135 -1 1221 = . Ĩ 77-7 ...... _____ -Lnl <u>E I</u> Æ , the 191 1..... . . ij. **H H H** -F 5 đ, 1 - dest in the second _____ -1-1 -Ŧ -1-4 77 391 trfr 

₩₽ Щ THH HHT Π ±__ 1 T 4 m- 1 FL 三世 神間 Ŧ ਜ i. Fight Linf THF - 11 114 7 η£ h. #-++-# - 1 S. H41 -4 ;=‡: • +++ hπ. . Miry - 1 中華市 -174 : t/E 1-1-14 --174 ---t E Ŧ -.t= F, <u>-</u> <u>J</u>FI, 규폐 日子 - += ۴m 3-71 -54 -11 Ĩ. E 1117 ±₽⊐ 200 i 🏥 1.111

84

÷

					111 1-11-11-11-1	
				the state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second st		
				······································		<u>S</u>
		X		int in the second second		
					二十二月二日十二月二	
			1			
			0			
				$\frac{1}{1}$		
		10 - 14				SQ I
				-+-		
		35 CO 1 35				
		10.0 - 3.9				
		1 M 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
		the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon			The second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon	
tertitertertertertertertertertertertertertert		and a straight from the state of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straight of the straighto	The second second second			
		anne state and a state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s				
	Contraction of the shall					

部であたの

the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of th

H.H.M.M.M.H.						
			<b>X</b>		Életter.	
		d自己的问题:				
			hu'ur h			
					<u>nµ ==   _ </u>	
		三月一日	lant-ni-h			
			<u></u>			
	1 1					
	町日月					
			-			
			1			
				+		
			154,3781			
	6 Y =					
			1. 7 = = = = =			
			·			
		<u> </u>				
		S. S. S. S. 1				
		ZQYIC -				
The second second second second second second second second second second second second second second second se		REA SIG				
		55 39 9				
		11	11 42 2			
		Main II				
					,	
			=_ <u></u> ,,,,,,			
	IT WHERE		222.2.2	27 7 T T T		
			ELIMPLE.	計畫 畫		
				17-7 E	Trainflecture	
distanti in the Party and			E. L		7.1.41.31.31	

I A MALL IN THE PARTY

	0	
		P P P
0		
Constant de anteinertinet - atte- atte		

۱

The second second second

12			
		神香云地	
	0		
<u> 新設生材</u>			
	N. No		
	Sold State		
	the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon		
		Lishtan Hillinds Sail	

1.1

.

assembly. This information becomes extremely important when, in the next section, the parachute assembly must be sized and, in Section 11, the materials selected. Naturally, the selection of materials will be based on the required material strength, its weight, and its cost. Since a number of choices are available, optimization of selection becomes critical.

At the outset of this study, it was decided that so far as the canopy material was concerned, the choice would be limited to  $1.6-oz/yd^2$  MIL-C-7020, Ty. II, or  $1.1-oz/yd^2$ MIL-C-7020, Ty. I. The differences in these two canopy materials can be seen in Figs. 80 and 81. Reference to the former shows that, for any given condition, the weight saving in using  $1.1-oz/yd^2$  cloth is substantial. However, Fig. 81 reveals that the strength of  $1.1-oz/yd^2$  cloth is only 66% that of the  $1.6-oz/yd^2$ . The same figure shows that the strength-to-weight ratios of both materials are approximately equal, as are the costs. Hence, on the basis of what is depicted in Figs. 80 and 81, it appears that the  $1.1-oz/yd^2$  material is the better choice of the two.

Figures 82 through 86 depict various candidate materials that may be used for suspension lines for the parachute assembly. Reference to Fig. 82 shows the two most efficient, in terms of strength to weight, to be Pioneer Specs. EI-4142 and EI-4151. Reference to Fig. 83 shows that, for any given suspension-line length, these materials weigh considerably less than the others. Finally, Fig. 84 reveals that these same two materials cost considerably less than any of the other candidate suspension-line materials. From Figs. 82 through 84, it can be concluded that Pioneer Spec. EI-4151 competes most favorably with either MIL-C-5040, Ty. II, or MIL-C-7515, Ty. I.

Figures 85 through 87 illustrate various candidate webbing materials that may be used as the riser for the parachute assembly. Finally, Figs. 88 through 90 and Figs. 91 and 92 respectively illustrate various candidate singleand multi-ply webbing materials that may be used for the center line and riser extension for the parachute assembly.

## 9. SIZING THE PARACHUTE ASSEMBLY

2

\$13

🚖 and 1. Th

Figure 93 depicts the total canopy area needed (calculated from .q. 9-1) to touch down a 50,000-1b gross rigged weight at 24 ft/sec STP:

$$(S_{o})_{CL} = \frac{2W}{(C_{D_{o}})_{CL} P V^{2}},$$
 (9-1)

	12 12 12 12 12	
느ㅋㅋㅋㅋㅋ	0 10 287	
	D. CHE	PY DIAMETER IT
trover	80- CARPY CEC	OTA HEIGHT THOWAY AS A
	I ZHETHEY OF B	SABACANTE DIAMETRA KOC
	THE CANAL STREET	
	- ditter SEAM 7544	WIDEL IN FREE BROKE
	OF SORES (A= D	NAIQUES IN CHE ASSAULS

·····		
	marina institution and a second	
	and a state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the	
S.		
		바퀴운드: 비 티 티 티 티 테 메이드
	- GANORY 62274	9 - LAT AL PROPERTY OF ALSO
		그, 커피드 그 모르티즘 프릴브 및 프
	리티비네리즘 우리에 빠르고	
	8 - 110 - 12 - 14 1 - 14 - 14 1 - 14 - 14 1 - 14 - 14	10002 / ERGHT SHORN HO SHOWEN SHOW AND STORES
	ATZATZYA TZYA	
		·····································
	<u>n, an marine de de de de de de de la company</u>	0.15, 40.5005060600000000000000000000000000000

1. A. C. 250.

言いること

		1111 <u>1</u> 44			
			₩ [₩] ₩₽₽₽		
				₽₽₽₽₽₽₽₽₽	
			平下する		
			X X7 + 21		
			2 11/2 6	2242 11 2	
			1 112-0	7.2.7.3 77 2	
			4-22-42		
	<b></b>		- X72+E-		
Fille Fille					
	₹	#######################################			
				<b>N</b>	
		TERT			
	╪╤╧╘╪╼				
			<b>₹ <del>1</del> 1 <u>1</u> 2 7 1</b>		
	FT4 SEL				
	The				
	72	-//0		ey:	
	<u> </u>				
	<b>745</b> F&#K</td><td>108-1186 4</td><td>WIT HATCH</td><td>T VILLE</td><td></td></tr><tr><td></td><td></td><td>LIEE</td><td></td><td></td><td></td></tr><tr><td></td><td>超する王章</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>776782</td><td>SZ- KEEP</td><td>en sesere</td><td>15100 L 1878</td><td>57.57.467.4</td><td></td></tr><tr><td></td><td>SROWN A</td><td>1. P. P. P.</td><td>A 15 775</td><td>2442 38 35.43</td><td></td></tr><tr><td></td><td>SOR PIRI</td><td>1943 - A 4.40 A</td><td>1.1.1</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>A-16-1726-9</td><td></td></tr><tr><td></td><td></td><td>FE FFE</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>and a state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>E F E E</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>a sinterest and the state</td><td>and the second second</td><td>r t silt handle</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>				

hi-ninger. - hab -14 5月1月前 

-E 1Auf

Maria Manual . Charles Anna . Ŧ 125 7 ŧ **3** 

94

一曲

					F-F-			
					EL E			
			<u>-Est</u>					
		ASACE	A State of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the sta	72+	72 S.	ALC , ME	74.4282	1. J. J. J. J. J. J. J. J. J. J. J. J. J.
		AS 960	ALL LAS	124 8		· · · · · · · · · · ·		
	1-10-14							
				1				
		F						
			<u> = = = : -</u>		====			
				手手手				
				to a				
<b></b>								i i i i i i i i i i i i i i i i i i i
								III A
	08 3			tingende 1				
		V III				· •		T.
					= =			
		1						
		1						
		+						
			1					
		<b>n_</b> = 1 ··· ₩=	<u>+++</u>					
	72			<b>F#-#</b> #				
		1	打击王	FFFF				1
		: AUE_	E .72	- 2.00				<b>.</b>
			1					
		1052-57	370 A- 2-	18 A.	CT 227	Q. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.		
57E	N 2 2 27	4 4724			710 3 74			
			CTI TRO	MARY 1	G LAK	66 6 69		
		3414	ere li en	11 17	3 8787	2 22.70		
			1000 00	ADION	TE HA	728744	£	
				<u> </u>				
					<u>+</u> +			
				1 . 5		-',		
		see an distant	a - a faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith faith	ثيلتمت لمنستمند	The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	J 2	traitters in citie	-tatestigtigtigterel

.

.

1.14

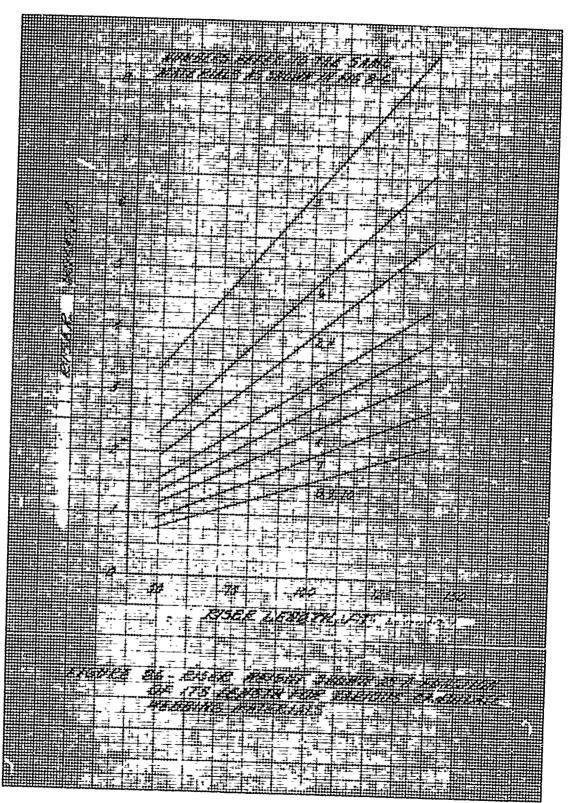
han and a second

.

95

.

N. A. A. A. A. A. A. A. A. A. A. A. A. A.		2 944 981 52 45 2 944 98 99 52 45	
		2 372 A 972 7 7 297 - 90 297	
		5 ML 2 205 7 5	(* 7 8222 A
		722-74-638-74	
			2017 2007 201 217 2007 20 217 2020 20 217 2020 20 217 2020 20 22007 20 22007 20 22007 20 22007 20 22007 20 20 217 2007 20 20 20 20 20 20 20 20 20 20 20 20 20 2
ee			
5.00 ⁴⁶ 0			
	#658298 #28		
10000 8.5 10007	273 - XAXX 25		



		言語には			
Generation of			世界的中学品		
	1 - MR. 9.4	25 85 FEF	THE THE		C PAR
	45 1807	9.60° 154° 1.79	8 9 2		
			retar test s		
N.					
		0 / 0			
	0 01-	- 23	202	24 J C C	
			£132	$\mathcal{Z}$ with	navez a care a
			-	- Crant	
	CALS TO	MITT 14 200 17		****	
	= runcile	an of II		WCIGHT	
	TARIOU	CANUTU	HE N	<i>c 20/1/6</i>	
	AATERIA	<u> </u>			
			- 1-221-1	17=17=1	
tas al para lagestantes antes antes antes				the second second second second second second second second second second second second second second second se	

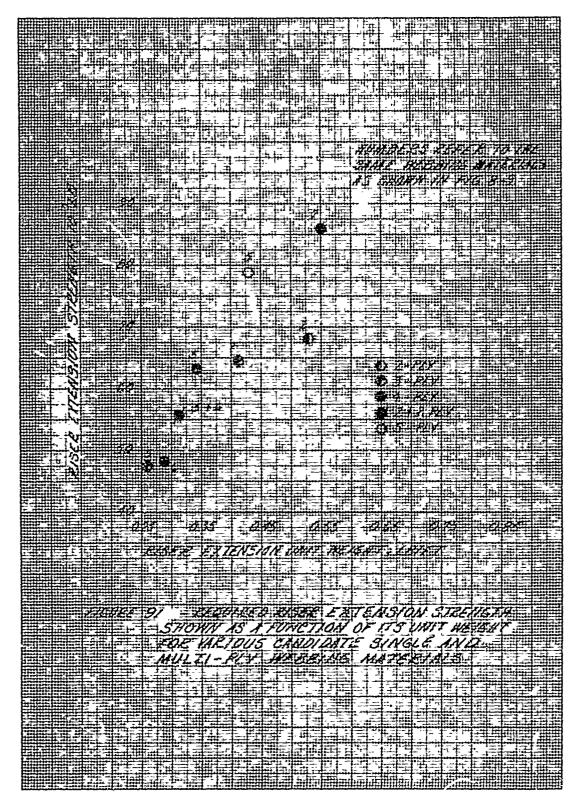
.

	111111		-11.1 11.1														
							11.P.	THE T	1		-1-	1 <del>1</del> 1.				181	田田
		H-	46-16			1 - 1	F 1	1991			्र-१स	臣臣	in in		1. 11		i di
		linin		HE H				<u> </u>		È: lir'	1. J. H				hcidin		
			<u></u>	1,111-5	,P.47	11 212	t in				1	<del>1.</del> <del>1.</del>			h lie	1	<u> </u>
			+	1.003	16.25	CAL		x cr.	<u> </u>	A			112.114		1 2 2		
				1.5	1940	E XA	1	1.00	P		-+	F F		E HH	<u>,</u> [7	Fil	
				1 13	ATTL PAGE	H	4602	1.7%	6 1	14 A			hi leti	11.1	THE		
				- d:	RHO	C. 475	12	1201	1-11	with -	1.1	P_E	<u>17</u>			tor!	hit
						1.10	后午			L ALLE	TTT						
					57 M2 7%	×××0				<u> </u>					111.41.1		
					Mez	17-1	1100	1.64	<u>5 7 8</u>								
	1.7			1 - T	17264	F##	16	1.10	- AJ	¥ • 142		i F.F.			2	1.11	
	U.T				121-			111	1.34.5.	FF		<u>ka in</u>		e.			
	4			1 1	1-17		F Ent	1 IF	<u>†</u>	h-11		LEILE	unin'r	-1.67			
		1942													napu raib		
											1						
				11:511	1		<u>-</u>	-	T #1	F.I.	· - ·		<u>e</u> mj	HIM			
					Julie	i ⊧ F -				M 28 14	6	L-12-1	, 6			1.1.1	
			in the	12-16-1		1		<b>1</b>		<u> </u>	- Tes		$\Theta$				
			<b> </b> , <b> </b>		1.1			<u> </u>	<b> </b>								
				EF -				<del> -</del>		14 							14
					<u></u>	<b>+4</b> f		<u>}                                 </u>		::= <b>:</b> ***	**	put		× 2			
	<b>9</b>					E 122		<u></u>		<b>1</b> 1.	-			hef			
			<u>+-</u> =	FΞ	1-E					, <b>1</b>	- +-						
	(i=)						<b>i i - -</b>		1.5			- 1-					
									-104		-						
		37				=			• - <b>1</b> [2	- <b>N</b>			шu-		E FILI		111
						<b>-</b> 4 - 7	ヨモ			<u> </u>			5-72-1				
	-							1-1- <u>1</u>	- I-F								
														T.			H
111 S	1.25			EII	Ē						- 1-4	5.2	5/40	Χ÷.	Ω.P.		H
1	4,344		t. t#.					A. 1-1-1									
			1 7 -4				<u></u>						200	ZE	e y i	1741	****
													2000 7-22-10	25 7			
												Ö	8000 121	25 22	2 Y X()		
												Ô	1210 1211	25 22	212 X2 7		
												0	8008 12.7	28 22	812 863		
												Ó	8010 729	25 92 2			
												Ó	872 72	25 92			
												C		25			
		2X.										8					
										2	20						
																X	
					LEN CEN					100 A	20 20						
											10 A					×	
and the second second second second second second second second second second second second second second secon									2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2	100 A						
				8			126	2 £									
				84	7 - 2	- 	126	0 E 140	E 147		14 14 15 15 15						
				84	7 - 2	- 	126	0 E 140	E 147		14 14 15 15 15						
						E 238 F 238 F 245	18.E. 2125	1 2 4 4 4	5 /A		HE 175						
				2 S S A		E 238 F 238 F 245	18.E. 2125	1 2 4 4 4	5 /A		11 E 17 S E E						
a de la companya de la companya de la companya de la companya de la companya de la companya de la companya de l Notas de la companya de la companya de la companya de la companya de la companya de la companya de la companya d Notas de la companya de la companya de la companya de la companya de la companya de la companya de la companya d				8351		E 238 F 238 F 245	18.E. 2125	1 2 4 4 4	5 /A		1. 173 5. 5.						
				2 S S A		5-22 7-3 7-24 7-24	12 A 7 A 225 7	1 2 4 4 4	5 /A		11 E 17 S E E						
				8351		5-22 7-3 7-24 7-24	12 A A A 225 I - W		5 /A		11 11 11 11 11 11 11 11 11 11 11 11 11						
				8351			12 A 2 A 2 A 2 A 2 A 2 A 2 A 2 A 2 A 2 A		5.43 7.22 1.22 1.22 1.22 1.22 1.22 1.22 1.22		115 173 158						
				8351			18. 6. 7. 4. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7		5 M. 7 820 1 M 200		11. 11. 11. 11. 11. 11. 11. 11. 11. 11.						
				8352			18 A 7 A 7 A 7 A 7 A 7 A 7 A 7 A 7 A 7 A 7		5.46 782 1925 1925 1925 1925 1925 1925 1925 192		173 173 2.2						
							12 A 225 A		5,40, 7,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20,10,10,10,10,10,10,10,10,10,10,10,10,10		115 173 27 27						
				8352			12 A 225 A		5,40, 7,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20, 1,20,10,10,10,10,10,10,10,10,10,10,10,10,10		115 173 27 27						
							12 A 225 A		5.46 782 1925 1925 1925 1925 1925 1925 1925 192								

					F	1.64	HEAD		- <u>11. 1</u> 0			- Hans	IIII an			
			1666-								1.1 <u>1.</u> 1.1				4 111	
													1			
										╵╽╴┤╏			- <u> </u> 			
				HE FL					4							
	-62-1				de la								11 (11) 12	+ 11		
										2011	10.0	100	97.5	1		
					(Cour	47.23	HOT C	cer ar_	100	ц е	9-	#"		- 1:	145	
												1 +				24
	64								-						جر ا	
										<u>-</u>					5.au	
							1					4 ·ii -	1.2		Street	
									<u>_</u> 4 r				<u>.</u>	يا ترز	6746	15
	32													<u> - 11=</u>		
												فيتغلق				
										The state	م منبعها	E-	- [H-1-2	6	12.05	
					EE				2			1	1.1	. 3	nag i	Ύ́C
	£2			=					م بر ا	=		فمبتبوا		1		
									<u></u>		-	-		1.3	42.45-2	¥.4
<u> </u>				*****		1		<b>₽</b> ,≓Ξ	<u>ب ا</u>	0		<b>1</b>		- 1 ² - 1	127.00	な書
							<u>T</u> H-			مستنهج	- <u>-</u>	-				
					<u></u>		يبارينا			سبيها	- Antina	EE	1-1-	i ga	Der H	82E
			61				ملر 1	1		ф-1-	<u>.</u>				574	2.2
	5		<b>O</b> .		. ممبر	م بر _ا	متر ا				-		-4			
						فيتنز	ΦŦ		للمشبو	1			†≞=≣			
								بتبينين								
			8													
						-3				<u>r:</u> _i	<u>E e e e e e e e e e e e e e e e e e e e</u>		i i		<b></b>	
		-								1	E-T-E					1 1-14 15
	1.0						1.1		ΓĒ				<u></u>			
		l d														
	4				-1						EE					
		<u> </u>		- i- , İ.				-		<u>i</u>		-				
			E E	727		^			2	E	Ø				2	- 9
			E			ويزارى		110	11.40	7.4						
										152.7		+				
															t	
														1		
		GE J	RQ		S. 117		1755	217.27	1,50,00	- 21.00	21022		3.7	1117		
-			- 	FJ	Fre J	1.75	14	111	1 123	27720	(1.15 17 - A	3272		ALT TT	<i>rur</i>	
				JHA'Y		DC7	-174 -177	7 6029	2.12	1150	275	22/1 Z	1 37 11	2.12		
			<b>J</b> ۃ		Ē		01401				CZZAT C	126	1527	853		
				<u> </u>	-											
								11-1 								
1																
					the second second second second second second second second second second second second second second second s	-444 - 4						112-1	·		i	
														-1-1-111		

filles the second second second			teres into											
				₩ <u></u>			<u></u>	144.1	王王	<u>I =n</u> ⊟	14414		1.1.1	
					- <b>1</b> 1	- 1+ 1-			it min		hdia			
		<b></b>		-			Trip.	1-1-	i i i i i i i i i i i i i i i i i i i					
					i Juit	¥	124	ITT-			<b>P 1</b>		h 🖽	
				# 13	₽. <b>₽</b> .	F=T-	<u></u>	TT			<b> </b> ₩,;;;	1-11-1	E Hill	
			.## <b>!</b> .4.		F FIL		THE		1.1	1711				
	<u>нин,</u> ,	निवित्र		<b>1</b>				<u>₩</u> F1	<u></u>			liter tu-		
	######				1-1-						1114171	<b># ##</b>		
			19-10-0	66.0	њ <i>е</i> г	12.2	1727		SAM.	E H	1.96	1000	S	
	- Hari	-	中之		1.7.7	174	SHE.		転じき					
	Entre.	HE IE					T-T-		<u> </u>			1,		
						<b>H</b>		<b>-</b>	<u>+</u>					
		<u></u>					1 E -	<b>1</b> -154	H 23	E ==				
			1272	1= <u>-</u>	E	<u></u>	1-4-3-	1	1 -1-,					
	- <b>-</b>			EE	1 = -	== =								
						tin 🖻	F							
					+ ===	1			1.5					
	1: 2.2		1				F	=			<b>*.</b> ###			
		360		<b>₩</b>		r	- 7	1.2.5						
		Ŧ₽			==-	1-73	E 34	<u> </u>	-	100				
	<u>ta - j=</u>	<u>+</u> =≡				<u>t</u>							Ľ#. II	
		<b>€</b> ≡±Ē	1	E.		<u> </u>	T . tut.	E						
			1-1-	<u>+</u>	E		ŧ	E						
		<b>F</b> E	<u>1</u> 17	: <u>-</u>	<u>+</u>			<u> </u>						
		<b>1</b> ==		E		$\perp 0$	17.5							
	_ <del></del>	4	1=				†	· · · ·		= 1				
		11-	155	1	<u>⊧-</u> ⊁#			-	ta per					
			+ - *	-										i i i i i i i i i i i i i i i i i i i
	1.1.1.1.	<del>1</del> =	==	<b>.</b>	- 61				Ĩ					
		+-=-	ŧ=j≡	<u></u> .	15.9	E				I B				
1.1		<u> </u>	177		+ - <u></u>	*		<u> </u>	· ===	5 P.				
	it. I		<b>-</b>	<b>1</b> - 1			· .	F 7	5 67	eler je je	1.17			
	1	<u> </u>	1											
	12 ¥		<u></u>						F 224	21.27		X X III		
		1	1		<b>=1</b> .	·	222		÷ 22	144	100	cY II		
		1==		1. and						- 1. H	HE	112.00		
			1-1-					11.1		f				
		<u> </u>								i.f				
	1012			- <u>-</u>		₹=€	<u> </u>		- #4	파티	<u> </u>			
		<b>打</b> 臣					<u> </u>							
			1											******
			4		-1.7		====							
trentertett	6	Į.												
	6						<b>X2</b>					22 22		
	6						121					22 22		
	6				276		19. KA	+- **		10 10 10		20 20 20		
										1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		10 12 12		
								8877 1		64		20 22		
	6	90		а. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.					PF 7		7.77			
		1	125 4 1	2.44 7.24	12 12		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A70				77.0	2345	
	-	- Cd	727 L. X 97 L	2.44 7.72 7.72			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A70				77.0	2345	
	-	- Cd	727 L. X 97 L	2.44 7.72 7.72				A70		257 7 A 728	1971 1972 1988	ALT.	2345	
		- C.I. - #1.A	454 747	244 7224 2.172 2.172 2.172			130			257 7 A 728		81.A 81.A	2345	
		- C.I. - #1.A	727 L. X 97 L	244 7224 2.172 2.172 2.172						257 7 A 728		ALT.	2345	
			234 737							257 7 A 728		8/8	2345	
			234 737					77 77 77	72 Q 727 827			8/8	2345	
								2007 A	72 Q 727 827			814	2345	
									2 C 22			86		

L



	m
	11
	H
	III
	궤
	Ħ
E TE ENRERS EELER TO THE SECTOR	₩
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	訠
	間
	▦
	盟
	劅
	圕
	臝
	围
	围
	9
	Щ
RISER EXTENSION LENGTH FT.	
	▦
FIGURE 92 - ROSER LITENSION WEICHT SHOWE	
THE ASA FUNCTION OF ITS LENGTH	
FOR PARIOUS CANDIDATE STREAS	
AND MULT PLY WEBDING MATCHARDS	
	Ħ
	国
	Ø

.

•

•

and a series of the second second second second second second second second second second second second second

103

_

.

Ē 旧 4 de 11111 EH. -<u> (</u> Ŧŧ---H ц., 「日本書の ÷. 1.'1 46-₽ --ल्ल र म्ह u<u>r ler</u> En:E 11111 ter Her <u>e</u>.]. - 1 -Ì Ţ. τĽ. E. 8 111 AL CANDRY ART M STUSSER il. âŋ. S F E ____ -. 1 1 5<u>1</u>1. ##**1**3-1 24-41 -1--F Ħ H ----------CLASTER OF -1:-=++ 1 12 -<u>nd=</u> Ŧ -= 33 1-1 ₽₽₫₩ **4** -----**P**''' -7712 Linte ..... Ш E , I, ------11 1 1.3 3 _____ -# ..... ------1 Ŧ = --)=:: -----E F 7 -13 -1 ...t -----1.... 7 ٦ -----1 -+ **F**# -----Ъщ F_1 CAUSER REES TH CLUSTER UP 70 20 Ę 극 2 7 *90* -47 3.1. TOTH -AZ ..... ŧ.Þ -----FIGURE 93-- TOTAL LANDPY AREA NEED TO FOOLADDAWN 50,00018 SKOSS RIGGED HEICHT AT 24 ATA FOR OPERATIONAL CONDITIONS DE SEA •## Ŧ 3 22425 STR <u>_</u>____ ----đ 1.5.5.5 ..... 33 4 7 - # -1--. -- F. - 1 Ŧ ..... ΨĒ 2 -----1-11 -116 11. + -11 i. Ŧ -. 1.15 1-1-1 Ŧ

where the cluster steady-state drag coefficient,  $(C_{D_0})_{CL}$ , is

a parameter of considerable significance. Section 5 presents the results of an appreciable effort to determine within a fair degree of accuracy the magnitude of this parameter.

With regard to the number of parachutes selected to comprise the cluster, it was felt that six is the maximum. This is based primarily on the premise that a smaller number of parachutes would require assemblies of larger diameter, making them extremely unwieldy, therefore most undesirable. Using more than six parachutes to comprise the cluster would lead to a condition conducive to a high degree of cluster interference. In addition, using more than six parachutes would mean that the individual assemblies were relatively smaller in diameter, which would limit their overall efficiency.

For a cluster of six parachutes and a cluster steadystate drag coefficient of 0.85 (see Fig. 27), Fig. 93 shows the total canopy area of the cluster to be 85,000 ft². Figure 93 also shows the diameter of each individual parachute to be 135 ft.

## 10. PERFORMANCE

In Section 9, it was shown that a cluster of six 135ft-diam. parachutes is required. This section will now attempt to establish the maximum load that any one of these parachutes experiences while in its operational mode.

## a. Effective Drag History

All the numerous views concerning the drag history of a parachute system during its inflation process are premised on empirical studies; none is founded on established theory. The problem of inflation dynamics becomes even more acutely complex for clustered parachutes. Hence, it is felt that a study of the drag histories (Figs. 94 through 108) associated with the drops listed in Table 1 will lead to an envelope from which a drag history can be selected for the 135-ft-diam. parachute. Hence, it is with regard to Figs. 94 through 108 that the drag coefficient for a single chute and for a cluster of chutes can be calculated by the following formulae, respectively:

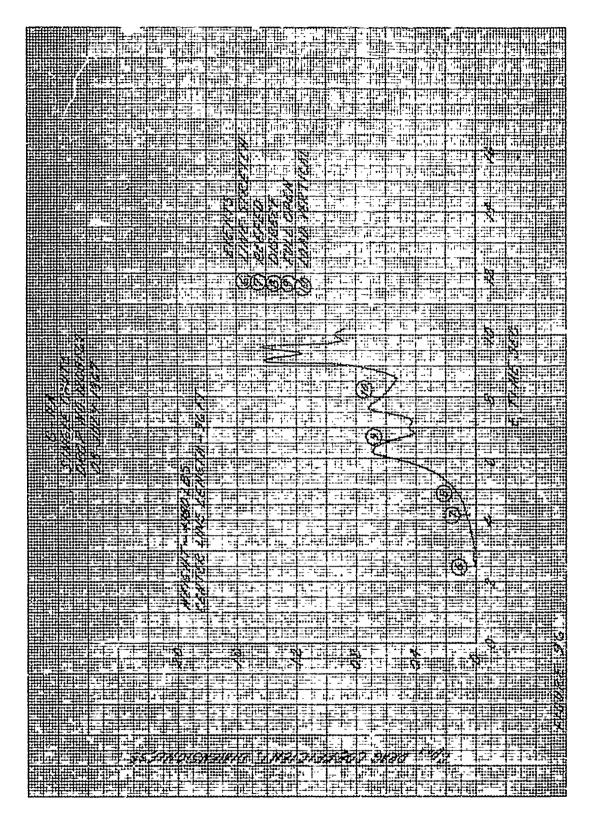
$$C_{D_{o}}(t) = \frac{F}{qs_{o}}$$
 (10-1)

and

					if			
							16 ISP	
			-					
	r. 125   15   15							
								<b>N</b>
								N
24					<b>.</b>			
								X
					<b>.</b>			
								N-1
							k i di	
ALC:					E-			
				<u> </u>				
					<b>S</b>			
				6				
				l C				
					lines			25
		8					X.	
				R.				
		10. NI						
				ξħ.				
			R SS V	2.5				
		15.5	13. 11	3			157	
		হি ও	8.5.5				成金書	
		8 5	N. 50. 12	20-			91	
		33						
			- CACK	<u> 90</u>			Q.1	
	- 1-1-1-	55	8	J	5			0
		<b>N</b>	8 X		85 53		\$ \$	
				N.				
								S.
								5
		1		· · · · · · · · · · · · · · · · · · ·				
	552972	SASA THE	5 71 21	21, 1, 19	01 sr	17 170		
						10 120		
	t	سنغو للتشتشينات		1	1	بغافة المنتقد	<u>11, 111, 21   1</u>	

-

<b>638</b>	the fai	n.	Ter			<u>eu</u>		<del></del>					·····				-				_			
		l T		<u> </u>	"=			1.	<u> </u>	<u> </u>		::-:: 	<u> _:-</u>			T			<u></u>		1			
	빌						HE		بطبا			_::- 	1			· - [			E		•		Ì	
			1						<u>.</u>				ŀ F	15.						 			Ţ	E E
	E.F.	归		1	ha l					- <del> </del> = - +	<u> </u>	ţ.			E		1		F.				·	·
				ΞĒ.			E.	Ξ.	· · · ·	1				1.1										
5.					<u>+-</u>	<b>[</b> ]:	11				15	1-1			- : :		-	<b>C</b>		-			<del>.</del>	
		1					1	-1		· • •	12								÷	-				
								1			- 5	ĥ			N-							<u>ai</u> ,		<b>.</b>
[]		1-						-			÷Ň	5	1		<u> </u>			: 1: • 			1.5		HE	- 1 - E
								 				1			¥1	- 1	<u> </u>				3-'3	2		
					-		1			<u> </u>		Ę.	_ 1,			. 1	1	1				F	1.1	
							fi.	- 1			14] 17 11 12 17	S.	7.6	Y.	si QL.i									
		1.11	<u> </u>		1		17:	1			25	Ľ.	$\mathbf{N}$	12	4				-				1	
				4-4				- 1.			Ĵ	. U	<u> </u>	V S	<u> </u>			117						
	Щ.							=		1	cS	S		31.			-					<u></u>	-	
		1			-1	- ·	1 =				<u>1</u> .	ų,	5.2	5	<u> </u>	ag je	.11.				∱∓F			
	in.	1				÷	<u> </u>			7 1 1	Ê	÷ς	2		ų		1.7	•				-		
					l. :l::			1			الجنهم	Corr	<b>646</b>	64	Ŋ	=			÷					
							-						-		i					-#: 24				
	4 🗉			1.1	1		<del> </del>	÷			-		-			<del></del>		-	-			-1		
								-	÷	<u> </u>	1		بيلابتنا			[	1		H					
		ěç,	1 - d. 8 - 1 - 5 - f - g		-	_		4							; 	<u>.</u>	÷					212.		
		2					ļ., '.	<u>.</u>				<u> </u>				_								
		ر. × احد	10			-	<u> </u>			· :. 		: [	·	<i>کر</i> نام ن	Li	-	111	Ц.E				S		<b>P</b>
	N.	26	<u> Şi</u>				 	<u> </u>			1 - 1	. 1.		~	18	-	T					ΠĴ	- , i	
	1	N.		l ai	<u> </u>	÷ '			-1				1	<u>9</u>	$\boldsymbol{\mathcal{D}}$		1		<u>n</u> a	1 1 1 1 1 1 1 1		5		
		<u>S</u>	3	<u>1-1</u>	al	ie.	. <u>.</u>	ŀ				10	-		<u> </u>	_		<b>F</b>						
E me	°.∖¥	$\sum_{i=1}^{n}$	<u> </u>	E.							E.			-					-					
ET.	S.S.	$\Sigma$						<u>-1-</u>				+				<u> </u>	1					1.1.8		
	1×	হা	2						<u> </u>		ja.m.j.					44						12		1.0
	ŝ	ŝ					<u> </u>		÷	~÷	<u> </u>	-1-				2			E.	<u> 1 1</u>	<u>, </u>			
							NG	-	₩- <b> </b> -			-		· ·			2		·	<b>F</b>	- Y	127		
T. 111				<u> </u>			34				<u> </u>	<u>.</u>	<u> </u>			÷۲	-		+	11	i i i			
	i i i i i i i i i i i i i i i i i i i			1-1. 1-1-1-1			8.3	4_				İ.				12	6		4				21-5	1.7
			<u>. 177</u>	<u> </u>	- <b>L</b>		1.12	<u>.</u>					· .		1	1.		1	-		_			
			<u>.</u>		1		ંસ્પ્રિ	5f . 11	1			1	]	4				25			- 11	1-21		191.1
				1	Ϊ,	· . 1	K N		: 1			1		ΤŦ				خبري	X	7				
				=::		<u> </u>	1.5	ł											÷Ę					
		Ŧ					50	F										<u></u>	+	2-1	;;			
	1.1	÷			1		10.0	<u>.</u>				-		أمدفقت		+			+-	-31	- de			
1						j-reilj j	2.2		•	• ••••						1			4			13:4.		圕
				 -:::	<u></u>			+-	<del></del>	<u>.</u>	<u> </u>			<u> </u>		1		<u> </u>	<u></u>	<u></u>			<u>_</u>	
F===	<b> </b>				<b> </b>			<b>.</b>					······································						1.			1		
						<b>-</b> -	<u></u>	-	<u></u>			<u> </u>			·	•••••••••			****	<u>}_</u>				IV.
		-			1	1		۹. ج	. S			<u>.</u>			2.	1,1	1	1		2				0
						<u> </u>		÷				<u> </u>		<u> </u>		<u> </u>			•			1.10	32	
		÷.	-	<u> </u>	1: -			1								15								
	<u>fill</u>	<u>_</u>	12.	<u></u>				-	: ::				-1_			ţŢ			-					2
E. 115.	t er	3						<b>.</b>	12			1-	1	t si										
11-1				<u>h</u> .		-						- <b>.</b>					-		-				1	
			_		-		<u>.</u>			1				<b>e</b>	-		4				**, **		-	$\mathbf{x}$
				<u></u>	-	1	عرجرات	1	7		7 ];	1					1	191. X	Ŀ				1.5	
							1125	12.5	CH 2	Fre	<u> </u>	3	(2.7.4	2.1	10	FA:	YŒ		$\Omega$	<u>.</u>	-			
								-					1. E-	1.1	74 0		1			-				
<u>tiun</u>	II II					-F								2		·	1.							
																						1		1111



ŧ

transferentering fill and the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s
ferenden beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter beiter
S 97/10/13/201/17 1772 2/2017 20-1

11 and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s ;Fhill ÷ **[**]:4 <u>a</u>ri 미히 **F**ha . 1'4 1 **H**E 3,4 ŦΞ ١. Ē **P**E--1 0 10 Ū. ΠØ ie. 12 i.i. • c II

٠

					HIPE IL.		<b>.</b>				
			<b>市市</b> 于								
								7			
								FLE L			
			····		1.11.11	=	T.			15	
					ie tri						
			計り目							1.5	d de la com
							- I			1.95	
				-13		- <u> </u> =-		i = l = l		仁和世	
					-	3					
					-	1	-1-1-				
			-E	-		2.4	- 1				
						-5					
						1					
		計畫目	<u>_</u>	1		<u> -</u>					
			i per	PF-E			الم البين				
			- C				3 5			TRI I TRI	
	<b>1</b>						1 = = ;	<b>1</b>			
	<u></u>					No. and a start					
	20-										
										1	
	ad in the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second						- 45	3			
	No.		· · · · ·	1=					larhi, i		
22											
								S. 1			
	· · · · · ·						1		¥. T. T		
							IEL-E		( T		
							=		- X		
		-27-2									
			-								
									C 2HF		
		1-2:1-1							Zh I		IIIE (
									91.		
											Ĉ,
									0		Đ,
											5
		**************************************				5	-			<b>k</b>	
						- 55	-	ţ			
											N.
									1	111 - 1 - 1 - 1	
					4						
								- 15-1-2			
	1 200	7 87 2 5	2132257	e	Phat +	_10	JAQ.	運手			
		××7 5 7 5 4	e	2032	4.1.1.2	75 59	20-	67	1		
										distant in the	
								<b>1</b>			

£

in the series of the		
tatter to the state of the state		69 10 10 10 10 10 10 10 10 10 10 10 10 10
	Neressen in frage faith and the server of the	
G.81.1		2 2 1
52749/347	12 19 2 0 2 15 00 5	

		10001 -100 100000			· · · · · · · · · · · · · · · · · · ·			****
			201 ² - 1 4 20					
				ÉH T				
				tout"			11-4.1	
				111		11-1-12		
	H. H. H. H. H. H. H. H. H. H. H. H. H. H	1 nf 184-1.4				<u>₩</u> ₩ ₽	1.1	
	1-1-1			n-ii				
					41.00-010	1.1		
	1							
		1				<u></u>	tra pilm	
				FB				
				1				
				PH1				
			7					
				1				
	1				1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-			
	7-7-1-2							
			N,				17	
	-							
					-			
				<b>h</b>				
		FILE		戸二 7				
						1.411.		
	12.2					1	Spin-Langing	1X
					21-1-1-1			
	12 21 1		3.4-5 ( <u>.</u>		(			
	13-155	<b>₽₽</b> _₽				<b>12 1</b>		
		1 3 2		F				
				i fêr				
			50	<u> </u>				
		- dit	13-11-					
	5	12 31 3	2 ¹ .85	tu				
						3:51		
	i Cia	5.912 3	901521			1		
		1 2 1 2 3	iscirci -	<u>- + -</u>				
		13. N. E. N		* • •				
	St. St	1 200		<b>T A</b>				N.C.C.
		· · · · · · · · · · · · · · · · · · ·			·····		5,412727	
Transfer and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s				and the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of t				
	· · · · · · · · · · · · · · · · · · ·							
		‡==						
			- <u>-</u> - =]=			E		
	deel 3	באנ ער ונינוי	and the second	2 2	107 5 WM	Fizi		
		Name ut y	Concentration of the		41 - 11 Q 512 - 17 Q	89.		
	14444	PERSONAL.	2 47 18 7	2°975	ww.2722	H. Ed.		
		<b>宇宙中国</b>		117 1		H4.144	12141	
متدينة المستسانية المستحد مسترك متنجل بيناو	*******	تنتستيتسمي	• •	*****	بمعمالة معيدة مجمعه معمدهم	-ا <u>م</u> ة منعدمه		لةنفقانهمه ويسموه

1 11111-1-in-10 HI | | | | | | -.... Fille <u>____</u> HA 1111-11 14. HL. RH: 1 1-11 th: 1.1 ..... 5P 100 Ē I.LE 9 -1---11 **24**2 ±#, Щ_{ей} itr i . ĦF Ξ -1-ł H -117 ŦŦ = ...Ľ 크크 -E ÷. Ŧ 1112 ..... пяģ - 1<u>-</u> 7 14 122112122 تج 

AND CONTRACTOR AND A CONTRACTOR OF A CONTRACT OF A CONTRACT AND A CONTRACT A CONTRACT AND A CONTRACT A CONTRACT

					<u>it de</u>			
					「里	二十二		
						四十五		
					11-71			
			F. HE	<u>1</u>	·			
			日日三		i F			
			LEE					
						に目に長		
		= 5		「三三三	-1-		741.4	
				1-1-1-1	E-F-			
			E. E.					
					11.53			
	PAR -							
					F.=_		1-11-1	
				a t				
					T			
	120 (55.55)							
					1			
							1	
							9	
				<u> </u>				
				E	<b>*</b>			
		· · · · · · · · · · · · · · · · · · ·						
		ELE.S	S	8				
					S.	- <b>S</b>		
		E E L L L						
С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997) С. 1997 (1997			EFF.					
8 8 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9								
041.40341507729.45940.3 5577445747440 4.4379443902 94945 42								
552788457434810 ZNF721457905 39885 42				941.10	17/5	272 P. x	C 240	
		52	27 19 15 4	1417 -	4 77 72	13902	94.27 1	

×-					
					****
				" <u>∔'nini##</u> F#C	
				<b>3</b> ×₩-₩₩	
<u> C</u>					
			* # = + +		
					<b>P</b>
			an an tail		
		1	Title distant of the	the second second second second second second second second second second second second second second second se	
	77172150150	1 11 21212	12 0 2 1 1 1 1 S & S & S	X	
			900 Orski	X 440 X 4	

.

alternative between the

ı

	公常穿殖的"马克兰牌"。 医子宫 医子宫
La la la la la la la la la la la la la la	
A big which had a start and the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the balance of the bala	

Ŧ 90 T.T Ŧ , ‡ ġ <u>_</u>F i fini: ΞįΕ 771 Ē 画 F.+3 4 Ξ1. **F** + e H H, 1 - F Ŧ 4 ļ. - 12 Ŧ že X # 11 -11 -F 24 , , 3 H -Ĥ. Ξ£ 4 Th 1 ++ -t.t. 12121 H-L-I Ę 1 ÷ 乱 = 1 111 the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s -÷. 15 ŦIJ -... Ŧ ÷ ΞĒ Ĕ <u>f</u> ā Ŧ 7774 7842 AP 2 2439-2 Z R 257 1 # 

and the second states of the second states of the second states of the second states of the second states of the

£												
					- E.		-					
					14 <b>*</b>			<u> </u>				<b>1</b> 73
			1.1.1-1							i ri		
				自由自			<u> – – – – – – – – – – – – – – – – – – –</u>		<u> <u> </u></u>			
									1.1.1			
									1.1.1.1			
	1				<u></u>		####					
						. 1 - 1	-	<u> </u>				
		ET E						1				
				EBE	<b>F</b> )	È F T						
						\ <b>!</b>	<del>zi</del> te	<u>الله</u>				
						3. E						
					<u></u>							
					巴巴							
		Fight			TET			, J . E				
						- <b>- H</b>						
		<u>È i l</u>			<b>Ç</b>							
						==1	T T			n di bili		
		+ 7 = 1 = =			日子 。	T-Ft-		I.				
	D ==		₽ <b>-</b> 1-1			14					di li	
			-			S.L			<b>H</b>		6	
							1				3	
						- 1						
		<u></u>						5.1.4	18.1		<b>6</b>	
		- <u>-</u>							3.257			
		111-1-1-							41 ji 🚍		5	
			- # <b>*</b> -		127	1		-122	2-1			ЦŶ.Ш
					Ŧ.	- 1						
							1.2		く注意	- <b>X</b>		
					-=							
						<u></u> #						
								-	2			
		Ē-	1- F=			- F	聖書		DT I			
						· ==	Epide					
						<u>i n</u> t			7.3-			
								ĒĒ	52			
						- <u>6</u> -						
											- 1121	- <b>1</b>
			X.	Sy	61 51							聖見
		<b>N</b> - 1	<b>X</b> .	<u></u>	- 54	="F.l					Fai a	i i
				-		Ē	14 <u>-</u> 1					
						-	+					
												ШĒ
						1-1						
		1.7.7.0.2		94 SYA	¥. ₹ }	19 <u>6 –</u>	14.64				19	
	5577	PF78 8015 #7	COLL CA	Hutte	1282	sel c	<i>407</i>	-¥.u				
						للمنتشب	التغينين			كتحنفيص	للترتيب الم	لتتلنديي

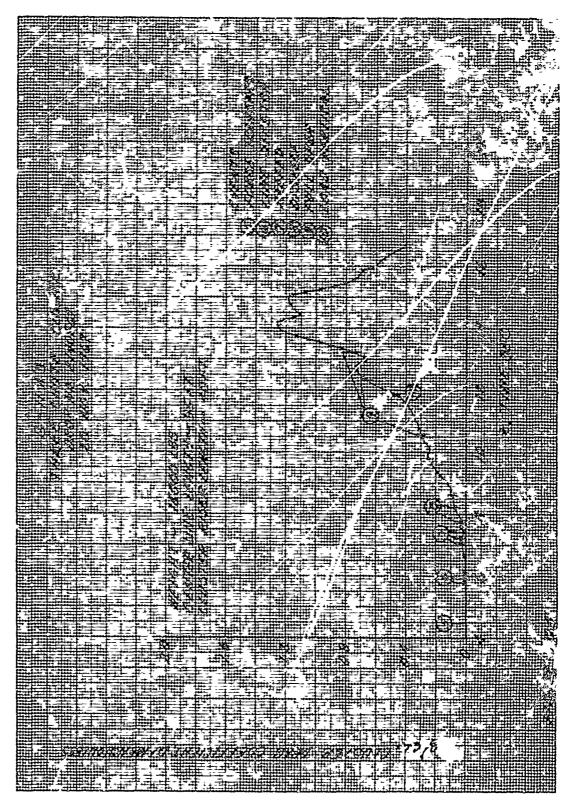
.

	1531	
	300 2 m Q .	
	CISRINA I	
<b>T (3 = 1</b>		
	<u></u>	
	<b>戸油ド・/三</b> 目	
	-issan - same - conservation - same	
	202 22007	
all the the se	922 F F A 577 7	

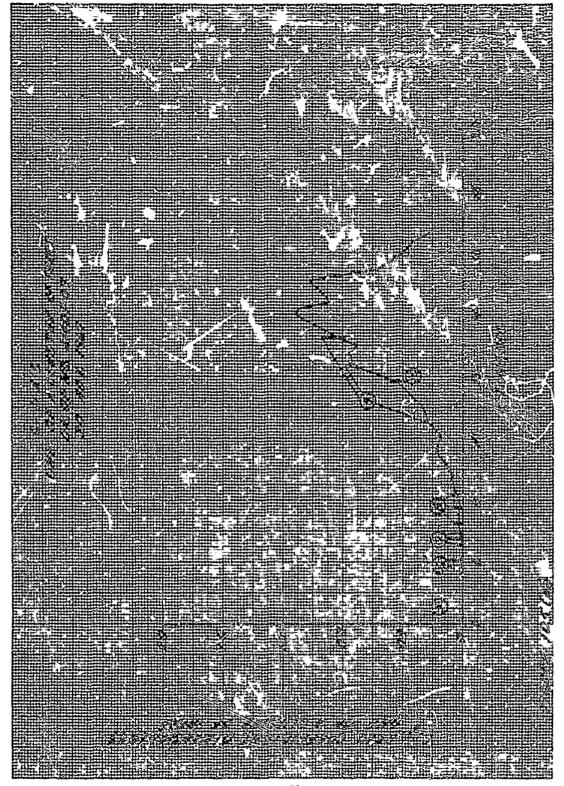
1-1-1 1 न ∓ -J . 4 ..... ..... 111111 - T S_₽ Ŧ SE-1 = 1.10 -1 1271 UTE ŧ <u>.</u> Шſ -E 1ª hE f H -4: Ŧ Æ -----Ŧ ÷ 1 4 Ŧ <u>.</u># 7 -11-4 Ŧ TT E +++ 111 Ŧ ------1 1 ..... # τŕ ÷ 1 H.H.P 글 -initi. =1 3,12 1..... ΞIJ 4.2. 25. -5h. 1209 2120 <u>e fi</u> t dt. - +

737 5 ्यः न्यिन्युः स 盡 : h..... LE ···· **T T T** 77 1 -j Ē Ξiu , Table FERELE 1.2 ≡r•1 -**I**FLE Ŧ -1-5 H. ŧ 11.9 1217 3 井 Ħ Ŧ 

the resulting in an



A with the state of the second



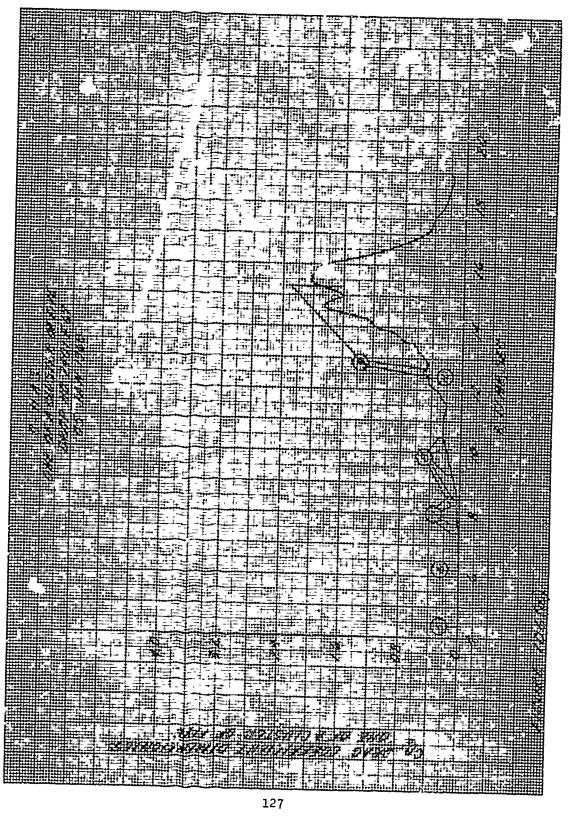
feine allen bei feine in anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter anter	
	<u>#</u> ##2.55
	21
	49 3 1 1 1

ĒĐ 1-Ŧ Ŧ -4 Ŧ. Ŧ ------r 1.7 F 1 -1. 1 - 1-1 1 <u> TE</u>E ΞŦ. -11-ale i H II G.H 1.11 ЯE 7.12 -----.... 14 23 -1-21 114 **H** ×.1 131 itre -4 - 6.2 11235 <u> 1</u> -E S. ..... -1: - i.<del>1</del> ЦΨ, F. 14. . 14. dil-5 訷張 1-15 = L1 ÷. ,;;+**;**+;+;+; rīri 11 Ţ. Щ. -127 -11 

Sources and a second second

i

an' ara willing



Ē .74 里 *** High <u>i</u> **1** Æ - - -<u>___</u> à ----- 1 1-1 山口 Harr P 3 # ..... 1 - M 1. ill sub 11.III HIH THE ₫ <u>....</u> ai te i Ŧ = 구글 ---------.<del>¶_</del> 

128

All and when the second shall

Ŧ In PER. ī. <u>.</u> . 1 -Ŧ , Con =1 Ĩ Ř Í Ŧ -11 Ē **5**4⁵ + -1 T Ξŀ î. Ŧ Ŧ F -đ. ÷, 11.1 Ē <u>F</u> T FF R. de C 10707 

227 TET 1211-1 225 67.04 <u> ar</u> Ē _____ Ŧ -----112 

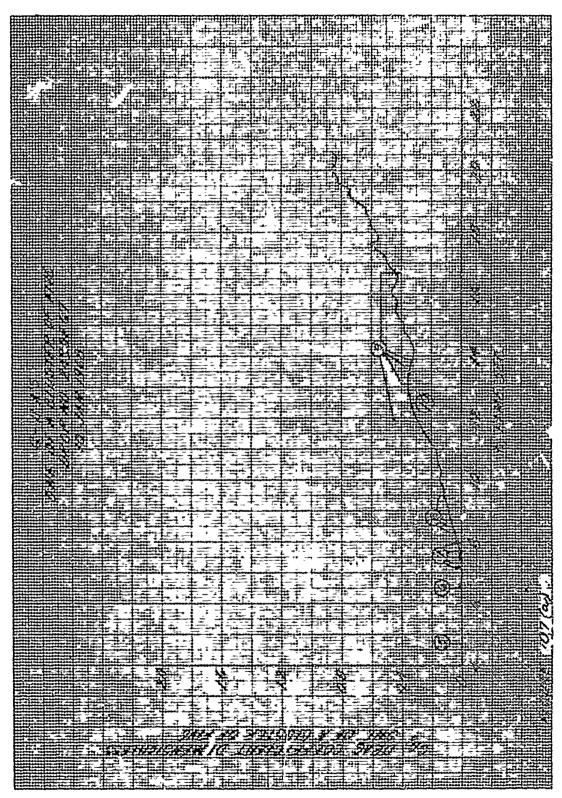
130

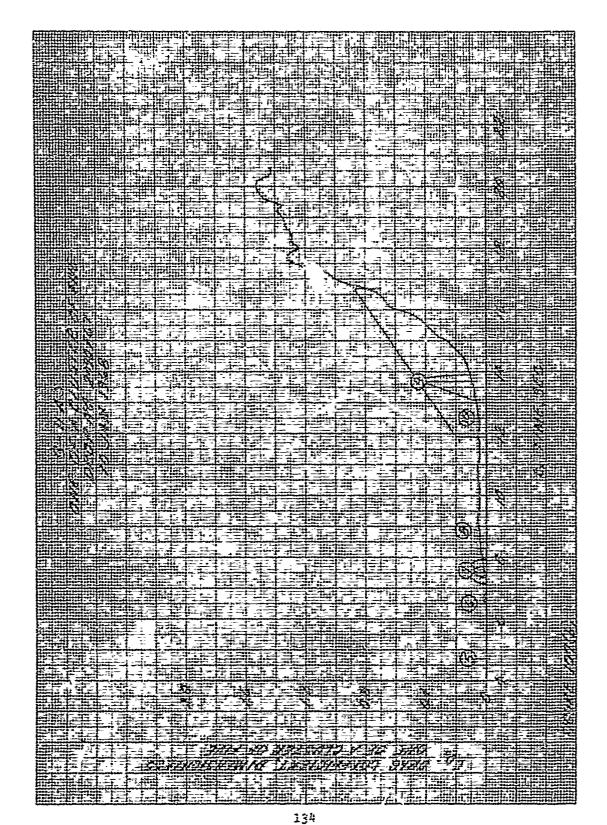
and the second second

Ē . 1 -Ŧ rt H ip fri ŧ. -,± F ft. -tr T ____ ¥¥ j. til. ≡t +19.3 4.4 E ų., Ŧ Ŧ hh 1 邗 4.1 # -1-1 -In 1414 ...... <u>*</u> -11 ш<u>р</u> _____ Ť • • • • • • ±., **H**# 1-16

132

あいい いんしんしん





a a substance of the second second second second second second second second second second second second second

١

- -

Summer Strongs and an

ALL THE PARTY OF A

		: Hr-7. :			
	n. h.:				
10 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					192 jan 12
				<b>5 </b> ≠, <b>4</b> , <b>1</b> , <b>1</b> , <b>1</b> , <b>1</b> , <b>1</b> , <b>1</b> , <b>1</b> , <b>1</b>	
			¥ ¥		
			<u> </u>		
					i pur pur pur pur pur pur pur pur pur pur
	1.1.1				
					<b>.</b>
			計畫主		75.414.4.5
					N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND N. AND
			******		the first state and state it is
tel mertelene fantig ver ben fur atte			and the second second second second second second second second second second second second second second second		
				的温	
				· · · · · · · · · · · · · · · · · · ·	
				344	
	TELOS XI	10 2 2242	2 1 10 5 1707 9		
				<u> 1 1 . 1 . 1 . 1 </u>	at the last balling the

うろうう あっていてい きちちょう ひちに ちちょうちょう

	finnen nen en en en en en en en en en en e	
S. I. I. I. I. I. I. I. I. I. I. I. I. I.		
		the second second second second second second second second second second second second second second second s
	21.2.4.10-1XS	

stermen werken von nikken waardinaan kolonien an te na na dat in an inder een seelen oor oor dat in an inder e

11-12-12

* 37 I M *

•

ションを見たけたないないないない

741 1922 ist, iiiii EE A 1211 招召 2E 11 1.1111 ----m s 1-].,**...** HD: i. 1 1: 1-2 नुनन -I III . 1.14 in hitte ..... 581-3

1?7

and the second second

		//////////////////////////////////////
	24 3.2°C+' 7	
	energy to rath the	

다 개통 위험은 분위 분위되		
	J. H. Salar	
	II FILL	
		1974 19
	4-4	
10 10 10 10 10 10 10 10 10 10 10 10 10 1	SAL 17 77	
Contraction of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second		

	a <del>m</del>		1						त्व्य				:;					1111	<del>;;::</del> ;;	<del>n</del> n							<b></b>						
	15				E.	Ъ.		H	ЩЩ	Щ		11	Hit	Ш	<u>111</u>	<u>h-</u>		1-1	Ī.	7.7 7			·			14 	·; +		4				
		í lu			5.1		鬪		<b>I</b> h.]		1.1			ini)		<u>111</u>	31	1	Γ.	Ξ ^{LI}		<u></u>			-	=						Ξ.	
	ШĽ		IШ.					H	ЩI			Ē	#	<u>, i</u>		1	- 3	1111 11-		ЦI Ц	<b>5</b> -	11	Ľ,		Ρ,						hΞ		
5.1	百							, <u>1</u> []		rth,		H	E.i	į I	Ē	1. 1.		ū.	년 1 년	E"		ΞĘ,	Ξ.	11					閆		1		111-21
			١.				늞		7.11	h in	59	-11		ΞĿ	i				14				:	-	-4-		1.7.		厅	1		1 1	
			鼲		5						Η					12			-	÷	11	-		тщ.		÷.,	i tr	-			Ē÷;	1	<b>H</b>
						-										<u>  -</u>							-	<del>ا ت</del>	-			·					
											Щ					<u></u>			- -	33	1	-							F	μĘ		<u>-</u>	
			Ŀ,		1111			H.1						_	-	1- 1	ШĨ	-			÷.,					-					Ē		
	<b>.</b>	<u>.</u>				-		1											1	-				- <u>f-</u>		- #	1	=	E	<u>E</u>			. 744
	ų.,				L				7. H	Ш,	罟	1			5.	ΞŦ.		·•	臣	=-		<u> </u>	1	٠.	-		-		15				
		1	12				21	-			<b>.</b>				1.1		Ēr			=				'	T.		<u></u>	E.	-5	V.		ΞΞ	
		11				-	1											1-1-			Ē			Ē	-		<u>.</u>	=	<u> 1</u>	1			-===
										111					i.			÷.		Ē	-						E				-		
	i -																=					1	=	-		=	=	١.	-		ĒΞ		-Hà
		15					111			<u> </u>										<u> </u>		<u> </u>		12_ 7 [			1		=0	<u> </u>			
											H								E				-				E	<u></u>	Ē	<u>N</u>	Ē		
	1					94	l ini				:	11-11 			-	2				+	115	1	E.		4		E	E	1	1	EE.		
	iii,		14			Ŧ					-	<b>,</b> I., <u>1</u>		<b>#</b> -	E.	Į.	2	Ξ		Ξ	<u> </u>		Ē	<u>=</u>	Ē	ir ::		Ξ	Ē	Fir,	E		
	R					. ci							i <u>m</u>	r.,		Ł		1			Ē	1	[4	ŧΞ.	Ē		<b>;</b> :	E	E	1	E		
	Щř	44		F.							14	<b>F</b>	16	Ē.,		<b>1</b> ±,		-	-	,			-	E.	E.E	E	E		F				
						-												+						ΕĒ				Ē					
	ii.																-	1					1	÷į		-	==	****	ŧ		=,	-	
	丧			-									E		μ.,	=	-	-			E	E	-	12			Ì	1	ĻΞ	E			
	4										1		E						Ξ		- 11°			;;;;;;;;;;;;;				=		ţ			
			Ζ,								141		-	÷	=	E			1	=			ΞĒ	-	EŁ		÷=	<u></u>	E	1	13		
	ΞX			T.H				冒	E			=			ЪЩ.				F -		F-	E	Ē-	ì	E	7.	ГЦ.	1-1	1=	-	踻	<b>F</b> -1	
								L.	14							-	ца <u>г</u>	f		1	Ē		E	-	ť9	1	E2	L.			R	E	
		15					1			4		1	1.3		=		Ē	I .;	Ŧ	Ξ÷	E		Ē	E	$\cong$	K	ΕŤ	<u>a</u>	E	<u>.</u>	q .	1	FT
	Υļ δ		13		1			E			****		Ē				E-	1 11			=	2		P3			6.1			Ē			F III
		15	13		Ē				HI,	甲			=	E		E;	E	=			-	1, 1		-	÷,	=		Ē	Ë.		R		
	֖,															-	<u> </u>	<u> </u>			-		-		=	<u> </u>			i.		ll.		
		ΞQ.	5				1		ļ書	<u> </u>		=	E		E		<b>F_</b>	=	<u> </u>	-	1-	-	=	H	Ë=			12-	1	11	H.	; <u>.</u>	
									,=E								<u>-</u>	Ē	Ē			F -					11	<u> </u>	1	¢	Ē	=	
	15		12					ĽΞ.	u			<u> </u>	14		E	1	1.	j.'⊞		Ë-	-			1-1	12	***		1=	Ē	2			
		2								ĮĮ,	-11 TU	=	Ē			<u> </u>	=	-	Ē	1	-		[•]	1			5	1					
								in:	Ē	f-Ξ	4	E.	Ē			L.	. =			<u>+</u>		E			43	ι.,		ļ£.;		1			
	<b>H</b> ';				L.		1.1	E		=	-			ŧĒ	Ξ.	ŧ- :	E.	1.1.5	E		1:		ΪΞ	E	E	P	R				E		
								<u></u>						L.	<u> </u>	12	-	<u> </u>			1	E	Ē	I.				2	1	<b>1</b>			
						1.71	Ľ			Ē			E	1	[jii	Ŀ.	1.1		E	E	Ē	Ē	=	Ē		Ē	2				E	Ē	Fil
<b>H</b>						-71		Ē		E	<u> </u>	=	1	łĒ	E		17	÷.		Ē	-	畠	<u>h</u>	Ħ	Ē		H	Ŧ					
<b>H</b>				17	11			H	-			<b>Ë</b> .	₽	<u> </u>	臣	E			H	-	-	Ē	-	4.		Ē		<u>t</u>			Ŀ		
		Ē			h			<b>.</b>		É	1	hi.		E	E	<u>m.</u>	1	E		1=	E	E	Ē	<u> </u>	-	13	S	-	-	4	E	E	
		Шŋ.		12	1	Ŀп		E	Ē.	122	=	<u> </u>				<u> </u>					Ē	-		E	Ē	ļ.,		lā	Ē			L.	
									E				5.	ŧË		-		1 <u>-</u>			E	E	E	1-	-	1	Ė	Ŀ	F	Ē	E		
				L.	hh		Ľ.		H	Ē'	÷.	i in	Ē	ŧ.	Ē	II.		6		Æ	•			1-	ļ		6.2		=		hΞ	5	
					hi	ii,	17		P	==	E				Ē	E	1	÷.		F	F	<u>.</u>	E	[=	E		P.	HE.	E			E	
			il:	1	E			E	<u>rsi</u> Ka	<u>prot</u>						128	t=	<b>1</b>	1			1		F.×	=	1=	Ē	11:	Ħ		E		T.E
							F	'n		F.	-	ц <u>.</u> 1. П	į.	E		15					6	F		Ħ		1	F		9=		E		- IQ
			Ē						F.	<u>t</u>		Ē				E				1-	Ē	<u>.</u>	-	5	Ĕ	Ē	<u>.</u>		F				
				E.	F.		Ē		匚	LI.		1	Ë				<u> –</u> –	Ħ	Ë-		E		E	Ľ-	E.	ŧĘ	Ë.	13		Ë.			₽.‡Ÿ
						ĽЩ	H	μΞ	臣	-		<u>.</u>	-		ŧ.	Æ		E			Ľ.	Ē		1	1. 1:	÷.					1	Į.	
<b>H</b>		da	1-	<u>h</u> ili		L.H.	ŧĒ		8-i	22	1	P	÷.		μĒ	77	ĘĽ,	12.3	Ē	÷.	Ē	2	<u>re</u>	يد م تيسيۇ			1-	E			E.		
		1	F-	ħ.,	HB2		2	28	25	15		1	Ø.,	國	凸	γ,	Z	<u>e</u> k	P.	17		K	10		D				Ľ	13	E		日
					1.0		Luf-		Ē		±1	1aí	F				1.	i.		Ē	E	1. 17		1	127	1. 1	+r	= :	F		17		
					E		E	E	Η,	1	Ē	E,		Ľ.	E.	E	E	E		-		-	E		-	i.i					Ь.Б		
			. تشتار	17,71	1				I	11.7.1		1-1		1111	1.11	للتبنة		<u> </u>	124-			1111	<u></u>				1		022		1111		

۱

2

1014

140

'¥

ille cifeire.

			· · · · · · ·	
		<b>a</b>		
		- <u>S</u>		
				S.
		 		and a straight with a straight
			- N -	
XXX			ŢΫ -	
		6		
	144-14-14-1			
			6-	
			6	
			6	

		-2
		N
	192-3	
	402 d	
	<u> </u>	
	- E.E. Sunit Provide	

al its lice and a second second

			me	HIR	T.	and the	ΠŦ	n filt	1419	Jarg taal	EHT!"		е. т <u>а</u> ц				<b>vada</b> ti	
			Ęф	<u></u>	<b>1</b>		444	1	μĘ _r		E.E.	-13			<b>₽.</b> ₩			
			μŦ	Щ. ji	<b>.</b>	L.		ЩĘ				<u></u>	1	lant.	di di Tita			
			Hil	167	<u>t</u>	b + 1	1II	권극	in s		E.L.	上主	E i i	1		11.11		
			li-it	-111		- I.,		日日	- 1 -	: <u>1</u> 73		1 F 4		mu -	13		Filli	
				713			1.4	14	1	-			+ +					
					<u> </u>		i al		TE:	日戸	my r		<u> </u>	PH				
				<u> III (</u>			<u>, "</u>		-		1	<b>⊨</b> #=						
	s., 11-1			=			E a li					E + 1						
	<u>i                                     </u>		= <u>-</u> 14				124.	<u> </u>							2.11			u lli
					11	. f±	-					F ==					FEE	
	2			-[-					#_		1-25		三十二	E   -				
			1	<u>-</u>			<u>1</u>				白麗宇							
					£_4			11	-			- 21						
	, <u> </u>	主主主		<u> </u>		7			Ē	4 . H		<u> </u>		1. 1.				調査
				TE-	÷	<b>F</b> - <b>F</b> -	1-1		E		Citri C	<u>r = </u>	555-1	日志				
					1-1-1	E 17	-1	=	11		THE T	F===						
				<u> </u>		H.F.	En j.	-	4		P====	- 1.2	1					in na
				睅				=h#	<b>-</b>								( <b>.</b>	
				- <u>_</u>	E				<u>.</u>									
			1 - F		1.2	1.4		-	+			P====		<u> </u>				
	Lin-E	EE.	-	. T			1-1	-			1	I=	F=	1	II 1		世世	HER
	ET	11-7-7-7-			4			-19	眝		FT:	<b>1</b>						ЦH.
			-	<u>طل</u> ان	4- ⁴ -	-	t-t	1	<u>i</u> ti									
				<u>ع</u>			<u>Fi</u>	-										
	E		1.31															
		IFH, E	E.				T	-	1.	1	日生							
				-1-	<b>u</b> .	-	1.1		Ŧ					E I P			N DE	
				E	E ;	H-F		1										
			Ē		ŧ -			Ē				i i i				li il i		
	KHU	-		<b>-</b>	يندو م <b>يتعرب</b>		· · · · ·	÷Ēž	1					-05				
								- 211	1-				$\Delta =$			<b>1</b>		
	<b>S</b> (1 -=			- i-i	E	- jent									45.6	725 E		S.H.L.
	W.F.						1	-1		<u> </u>								
				T.	مذريبة ه					-1-1								
	14 <b>-</b>					1			÷-	<u> </u>					1511			
			<u>l</u> ine i		<u>h #</u>		1:1							L				
						1.11	15	-1-	H.	ΓĒ		EI			1	1272		
					1		1-1						- <b>*</b> -		-			
						7== -:			- <u>t</u>				E		1.1			
				-	<b>;;;;;</b> ,		扫	7.7	<b>1</b> -	in tair			Fi	Ē				
				-			<b>∔</b> =‡			<u> </u>	1 1							
				Ę.	د مان		<u>[</u> ]							日田				
	- =		<u>.</u>	-1-	1	1. 4	1-1-1				1 11				1-0-			
				1-1	-	12 4	13-1				ET.		r ier					
						F H	T		ir-		T-È							
				-	Ţ			-	f -					Ē				
				<u> </u>			HT.	4		تسلق حما	<u>i la la la la la la la la la la la la la </u>							
					1,1-				-F			Ŧ			1 1 1			
						• -	f,	-	ŧ;			F		F_ 1=	FG			<b>三</b>
				- H	1 1			I -						===			la find	
PERCENTER I		ET_		4	1	mine	<u>ti oj</u>		Щ.		1	0- 14-4 -e		ri				
L - Ministeries	Here attack		a.J	NE.	+	<u>بې</u> ېسې	軠		ti s		F			<b>F</b>				
	Ant Inter	+*	1	<u> </u>	=	ļ.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<b>f</b>						ladia	*****				
		ļ.	F	* **		8			1÷:	· +				F 22.2	11111	1	171121	*****
			-11		1		1.1	in the s	<del>مب</del> کرد	ha inai								
					1			<b>H</b>	Ì.	11				1				
					1													
					1					7/5				0 - 2 - 2				
							10		谷	22	29.7 297			2 7 7 7				
							10		谷	22	29.7 297							

للعف طلاقتهما المغال

and a sub-sector and a sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector of the sector

whether the state whether the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s

				-		 
			it, i Last			
					空于理	444
					EFEE	
				TI LI II II		1. T
x						
				india a -	Σ.	
					C.	
					FT JE	
						軍甲
					1	
	<b>7</b>					
						1.114
						7.111.61
					<u> </u>	
				E Francis		
	· · · · · · · · · · · · · · · · · · ·					
	in in the second					
			2.200128.07			
	the set of the set			2.21 . 22		- Milet
	HURLE I	₩ <u>₩</u> ₩₩		Helder to the	H. F. Mart.	

24 - Protein

MIRTIN .

11 and 11

-----

į

144

- 🤉

		배지 어머리의 귀엽이 나오는 지원으로
등을 비밀도 비용을 통을 하는 것을 통		
	776, jan (* 1967)	
	N- O	
	मिल्लान्स र की रसे की दान	
to d production of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s		
		ogolektole i k
	1 - Charlennenien	
		\$####\$**#\$\$###\$\$###\$#\$#\$#\$#\$#\$#\$#\$#\$#\$#
		\$####\$**#\$\$###\$\$###\$#\$#\$#\$#\$#\$#\$#\$#\$#\$#

$$(C_{D_{o}})_{CL} = \frac{\sum_{i=1}^{n} (F/S_{o})}{q},$$
 (10-2)

where the force F and the aerodynamic pressure q are known for any t.

Shown in Figs. 107 and 108 are the drag histories for two drops, each cf a five-parachute cluster deployed at 130 KEAS. A comparison of these histories reveals them to be fairly consistent. Since the drop associated with Fig. 108 had the highest cluster load (Fig. 108f) its drag history was selected for use in determining the maximum loads imposed on the six-chute 135-ft-diam. cluster. Because there was no way to differentiate the drag histories of the five chutes, the drag of the cluster had to be used.

Figure 109 illustrates how this cluster drag was simplified by linearizing. The necessary zero reference time is chosen as the time at which the payload leaves the aircraft and is concurrent with event 5 as shown in Fig. 108. In this figure, the time difference between even 5 (force transfer) and line stretch is 1.5 sec. Hence, the cluster drag history can be replotted as that shown in Fig. 110.

## b. Maximum Cluster Loads

With a drag history for the six-chute 135-ft-diam. cluster, it is now possible to determine the total force that this system experiences in its operational mode. The operational mode is defined by a deployment speed of 150 KEAS and a release altitude of 1500 ft above the terrain. The payload is defined by a gross rigged weight of 50,000 lb.

Five computer trajectory runs were made, one each for cutter delays of 2 through 6 sec. From studies of the El Centro drops contained within this report and from the results of Section 6, it is permissible to assume that the skirt exits the bag at about 1.4 sec after the payload leaves the aircraft. It is at this time that the cutter is actuated. In addition, it is permissible to assume that line stretch occurs at about 1.5 sec after the payload leaves the aircraft and that it takes approximately 1.8 sec after line stretch to reach the reefed state. Table 2 lists the cluster's drag history for the different cutter delays.

-----

: ]

Évent		Line stretch Reef Disreef	
( c _{Do} c) cL •	د. ۲	н с с с с с с с с с с с с с	74,000
(c ⁿ ) ch	0	00000000000000000000000000000000000000	0. ೮5
for	6 sec	чис очи изало о и чис очи изало о и и и а а и о ч о ло и о и о и о и о и о и о и о и о и	0.001
Xit *	5 sec	, , , , , , , , , , , , , , , , , , ,	•
<u>ب</u> م	4 sec	, , , , , , , , , , , , , , , , , , ,	
Time, sec	3 sec	4844444 9867998748 984449987 9844789998798	100.0
	2 sec		

"At 1.4 sec after exit, it is assumed that the canopy skirts leave the containing bags, initiating the cutters. At 1.8 sec after line stretch, or 3.3 sec after exit, it is aswumed that the cluster has attained its reefed configuration.

	ЩĘ.		1	ŀ	<b>.</b>		ļ.		17	π,	<u>"</u> [#	1	F		PE.	<u>H</u> I	r II	ł., 1	+	囘		n,	H		24		412		<u>1</u>	-	H.
		11	1.	Ţ	Γ.Έ	Ц,	Πí	Ϊ.				E	1.11	h.		1	뒥	7.1			ШÌ	¹ ii		iii	÷ij		-			ź	111
					-7.			14	1	Ξ.			1		1	<u></u>	IE-1	<u></u>			Шİ	. <u>.</u>	trui ·	ī.		-	-771				
		-	- -				L.			-11	r -	<u></u>	1-1		111	F.,								<u>.</u>					1		1
	fr'	22		<u>†:</u> i	11	1.	۴r	" L		<u>,</u>		<b>1</b>	Fri		睉	<u>h</u> #	14	ΗF.	Į	4	E		FUL:	鼬	- 1			ti "	1.1		Ē
	diff.	តិដ្ឋាត	1E	Ţ.,	-21	I.I	-	а.	<u>н</u> .	- 11		l:,-1	<b>T</b>		1,4			1	F,	e i	щ	1			1		Ľ		FI		Ξ
	10H			1.1	5	15	ij.		1			ËĦ	<u> </u>		h ii	1.1		È,		1			ni	Ŧ	Ħ	=		==	-++	ΞĪ	Ē
				<u> -</u> #				<b></b> .					1-1	117 <u>.</u>	1111.	121-1		_		1.1 			11111						-	-	ат. Т.
	清田			1		H-	Ē			- 14	11.			L H	ĒŸ	詽	an		<u> </u>	- 51	ηЩ	J.	-	Щ.	<u>.</u>	· ·	1	••••	ia 'i		
H.F.			1.11	94			17	1.5	11	Ξ.		15		FI'I	归	HU.				-	г	<b>.</b>	-Hr	ŦĽ	-1			1	1 .	27	0
	1.5	i i fan				1.	E		7	171-	:		曲	÷ē,	İŔ.	144	h TT	iii i			mit	31	Pul	=			- 1			-	
				Sir			1.1			in i	***				i.					-		_							+		â
						17	24	$\mathbf{Z}$		<u> </u>			67		<u>lañ</u>	11.	1.1	÷.,	= 1		-4	<u>5</u> 1		<u>1</u>	-#		-177	1	a -4	1	
		i di lui	11.			<b>11</b>	1	뜨님		E	52	Щ	Ŀ.	HS.	linc.	<u>h II</u>	ait,	1.	1.1			ΞŰ	n:14	51	- 41	Ĩ.	E	, '	1		•
			<b>.</b>		E.	1.11	2	-117				1	tai	12	1.4		=	ī I	=	-			-	i h	1	-		-			-
		· • • • • • • • •					·			-		11			h.	1		11.7			-	-	****	<u></u>			- 01	¥	. 4		
in the				ijer		<i>2</i> –		Ë,		==			<u>.</u>	N.	ES	117	1	FT		75	+ 11	a:	ゴボ	-		-	-	E	14		÷
					1.24		莳	11.2	4	27		<u>-</u>	5	$\mathbf{x}$		ii:	211			- 1		17	<u> </u>	<u>-</u> E		₹,]	-				
1.110			li in		r III	F	Fai		<b>h</b> hi		nt, r	-ur	Ç.	L.II	E.	(.m		Ξ.	F	퍀	<b>j</b> iil	<u>,</u> ,,,,		Th		ari		_	1_1	-1	
	氏岩			Ξ¥	H.		-						H.	X	F#	11				1.				=Ľ	=						
<u>nu n</u> i	1180		Hij.	<u>fi</u> H	ЩЩ	ΞIJ	<u></u>			- 1	=]]		ιų.	5	<u>F.</u>				<b>-</b>			нŗ:	i i i	-1		:==	<u> </u>		·. 1	•	
HEAL	323		y.	EP 1		H	11	FF.	谭	5	Ŧ	<b>.</b> ,		X	ES.	Ē	-		-1	34		11		÷Ę	14	H		111-	11		-
					p#I	Ģ							ĘУ	12	E.		= +				1			F.	=	~	ΞΠ	<b>a</b> .	1	Ēŧ	-
		14		11-11 11-11		ii.				-		Lini	Ľ.	E.	<u>4. 1</u>			1	-			_		Ŧ		<u> </u>	-1111		19 344 29-14		
	1414		L.E				끰	1-1	E	Ŧ		-11	Ľ÷.	1	1				<u> </u>	-		1		<u>#</u>	=#		<u> </u>		<u>h</u> I		11
用前面	<u>P i</u>		1-1			т <u>р</u>	1.1	£	Filt	51		-	王	ĘУ	3				= 1	무부	-				di i			Ξī	丰		
				1		1	÷1.		1	1		i h		1174	H.		r.#	±	1			-1	-	T		<b>.</b> .]	Ē	1.	1.0		÷
illi ili		ii: "#	ΗE.		H <u>H</u>		-				-				11	- <b>-</b>		ri:		<u>-</u>		11						5 1 7	<u>21</u>		÷
			1.	11.13		ЪЩ	3-				1	Ξ.		11-1	iu	<u> </u>	,# <u>1</u>					-	₩µ=	ŦF	* <b>*</b> :‡:	-4		=1		±[	
1111			1.1	114	11.1		G.		1	Ξī	+	I.F			Ŧ			11	1.7	123	1	1-	- F	FIF.	<b>.</b> .,	11		111	ΕŦ	Ŧ	ĒĮ
HALL	1		121	Ē	<u>a</u>	المرز	-						+- +		1.2	Ē	-	-		ĘĘ				нi,	Fi	ii[		-	3	2	ĒĨ
1							ιΞ.			÷												_		_				<u> </u>	<u> </u>	_	
	1		11.1		11	Ε.				2		1				-	31	÷									<u>i di</u>	<u> </u>	1 ² 12		
10111	1211	- E E			1		5'1	, , ,	<u>م</u> د '			12	E	<u> </u>		E			E	-	-#	- 1		E				3.			\$
3445	11111	<b>F</b> T∄	IT		1.01	1-1		-		۱IJ			ΞI	<b>P</b> II		H	21944	22.0		-	5.1			-	-			٣Ì	52		Ē
		hinin.	Ē	Ħ		त	-		-71	-				i i i		-			-	=		<u> </u>	-								
		1444	117				+-1	T.	4.4		_			1.	1				- L	1		Ξ	-111		ш		-2	囶	<u>-</u> 7. †?	-	222
	1		144	цт <u>,</u>	i d	-	-11		13	멸		-	-	-1-		<u> </u>		-		-	<u>.</u>	57	<u>   </u> ]	۲H	<b>1</b>	∵#Ì	-	<u>.</u>		Ŧ	Ľŧ
		Г, Щ	- 11	<u></u>		1			-17	- 1		-	* 11	÷			****			HE C					-	- 1		F			Œ,
		-	1					-		-	Ē											-	1				=			=	
huin	분권					<u><u> </u></u>	41	Ē				<u>.</u>	1	+ +				-	=			-	1.1.1	ΞĒ	_			<u>1</u>		Ξþ	ĒB
	1-1	di Titti	15E	₽.	=	<u> </u>			- 1	-		-			11			-			= ]					Ŧ]	Ľ	1-1	댺	÷#	#
<b>FINDIS</b>			EE				11	- 1	- H	Ξ	5	_		Ξ.	-	-							= +1			1	-19	Г.		T	È
											-		=			- 1 -		-	Ťţ			-				-1		uiii		-1	÷
				÷.	124	<u>      </u>		_	- 1	- 4						7			<u> </u>	1			211	- 2	<u>.</u>	-1				- 1	-
Teller		Hit	E	<u>#</u> 3	<u>'</u>		<u>+</u>	-1	-		-		1111			t	1	=	14			3		13	Ē.	<u> </u>	<u>=</u>	ЧЩ	H		ij
	1					=	÷	33		-	- 1	E	ц.,	-				3	<b>F.</b> .	Ŀ.†	Шij			邗	ų,		=1		ШĒ	œ١	
hif.	127			<u>.</u>	Hil	F.	-Ti	, वर्त							Ē	<u> </u>		=			<u> </u>	uil	Hitti		#	1	-¥	ŧŧ		<u></u> _F	Ŧ
			<u> </u>				1=		1	-+	-12		in			<u> </u>		≣		#	-	_	ΞŦ.			<u>.</u> F	ل تيون ا		iiinr	ΞĒ	Ŧ
	HEE		면		-4	ΞŦ		$\equiv$	:=:}	-1	1	-		<u>HH</u>		<u>.</u>				=		-1	1, E		<u> </u>	÷‡	<b>F</b>			ы₽	-
					<u>.</u>	Ħ	4	=	=	-1				=		-	1.44	्म्	1	mł.		믭	Ę	H.	17.	÷	=	1		Ē	121
EEF E	i di		<u>F</u>		j#T	<u>i</u> tt	H	21		=	i, ii	١.	1.1	<u>.</u>			=	б					1.11		Ħ	-	Ē	-		Ξĥ	H
	<u> </u>				<u> </u>	Ξ.	-					Ē.					:	EĮ	<u> </u>	-	<del>5-1</del>	<u> </u>		1			5			1	<u>بت</u> د جو
耻罪			<u>F</u>	= 1	<b>H</b> -1	5	. 1			5	Ξ	-				ΞĘ	1	4	76		-1	-		-	<u> </u>	<u> </u>	ΞŦ	<u>, 1</u>	≝ŀ	4	1
<b>Hit</b>		到已	83		14	55	1	44	ШĘ.	-38		Ħ	= 1	353	<b>F</b>	<u> -</u>		4	1 ²⁶	4		-54		ц.	ŧ.	-	L.,		-	Ŧ	Ħ
且曲	11-1-1		1±		<u> </u>	-	-1	FĴ	T et		6.71		1		21	- 1	1	ΞŦ			±†	-11		12	Ŧ	7	₫.		LAT AL		H
<b>H</b>	E	17 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	h j			5		<u> </u>		Ħ		=						-	-		Ŧ	-		-	***	34	=				Ë
蜡膳	<u>titti</u>	ة و 10% بيتنية	ŧЩ	<u>L 4</u>		Щ			曲	1-T		-	_	1	_	51		=	-		mb.			<u>-</u>	-	<del></del>	<u></u>	=ľ		-	<u></u>
In the	臣머	<u>= 1</u>	<u>þ</u> 2	Ē		<u> </u>	44	-1	Ш	Ľ.	Щ				1	弄正	i ili		-	=	1.	=		<b>F</b>		-	-	. III	÷μ	H.	ų
	扁	-1-		5	뛬	Ē.	÷	F	±;		ΞÌ	Ħ	1	E	F	ТĘ	D P				Į.	Ħ	ш <b>.</b> :		Ē,			<u>i</u> t	ШÈ	1.1	₿
niii -	ii.		₽Ŧ	t di	-	1-1							글북		T	=đ		-	= 1		-	1		-H-	****	-					#
旧明明	<b>正計</b>	1.1.1	L.	_1		ШŤ		<u>* 1</u>			Η¥		ŧ¶	Ē, I	Ŀ,	E'		4	÷÷	Ē	ΥĽ	ΞĹ	ыE	1	ØF.					生	Ē
Harffitt	iiii Se	271	20	SX	247	14		20	R.L		1	725	理	訪	72	ΞX	ΞŻ.	ŝź	77,	Ъľ	Ē	€₽	20	#Fi	Ч	-\$	<b>4.</b> ];	ŧ.		-	H
	FDI	L I F	啊	-	udi.	HI.		Ed			EH		- 11		1		54	Ē		-		1		11-	Ī	÷‡	li	ń.	핖		H
	<b>m</b> +	<u></u>	H-	-	÷	ŧ		#1	ĦŦ	Ш.					111-			4		Ē	-12	-		-	#	÷.		₩.	1	4	Ë
*****	· · · · · · · · · · · · · · · · · · ·	- 1- ]	L 7	11 - T	-437	말물문		44	보네		-	<b>H</b>				#"l	4 44	FI		-1	<b>*</b> ‡1	r-t,	apr.	11:	172	:4:	T F	· •#ī	ŧΩ	i:H	ιŧ£

ીય છે. સાંસિયમાં સાથ છે.

				<u></u>	1 101000-0-0-0		
		1111 <u>-</u>			t t t till		
		<b>WLF   -</b> ] -	1	5. 7. 944			
			-1: -1: -1:		i i Tippi		
		Finit Links					
		빠르 님 _					
		<b>1.</b> 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	Full Har	nii'n'i <u>u</u> i-4,	411 11 11 11		
En un en la ka	Labachine	pili in the second		Billion 11 -		<b>二非非正</b>	
							RU
	p <del>1. 11</del>	1					
			<u></u>				
		H		- ''''''''''''''''''''''''''''''''''''			
			<u>Si</u>	<u></u>	11 T 1 E . L 5		
	Esta Mer						
Elist had a distant		1 1	1	E 11			
			2				- AGE - INISA
			1.43		-:		
	1.4		- 11 183				EREPTOR
	Z	1 = = =				THE LINE	THE DR. HINKING
				S			- Automation for
				X			
	<u> </u>		1-4 15 2 1981		4		
	1354-18			<b>X</b>		Palater	
	1 at 1.4				11		
				Sure Link			
					-		
			- S W	S			
Hellinger algebra				257.18 11	12 Fait - 1 a	EP12.7 E	
E-14/2-14 -1 -1 - 10-01	1			Constitute of the			
						h - 1 - h - T	
						FILLEP.	
						LIL ISSAN	
						17	
	47611°1  †		A many succession to a state state				
	IN-HEN IT	1-1-1-1-1					

Figure 111 depicts the maximum forces experienced by the cluster for the various cutter delays. As can be seen, the maximum cluster load is associated with the 2-secdelay cutter. This 144,000 lb exceeds the maximum allowable 2.5-g requirement, that is the maximum allowable 125,000 lb. For this reason, it is necessary to consider the 3-secdelay cutter. The maximum force is reduced by 31%; and the altitude at which the cluster attains a perpendicular attitude to the horizon is very near that for the 2-sec cutter. Hence, for reasons both of force and of altitude, the 3-sec cutter appears desirable. It becomes necessary, however, to consider the selection of a cutter on the basis of how it can contribute to uniform inflation of the individual chutes comprising the cluster.

Classically, the cutter is used to reduce the loads imposed on a parachuce during its opening. For largediameter parachutes dropped singly, a brief cutter delay, such as 2 sec, contributes very little in this respect; however, it does tend to assist in making the opening more uniform. But for a cluster of large parachutes, the proper cutter delay can reduce the maximum cluster load, both for reef and disreef. During reefed inflation, the cutter enables the individual parachutes to catch up to one another and disreef at nearly the same time. This reduces the peak disreef force experienced by any one parachute. For this reason, it appears that a 4-sec cutter delay is the most desirable. Although the alwitude at which the -90° path angle (first vertical) is attained is some 100 ft lower than that for either the 2- or 3-sec delay, the lower reefed force in the cluster and the potential for a lower maximum disreef force in the individual parachute are significant reasons to incur the altitude loss.

With regard to reefing ratio, available data are insufficient to incorporate the effects of reefing ratios into the computer trajectory runs. Since the drag-history data are based on full-scale drops utilizing reefing-line lengths of 19.1% of the G-11A reference circumference, it is logical to apply this ratio to the 135-ft-diam. parachute. Hence, all computer runs for the 135-ft-diam. parachute cluster were premised on use of an 80-ft reefing line.

#### c. Maximum Load Experienced by Any Single Parachute

Section b (of Section 10) dealt with arriving at the maximum cluster load. This section attempts to arrive at some idea as to the magnitude of the maximum load

				5.28
		CARACTER STREET		
		furt t		
			K. * 152 X	6273 BUES BUS / / / Second
			1.1000	
			in the second second	
	G			
	-A1			
		68782	C - 2024 X 50	
<i>1161/20</i>	111, - 60	TANKA USS	TEE COLOR A	
	P12 5928	T X 11 8 8	F ### ###	
	1223/1712	REFERRED	R.C. 1667/445	
	- 647748	CLASS ASK I	- CLEISTER E	
		STAT IN THE	18 A. 18 A.	
目的自己自己	1 - THE TRUTH HERE - 1144	······································		
		手推手指击的力	백년달, '부분	

And Party States

Contraction of the second

experienced by any one chute comprising the cluster. This load will then provide the basis for the design of the six 135-ft-diam. parachutes so far as material strength is concerned.

Reference to Fig. 108(f) reveals that, for this particular full-scale drop, the maximum cluster load of 73,000 lb occurred at approximately 2.9 sec after line stretch (event 5). The force traces for this drop show the load to be distributed among the five parachutes as follows.

> $F_{1-5} = 24,500$  lb,  $F_{2-5} = 23,900$  lb,  $F_{3-5} = 10,200$  lb, (10-3)  $F_{4-5} = 9.000$  lb,  $F_{5-5} = 5,500$  lb.

From the pattern of the load magnitudes, it appeared that two chutes led the opening process, two chutes lagged somewhat, and the fifth chute lagged even more.

The question now arises as to whether the maximum individual parachute load would be higher if only one chute led the inflation process. Reference to Fig. 107(f) reveals that, for this particular drop, the maximum cluster load experienced was 62,900 lb and occurred 2.5 sec after line stretch. This load was distributed among the five chutes as follows.

$F_{1-5} = 22,000$	lb,	(10-4a)
F ₂₋₅ ≈ 13,100	1b,	(10-46)
$F_{3-5} = 12,500$	lb,	(10-4c)
F ₄₋₅ = 9,600	lb,	(10-4d)
$F_{5-5} = 5,700$	lb.	(10-4e)

From this pattern, it can be seen that one chute led the inflation process, two chutes lagged somewhat, and the remaining two lagged even more.

A comparison between the distributions of the maximum cluster loads in these two drops among their respective parachutes indicates that, regardless of whether one chute or two lead the inflation process, the maximum load experienced by any one chute will be of the order of 24,000 lb. This reasoning implies that, for any drop, it appears that at least two chutes will be opening approximately together. If these two chutes lead the inflation process, they share the major portion of the cluster load; if they are behind the lead chute, then together they share a portion of the cluster load approximating the load of the lead chute; finally, if the two chutes lag, then the major portion of the cluster load is distributed among the remaining three chutes, and in no way can it be expected that the load of any one of these three chutes will be greater than the above 24,500 lb.

If, for the drop that experienced a cluster load of 73,100 lb, it was assumed that the inflation of the five chutes was completely uniform, then the maximum load seen by any one chute would have been

$$F_{1-5} = \frac{73,100}{5} = 14,600 \text{ lb.} \tag{10-5}$$

This means then that, because of nonuniformity of inflation of the five chutes, the lead opening chute experienced a load 68% greater than if the opening had been completely uniform. It must be realized that this drop, utilizing only a 2-second-delay cutter, was for all practical purposes a nc-cutter recovery system. Hence, nonuniformity in the inflation of the five chutes was at its worst.

In the system arrived at, that is the 135-ft-diam. six-chute cluster, a 4-sec-delay cutter was judiciously chosen on the basis of its effect in reducing the maximum cluster load. Reference to Fig. 112 reveals that the maximum cluster load is predicted to occur at or near the initial stages of the reefed configuration. Assuming that, prior to reef, the nonuniformity factor for cluster inflation is 1.68, then the maximum load felt by the lead opening chute during this stage of inflation is

$$F_{1-5} = \frac{1.68 \times 101,335}{6} = 28,300$$
 lb. (10-6)

		27		
		Ert Render Fille	ter fre et gegin ernellete bei	
Š.				
	SS.			
			6 - 7	
	× 1			
	1			

the second water and the second second second second second second second second second second second second se

Figure 112 also reveals that the maximum disreef load is approximately the same as the reefed load. However, owing to the 4-sec cutter delay, it is felt that the nonuniformity of inflation after disreef will not be so severe as prior to reef.

### d. Reliability with Regard to Maximum Rate of Descent

As was seen in Section 9, the requirement that the rate of descent not exceed 28.5 ft/sec under various conditions of altitude and temperature determined the effective drag area required of the cluster. The parachutes were sized on the basis of careful analysis of existing full-scale drop-test data concerning largediameter, vent-pulldown, clustered parachutes and on the basis of a nominal descent rate of 24 ft/sec STP; this corresponds to a descent rate of 27.3 ft/sec at the worst-case condition of 5000 ft altitude and +100°F, which is still 1.2 ft/sec under the maximum allowable.

Extensive analysis of clustered parachute drops on the Project Apollo program indicated the standard deviation ( $\sigma$ ) for the rate of descent during a given drop and over a series of drops at about 30 ft/sec is about 0.8 ft/sec (ref. 6). Analysis of the drops listed in  $\neg$ ple 1 shows that, for these drops, the standard deviation of the average rates of descent varied from more than 1.0 ft/sec for drops of single chutes to about 0.63 ft/sec for clusters of five. This latter information is illustrated in Fig. 28, where it can be seen that, for a six-chute cluster, the deviation in rate of descent is projected to 0.63 ft/sec. Hence, the 1.2-ft/sec design margin indicated in the previous paragraph corresponds to the 1.90-value; this means that the impact velocity would be expected to exceed maximum in only one drop out of 19 under worst-case conditions. Therefore, the reliability for worst-case operations (such operations are rarely likely to occur) is approximately 95%.

#### 11. PRELIMINARY DESIGN

The purpose of the preliminary design is to establish an order-of-magnitude strength requirement for the material that is to be selected for use in the parachute assembly. It must be pointed out that the establishment of parachute theory is extremely difficult owing to the very nature of the structure. It is a flexible device, constructed from a fabric, and operates in a highly dynamic mode. So far as stress analysis is concerned, it is not necessary for Pioneer to attempt to conduct a high-order analytical study. Rather, some basic assumptions are used that, when coupled with experience and intuition, lead to "ball-park" results.

#### a. Maximum Canopy Stress for a Vent-pulldown Parachute

Use of the vent pulldown leads to opening-shape characteristics somewhat deviate from those normally associated with the standard parachute. This is indicated in a study of movie film depicting deployments of single and clustered G-llA vent pulldowns from an above-terrain altitude of 1500 ft and a release velocity of 150 knots. The general opening shape for all the canopies in these drops is depicted in Fig. 113. This shape is most definitive at or just following full reef, the point at which the parachute loads are at a maximum.

Figure 113 shows that, at full reef, the canopy exhibits prominent domes ("false vents"). The true vent is, of course, pulled down to the skirt area. Hence there is no physical means for the canopy to bleed off pressure. This accounts for the relatively quick opening and resulting high loads associated with the vent-pulldown parachute.

## (1) G-11A Cargo Parachute

ALCON ST. COMP.

The G-liA cargo parachute under study herein has a reefing ratio of 20%; that is  $D_{\rm R} = 0.2D_{\odot}$ . This then implies that, at reefed state, the parachute diameter is 20 ft. Figure 114 shows the results of scaling from the frames of the previously mentioned movie film. As can be observed, the scaling was reasonably accurate. Hence, from this figure it can be established that the high-pressure area of the canopy is located approximately 40 ft from the skirt of the canopy. Figure 115(a) shows that the width of any individual gore at this location is simply

 $2 \times \frac{10}{50} \times \frac{32.5}{2} = 6.5$  in. (11-1)

Since the canopy has 120 gores, this means that, at the location of the high-pressure areas, the circumference can be calculated to be

$$120 \times 6.5 = 780$$
 in. = 65 ft. (11-2)

From scaling the film, it was determined that the false vents lie on a circumference of a circle whose diameter is approximately 18 ft [see Fig. 115(b)]. Hence, the circumference is

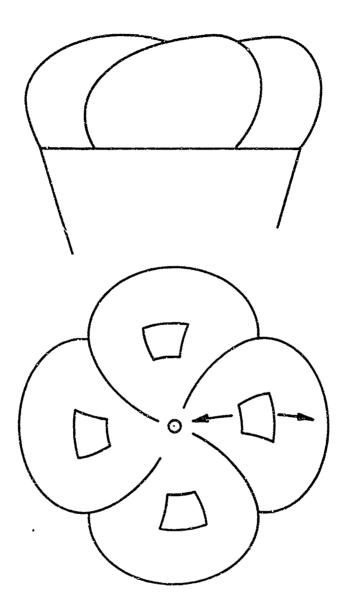


FIGURE 113 – GENERAL SHAPE CHARACTERISTICS ASSOCIATED WITH THE OPENING OF THE G-IIA VENT-PULLDOWN PARACHUTE.

i

-

a -----

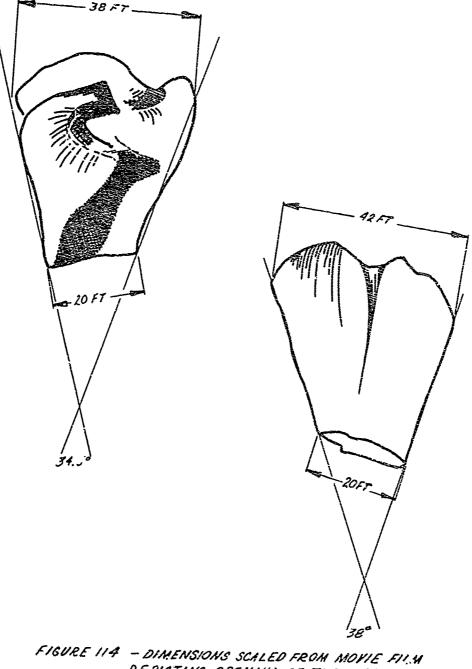


FIGURE 114 – DIMENSIONS SCALED FROM MOVIE FILM DEPICTING OPENING OF THE G-IIA VENT-PULLDOWN PARACHUTF



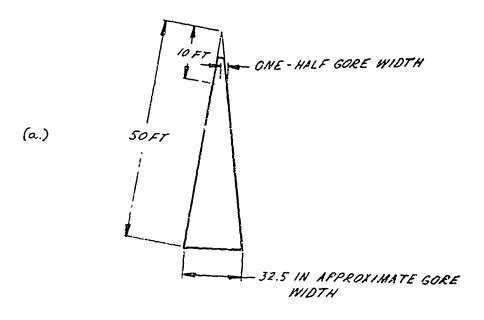
*

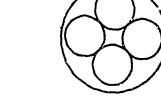
~

4 114

A Contraction of the second second second second second second second second second second second second second

AND A SAME AND AND A SAME AND A SAME AND A SAME AND A



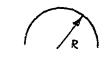


(b.)

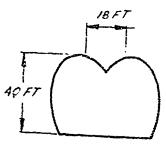
- ---

ĩ

INALIZZARI DE DA SUBSTITUTI



(c)<u>,</u>



/ R.g.

FIGURE 115 - APPROXIMATE DIMENSIONS OF SHAPE ASSOCIATED WITH THE OPENING OF A G-11A VENT-PULLDOWH PARACHUTE.



#### $18\pi \approx 56$ ft.

The difference between the above two circumferences is 9 ft. This means that, at the reefed state, there is some 9 ft of fullness, or, for the case of four "false vents," 2.25 ft per false vent. This amounts to some four gores per high-pressure area that have not yet unfolded.

The stress in the canopy is now determined by assuming that each of the high-pressure areas lies on the dome of a hemisphere of 18 ft diameter. Viewed this way, the maximum stress simply becomes the hoop stress; hence,

$$aR = 30 \times 9 = 270 \ lb/ft = 22.4 \ lb/in.. (11-4)$$

where q is the aerodynamic pressure, which El Centro droptest data reveal to be approximately  $30 \text{ lb/ft}^2$  at attainment of full reef.

Figure 81 shows that the strength of 1.6-oz cloth (used for the G-11A canopy) is approximately 70 1b/in.; however, use of a 1-in. main seam with the canopy gores sewn on the bias increases this strength to approximately 106 1b/in. [refer to P-3171 (revised Feb. 1968), Appendix A, p. 3--Pioneer's response to Natick's RFQ DAA G17-68-Q-0113-011]. The ultimate margin of safety for the maximum canopy stress (accounting for a safety factor of 2.0 and a design factor of 1.5) is

 $\frac{106}{22.5 \times 2.0 \times 1.5} - 1 = \pm 0.57.$ (11-5)

It can be concluded that the above approach to the maximum canopy stress present in the deployment of a vent-pulldown parachute is conservative because, in practice, the main seams carry a significant portion of the parachute load and consequently cut into the smooth hemisphere. From Fig. 115(c) it becomes obvious that, since R_g < R, the product of q and R is reduced.

(2) Prototype Parachute Assembly ( $D_0 = 135$  ft)

For a cluster of six 135-ft-diam. ventpulldown parachutes, it must be assumed that the highpressure areas each lie on the dome of a hemisphere of diameter equal to

160

(11-3)

The aerodynamic pressure at the time of maximum cluster load (at or following attainment of full reef) is approximately 35 lb/ft² (arrived at through trajectory study). Hence the maximum canopy stress is

$$_{q}^{R} = 35 \times 12.15 = 425 \ lb/ft = 35.4 \ lb/in. (11-7)$$

To apply the safety factor of 2.0 and the design factor of 1.5 means that the required strength of the canopy is

$$35.4 \times 2.0 \times 1.5 = 106 \text{ lb/in}.$$
 (11-8)

b. Selection of Material for the Prototype Parachute Assembly ( $D_0 = 135$  ft)

(1) Canopy

The canopy material, on the basis of the above calculations, must be 1.6-oz cloth. Use of a 1-in. main seam with the canopy gores sewn on the bias is necessary. Hence, the ultimate margin of safety for the maximum canopy stress (accounting for a safety factor of 2.0 and a design factor of 1.5) becomes

 $\frac{106}{106} - 1 = 0.0. \tag{11-9}$ 

Figure 80 shows that, for a 1.6-oz cloth using a l-in. main seam, the weight of the canopy of a 135-ft-diam. parachute can vary from 165 to 180 lb, depending on the number of gores used in the canopy. The G-llA, a 100-ftdiam. parachute, uses 120 gores, therefore its D /N is 0.83. Applying this ratio to the 135-ft-diam. parachute results in a maximum canopy weight. On the other hand, a minimum canopy weight is associated with a D /N of 1.18; however, this means that the suspension-line Strength requirement will be increased considerably. Hence, for the 135-ft-diam. parachute, it appears that a ratio of D /N = 1.0 is the most efficient from the point of view of canopy weight and suspension-line strength. This means that the 135-ft-diam. prototype parachute will have 136 gores.

(2) Suspension Lines

Equation (10-6) yields 28,300 lb as the maximum load expected to be experienced by any one parachute assembly in a cluster of six. Reference 8, p. 378,

101

expresses the strength requirement for each suspension line in a parachute as

strength = 
$$\frac{Fjc}{Zuoek}$$
, (11-10)

where F and Z are the maximum force and number of suspension lines, respectively. The terms j, c, u, o, e, and k are all factors to account for safety and design. They are defined in Section 2.

From Eq. (11-10) the suspension-line strength requirement is found to be

$$\frac{28,300 \times 2.0 \times 1.055}{136 \times 0.8 \times 0.95 \times 0.35 \times 0.95} = 640 \text{ lt.} \quad (11-11)$$

Figures 82 through 84 show that Pioneer Spec. EI-4137 is the most efficient suspension-line material. Figure 84 shows its cost to be about 60% that of MIL-C-5040, Ty. III. Hence, the ultimate margin of safety, accounting for the above safety and design factors, becomes

 $\frac{650}{640} - 1 = +0.02. \tag{11-12}$ 

Using 136 suspension lines means that the 135-ft-diam. prototype parachute assembly will have to have 14 groups of suspension lines. There will be 10 suspension lines in each of all but four groups, spaced 90° apart, which will have nine suspension lines.

#### (3) Riser, Riser Extension, and Center Line

Since there are, at most, 10 suspension lines per group, the strength requirement for the riser becomes

$$640 \times 10 = 6400 \text{ lb.}$$
 (11-13)

Figures 85 and 86 show that MIL-W-27657, Ty. III, is the most efficient selection. The ultimate margin of safety, accounting for a safety factor of 2.0 and a design factor of 1.5, is calculated to be

$$\frac{6500}{6400} - 1 = +0.02. \tag{11-14}$$

Since there are 136 suspension lines and the strength requirement for each is 640 lb, the strength requirement for the riser extension becomes

$$640 \times 136 = 87,000$$
 lb. (11-15)

Figure 91 shows 4-ply webbing of Phoenix WN 1811 to be sufficient. The ultimate margin of safety, accounting for the usual safety and design factors, becomes

$$\frac{87,000}{87,000} - 1 = 0.0. \tag{11-16}$$

From the results of El Centro drop tests, it has been ascertained that the center line experiences a maximum load approximately 40% of that of the parachute maximum load. On this basis, the center-line strength requirement, accounting for a safety factor of 2.7 and a design factor of 1.5, becomes

$$28,300 \times 0.40 \times 2.0 \times 1.5 = 31,600$$
 lb, (11-17)

Figures 88 and 89 show Pioneer Spec. EI-4148 webbing, when used in the double ply, to be the most efficient. The ultimate margin of safety, accounting for safety and design factors, is

$$\frac{31,600}{31,600} - 1 = 0.0. \tag{11-18}$$

## c. Consideration of Center Line as Primary Loadcarrying Member

There is one point in the preliminary design that has not been made; that is, if the center line experiences 40% of the maximum individual parachute load, then the suspension lines experience only 60% of this load. Equation (11-11), when the maximum force is now 17,000 lb, shows the suspension-line strength requirement to be 384 lb. Figures 82 through 85 show Pioneer Spec. EI-4151 to be the most efficient selection for the suspension line. The ultimate margin of safety for this selection is

$$\frac{460}{384} - 1 = +0.20, \qquad (11-19)$$

n bits anna 10 fe dao

This margin accounts for a safety factor of 2.0 and a design factor of approximately 1.5.

To continue the above reasoning, the required strength for the riser becomes

$$384 \times 10 = 3840$$
 lb. (11-20)

Figures 85 through 87 show MIL-W-27657, Ty. II, to be the most efficient selection of webbing for the riser. The ultimate margin of safety, accounting for a safety factor of 2.0 and a design factor of 1.5, becomes

 $\frac{4100}{3840} - 1 = +0.07. \tag{11-21}$ 

With regard to the riser extension, its strength requirement remains that indicated in Section 11.b.(3) since it must withstand approximately the total load experienced by the individual parachute.

#### 12. CONCLUSIONS AND RECOMMENDATIONS

On the basis of this study to determine the most suitable design for a prototype cluster-parachute recovery system for a 50,000-lb unit load, it can be concluded that with respect to:

#### Steady-state Drag

(a) the vent-pulldown technique improves drag characteristics by at least some 20% over the same parachute with no vent pulldown,

(b) the increase in drag owing to the vent pulldown cancels the loss of drag owing to clustering when comparing the drag of a cluster of six vent-pulldown parachutes to the drag of the same single parachute with no vent-pulldown,

(c) the maximum drag (fficiency occurs for a ventpulldown parachute system when the ratio of suspension-line length to parachute diameter ( $L_{\rm g}/D_{\rm g}$ ) is between 1.15 and 1.5 and when the vent is located above the skirt so that the ratio of the center-line length to the parachute diameter ( $L_{\rm g}/D_{\rm g}$ ) is approximately equal to  $L_{\rm g}/D_{\rm g}$  + 0.10, and

(d) the minimum steady-state drag coefficient for a cluster of six vent-pulldown parachutes is approximately 0.85;

#### Design

ي جه الساقي ال التي

(a) six parachutes represents the most efficient number to comprise the cluster,

(b) the vent-pulldown technique is currently the only practical means available for touching down a 50,000-1b payload using a reasonable-size cluster and reasonable-size parachutes,

(c) a cutter delay of 4 sec is necessary to keep the maximum force experienced by the cluster within reasonable tolerances without incurring severe altitude losses,

(d) each chute requires four cutters,

(e) the maximum force experienced by any one chute in the six-chute cluster is approximately 28,300 lb,

(f) the aerodynamic pressure at the time of maximum force is approximately  $35 \ lb/ft^2$ ,

(g) the time required for the parachute canopy skirt to leave the bag is 1.4 to 1.6 sec following payload separation from the aircraft, and

(h) the time required for the parachute assembly to become completely stripped from the bag is 1.5 to 1.8 sec following payload separation from the aircraft.

On the basis of these conclusions, the following is recommended:

(a) six 135-ft-diam. vent-pulldown parachutes,

(b)  $1.6-oz/yd^2$  cloth for the canopy,

(c) 1-in. main seams with gores sewn on the bias,

(d) a suspension-line-to-parachute-diameter ratio of 1.25, and a centerline-to-parachute-diameter ratio of 1.35,

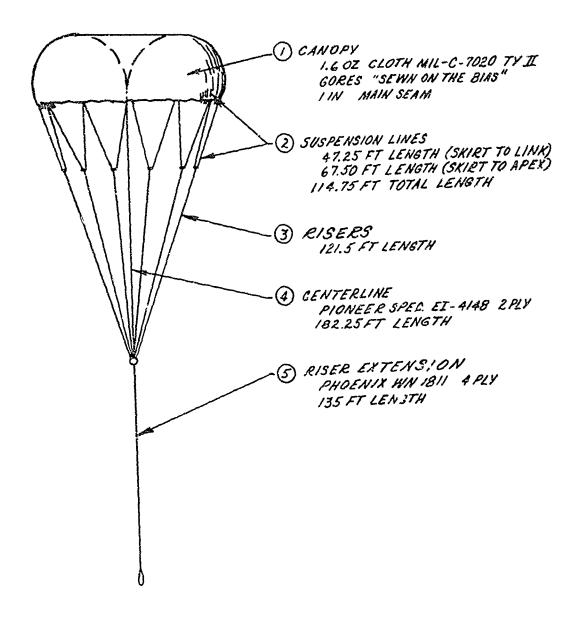
(.) a riser-length-to-parachute-diameter ratio of approximately 1.0,

(f) 4-ply webbing of Phoenix WN 1811 for the riser,

(g) 2-ply Pioneer Spec. EI-4148 webbing for the center line,

and

(h) one of the four systems shown in Table 3.



• • •

5

بار از ا

2 - - -

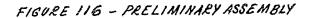




TABLE 3 -FOUR PARACHUTE ASSEMBLIES	IGNORING CENTERLINE AS PRIMARY STRUCTURAI, MEMBER		CONSIDERATION OF CENTERLINE AS FRIMARY STRUCTUAL MEMBER	
	MODS TO 5-114	1816 BROTHER" TID 6-11 A	MOD5 70 3+11 A	"BIG BROTHER" TO G-11A
(INOPY 1.6 02 MIL-C-7020 TYE GORES SENIN ON BIAS WEIGHT = 175 LB M 5 = 00	. ~	$\checkmark$	~	~
SUSPENSION LINES PIONEER SPEC EI 437 136 LINES, ASIGNT - 56 - R 14 GROUPS 10 GRAMPS - 10 LINES/GROUP 4 GROUPS - 9 LINES/GROUP H 5 = + 002				
MIL - C - S940 TYTE 160 LINES, WEISHT = 68 L8 16 GROUPS 10 LINES/GROUP M 5 = + 0 09		V		
PIONEER SPEC E I - 4151 136 LINES , WEIGHT + 34 LB NS = +0 20			~	
MIL - C - 504C TYI 160 LINES, WEIGHT • 51 LB 14 S = +0 11				~
RISERS MIL - W-27657 TY 3 I LEGS, WEIGHT = 5048 M 5 = 1 (202	$\checkmark$			
MIL - N- 27657 TY 3 16 LESS WEIGHT = 58LB MS = +019		$\checkmark$		
MIL-H-29657 TV2 14 LEG5, IVEIGHT = 39 L8 M 5 = +007			$\checkmark$	
NIL-H-27657 TY 2 16 LEC:3 NEIGHT = 45 LB M 5 = 10.26		4		~
RISER PHOE NIT WN 1811 4-PLV I ITEM, WEIGHT = 75 LB M 5 = 0.0	<i>✓</i>	1	1	$\checkmark$
CENTERLINE PIONEER SPEC EI-4148, 2-PLV I ITEM WEIGHT = 31 LE M S. = 0.0	1	1	1	~
TOTAL WEIGHT	387	407	354	377

## 13. ACKNOWLEDGMENTS

The authors wish to acknowledge the support contributed through reviews and suggestions by Messrs. Arthur W. Claridge, Roman W. Maire, and Stanley Shute, all of the U.S. Army Natick Laboratories, Mr. Claridge being the project officer.

The authors also wish to acknowledge the contribution of Professor H. G. Heinrich and Messrs. Eugene Haak and Robert Noreen, all of the Department of Aeronautics and Engineering Mechanics of the University of Minnesota.

Finally, the authors extend their gratitude to Messrs. James D. Reuter and William J. Everett of Pioneer Parachute Company, Inc., for their guidance, assistance, and cooperation; to Mr. George Kern of Pioneer for his technical editing consultation; to Mr. Samuel Zwick for his drafting assistance; and, finally, to Misses Karen Burke and Sharon Quinn for their typing.

#### 14. REFERENCES

1. U.S. Army, Natick Labs., Request for Quotation DAAG17-68-Q-0113, 31 Oct. 1967, as ammended by Amendment No. DAAG17-68-Q-0113-001, 22 Jan. 1968.

2. Stone, J. W., "The Performance of Large Cluster Parachutes." Paper presented at Univ. of Minn. Course in Aerodynamic Deceleration, Jul. 1965.

3. ---, J. H. Wilder, and C. J. Silcott, "Analysis of the Free-Flight Tests of Clustered Large Parachute." Vol. II of <u>Investigation of the Controlled Opening of Single</u> and <u>Clustered Large Parachutes</u>, <u>SEG-TR-66-</u>, <u>Technology Inc.</u>, Oct. 1967 (unpubl.).

4. ---, and J. J. Schauer, "Wind Tunnel Tests of Theoretically Suggested Model Chute Modifications." Vol. III, <u>ibid</u>.

5. Knacke, T. W., and L. I. Dimmick, <u>Analysis of Final</u> <u>Recovery Parachutes B-70 Encapsulated Seat and the USD-5</u> <u>Drone. Final rpt., Contract AF33(616)-8371, Space Recovery</u> Systems, Inc., Apr. 1962.

6. Stone, J. W., <u>Terminal Rate of Descent Analysis</u> - <u>Apollo, Gemini and Mercury Projects</u>. Northrop Ventura rpt., Mar. 1964. (unpubl.).

7. Myers, J.R., Col., USAF, "Load Recovery," in "Letters to the Editor," <u>Aviation Wk. & Space Technol.</u> 88:2, p. 106, Jan. 8, 1968.

8. USAF Flight Dynamics Lab. Research and Technol. Div., Performance of and Design Criteria for Deployable Aerodynamic Decelerators, ASD-TR-61-579, Dec. 1963.

9. Toni, Royce A., <u>The Dynamics of the Unfurling</u> Process of a Parachute System Mortared from a Conveying Body with Application to High Altitude Systems. Langley working paper 439, Jul. 1967.

10. ---, The Dynamics of the Unfurling Process of a Parachute System Mortared from a Lody with Application to Systems Tested at Ground Level. Langley working paper 464, Aug. 1967.

11. ---, "Theory on the Synamics of Bag Strip for a Parachute Deployment Aided b. a Pilot Chute." Paper presented at AIAA 2nd Aerodynam. Deceleration Systems Conf., Sep. 23-25, 1968.

## APPENDIX

## DRAG COEFFICIENT, INFLATION CHARACTERISTICS AND CLUSTER PERFORMANCE OF MODIFIED G-11A PARACHUTE MODELS

Ъy

H. G. HEINRICH, R. A. NOREEN, and D. J. HORN

۱

University of Minnesota Minneapolis, Minnesota for Pioneer Parachute Company

#### ABSTRACT

Wind tunnel experiments at subsonic speeds were performed to measure the drag coefficient of solid flat parachutes of the type of the G-llA cargo parachute with vent sections pulled down by means of a so-called centerline. This investigation covered also parachute configuration with varying suspension like length with various ratios of suspension to centerline length. A configuration with centerline was identified which is considered to be a nearly optimum solution in view of drag, canopy bulk, weight and simplicity. The drag coefficient of this configuration is  $C_{D_{c}} = 0.78$ .

The inflation characteristic from reefed to fully opened stage of the optimum configuration was studied without and with two different internal canopies. These experiments did not yield conclusive results, because the reefed stage was somewhat artifically reproduced by means of a rigid ring holding the canopy inlet open. This is usually the effect caused by an internal canopy, which beneficial action in other studies has been shown to exist during the very early phase of inflation. A further examination of this phenomena was beyond the scope of this study.

Optimum configuration parachutes were assembled to clusters of three and five canopies with varying total distances from canopy skirt to the confluence point at the load. Contrary to common experience, the drag coefficients of these clusters decreased with increasing characteristic It was furthermore observed that clusters with distance. longer characteristic distances performed random motion with a lower frequency than the same arrangement with shorter distances. Therefore, one may speculate that the fast moving clusters experienced an increase of drag due to interference of mass effects as they occur on rotating blade aerodynamic decelerators. The reason for this uncommon behavior may be a so far unknown effect of the centerline. It was also observed that the decrease of drag efficiency with these clusters was less than previously recorded. This fact may also stem from the postulated rotating blade A further investigation of this observation was effect. beyond the scope of this study.

# LIST OF SYMBOLS

The state of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s

с _{D0}	drag coefficient based on canopy surface area S _C
C _D Std	drag coefficient of the standard configuration G-11A
D _o	nominal canopy diameter
^D Std	drag of the standard configuration, G-11A
Lc	length of parachute centerline
L _s	length of parachute suspension lines
σ	statistical deviation from an average

۲

## DRAG COEFFICIENT, INFLATION CHARACTERISTIC AND CLUSTER PERFORMANCE OF MODIFIED G-11A PARACHUTE MODELS

#### I. INTRODUCTION

The subject of this project is to study the drag and the opening characteristics of the G-llA parachute with various length centerlines and varying suspension line length with the objective to find the maximum drag under consideration of practically possible line configurations. In inflation studies the effect of internal canopies was also studied.

Parachutes representing the optimum configuration found in this phase were then combined to clusters of three and five canopies and the cluster riser length was varied from 0.5 to 1.5 and 2.5 D. The objective of this study was again determination of an optimum solution in view of drag and simplicity of the configuration.

#### II. PARACHUTE DRAG AND VARYING SUSPENSION AND CENTERLINE LENGTHS

## A. Approach

Exploratory tests for the determination of the optimum drag configuration of the G-11A were made on a model parachute in the open section of the horizontal return wind tunnel at the University of Minnesota (Fig. 1). Since the dynamic pressure in this section varies slightly, the drag coefficients were not calculated directly from the measured drag, but a ratio of drag obtained for each configuration to the drag of the standard G-11A configuration was determined. In order to convert this into realistic drag information, the drag coefficient of the standard G-11A was obtained by means of a smaller model placed in the more precise closed section of the wind tunnel. Introducing this drag coefficient into the previously obtained ratio should provide results with acceptable accuracy.

#### B, Models

greet to any no

For the exploratory tests in the open section of the wind tunnel, models with 120 gores and a nominal diameter of 40 inches were used. The suspension lines from the canopy were gathered into twelve groups of ten lines. Each of these suspension lines was 14 inches long or 35% of the nominal diameter (Fig. 2). From the group confluence point, a single line leads to the main confluence point of the parachute. The length of the twelve single lines was varied to form the different suspension line lengths required in this study; in the following, the sum of a single line length and the length of the individual suspension lines are simply called the suspension line length.

The small model of the G-11A was a 64 gore parachute with a nominal diameter of 12.75 inches. To form the standard configuration of the G-11A, the suspension line lengths were 12.11 inches or 95% of the nominal diameter. These suspension lines were not grouped, but ran directly from the canopy skirt to the main confluence point.

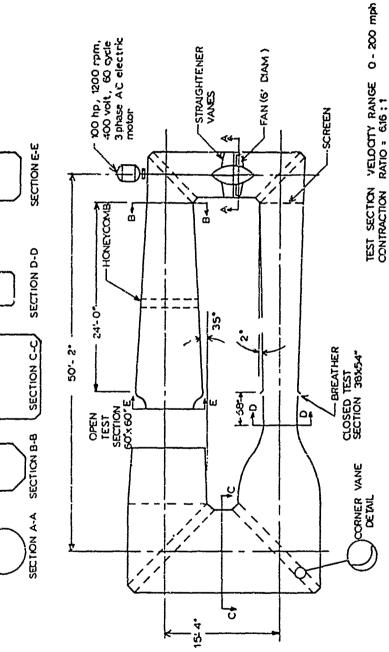
#### C. Test Apparatus and Experimental Procedure

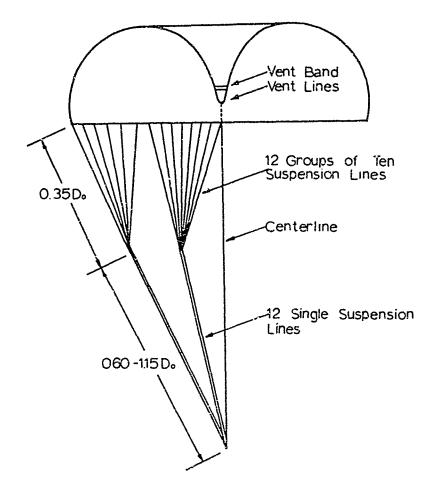
The 120 gore model of the G-llA was supported in the open test section of the wind tunnel by a guide wire suspended between two struts in the wind tunnel. The confluence point of the G-llA suspension lines was fastened to a force measuring cantilever beam attached to the upstream strut. The cantilever beam and the support wire were positioned so

. ŝ

and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s





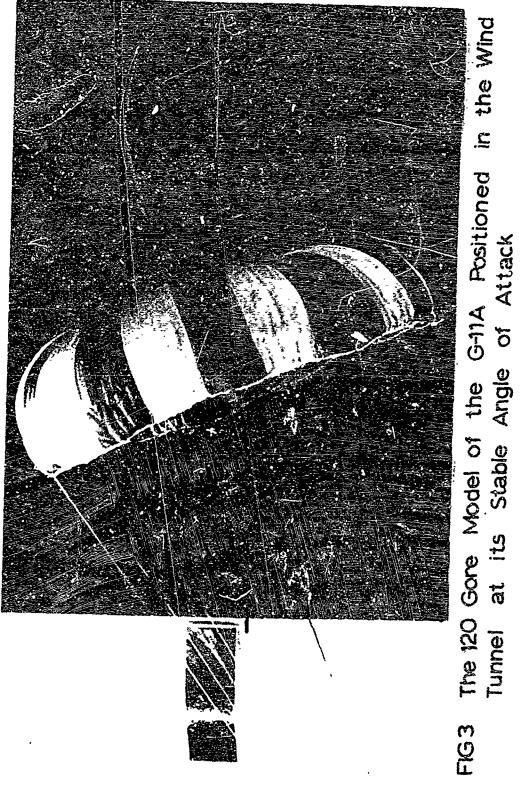


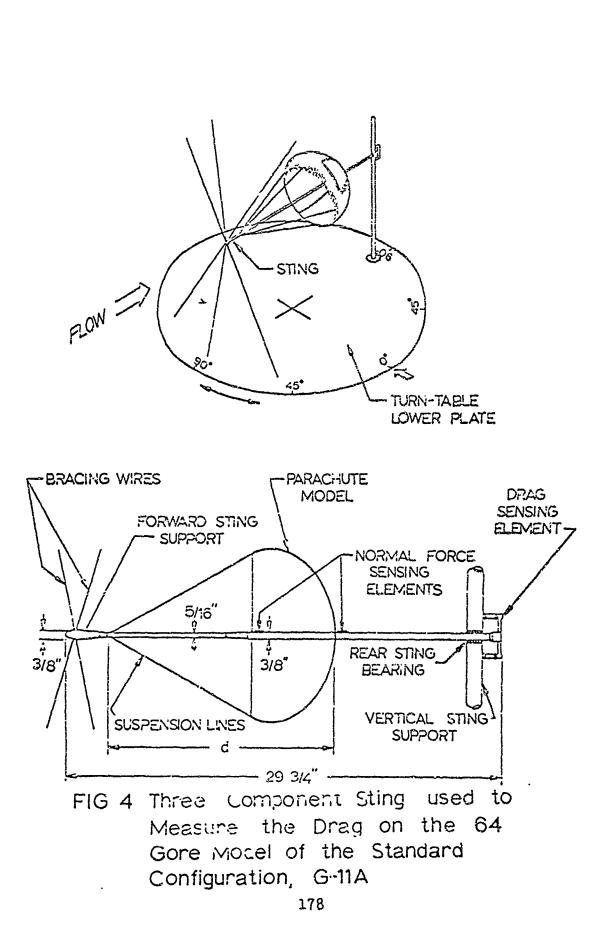
2

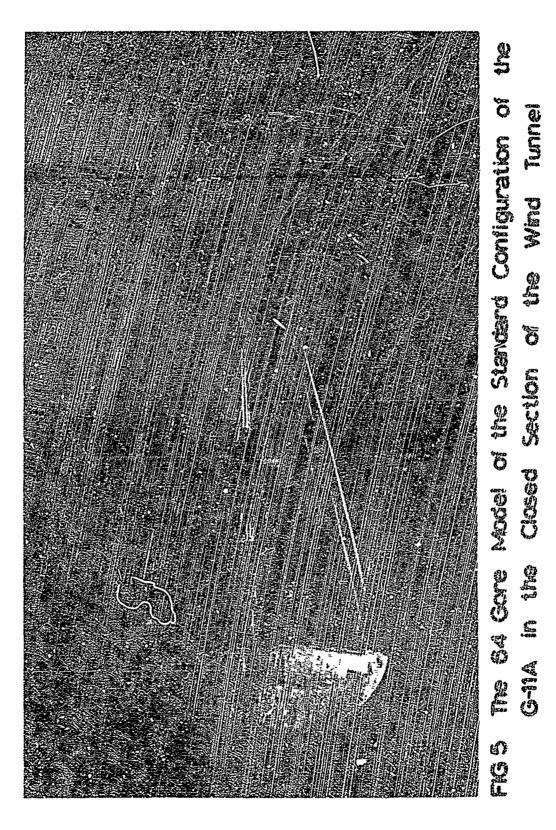
١

FIG 2 Suspension Line Arrangement for the 120 Gore Model of the G-11A 176

indur.







that the G-llA was allowed to stay at its stable angle of attack, trim angle, while the canopy still remained in the test section (Fig. 3). The centerline, which varies the position of the vent, was attached to the vent and the main confluence point. The lengths of the centerline and the suspension lines were changed, and the drag measured to find the optimum combination which would produce maximum drag.

The small 64 gore model of the standard G-11A configuration was supported in the closed section of the wind tunnel by a three component electric balance (Fig. 4). The angle of attack of the parachute was changed until the normal force vanished, at which point the drag was measured. This represents the drag at the trim angle. Figure 5 shows the 64 gore model in the closed section of the wind tunnel during testing.

#### D. Results

1. Drag Coefficient of the Standard G-11A Configuration

The standard configuration of the G-11A has a suspension line length of  $L_z/D_z = 0.95$ . The drag coefficient,  $C_D$ , for the standard G-11A was measured at three different dynamic pressures. Table 1 shows the  $C_D$  values obtained at each dynamic pressure. The standard value of  $C_D$  obtained and to be used in the determination of all other drag coefficients was  $C_D = 0.64$ . The drag on the Standard

standard configuration of the G-llA parachute was also measured on the 120 gore model in the open section of the wind tunnel. This drag was measured three times as a check at a dynamic pressure of 0.5 inches of water, and the average value, determined in this manner, is shown in Table 1. The drag of the standard parachute, used in all further calculations, is  $D_{Ctandard} = 15.32$  lbs.

2. Drag coefficient of the G-11A parachute with  $L_s/D_o = L_c/D = 0.95$  was found, in three independent tests with q = 0.5 in H₂O, to be  $C_{D_o} = 0.71$  (Table 2).

3. Different line lengths, but  $L_s = L_s$ , caused a significant variation of the drag coefficient. Table 3 lists the results of tests with five different lengths while Fig. 6 is a graphical presentation of the drag coefficient as a function of suspension line and centerline length. It

18v

# Table I

Drag Coefficient of the 64 Gore Model of the G-11A, Standard Configuration, and the Drag of the 120 Gore Model of the G-11A, Standard Configuration ( $L_s/D_s$ =0.95)

Configuration	Dynam1c	Dynamic Pressure, Inch 1120	1 11 ₂ 0	Average Drag Coefficteor
Coefficient	0.5	1.0	2.0	110717
Standard Configura- tiun of the 64 Core Model of the G-llA L _g /D _o = 0.95	0.64	0.64	0.63	9°0
Configuration	Dyramic	Dynamic Pressure, Inch H20	1 H ₂ 0	Avarage Drag
Drag (lbs)	c.5			(201)
Standwrd Configura- tion of the 120 Gore Wodel of the G-llA L _R /D _o = 0.95	15.32 15.41 15.23	******		15.32

## Drag Coefficient of G-11A Parachute with Centerline and Suspension Line Length Equal

$L_{s}/D_{o} = L_{c}/D_{o}$	Dia; (165)	D/D _{S,d} *	^C D ₀ **
(.9%	17.0	1.11	6.71
0.9	17.07	1.11	c.71
0.99	14.87	1.10	0.70

* * 
$$C_{D_o} = \left(\frac{D}{D_{\text{Std}}} \times C_{D_{\text{Std}}}\right)$$

Drag Coefficient of G-11A Parachute with Varying Suspension Line Lengths but Centerline Equal to Suspension Line Length  $(L_s = L_c)$ 

$L_{s}/D_{o} = L_{c}/D_{o}$	Drag (1bs)	D/D _{Std} *	°D ₀ **
0.75	16.3	1.06	0.68
0.95	17.0	1.11	0.71
1.15	17.9	1.17	0.75
1.35	17.98	1.17	0.75
1.50	18.40	1.20	0.77

$$C_{D_{standard}} = 0.64$$

* *  $C_{D_o} = \left(\frac{D}{D_{\text{std.}}} \times C_{D_{\text{std.}}}\right)$ 

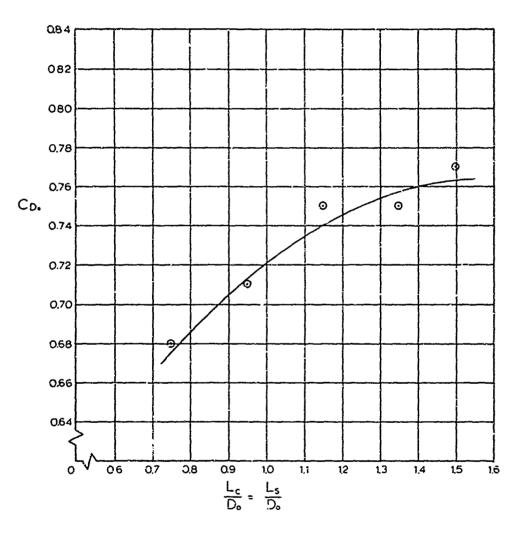


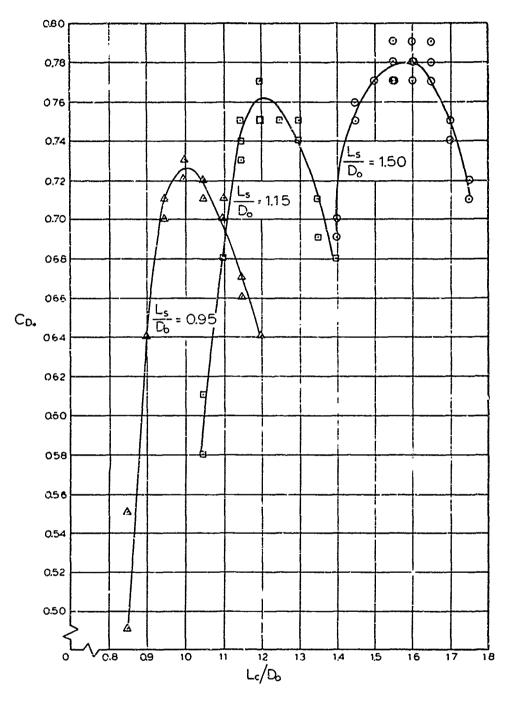
Fig 6 Drag Coefficient of the G-11A Parachute with Varying Suspension Line Length, the Centerline Being Egual to the Suspension Line

## Table IV

Drag Coefficient of G-11A Parachute with Varying Centerline Length but with Suspension Line Length Constant (L./D.=1.5)

L _c /D _o	Drag (1bs)	D/D _{Std} *	с _р **
1.40	16.80	1.097	0.70
1.40	16.61	1.080	0.69
1.45	18.00	1.170	0.75
1.45	18.18	1.190	0.76
1.45	18.03	1.177	0.75
1.50	18.90	1.23	0.79
1.50	18.44	1.20	0.77
1.50	18,51	1.21	0.77
1.55	18.50	1.21	0.77
1.55	18.70	1.22	0.78
1.55	18.90	1.23	0.79
1.55	18.70	1.22	0.78
1.60	18.60	1.21	0.77
1.60	18.90	1.23	0.79
1.60	18.70	1.22	0.78
1.60	18.86	1.225	0.78
1.65	18,95	1.24	0.79
1.65	18.72	1.22	0.78
1.65	18.90	1.23	0.79
1.65	18.42	1.20	0.77
1.70	17.90	1.17	0.75
1.70	17.70	1,16	0.74
1,75	16.95	1.11	0.71
1.75	17.35	1.13	0.72

* 
$$D_{\text{Standard}} = 15.32 \text{ lbs.}$$
  
 $C_{D_{\text{Standard}}} = 0.64$   
**  $C_{D_o} = (\frac{D}{D_{\text{Std.}}} \times C_{D_{\text{Std.}}})$ 



s^a

Fig 7 Drag Coefficient of the G-11A Parachute with Varying Center-Line and Different Suspension Line Length (L₁/D₀ = 0.95,1.15,1.50)

## Table 𝒴

Drag Coefficient of G-11A Parachute with Varying Centerline Length but with Suspension Line Length Constant (L_s/D_s=1.15)

L _c /D _o	Drag (1bs)	D/D _{Std} *	^C D ^{**}
1.00	10.60	0.692	0.44
1.05	13.90	0.907	0.58
1.05	14.3-	C.950	0.61
1.10	1( .3)	1.068	ζ.υδ
1.10	16.3,	1.068	C.c8
1.10	17.65	1.1,2	0.74
1.1%	17.52	1.144	0.73
1.20	18.55	1.211	C.77
1.20	17.80	1.162	0.75
1.2>	17.90	1.170	0.75
1.25	17.95	1.172	¢.75
1.30	17.95	1.171	0.75
1.30	17.76	1.199	0.74
1.3:	17.05	1.113	0.71
1.35	16.60	1.083	0.69
1.40	16.35	1.009	0.68
1.40	16,39	1.067	0.ú8

*  $D_{\text{Standard}} = 15.32 \text{ lbs}$   $C_{D_{\text{Standard}}} = 0.64$ * *  $C_{\Gamma_0} = (\frac{D}{D_{\text{Std}}} \times C_{D_{\text{Std}}})$ 

## Table VI

Drag Coefficient of G-11A Parachute with Varying Centerline Length but with Suspension Line Length Constant (L₂/D₂=0.95)

L _e /D _o	$Dia_{L}$ (105)	D/D _{Std} *	°D ₀ **
0,65	11	6.79	0.49
0,85	13.20	C.85	05
0.90	12.01	C.82	0.52
C.90	1,.40	1.00	c.64
(° <b>.</b> 97	17.07	1.11	0.71
C.95	رد. ۱۰	1.10	C.70
1,00	17.43	1.14	0.73
1.00	17.28	1.13	0.72
1.(-)	17.00	1.11	C.71
1,05	17.20	1.12	0.72
1,10	14.94	1.11	0.71
1.1.	10,80	1.10	0.70
1.15	16.10	1.C.	0.67
1.1>	15.90	1.04	0.66
1.20	15.32	1.00	0.64
1.20	15.41	1.006	0.64

* 
$$D_{\text{Standard}} = 15.32 \text{ lbs}$$
  
 $C_{D_{\text{Standard}}} = 0.64$ 

* * 
$$C_{D_o} = (\frac{D}{D_{std.}} \times C_{D_{std.}})$$

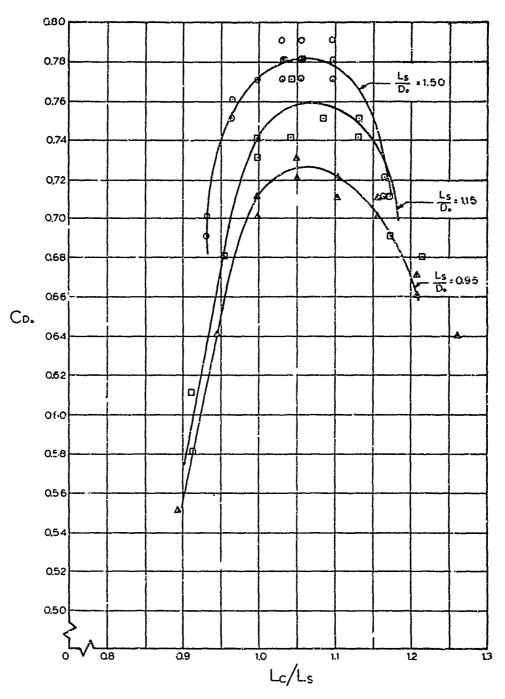


Fig 8 Drag Coefficient of G-11A Parachute with Different Suspension Line Lengths  $(L_s/D_0=0.95, 1.15, 150)$  and Varying Centerline to Suspension Line Ratios 189 can be seen that an optimum drag coefficient for this configuration occurs when  $L_c/D_o = L_s/D_o = 1.5$ .

4. The maximum drag coefficient with varying centerline lengths but constant length of the suspension lines, namely,  $L_{/D} = 1.5$ , was found through respective measurements. The results are listed in Table 4 and presented in Fig. 7. It can be seen that the maximum coefficient for  $L_{/D} = 1.5$  occurs when the centerline is slightly longer, hamely,  $L_{/D} = 1.6$ . With this configuration, the average drag coefficient amounts to  $C_{\rm D} = 0.78$ .

5. Additional tests with varying centerline length but constant  $L_0/D = 0.95$  and 1.15 were performed because the long suspension lines with  $L_0/D = 1.5$  are practically not acceptable. The results of these measurements are shown in Tables 5 and 6 and in Fig. 7.

In conclusion it can be stated that a configuration of the G-llA parachute with suspension lines somewhat longer than the standard length, and the centerline from 6 - 10%again longer than the suspension lines may be considered to be an optimum solution in view of drag, bulk, and simplicity of construction. Figure 8, which shows drag coefficients as a function of  $L_c/L_s$  with suspension line lengths as parameters, indicates this fact quite clearly.

## III. INFLATION CHARACTERISTICS

## A. Approach

The phase of inflation from reefed to fully inflated had been identified as the most important one, and an attempt was made to investigate this phase in detail. A parachute configuration was selected which appeared to be the optimum solution in view of the preceding studies, namely  $L_{/D} = 1.5$  and  $L_{/D} = 1.6$ . The inflation characteristics were studied with the centerline alone as well as with a centerline and an internal parachute. Two sizes of internal parachutes were used. Both internal parachutes were positioned such that the distance between planes of the inflated parachute skirts was 0.05 D of the main parachute. This position was selected in view of previous work as being the position at which the strongest effect of the internal canopy was observed (Ref. 1).

いましたないないないないないですが、 いっていていたい、 うちょうかいしい おうくちょう ちょう しゅうしょう やんざい うないかい

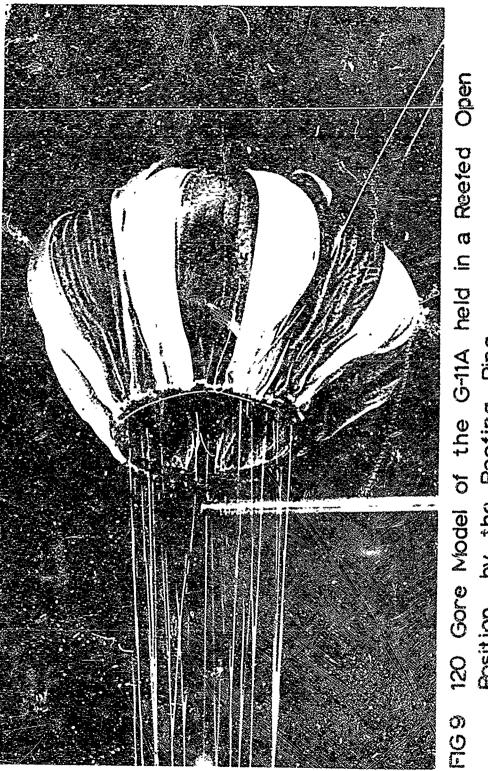
いいいい ちんちんかい ちょうちょう ちょうちょうちょうちょうちょう

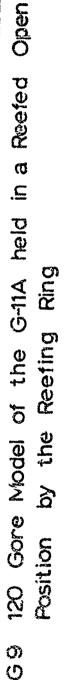
#### B. Models

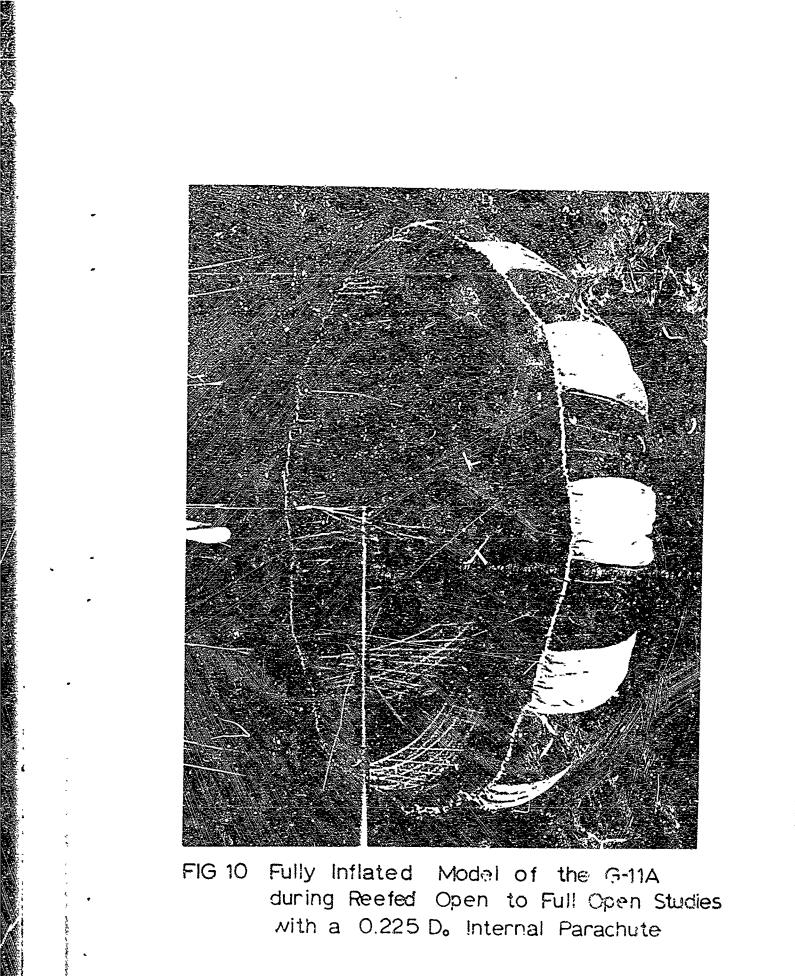
The parachute used was the 120 gore 40 inch parachute used in the drag tests. The two internal canopies were solid flat parachutes with suspension line lengths equal to their nominal diameters. The diameter of the internal parachutes was 22.5% and 15.0% of the nominal diameter of the main parachute.

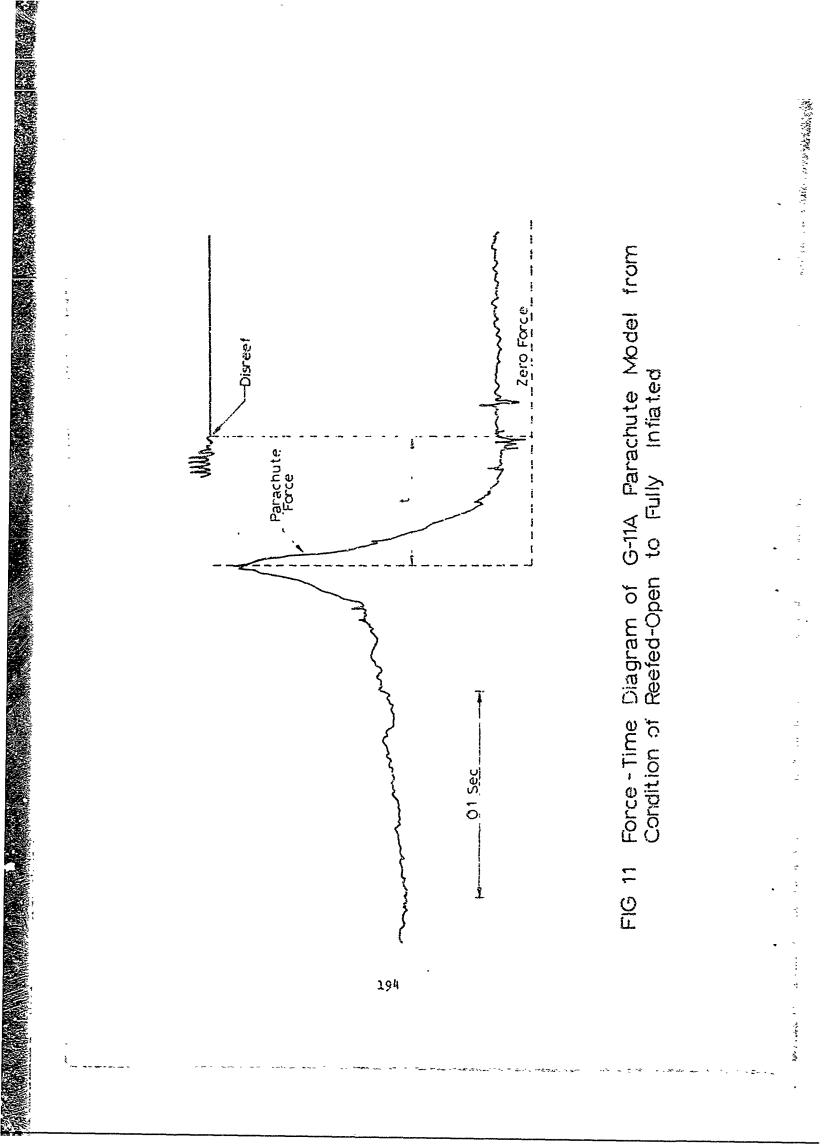
## C. Apparatus and Experimental Procedure

The parachute was supported in the wind tunnel in the same manner as in the exploratory drag tests. However, in order to hold the parachute in the ree."ed open position, a ring was constructed of a  $1/4" \times 1/8"$  steel band with a diameter equal to 15% of the projected diameter of the G-11A parachute model. The ring was mounted on a strut so that it could be positioned in front of the skirt of the parachute. To hold the parachute in the reefed position, the skirt was laid on the ring and held in place with two spring steel straps (Fig. 9). The straps were removed by an electrical impulse, allowing the parachute to inflate. Figure 10 shows the parachute fully inflated with the mounting ring visible. The opening time of the parachute was defined as the time from disreefing to the maximum force. At this time, the internal canopy is collapsed which is also shown in Fig. 10. Figure 11 is a copy of a typical recording taken by means of an oscillograph. The disreef point is indicated by the electrical impulse sent to the reefing ring straps while a force versus time trace is plotted by the oscillograph.









## Table VII

Opening Times of G-11A Parachute with Suspension Lines of 1.5 D, Centerline of 1.6 D, and no Internal Parachute

Configuration	Time (sec)
	0.058
	0.058
G-11A with	0.060
$L_{c}/D_{o} = 1.6$	0.057
$L_{g}/D_{o} = 1.5$	0.061
and no internal	0.057
parachute	0.058
	0.057
	0.057
	0.061
	0,052
	0.055
	0,0 <u>5</u> 3
	0.057
	$t_{ave} = 0.057$
	$\sigma = 0.002$

## Table VIII

Opening Times of the G-11A Parachute with Suspension Lines of 1.5 D, Centerline Length of 1.6 D, and a 0.15 D, and 0.225 D Diameter Internal Parachutes

Configuration	Time (sec)
G-11A with $L_c/D_o = 1.6$ $L_g/D_o = 1.5$ and a 0.15 $D_o$ internal para- chute	0.066 0.067 0.066 0.062 0.061 $t_{ave} = 0.064$ $\sigma = 0.003$
G-11A with $L_c/D_0 = 1.6$ $L_s/D_0 = 1.3$ and a 0.225 $D_0$ internal para- chute	0.061 0.060 0.060 0.060 0.053 0.060 0.055 0.055 0.055 $c_{0}055$ $c_{0}055$ $c_{0}055$ $c_{0}055$ $c_{0}055$ $c_{0}059$ $\sigma = 0.059$

196

(1) 3 (14) 20°

er and de la an

#### D. Results

1. Without internal parachute, the opening time of the parachute from the reefed stage to maximum force was measured several times to obtain a good average value. The average opening time obtained in this manner amounted to  $t_{average} = 0.057$  sec and  $\sigma = \pm 0.002$  sec with  $\sigma$  being the statistical deviation.

2. Opening time with centerline and a 0.15 D and a 0.225 D internal parachute was measured in the same manner. The internal parachutes were positioned as mentioned before, 0.05 D behind the skirt of the main parachute and held in place by attaching its confluence point to the centerline. The opening time of the G-llA parachute model with center-line and 0.15 D internal parachute was  $t_{ave} = 0.643$  sec and  $\sigma = \pm 0.003$  sec; while the opening time with the 0.225 D internal parachute was  $t_{ave} = 0.643$  sec and  $\sigma = \pm 0.003$  sec; while the opening time with the 0.225 D internal parachute was  $t_{ave} = 0.059$  sec and  $\sigma = \pm 0.002$  sec. The values of Opening times without and with an internal parachute are listed in Tables 7 and 8 respectively.

These tests indicate that an internal parachute would not aid in the opening time of the G-11A parachute from the reefed position to the fully opened position. These results are not conclusive however, since the reefing ring probably acts like an internal parachute in the early stages of opening. The advantageous effect of the internal parachute as observed in other studies, occurs during the opening phase from the snatch to the reefed position. In these studies the internal canopy may have choked the air inflow while the ring held the canopy open. Time and fund limitations prevented further study of this condition.

#### IV. CLISTER PERFORMANCE

## Approach

The drag coefficient of three and five clustered parachutes was calculated and compared with actual measurements. In these studies each parachute was adjusted to the optimum configuration as established above, namely  $L_{\rm g}/D_{\rm g} =$ 1.5,  $L_{\rm g}/D_{\rm g} =$  1.6.

#### B. Models

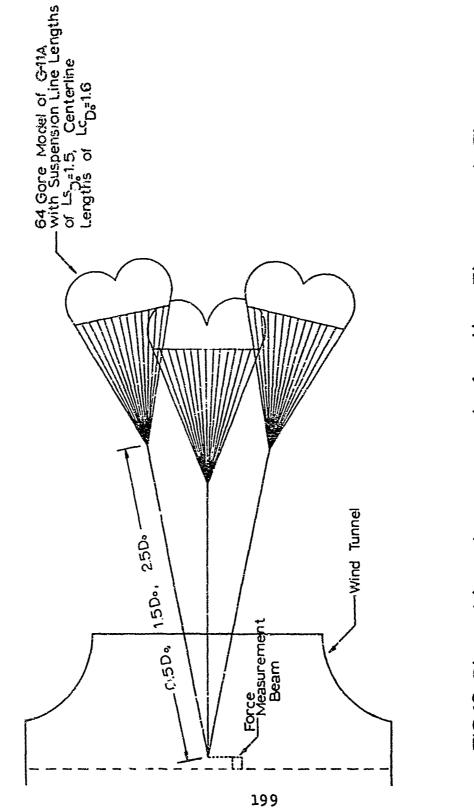
Each parachute had 64 gores and a diameter  $^{\circ}$  12.75 inches as used for the determination of the drag coefficient of the standard G-11A parachute. Each parachute was attached to a riser and the confluence point of the risers has attached to the force measurement beam (Fig. 12). Three different riser lengths of 0.5 D_o, 1.5 D_o and 2.5 D_o were used.

#### C. Test Apparatus and Experimental Procedure

The cluster riser was attached to the force measuring device on the upstream strut. As before, the canopies assume their stable angle of attack and still remain in the test section. Figure 13 shows the three and five canopy clusters in the wind tunnel during testing. The riser length was set at the three positions mentioned, and the drag coefficient of the three and five canopy clusters determined at each riser length.

#### D. Results

When exposed to the air flow, it was observed that the canopies do not stay at any particular location, but move at random and sometimes very rapidly back and forth across the test section. Clusters with shorter risers move faster than those with longer risers. The measured drag of the various configurations is indicated in Table 9 and Fig. 14. As can be seen, the drag of cluster combinations decreases slightly with cluster riser length and is in general higher than usually reported from full size tests. The drag coefficient of the clusters is expressed as ratio of  $C_D$  /n $C_D$ , where n is the number of the individual cluster o canopies.



AN ROOM WARTS IN THE

のであるというとなったがないとない

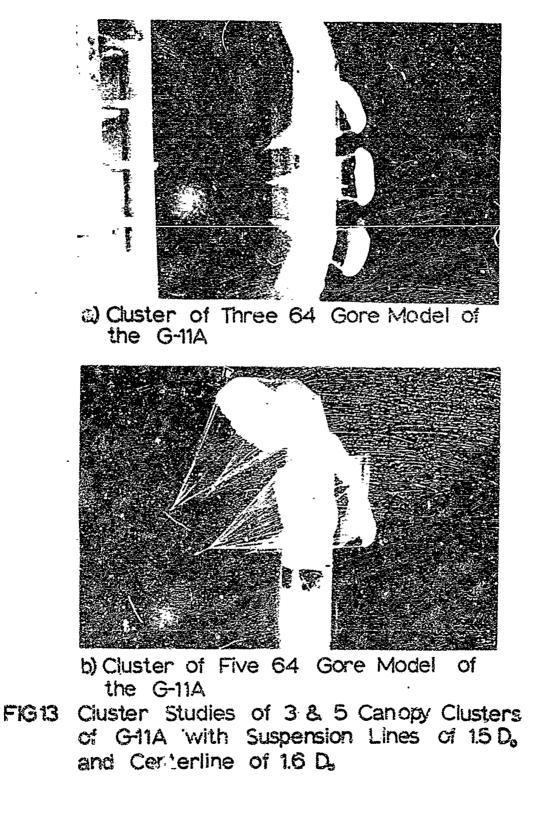
1.12.21.2

and Five FIG 12 Riser Line Arrangement for the Three Canopy Cluster Studies

والا ودوافقات بالمعالية المالية والمتوقية والمقوماتية المالية المراجع والمراجع

ANAL FUEL BUILD BUILD AND

and a photometry real



この記録

NOTATION CONTRACT OF

200

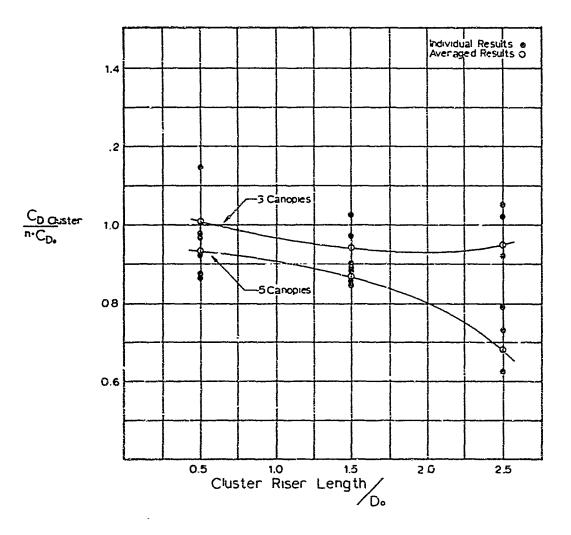
## Table IX

Drag Coefficient of 3 and 5 Clustered Parachute Canopies with Varying Cluster Riser Lengths

Riser Length	Number of Canopies, n	°D _o *	C _{D_o} Average
	3	0.83 0.96 0.78	0.86
0.5 D _o	5	0.74 0.74 0.83 0.82	0.78
	3	0.74 0.75 0.82 0.86	0.79
1,7 D ₀	5	0.73 0.76 0.72	0.74
	3	0.67 0.78 0.89 0.86	0.80
2.5 D _o	5	0.j3 0.62	c.58

にためため、日本ののないのない

* CD=DTOLE



Bert De

ALL SAME

۱

with a more so in moundanestablesons

## FIG 14 Drag Coefficient of Clustered Parachutes

Reviewing the results, it is surprising that longer risers cause lower drag coefficients. A possible explanation of this observation may be that clusters with shorter risers, which move faster, cause more interference drag than slower moving configuration with longer risers. In this respect, fast moving clusters may reproduce to a certain extent the conditions of rotating blade decelerators.

The drag coefficient of a cluster of five parachutes is generally lower as the one of a cluster of three This observation has also been made in full size canopies. The fact that the model clusters have shown higher tests. drag coefficients than full size configurations may be caused by the relatively faster motion of the models. Larger parachutes are better damped probably because of their larger included and apparent masses. However, the modified form of the canopies involved, due to the action of the centerline, may also cause so far unknown effects. From the standpoint of general knowledge, it would be very interesting to compare the results of these model tests with those of related full size experiments, whereby the motion of the entire cluster with respect to the load and the relative motion of the individual canopies may be a prime point of interest in the observation and recording of the test results.

į

ALL RULES

## V. REFERENCES

1. Heinrich, Helmut G. and Miccum, Ronald J.: <u>A Method</u> to <u>Reduce Parachute Inflation Time With a Minor</u> <u>Increase of Opening Force, WADD-TR-60-761, August</u> 1960, ACTIA Document No. AC 268 680.

DOCUMEN	T CONTROL DATA .	RED		
(Security classification of titls, body of abstract and	Indexing ennotation must l	The Cold State of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the Local Division of the	States and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states and states	والمراجع والمتحاد والمراجع المتحاد المراجع والمحاد والمحاد والمحاد والمحاد والمحاد والمحاد والمحاد والمحاد
I. ORIGINATING ' STIVITY (Corporate author)				ASSIFICATION
Pioneer Parachute Company, Inc.		15. GROUP	Unclassi	ied
Manchestor, Connecticut		10. URUUP		
B. REPORT TITLE		<u>L</u>		يدجي فحو ورشابي والإشار ورحموني
Prototype Cluster-Parachute Recovery	v Svsten for a 50	).000-1b. U	nit Load	
Volume I - Design Study		,		
				_
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)				
Final Report. May 1968-January 1969 6. AUTHORIAN (First neme, soldate initial, fast Jane)	)			
	•• •			
Royce A. Toni Marcia G.	Wood			
Wolfgang R. Mueller Milan M. Knor				
Milen M. Knor Report Date	TA TOTAL HO	OF PAGES	75. NO. 01	REFS
January 1969	20	3		11
SA. CONTRACT OR GRANT NO. DAAG17-68-0142	24. ORIGINATO	R'S REPORT N	MBER(S)	
-				
5. PROJECT NO. 1F162203D195				
e.	ED. OTHER ME	FORT HOIS /Am	other numbers	Cat may be assimed
		CRT HOISI (Any other muthers that may be easigned		
d.	69-82-4	D		
10. DISTRIBUTION STATEMENT				
This document has been approved for is unlimited.	r public release	and sale;	its distr	ibution
11. SUPPLEMENTARY NOTES	12. SPONSORIA	IS MILITARY AC	TIVITY	
Yolume I of study		my Natick	Tehoretor	Hes
	I H.S. Ar	U.S. Army Natick Laboratories Natick, Massachusetts 01760		-
i the second of a party		-	etts 017	760
TOLUES I OL BOULY		-	etts 017	
IS. ADSTRACT	Natick,	Massachus		
This report covers a two-phase, 7-no	Natick,	Massachus developme	nt progra	m to design
This report covers a two-phase, 7-no and fabricate a prototype cargo-reco	Natick, onth research and overy parachute a	Massachus I developme assembly fo	ent progra	m to design pping heavy
This report covers a two-phase, 7-no and fabricate a prototype cargo-reco unit loads in the order of 50,000 lb	Natick, onth research and overy parschute a o. The design st	Massachus I developme assembly fo	nt progra or airdrop the trad	m to design pping heavy le-cff
This report covers a two-phase, 7-mo and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe	Natick, onth research and overy parachute a o. The design st acts for a comple	Massachus I developme assembly fo udy covers te parachu	nt progra r airdrop the trad te assent	m to design pping heavy le-cff bly. From
This report covers a two-phase, 7-no and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk onalysis and cost effectiveness aspe these studies, a design analysis and	Natick, onth research and overy parachute a o. The design st ects for a complet d a complete deta	Massachus I developme assembly fo udy covers te parachu	nt progra r airdrop the trad te assent	m to design pping heavy le-cff bly. From
This report covers a two-phase, 7-mo and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe	Natick, onth research and overy parachute a o. The design st ects for a complet d a complete deta	Massachus I developme assembly fo udy covers te parachu	nt progra r airdrop the trad te assent	m to design pping heavy le-cff bly. From
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with	Massachus d developme assembly fo ady covers the parachu diled desig	nt progra or airdrop the trad te assemb n were ma achutes w	m to design oping heavy le-cif bly. From de based on rich vent-pul
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei jests an	Massachus d developme assembly fo udy covers the parachu diled desig d C-llA para d parametr	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off bly. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pul s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined
This report covers a two-phase, 7-nd and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk analysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet d a complete deta n requirements. cargo drops with d tunnei sests ar parachute of 135	Massachus d developme assembly fo udy covers te parachu diled desig covers d C-11A par d parametr ft. diam.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off oly. From de based on rich vent-pull s determined
This report covers a two-phase, 7-mo and fabricate a prototype cargo-reco unit loads in the order of 50,000 lk unalysis and cost effectiveness aspe these studies, a design analysis and the specified performance and design Use of data reduction on full-scale down configuration, scale model wind that it is feasible to use a cargo p	Natick, onth research and overy parachute a b. The design st ects for a complet a complete deta n requirements. cargo drops with 1 tunnei sests ar parachute of 135 ad unit of 50,000	Massachus developme assembly fo audy covers the parachu diled desig c C-llA par nd parametr ft. diam. ) lb.	nt progra r airdrop the trad te assemb n were ma achutes w ic studie	m to design oping heavy le-off by. From de based on rich vent-pull s determined

.

¥

Unclassified

S. S. State

1

Ē

4. KEY WORDS		LINK A			LINKC	
	ROLE	W7	ROLE	₩T	MOLE	*7
Design	8					
Fabrication	8					
Cluster parachates	9					
keria! delivery	4		4			
Airdrop operations	4		4			
			8			
Clustering						
Faruchutes			9			
	i i					
			1			
		Į				
					(	
		Und	classi	fied		
		Security	Cleasific	ation		<del></del>
	* * * * *					