UNITED STATES FEDERAL AVIATION AGENCY

AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volume IV-B

CLIMB

FOR

BUREAU OF RESEARCH & DEVELOPMENT U S FEDERAL AVIATION AGENCY Washington 25, D C

BY

APPLIED SCIENCE DIVISION
FAIRCHILD ENGINE & AIRPLANE CORP
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AIR VEHICLE PERFORMANCE CHARACTERISTICS This is a fourteen volume study, containing the following

	Volume	I-A			•					Ground Operations
	Volume	I-B								Ground Operations
	Volume	II								Take-Off
	Volume	III								Pre-Climb
	${\tt Volume}$	IV-A								Climb
	Volume	IV-B								Climb
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	Volume	VI		•						Descent
	Volume	VII								Approach
	Volume	VIII								Glide Path
	Volume	IX								Landing
*	Volume	X-A								Classified Military Aircraft (S)
*	Volume	X-B								Classified Military Aircraft (S)
*	Volume	XI								Future Aircraft (S)

* Volumes I-A through IX contain flight phase data on current aircraft, except those classified by the military The latter are in Volumes X-A and X-B, and future aircraft in Volume XI. These three volumes have a security classification of secret

GROUND OPERATIONS	TAKE- OFF	PRE- CLIMB	CLIMB	ENROUTE	DESCENT	APPROACH	GLIDE PATH	LANDING
I-A I-B	п	щ	IV - A IV - B	工	ΔI	AII	XIII	IX.
			FLIG	HT PHA	SES			

UNITED STATES FEDERAL AVIATION AGENCY
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MASTER INDEX

The following is a complete listing of the 122 aircraft reported and their location by volume.

Aircraft	Vol.	Aircraft	<u>Vol.</u>
Aero Commander 500	I-IX	Convair C-131A	I-IX
Aero Commander 680 (L-26C)	I-IX	Convair F-102A	X
Aero Commander 720	I-IX	Convair F-106A	X
Avro CF-100 MK5	x	Convair R4Y-1	I-IX
Beechcraft "Bonanza" K-35	$I \neg IX$	Convair T-29C	I-IX
Beechcraft "Twin Bonanza"		Convair YB/RB-58	X
(L-23D)	I-IX	Curtiss C-46R	$I \neg IX$
Beechcraft Model 95	I-IX	de Havilland "Beaver"	
Beechcraft MS 760	\mathbf{XI}	(L-20A)	I–IX
Beechcraft Super 18	I-IX	de Havilland Comet 4	I-IX
Beechcraft T-34A	I-IX	de Havilland "Otter"	
Bell H-13H (47G-2)	$I \neg IX$	(U-1A)	I-IX
Bell H-40	I-IX	Douglas AD-6	X
Bell XV-3	XI	Douglas A3D-2	X
Boeing 707-121	I-IX	Douglas A4D-1	X
Boeing 707-320	ΧI	Douglas C-124C	I-IX
Boeing B-377	I-IX	Douglas C-133A	I-IX
Boeing B-47B/B-47E	I-IX	Douglas DC-3 (C-47, R4D)	I– IX
Boeing B-52F	X	Douglas DC-4 (C-54)	$I \neg IX$
Boeing KC-97G	I-IX	Douglas DC-6	I~IX
Boeing KC-135A	$I \neg I X$	Douglas DC-6B	I - IX
Canadair CP-107	X	Douglas DC-7	I-IX
Canadaır Sabre MK6	X	Douglas DC-7B	I-IX
Canadair T-33A MK3	X	Douglas DC-7C	I-IX
Cessna 150	I– IX	Douglas DC-8	XΙ
Cessna 172	I-IX	Douglas DC-9	\mathbf{X} I
Cessna 175	I-IX	Douglas F4D-1	X
Cessna 180 (Amphibian)	I-IX	Douglas RB/WB-66B	I-IX
Cessna 182	I⊣IX	Fairchild C-119G	I-IX
Cessna 310A (L-27A)	I-IX	Fairchild C-123B	I-IX
Cessna 310C	I-IX	Fairchild F-27B	I-IX
Cessna L-19 A/E (OE-1)	I-IX	Goodyear ZPG-2	I-IX
Cessna T-37A	I-IX	Goodyear ZPG-3W	I-IX
Cessna TL-19D	I≁IX	Grumman F9F-8T	X
Chance-Vought F8U-1	x	Grumman F11F-1	X
Convair 340/440	I-IX	Grumman SA-16AGR (UF-1)	I-IX
Convair 600	XI (Grumman \$2F-1	X
Convair 880-22	XI	Hayes-Boeing KB-50J/KB-50K	I-IX

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Hiller H-23D	I-IX	North American F-100D	x
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Lockheed 1049G	I-IX	North American FJ-3B	X
Lockheed 1649A	I - IX	North American FJ-4/FJ-4B	X
Lockheed C-121 C/G	I-IX	North American TB-25M	I– IX
Lockheed C-130A	I-IX	North American T-28A	I-IX
Lockheed F-104A	X	North American T~28B	I-IX
Lockheed P2V-5	X	North American T-39A	$\mathbf{X}\mathbf{I}$
Lockheed T2V-1	I-IX	North American T2J-1	I = IX
Lockheed T-33A-1	I-IX	Northrop F-89H	I-IX
Lockheed WV-2	X	Northrop T-38A	X
Lockheed Electra 188	I-IX	Piper "Tri-Pacer" PA-22	I-IX
Lockheed Jetstar	XI	Piper "Apache" PA-23	I-IX
MACH 3 Transport	ΧI	Piper "Comanche" PA-24-180	I-IX
Martin 404	I - IX	Republic F-84F Series	I-IX
Martin B-57B	I-IX	Republic F-105B	X
Martin P5M-2	X	Sikorsky H-19D	I-IX
McDonnell 119A (UCX)	XI	Sikorsky H-34A (S-58)	
McDonnell F-101B	X	(HSS-1)	I-IX
McDonnell F3H-2	X	Sikorsky H-37A	I-IX
McDonnell F4H-1	X	Vertol 107	XI
Mooney Mark 20A	I-IX	Vertol H-21C (44-B)	I-IX
North American A3J-1	X	Very Large Subsonic Jet	
North American B-70	XI	Cargo	XI
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Piper "Tri-Pacer" PA-22 Piper "Apache" PA-23

Piper "Comanche" PA-24-180

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(date of latest revision September 1, 1959)

UNITED STATES FEDERAL Bureau of Research & Development

AVIATION AGENCY
Washington 25, D.C.

AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volumes I-A through IX

SECTION 2

COMMERCIAL AIRCRAFT

containing data on

Boeing B-377 Douglas DC-7B

Boeing 707-121 Douglas DC-7C

Convair 340/440 Fairchild F-27B

de Havilland Comet 4 Lockheed Electra 188

Douglas DC-3 (C-47, R4D) Lockheed 1049G

Douglas DC-4 (C-54) Lockheed 1649A

Douglas DC-6 Martin 404

Douglas DC-6B Vickers Viscount 745D

Douglas DC-7 Vickers Viscount 812

(date of latest revision September 1, 1959)

UNITED STATES FEDERAL AVIATION AGENCY
Bureau of Research & Development Washington 25, D.C

Sequence of Operations

From an altitude of 2,000 feet a constant climb airspeed of 165 knots IAS is maintained to cruise altitude Speeds plus or minus 10 knots from the optimum will not materially affect performance.

Tables I, IA, and Figure 1 present climb data.

TABLE I, CLIMB
(Climb Schedule for Normal Power at 120,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
2,000	1 8	4 2	1,910	200	165	170
3, 000	2 4	5 9	1,670	266	11	173
4,000	3 0	7 7	1,430	332	11	175
5, 000	3 8	10 0	1,190	420	11	178
10,000	7 9	22.6	1,150	870	†1	192
15, 000	12 5	37 9	980	1,480	11	208
20,000	18 1	58 1	815	2,000	11	226
25, 000	24 8	84 5	610	2,730	rt	246

^{*}Fuel consumed from start engines through lift-off 450 pounds

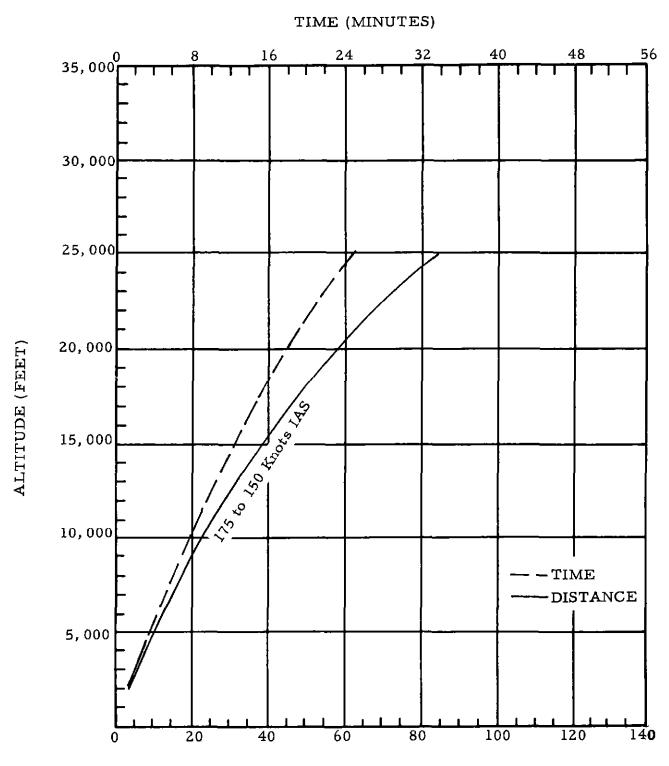
TABLE I A, CLIMB
(Deviation With Change From 120,000 Pounds Gross Weight)

	Per 5,000	Pounds Inc	ease in Gr	oss Weight	Per 5,000	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	${\sf Climb}$	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Clımb	Climb	Distance	Fuel	Climb
2,000	10%	10%	10%	8%	8%	8%	8%	8%
3,000	11%	11%	11%	9%	9%	9%	9%	9%
4,000	t t	11	11	10%	11	11	11	10%
5, 000	12%	12%	12%	11%	10%	10%	10%	11%
10,000	14%	13%	14%	12%	11	11	11	12%
15,000	15%	14%	15%	13%	11	11	11	15%
20,000	16%	15%	16%	15%	11%	11%	11%	20%
25,000	18%	19%	18%	18%	12%	12%	12%	25%

Each 10° C Each 10° C
Above Std Temp. Below Std Temp

Rate of Climb Time of Climb Climb Distance Climb Fuel

Not available from operators



DISTANCE (NAUTICAL MILES)
FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 1,500 feet, climb airspeed varies between 179 and 395 knots TAS

Table I, IA and Figure 1 present climb data

Boeing 707-12

TABLE I, CLIMB (Climb Schedule for Normal Power at 225,000 Pounds Gross Weight

						nb Speed	
Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	Climb Fuel (Pounds)	IAS (Knots)	TAS (Knots)	MACH
(Fect)	(Williates)	•	(1 oot per minate)	(1 ballab)	(2211005)	(221000)	
1,500	3.0	8 0	500	1,300	176	179	0 27
2,000	4.0	11 2	1)	2, 100	195	201	0.30
3,000	6.0	18 3	†t	2,900	215	226	0 34
4,000	8 0	26 2	11	3,700	235	248	0 38
5,000	10 0	34 7	1,000	4, 490	240	258	0 40
10,000	13 0	47 6	1,667	5, 540	11	278	0 44
15,000	16 0	62 0	I, 429	6,640	"	299	0 47
20,000	20 0	82 3	1,053	7, 920	235	318	0.52
25,000	25 5	112 4	834	9, 280	230	337	0 56
30,000	32.0	150.2	667	10,940	11	361	0 62
35,000	40 5	203 7	600	12,805	11	395	0.68

^{*}Fuel consumed from start engines to lift-off 1, 200 pounds

30eing 707-121

TABLE I A, CLIMB (Deviation With Change From 225, 000 Pounds Gross Weight)

	Per 10,00	0 Pounds Incr	ease in Gro	ss Weight	Per 10,00	0 Pounds Dec	rease in Gi	ross Weight
Altıtude	T_1 me of	$Cl_{1}mb$	Climb	Rate of	Time of	${\sf Climb}$	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
1,500	0 0%		0 0%		1.1%		0 0%	
2,000	11		11		2.1%		11	
3,000	L1		11		3 9%		1 3%	
4,000	TT.	Not	1.0%	Not	5 2%	Not	21%	Not
5,000	H	avaılable	2 1%	available	6 7%	avaılable	4 2%	avaılable
10,000	11	from	3 5%	from	7 7%	from	70%	from
15,000	5 9%	operators	4.6%	operators	96%	operators	8.8%	operators
20,000	7 1%		5 7%		11 6%		10.6%	
25,000	7 5%		7 2%		12 4%		11 9%	
30,000	8 9%		8 7%		13 5%		13.2%	
35,000	14 3%		10.0%		14 9%		14 7%	

Each 10° C Each 10° C

Above Std Temp Below Std, Temp

Rate of Climb
Time of Climb
Not available from operators
Climb Distance
Climb Fuel

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100)

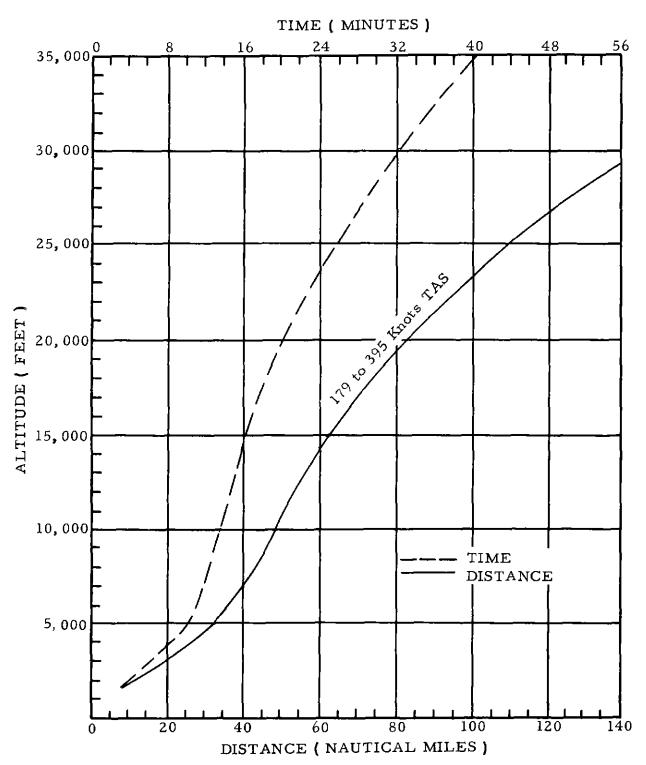


FIGURE 1 - CLIMB-DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb speed of 155 knots IAS is maintained until cruise altitude is attained. During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data.

TABLE I, CLIMB
(Climb Schedule for Normal Power at 48,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	1 0	2.1	600	14.5	155	156
1,000	1.8	4. 1	11	26. 1	11	157
2,000	3.4	8.1	11	49 3	11	160
3,000	4.9	14. 1	11	71.0	n	162
4,000	6.6	18.1	tt	96.0	u	164
5,000	8.2	24. 1	п	119.0	ti	167
10,000	16.6	50 1	11	241.0	**	180
15,000	26.2	78.1	450	388.0	Ħ	195
20,000	39 2	118 1	330	587.0	tt	212

*Fuel consumed from start engines through lift-off 140.5 pounds

NOTE Deviation with change from gross weight not available from operators.

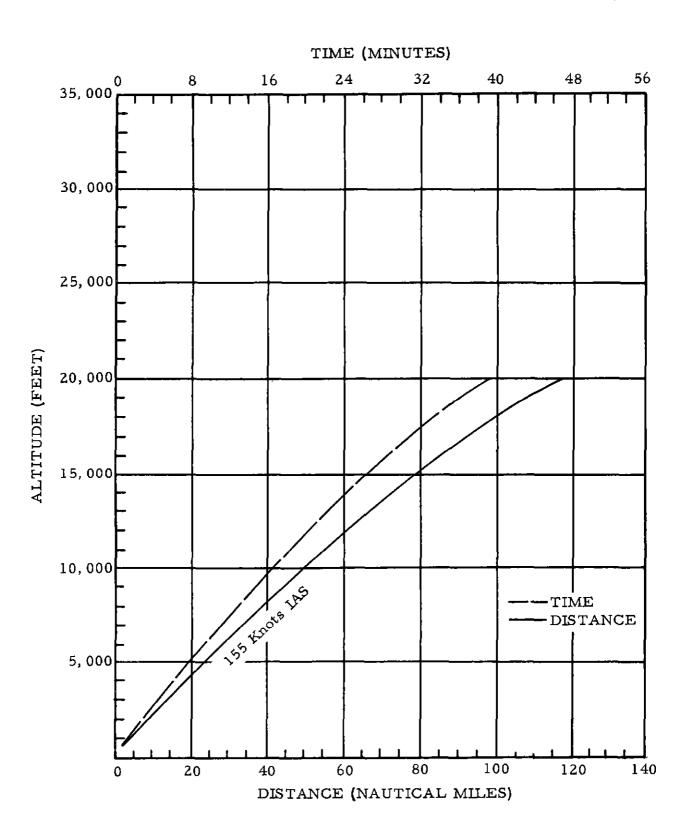


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 3,000 feet an airspeed of 320 knots IAS is maintained up to 23,500 feet altitude. Above 23,500 feet, Mach 0.74 is maintained until cruise altitude is attained. Rate of climb will vary from 1,660 fpm to 700 fpm. Speeds plus or minus 10 knots from the optimum will not materially affect performance.

Tables I, I A and Figure 1 present climb data.

3

De Havılland "Comet" 4

TABLE I, CLIMB (Climb Schedule for Normal Power at 140,000 Pounds Gross Weight)

					Clin	nb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS	
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)	MACH
3,000	1.8	7.5	1,660	1,350	320	330	0.51
4,000	2.4	10.1	11	1,650	11	338	0.52
5,000	3.0	12.0	it	1,900	11	343	0.53
10,000	5.1	24.0	2,310	2,600	11	370	0.57
15,000	7.3	38 0	1,960	3, 400	11	397	0.63
20,000	10.2	57 0	1,610	4, 250	н	428	0.70
25,000	13 5	83.0	1, 430	5,250	315	446	0.74
30,000	17.2	108.0	1,110	6, 175	280	438	1†
3 5,000	22.5	147.0	700	7, 250	250	428	11

^{*}Fuel consumed from start engines through lift-off 500 pounds

De Havilland "Comet" 4

TABLE I A, CLIMB (Deviation With Change From 140,000 Pounds Gross Weight)

	Per 10,00	0 Pounds Inc	rease in Gr	oss Weight	Per 10,00	0 Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	${\sf Climb}$	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
3,000	10.0%	7.0%	10.0%	6.7%	11.0%	7.0%	10.0%	10.0%
4,000	tt	7.4%	9.5%	7.3%	U	7.3%	9.5%	11
5,000	tt	7.9%	9.2%	8.1%	11	7.5%	9.2%	11
10,000	11	8.4%	7.7%	9.9%	11	7.8%	9.0%	11
15,000	П	9.0%	7.1%	10.2%	11	8.1%	8.8%	10.7%
20,000	11	9.7%	6.6%	11.1%	11	9.0%	8.0%	16.5%
25,000	10.2%	10.9%	7.8%	14.6%	11.6%	10.9%	7.6%	19.2%
30,000	10.5%	12.0%	9.9%	16.8%	11	11.4%	8.8%	27.0%
35,000		Not applica	ble		12.9%	13.6%	10.3%	30.1%

	Each 10 ⁰ C Above Std Temp	Each 10°C Below Std. Temp
Rate of Climb	14.4%	Not available
Time of Climb	20 .3%	${f from}$
Climb Distance	25.0%	manufacturer.
Climb Fuel	13.5%	

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

TIME (MINUTES)

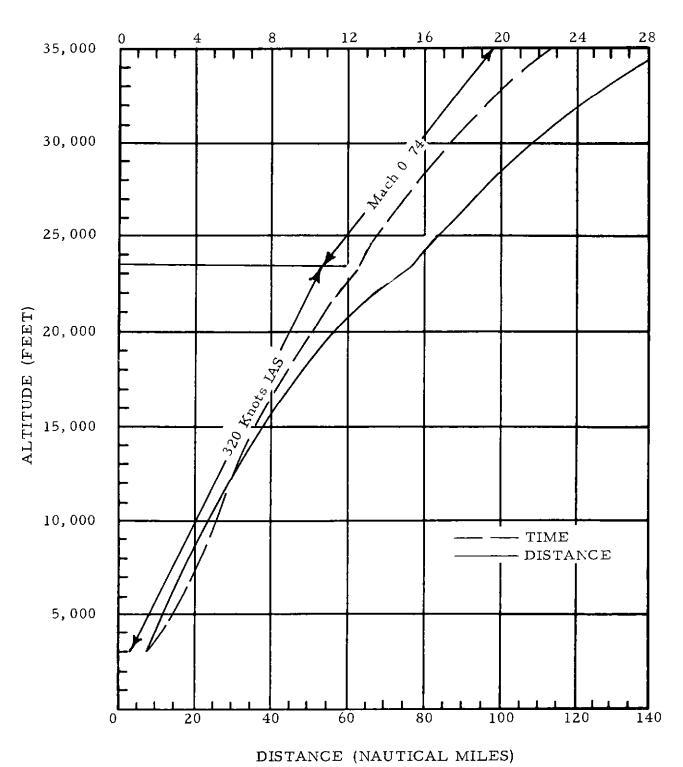


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 600 feet a constant climb airspeed of 105 knots is maintained until cruising altitude is attained. During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data

Douglas DC-3 (C-47-R4D)

TABLE I, CLIMB
(Climb Schedule for Normal Power at 25, 346 Pounds Gross Weight)

					${f Climb}$	Speed
Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	* Climb Fuel (Pounds)	IAS (Knots)	TAS (Knots)
600	1, 3	2.1	500	6	105	105
1,000	2 1	3 5	н	9	11	106
2,000	4, 1	7.1	11	15	†1	108
3, 000	6 1	10 7	11	21	11	110
4,000	8, 1	14 4	н	27	11	111
5,000	10.1	18 1	11	33	11	113
10,000	20.1	37 6	11	69	11	120
12, 000	24 1	45.8	u	81	11	126

^{*} Fuel consumed from start engines through lift-off 114 pounds

NOTE Deviation with change from gross weight not available from operators.

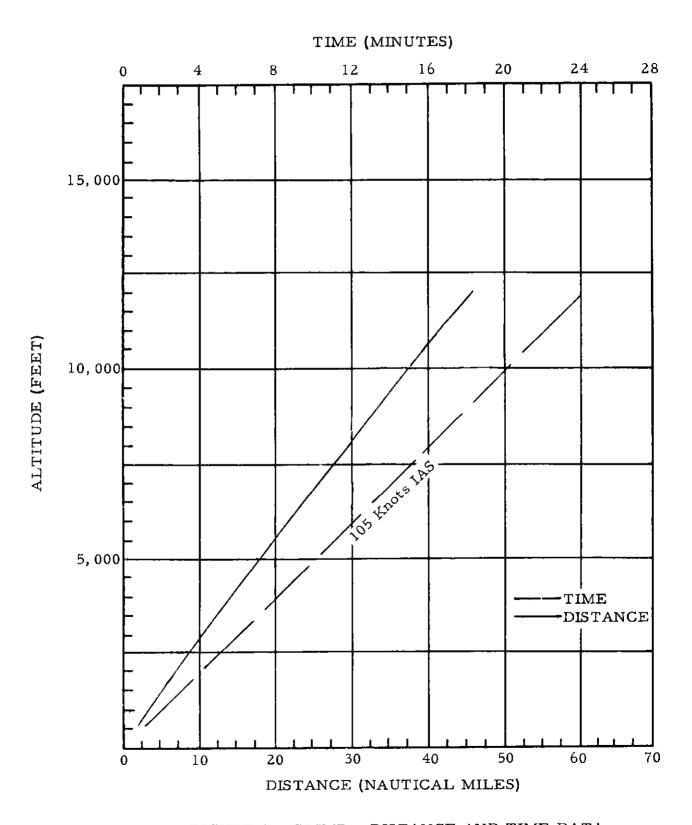


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant airspeed of 135 knots IAS is maintained throughout climb. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A and Figure 1 present climb data

Douglas DC-4 (C-54)

TABLE I, CLIMB (Climb Schedule for Normal Power at 70,000 Pounds Gross Weight)

					Climb	S peed
Altitude	Time of Climb	Climb Distance	Rate of Climb	Climb Fuel*	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.9	1.9	555	33	135	135
1,000	1.8	3.9	**	64	11	136
2,000	3.6	8.0	11	127	17	137
3,000	5 4	12.1	11	191	11	138
4,000	7.2	16.3	11	255	ш	139
5,000	9.0	20.5	11	318	11	140
10,000	18 6	43.3	4 75	656	11	145
15,000	30.0	71.3	400	1,060	ft	157

^{*}Fuel consumed from start engines through lift-off 202 pounds

Douglas DC-4 (C-54)

TABLE I A, CLIMB (Deviation With Change From 70,000 Pounds Gross Weight)

Per 1,000 Pounds Increase in Gross Weight					Per 1,000	Pounds Decr	ease in Gr	oss Weight
Altitude	$T_{1}me$ of	${f Climb}$	${f Climb}$	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500	0%	0%	0%	0%	0%	0%	0%	0%
1,000	6%	5%	7%	2%	6%	5%	7%	2%
2,000	11	11	6%	3%	11	П	6%	3%
3,000	4%	3 <i>%</i>	4%	4%	4%	3%	4%	4%
4,000	11	11	1 7	11	11	11	11	11
5,000	3%	4%	11	3%	3%	4%	11	3%
10,000	11	3%	3%	5%	11	3%	3%	5%
15,000	4%	4%	4%	3%	4%	4%	4%	3 %

	Each 10 ⁰ C Above Std. Temp.	Each 10°C Below Std. Temp.
Rate of Climb	•	•
Time of Climb		
Climb Distance	Not available from	operators
Climb Fuel		

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

48

40

56

32

24

16

35,000

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 400 feet, a climb airspeed of 139 knots IAS is maintained until cruise altitude is attained. This airspeed is held constant for all gross weights

Table I, IA, and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 90,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	$(K_{ m nots})$	(Knots)
400	1 0	2,1	700	30	139	140
I,000	1 8	4 2	750	74	11	141
2,000	3, 1	7.8	770	148	11	143
3,000	4 4	11 3	11	222	11	145
4, 000	5.7	14.8	11	296	11	148
5,000	7 0	18 4	730	370	11	150
10,000	14.5	41 0	610	850	11	161
15,000	23 0	67.5	580	1, 360	11	175
20,000	33.0	102.0	420	1,975	11	191

^{*}Fuel consumed from start engines through lift-off 300 pounds (estimated)

Douglas DC-

TABLE I A, CLIMB (Deviation With Change From 90,000 Pounds Gross Weight)

	Per 5,000	Pounds Inc	rease in Gro	ss Weight	Per 5,000	Pounds Dec	rease in Gr	oss Weight
Altıtude	T_1 me of	${f Climb}$	$Cl_{\mathtt{1mb}}$	Rate of	T_1 me of	${\sf Climb}$	${f Climb}$	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
400								
1,000								
2,000	ľ	Not available i	from operate	or	N	ot avaılable f	rom operat	or.
3,000								
4,000							_	
5, 000	14.0%	13.5%	13.5%		14.0%	13.5%	13.5%	
10,000	11	14.5%	13.0%		13.0%	11	12.0%	
15,000	15.0%	15 5%	11		11	11	11	
20,000	11	17.0%	17 0%		13 5%	11	11.5%	

Each 10° C Each 10° C
Above Std Temp. Below Std. Temp

Rate of Climb
Time of Climb
Climb Distance
Climb Fuel

Not available from operator

(The values above are to be substituted directly in the climb equation in the appendix. In substituting, divide all percentage values by 100.)

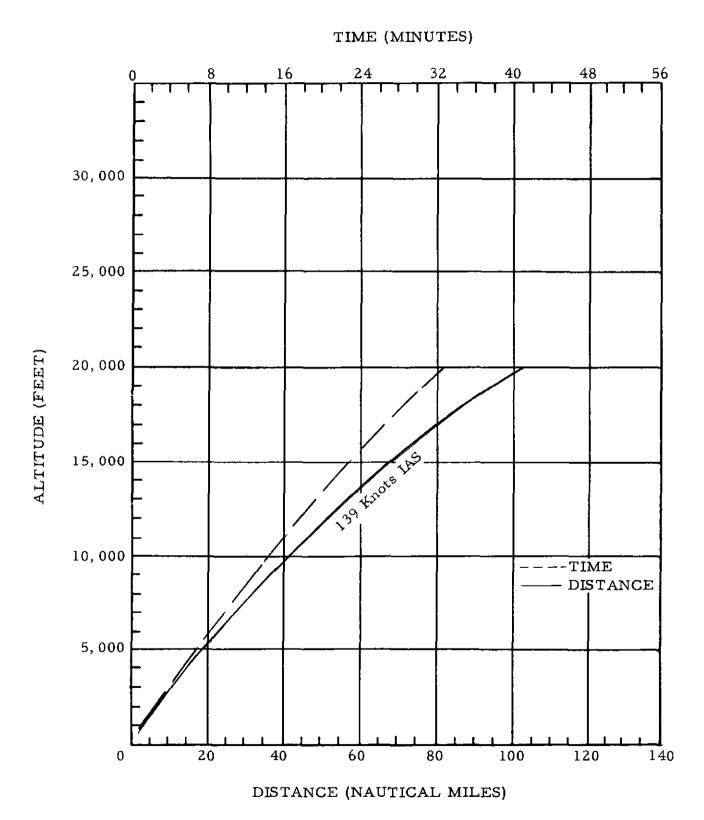


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet an initial climb airspeed of 155 knots IAS is established. During climb, airspeed will decrease approximately one knot IAS per 1,000 feet altitude until cruise altitude is attained Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I, IA and Figure 1 present climb data

TABLE I, CLIMB (Climb Schedule for Normal Power at 99,500 Pounds Gross Weight)

					Climb 8	Speed
Altitude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.8	1.9	670	130	155	155
1,000	1 5	3.7	u	260	154	156
2,000	3,0	7.6	11	460	153	158
3,000	4.5	11.5	11	560	152	159
4,000	6.0	15,5	H	660	151	160
5,000	7 5	19 5	640	760	150	161
10,000	15 5	41.5	610	1,300	145	168
15,000	24.0	66.0	570	1,940	140	176
20,000	36.0	102.0	260	2,690	135	185

^{*}Fuel consumed from start engines through lift-off 360 pounds (estimated)

TABLE IA, CLIMB (Deviation With Change From 99, 500 Pounds Gross Weight)

	Per 7,000	Pounds Incre	ease in Gro	ss Weight	Per 10,000) Pounds Dec	rease in Gi	oss Weight
Alt1tude	Time of	$Cl_{1}mb$	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	D ₁ stance	Fuel	Climb	Climb	Distance	Fue1	Climb
500								
1,000	Not a	avaılable fror	n operators		Not a	vailable fron	n operators	
2,000	24 0%	25.0%	15.0%	15 0%	20.5%	21 0%	8 5%	28.0%
3,000	24.5%	11	19.5%	31	21.0%	11	10 5%	28 5%
4,000	25 0%	26.0%	20 0%	11	22 0%	21 5%	13 5%	11
5,000	27.0%	27 0%	21.0%	15 5%	11	22.0%	14 5%	29.0%
10,000	29.0%	11	28.5%	17 5%	22 5%	23 0%	18.5%	32.5%
15,000	35.5%	29.0%	34 5%	23.0%	23.0%	24.0%	21 5%	38 0%
20,000	Not	avaılable fron	n operators	1	26 0%	27 0%	ti	50.0%

Each 10° C

Each 10° C

Above Std Temp.

Below Std. Temp.

Rate of Climb Time of Climb Climb Distance Climb Fuel

Not available from operators

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100)

TABLE IA, CLIMB
(Deviation With Change From 99, 500 Pounds Gross Weight)

	Per 7,000	Pounds Incre	ease in Gros	ss Weight	Per 10,000	Pounds Dec	rease in Gi	oss Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Clımb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500								
1,000	Not	avaılable fron	n operators		Not a	vailable fron	operators	
2,000	24 0%	25.0%	15.0%	15 0%	20.5%	21 0%	8 5%	28 0%
3,000	24.5%	11	19.5%	11	21.0%	u	10 5%	28 5%
4,000	25 0%	26 0%	20.0%	11	22 0%	21 5%	13 5%	11
5,000	27 0%	27.0%	21.0%	15 5%	11	22.0%	14.5%	29 0%
10,000	29.0%	11	28.5%	17 5%	22 5%	23 0%	18.5%	32,5%
15,000	35.5%	29 0%	34.5%	23.0%	23.0%	24.0%	21 5%	38 0%
20,000	Not	avaılable fror	n oper <mark>ators</mark>		26.0%	27 0%	11	50.0%

Each 10° C	Each 10° C
Above Std Temp.	Below Std. Temp

Rate of Climb	
Time of Climb	NT. 4 T. 1.1. C
Climb Distance	Not available from operators
Climb Fuel	

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

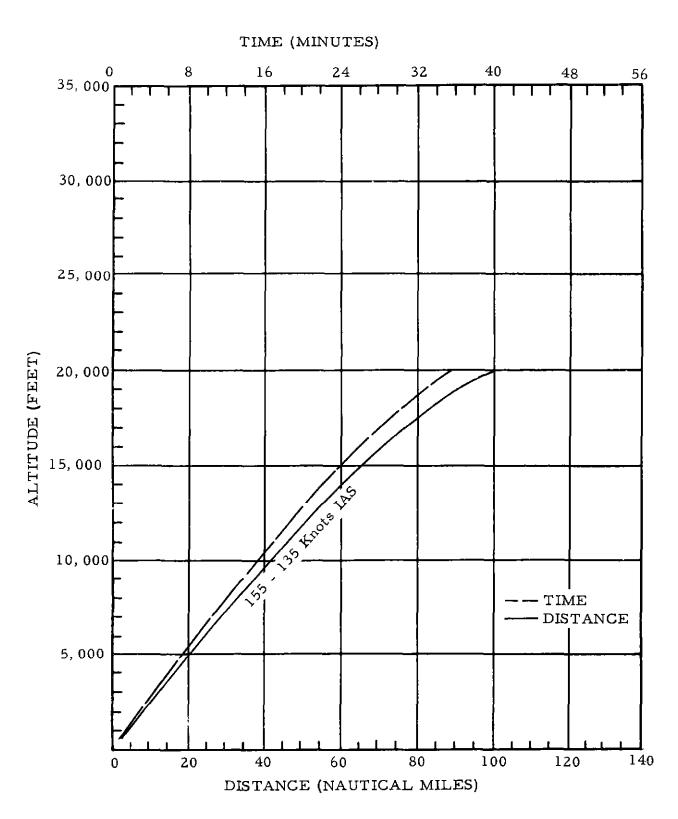


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 175 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance

Tables I, I A and Figure 1 present climb data.

Douglas DC-

TABLE I, CLIMB
(Schedule for Standard Climb Power at 109, 400 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	Climb IAS	TAS
(1 661)	(miliates)	(Mautical Milles)	(reer per minute)	(Pounds)	(Knots)	(Knots)
500	0 8	2 0	1,000	50	175	176
1,000	1 3	3 5	n	130	11	178
2,000	2 4	6 9	960	210	11	180
3,000	3 5	10 3	940	290	11	183
4,000	4.6	13 7	920	370	11	186
5,000	5 7	17 1	900	450	tt	189
10,000	11.7	36 8	790	950	11	204
15,000	18 5	60.8	690	1,520	tr	220
20,000	26 1	89 8	590	2,200	11	238
25,000	35 7	129 5	490	3,050	11	258

^{*} Fuel consumed from start engines through lift-off. 600 pounds (estimated).

Douglas DC-7

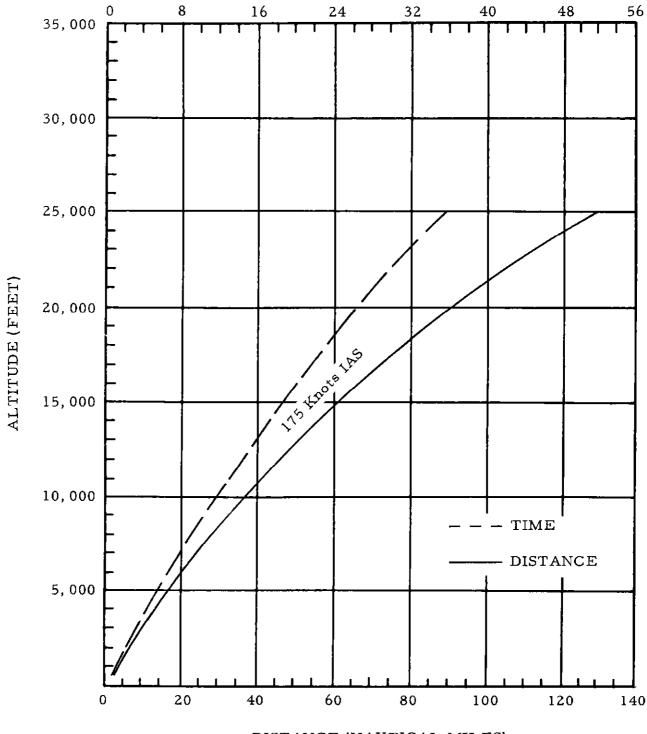
TABLE I A, CLIMB
(Deviation With Change From 109, 400 Pounds Gross Weight)

	Per 10,00	00 Pounds Inc:	rease in Gre	oss Weight	Per 10,00	0 Pounds Dec	rease in G	ross Weight
Altitude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500	21%	25%	26%	16%	16%	18%	17%	17%
1,000	11	11	11	11	ır	11	13	18%
2,000	l t	H	11	17%	11	tı	H	11
3,000	tt	11	11	1t	11	tt	tt	ti
4,000	11	11	et.	11	ff	11	11	11
5,000	11	11	11	18%	11	ŧt	11	n
10,000	23%	26%	1 t	19%	ft	19%	11	19%
15,000	25%	tt	11	23%	17%	11	ti	20%
20,000	30%	27%	2 7%	29%	18%	11	18%	£ t
25,000	34%	35%	31%	35%	19%	11	20%	ŧŧ

		ach l e Std	0°C Temp	Each 10 Below Std	_
Rate of Climb	Not a	.va1la	ble from	operator	
Time of Climb	11	11	11	tt	
Climb Distance	11	11	11	tt	
Climb Fuel	11	L1	11	H	

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100.)

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 175 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance

Tables I, I A and Figure 1 present climb data

TABLE I, CLIMB (Climb Schedule for Normal Power at 109, 400 Pounds Gross Weight)

					Climb	Speed
Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	IAS (Knots)	TAS (Knots)
500	0 8	2 0	1,000	50	175	176
1,000	1 3	3 5	1,000	130	11	178
2,000	2 4	6.9	960	210	11	180
3,000	3 5	10 3	940	290	11	183
4,000	4 6	13 7	920	370	TT	186
5, 000	5 7	17 1	900	450	††	189
10,000	11.7	36 8	790	950	į į	204
15,000	18.5	60.8	690	1, 520	11	220
20,000	26.1	89 8	590	2,200	ŢŢ	238
25,000	35.7	129 5	490	3, 050	71	258

^{*}Fuel consumed from start engines through lift-off. 600 pounds

Douglas DC-7B

TABLE I A, CLIMB
(Deviation With Change From 109, 400 Pounds Gross Weight)

	Per 10,00	0 Pounds Inc	rease in Gro	oss Weight	Per 10,000	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	${\sf Climb}$	Rate of	Time of	Climb	Clımb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500	21%	25%	26%	16%	16%	18%	17%	17%
1,000	11	11	11	11	11	11	†1	18%
2,000	11	11	tt	17%	H	If	11	n `
3,000	l f	† †	11	71	11	11	11	11
4,000	11	11	11	11	11	11	11	11
5,000	11	11	11	18%	п	19%	11	11
10,000	23%	26%	††	19%	11	11	11	19%
15,000	25%	П	11	23%	17%	11	11	20%
20,000	30%	27%	27%	29%	18%	11	18%	11
25,000	34%	35%	31%	35%	19%	11	20%	11

Each 10° C Each 10° C

Above Std. Temp. Below Std. Temp.

Rate of Climb Time of Climb Climb Distance Climb Fuel

Not available from operators

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100)

TIME (MINUTES)

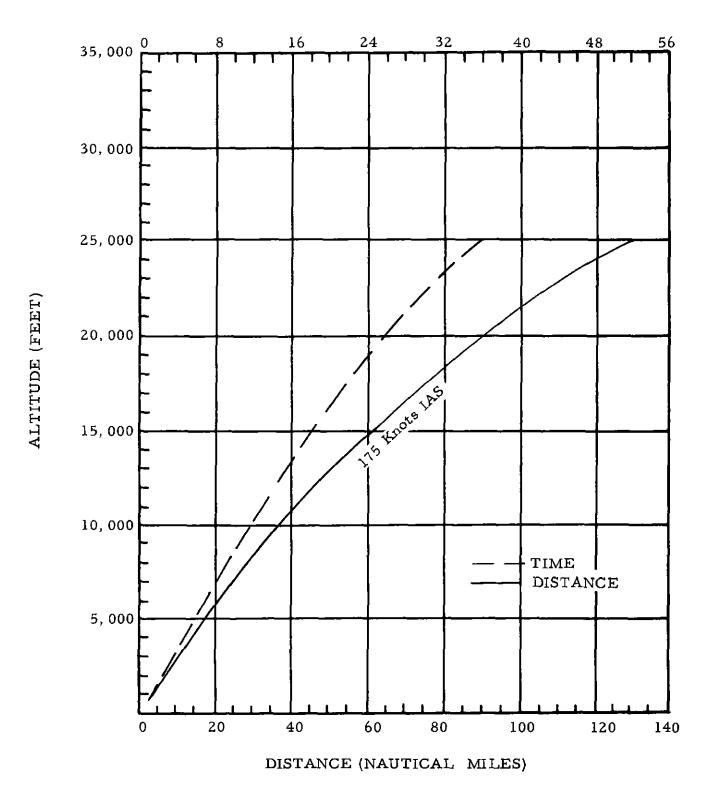


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

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Sequence of Operations

From an altitude of 1,000 feet, a constant climb airspeed of 175 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A, and Figure 1 present climb data.

)

TABLE I, CLIMB (Climb Schedule for Normal Power at 130,000 Pounds Gross Weight

A 1 1	m (a) 1		D			nb Speed	
Altıtude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	IAS (Knots)	TAS (Knots)	MACH
(=,	(===========	(Tradition)	/2 cor per animace/	(1 oanas)	(111000)	(111000)	11111011
1,000	1.2	3 0	700	99	175	177	0 26
2,000	3.0	8.4	ti	245	11	180	0.27
3,000	4.3	12.4	t1	354	Ħ	183	0.27
4,000	5.6	16.4	11	461	н	186	0 28
5,000	7.2	21.6	11	593	11	188	0.29
10,000	15 6	49 9	570	1,285	11	204	0.31
15,000	24 9	82.8	480	1,782	11	220	0.35
20,000	36 6	127 5	300	2,782	11	238	0.38
25,000	64.0	240.4	60	5,112	T†	257	0.43

*Fuel consumed from start engines through lift-off 301 pounds

TABLE I A, CLIMB
(Deviation With Change From 130,000 Pounds Gross Weight)

	Per 10,00	0 Pounds Inc:	rease in Gr	oss Weight	Per 10,000) Pounds De	crease in Gro	ss Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Cl_1mb	Climb	Distance	Fuel	Climb
1,000				26%				17%
2,000	7N.T .4	11 6		11	NT 4			11
3,000	Not avail	able from ope	rators	11	Not avail	able from o	perators	11
4,000	34%	35%	35%	11	14%	12%	14%	T I
5,000	33%	33%	25%	11	15%	12%	11	11
10,000	26%	25%	25%	21%	19%	20%	19%	25%
15,000	27%	27%	47%	27%	11	11	6%	26%
20,000	30%	30%	43%	12%	21%	22%	11%	28%
25,000	N	ot available fi	om operato	rs	28%	28%	Not available	30%
						f	rom operators	5

Each 10° C	Each 10°C
Above Std. Temp	Below Std. Temp

Rate of Climb	
Time of Climb	Not available from operators
Climb Distance	110t avaitable 110th operators
Climb Fuel	

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

Sequence of Operations

From an altitude of 1,000 feet a constant climb airspeed of 127 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet, the optimum climb airspeed will vary between 127 and 115 knots IAS. During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A, and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 34,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	XClimb Fuel	IAS	TAS
(Feet)	$(M_{1}nutes)$	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
1,000	3 3	5.9	1,000	30	127	129
2,000	4 3	8 1	ш	55	11	131
3,000	5 3	10.3	tt	80	11	133
4,000	6.3	12 5	11	105	11	135
5,000	7 3	14 8	11	130	11	137
10,000	12 3	26 4	11	265	122	142
15,000	17 7	39.5	860	410	119	150
20,000	24 3	56.4	660	565	115	157

* Fuel consumed from start engines through lift-off 200 pounds

Fairchild F-27B

TABLE I A, CLIMB (Deviation With Change From 34,000 Pounds Gross Weight)

	Per 1,000	Pounds Inc:	rease in Gro	oss Weight	Per 1,000	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	${\sf Climb}$	$Cl_{\mathtt{1}mb}$	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	${\sf Climb}$	Climb	Distance	Fuel	Climb
1,000	8%	10%	0%	8%	8%	9%	0%	8%
2,000	4%	5%	7%	9%	4%	5%	7%	4%
3,000	11	11	11	11	11	u .	11	11
4,000	11	Ħ	ŧŧ	11	11	11	11	11
5,000	11	i t	11	11	11	11	f f	11
10,000	11	u	11	#1	11	11	† I	11
15,000	11	6%	11	1 t	11	11	11	11
20,000	11	11	11	11	11	11	17	11

	Each 10° C	Each 10° C		
	Above Std Temp	Below Std Temp		
Rate of Climb	6%	4%		
Time of Climb	18%	12%		
Climb Distance	11%	4%		
Climb Fuel	14%	11		

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 1,000 feet a constant climb airspeed of 210 knots is maintained until cruise altitude is attained. During climb, speeds plus or minus 10 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data

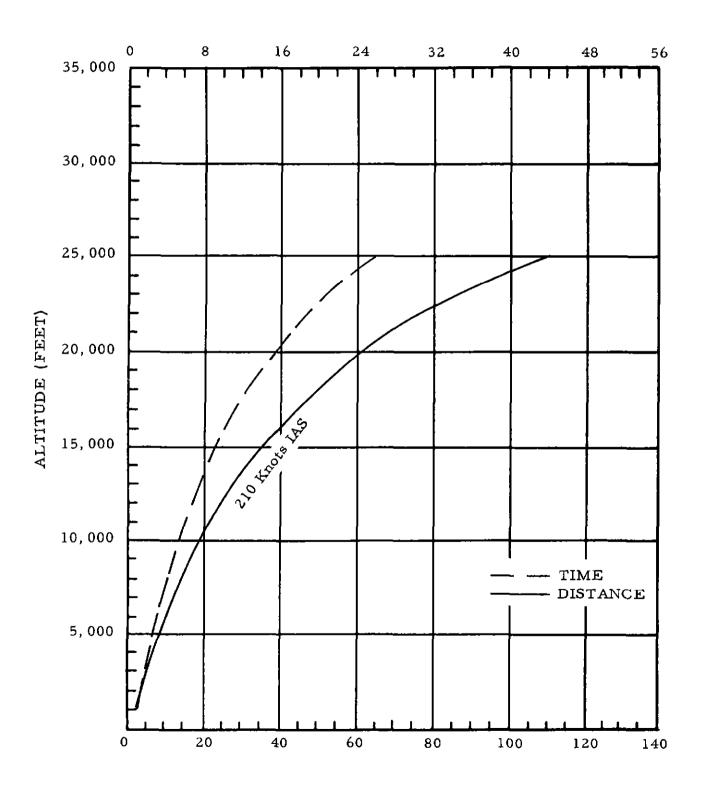
TABLE I, CLIMB (Climb Schedule for Normal Power at 108,000 Pounds Gross Weight

						nb Speed	
Altitude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS (Knots)	TAS (Knots)	MACH
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Miora)	(Miors)	MACH
1,000	1.2	3 2	1,000	240	210	213	0 31
2,000	1 6	4.8	II	340	11	216	0 32
3,000	2.1	6 4	1,100	460	11	219	0 33
4,000	2 6	8 1	It	580	11	222	0 34
5,000	3 0	9 8	1,300	700	11	225	0 35
10,000	5 2	18.3	1,600	1, 200	11	242	0 38
15,000	9.2	35 0	1,000	2, 200	11	260	0 42
20,000	15 0	61 0	600	3,600	11	282	0 46
25,000	25 0	110 0	400	6,000	11	305	0 51

Note: Deviation with change from 108,000 pounds gross weight not available from operators

^{*}Fuel consumed from start engines through lift-off: 1,760 pounds

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 300 feet a constant climb speed of 170 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 10 knots from the optimum will not materially affect performance

Table I and Figure 1 present climb data.

TABLE I, CLIMB
(Climb Schedule for Normal Power at 137,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
300	0.8	2 0	500	150	170	170
1,000	2 2	6.0	11	320	11	173
2,000	4,2	11 8	***	405	11	175
3,000	6.2	17 7	11	575	11	178
4,000	8.2	23 7	11	745	11	180
5, 000	10 2	29 8	tt	915	11	183
10,000	21 2	64.4	380	1,845	11	197
15,000	36.2	115 7	320	3, 165	IT	213
20,000	52 2	174 5	300	4, 605	ш	230
21,000	57.2	193 9	150	5, 055	11	233

*Fuel consumed from start engines through lift-off 190 pounds

NOTE Deviation with change from gross weight not available from operators

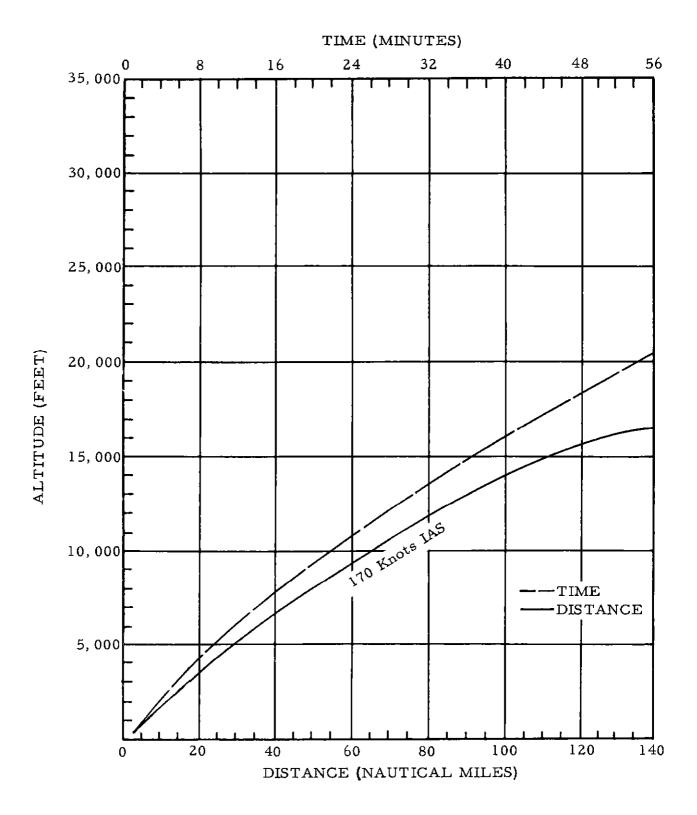


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

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NARRATIVE SUMMARY

Sequence of Operations

From an altitude of 300 feet a constant climb airspeed of 170 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, IA, and Figure 1 present climb data.

Lockheed 1649A

TABLE I, CLIMB (Climb Schedule for Normal Power at 160,000 Pounds Gross Weight)

					Climb	Speed
Altıtude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	IAS (Knots)	TAS (Knots)
300	1.0	2.5	300	120	170	170
500	1.7	4.5	n	200	11	172
1,000	3.3	9.1	11	410	11	173
2,000	6.7	19.0	11	665	***	175
3,000	10.0	28.7	61 £1	920	11	178
4,000	13.3	38.5	11	1,090	11	180
5,000	16.7	48.5	290	1,425	н	183
10,000	36.3	110 5	220	1,765	11	197
15,000	62.0	198.7	170	5,840	11	214
20,000	93.0	314.5	150	7,910	n	233

^{*}Fuel consumed from start engine through lift-off 330 pounds

TABLE I A, CLIMB (Deviation With Change From 160,000 Pounds Gross Weight)

	Per 5,000	Pounds Inc	rease in Gr	oss Weight	Per 5,000	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	${f Climb}$	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Cl_1mb	Distance	Fuel	Climb	$Cl_{1}mb$	Distance	Fuel	Climb
300					5 9%	5 9%	5 9%	
500					6 0%	6 0%	6 0%	
1,000					6 1%	6 1%	6 1%	Not
2,000					6 3%	6 3%	6 3%	avaılable
3,000	Not applicable			6 4%	6 4%	6 4%	from	
4,000		* *			6 5%	6 5%	6 5%	operator
5,000					6 9%	6 9%	6 9%	
10,000					7 8%	78%	78%	
15,000					8 3%	8.3%	8 3%	
20,000					71	11	11	

Each 10°C Each 10°C

Above Std Temp Below Std. Temp

Rate of Climb
Time of Climb
Not available from operator
Climb Distance
Climb Fuel

(The values above are to be substituted in the climb equations in the appendix. In substituting, divide all percentage values by 100)

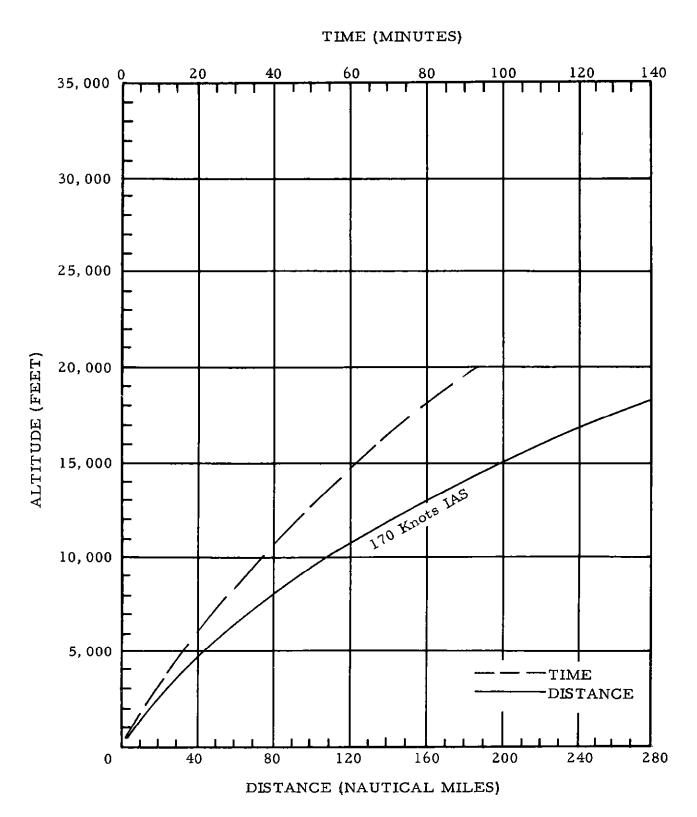


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 140 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from optimum will not materially affect performance

Table I and Figure 1 present climb data

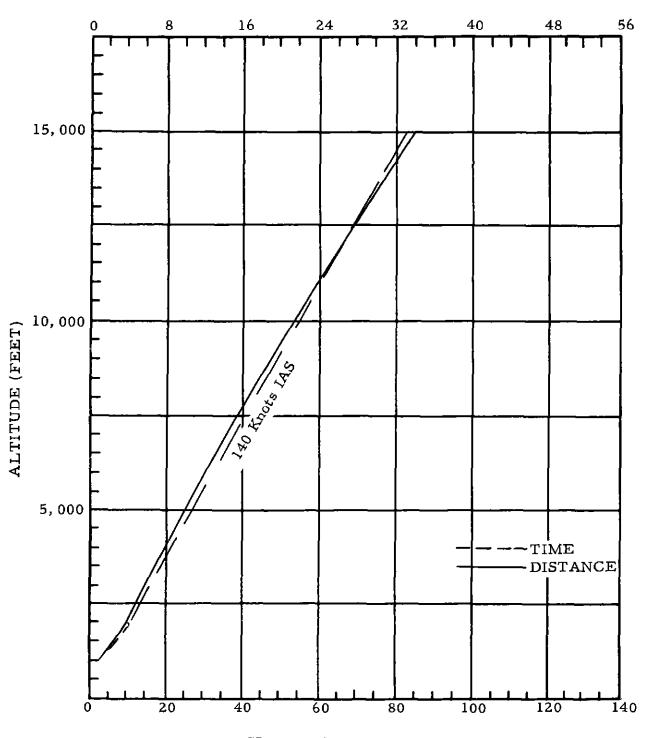
TABLE I, CLIMB
(Climb Schedule for Normal Power at 44,900 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	1 0	2.0	500	48	140	141
	_					
1,000	2 1	4.6	450	80	11	142
3 000	4 3	0 0	11	114	11	144
2,000	4 3	9.9		117		7.2.2
3, 000	6 5	15 2	11	178	11	1 4 6
5, 000	0	15 4		-10		
4,000	8.7	20.6	TT.	242	11	148
5, 000	10 9	26 0	11	306	11	151
10,000	22 0	55.0	11	626	11	162
	22.	0 = 4		0.47		18/
15,000	33 1	85.4	11	946	11	176

*Fuel consumed from start engines through lift-off: 112 pounds

NOTE Deviations with change from 44,900 pounds gross weight not available from operators

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)
FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 700 feet a constant climb airspeed of 160 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 10 knots from the optimum will not materially affect performance

Tables I, I A, and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for METO Power at 64, 500 Pounds Gross Weight)

					Climb	_
Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	∛Clımb Fuel (Pounds)	IAS (Knots)	TAS (Knots)
(r eet)	(Williates)	(Nautical Willes)	(reet per windte)	(1 ounds)	(1711013)	(1211015)
700	1,5	3 5	1,000	40	160	161
1,000	1 9	4.5	11	60	11	163
1,000	1 /	11.5		00		105
2,000	2.9	7 2	1, 120	120	ţ!	165
3, 000	3 6	9.3	1, 380	180	11	167
-,			,			
4,000	4. 3	11 2	1,400	240	11	169
5,000	5.0	13 1	1, 430	305	11	172
·						
10,000	11.0	31,1	700	650	11	188
15, 000	19.5	59.0	410	1,075	11	200
•	•	, -		•		
20,000	35.5	114.8	200	1,750	H	218

*Fuel consumed from start engines to take-off 360 pounds

Vickers Viscount 745D

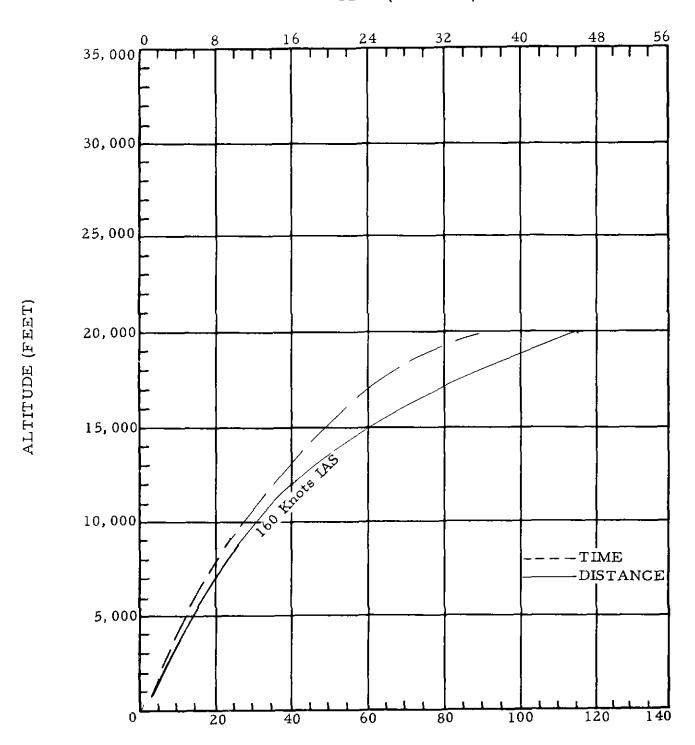
TABLE I A, CLIMB
(Deviation With Change From Maximum Gross Weight)

	Per 2,000 Pounds Increase in Gross Weight				Per 2,000	Pounds Decrease in Gross Weight		
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	$Cl_{1}mb$	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
700					6.0%	6 4%	5.3%	7.4%
1,000					11	11	11	ff
2,000					6 1%	6.2%	5.2%	11
3,000					6.2%	6.0%	5.1%	7.5%
4,000	Not	: Applicable			6 3%	5.8%	5.0%	78%
5, 000					6.4%	5.7%	5.1%	8.0%
10,000					70%	5 6%	5.2%	10.3%
15,000					77%	5.7%	5.6%	13 9%
20,000					8 6%	5.8%	6.2%	25.0%

	Each 10 ⁰ C Above Std Temp.	Each 10 C Below Std Temp
Rate of Climb	23.0%	Not available from
Climb Distance	11	operators.
Climb Fuel	13.1%	

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 160 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 10 knots from the optimum will not materially affect performance

Tables I and Figure 1 present climb data.

Vickers Viscount 812

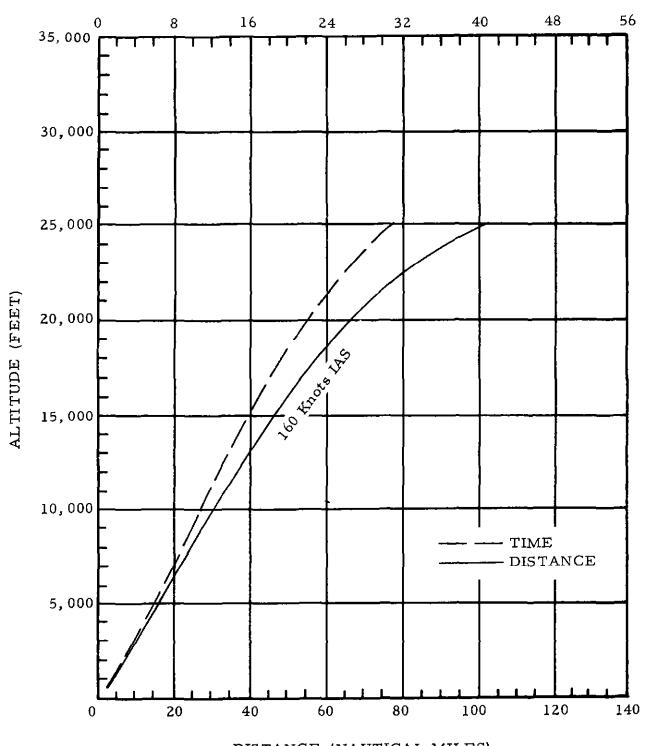
TABLE I, CLIMB
(Climb Schedule for Normal Power at 69,000 Pounds Gross Weight)

Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	Climb IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	1 3	3.0	1,000	230	160	161
1,000	1 8	4.3	11	250	11	163
2,000	2 8	7 0	11	270	11	165
3,000	3 8	9 7	11	290	11	167
4,000	4 8	12 5	11	320	11	169
5,000	5 8	15.3	11	350	11	172
10,000	10.8	30.3	11	450	11	188
15,000	15 8	46.5	П	650	11	200
20,000	21.5	66 3	750	1,000	11	218
25,000	31 0	102.3	300	1,460	11	238

*Fuel consumed from start engines through lift-off 230 pounds

NOTE Deviation with change from 69,000 pounds gross weight not available from operator

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volumes I-A through IX

SECTION 3

GENERAL AVIATION

containing data on

Aero Commander 500 Cessna 180 (Amphibian)

Aero Commander 680 (L-26C) Cessna 182

Aero Commander 720 Cessna 310A (L-27A)

Beechcraft "Bonanza" K-35 Cessna 310C

Beechcraft "Twin Bonanza" (L-23D) de Havilland "Beaver" (L-20A)

Beechcraft Model 95 de Havilland "Otter" (U-1A)

Beechcraft Super 18 Mooney Mark 20A

Cessna 150 Piper "Tri-Pacer" PA-22

Cessna 172 Piper "Apache" PA-23

Cessna 175 Piper "Comanche" PA-24-180

(date of latest revision September 1, 1959)

UNITED STATES FEDERAL AVIATION AGENCY
Bureau of Research & Development Washington 25, D.C

Sequence of Operations

From an altitude of 500 feet a constant climb speed of 95 knots is maintained until an altitude of 10,000 feet is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data

Aero Commander (500)

TABLE I, CLIMB
(Climb Schedule for Normal Power at 6,000 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.5	0.8	1,000	3	95	95
1,000	0.9	1,2	1, 300	5	11	96
2,000	1 8	2 6	1, 200	9	11	97
3,000	2.7	4 0	1, 100	13	11	98
4,000	3 7	5.5	1,000	18	11	100
5, 000	4.9	7 1	900	24	11	102
10,000	12.0	19 4	750	72	11	110

*Fuel consumed from start engines through lift-off 13 pounds

NOTE Deviation with change from gross weight not available from manufacturer

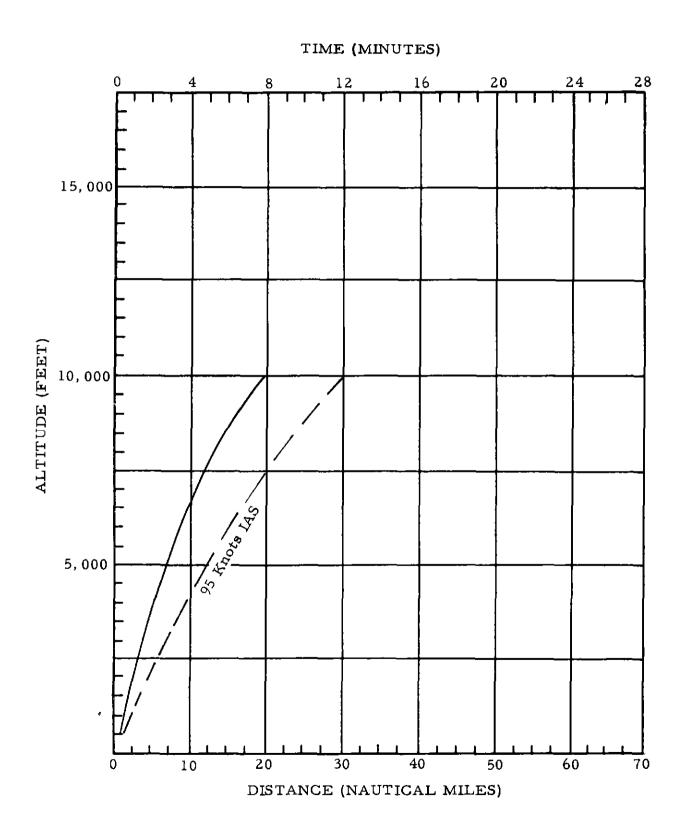


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 1,000 feet a constant climb airspeed of 113 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet, the optimum climb speed is 104 knots IAS. Speeds plus or minus 5 knots from optimum will not materially affect performance.

Table I and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 6,600 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	Climb IAS (Knots)	Speed TAS (Knots)
1,000	0 7	1.1	1,533	6	113	115
2,000	1 3	2 4	1,526	54	11	116
3,000	2 0	3.7	1,519	60	и	118
4,000	2 6	5 0	1,512	66	11	120
5,000	3 4	6 3	1,505	72	104	112
10,000	6 9	13.1	1,360	102	††	121

NOTE. Deviation with change from 6,600 pounds gross weight not available from operators.

^{*} Fuel consumed from start engines through lift-off 48 pounds

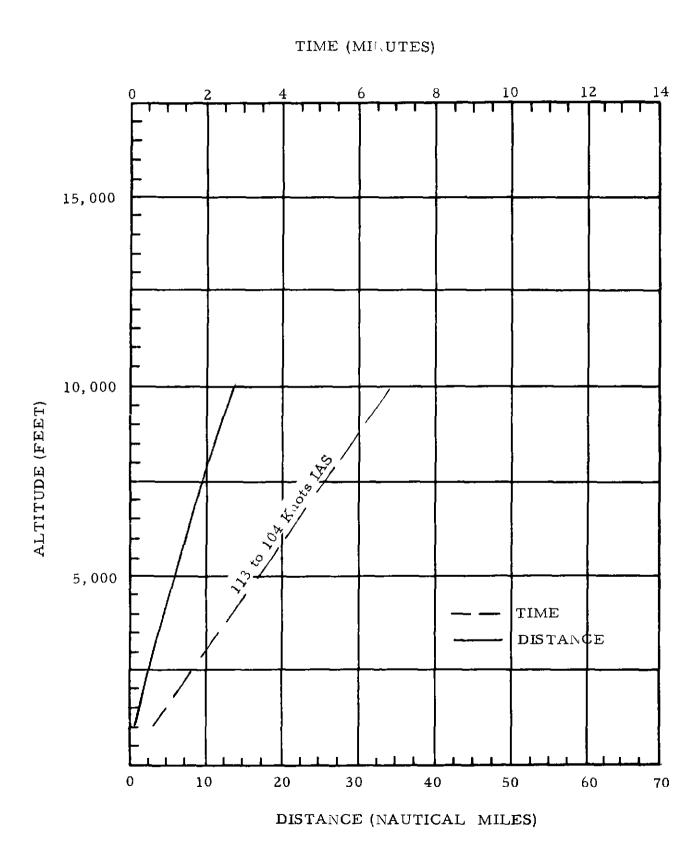


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 1,000 feet, a constant climb speed of 104 knots IAS is maintained until cruise altitude is attained. Flaps are extended 10 degrees during climb. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data

lero Commander (720)

TABLE I, CLIMB
(Climb Schedule for METO Power at 7,500 Pounds Gross Weight)

					Climb Speed		
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS	
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)	
1,000	1 0	1 6	1, 375	6	104	106	
2,000	1 7	2 8	1, 350	12	TT	107	
3,000	2 4	4 2	11	18	11	109	
4,000	3 2	5 7	1,325	24	11	110	
5,000	4 0	7 2	1,300	30	11	112	
10,000	8 1	15 2	1, 175	60	11	121	
15,000	13 3	26 1	775	90	11	131	

*Fuel consumed from start engines through lift-off 48 pounds

NOTE. Deviation with change from gross weight not available from manufacturer

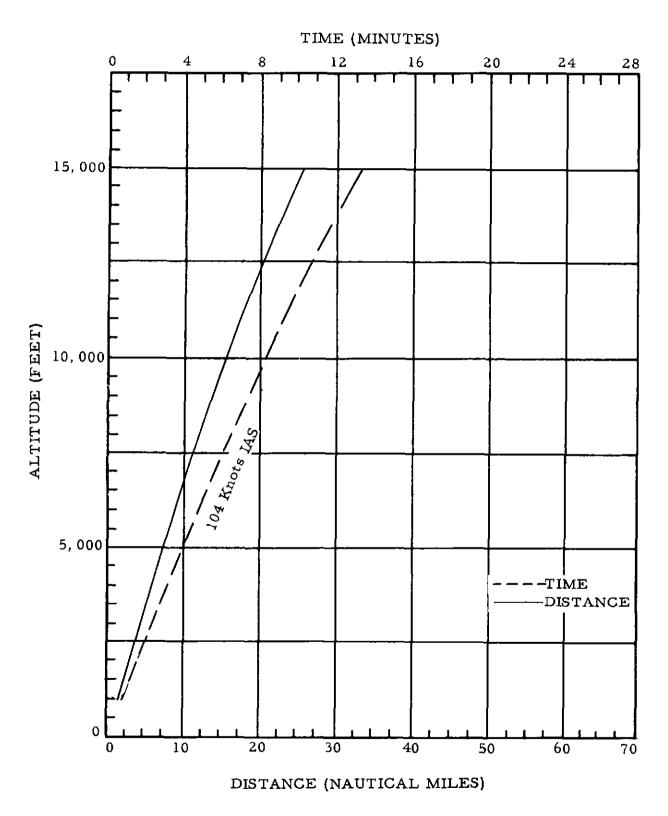


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet climb airspeed will vary between 90 and 80 knots IAS During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance

Tables I and Figure 1 present climb data

Beechcraft K-35 Bonanza

TABLE I, CLIMB
(Climb Schedule for Normal Power at 2,950 Pounds Gross Weight)

					Climb Spee	
Alt1tude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.4	0 5	1, 170	1	90	91
1,000	0 8	I 1	1, 120	3	11	11
2,000	1 7	2 5	1,065	4	11	92
3,000	2 7	4 0	1,015	6	89	93
4,000	3 8	5.7	960	8	11	94
5, 000	5 1	7 7	905	10	88	9 5
10,000	11 6	18 2	630	22	85	99

*Fuel consumed from start engines through lift-off 47 pounds

NOTE Deviation with change from 2, 950 pounds gross weight not available from manufacturer

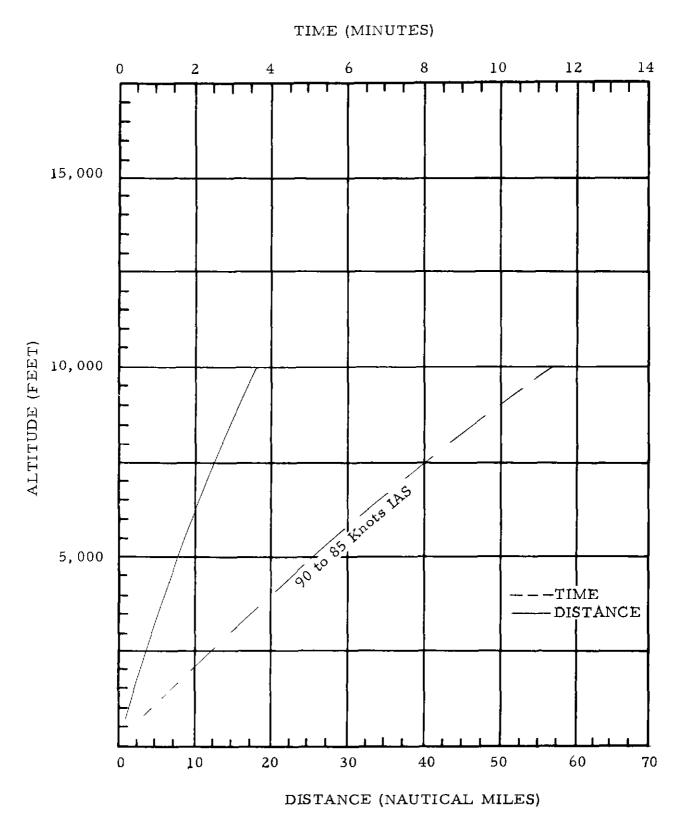


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 120 knots IAS is maintained until an altitude of 4,000 feet is attained. From this altitude to 10,000 feet, climb airspeed will vary between 120 and 110 knots IAS Speeds plus or minus 5 knots from the optimum will not materially affect performance

Tables I, I A and Figure 1 present climb data.

Beechcraft Twin Bonanza (L-23D)

TABLE I, CLIMB
(Climb Schedule for Normal Power at 7,000 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	Climb IAS (Knots)	Speed TAS (Knots)
500	0 5	0.6	500	6	120	121
1,000	1 3	2 2	1,000	13	11	122
2,000	2 1	3 8	1,500	19	tt	124
3,000	2 8	5 3	U	25	11	126
4,000	3 5	6.8	11	31	H	127
5,000	4.2	8 3	11	39	115	124
10,000	7.5	15 2	"	76	110	128

^{*}Fuel consumed from start engines through lift-off 24 pounds

TABLE I A, CLIMB
(Deviation With Change From 7,000 Pounds Gross Weight)

	Per 500	Pounds Incr	ease in Gr	oss Weight	Per 500	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Clımb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fue1	Climb
500					5%	5%	5%	5%
1,000					LT.	7%	6%	11
2,000					8%	8%	8%	8%
3,000					10%	9%	П	10%
4,000		Not Applicab	le		11%	10%	15	11%
5,000					14%	12%	9%	14%
10,000					11	17%	10%	11
15,000					15%	16%	11	15%

Deviation With 10° Change From Standard Temperature

	Each 10° C	Each 10°C		
	Above Std Temp	Below Std. Temp		
Rate of Climb	3%	Not		
Time of Climb	11	avaılable		
Climb Distance	2 4%	from		
Climb Fuel	2 9%	operators.		

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100)

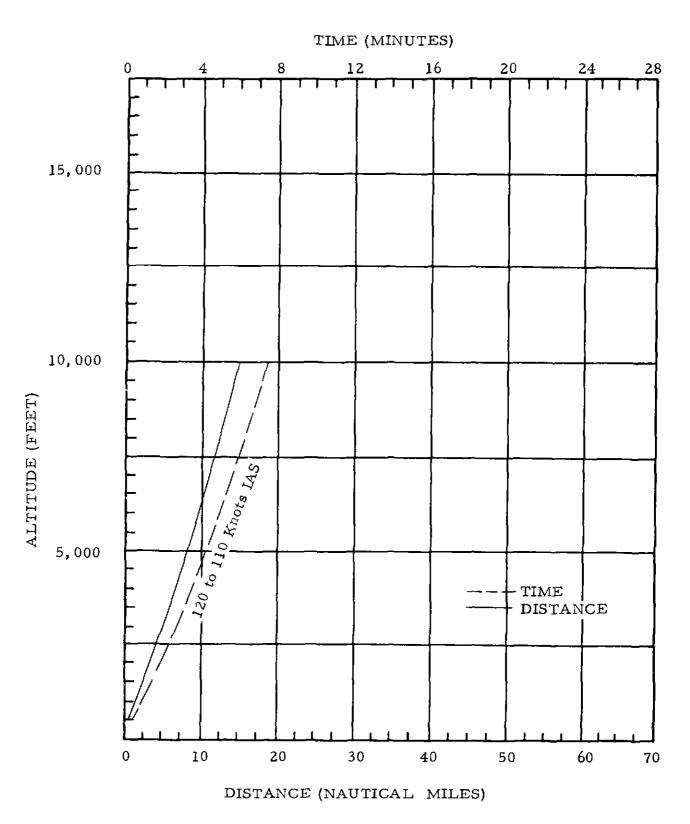


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet the climb airspeed varies between 90 and 88 knots IAS During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance

Table I and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 4,000 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance	Rate of Climb	*Climb Fuel	Climb IAS	TAS
(reet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.3	0.5	1, 320	2	90	90
1,000	0.7	1.0	1,290	3	11	91
2,000	1.5	2,2	1,225	6	11	93
3,000	2.3	3, 6	1, 165	9	tt	94
4,000	3.2	4.9	1,100	12	11	95
5,000	4.2	6.4	1,040	16	11	97
10,000	9.8	15.8	700	38	88	102

* Fuel consumed from start engines through lift-off 4 to 8 pounds

NOTE: Deviations with change from 4,000 pounds gross weight not available from manufacturer.

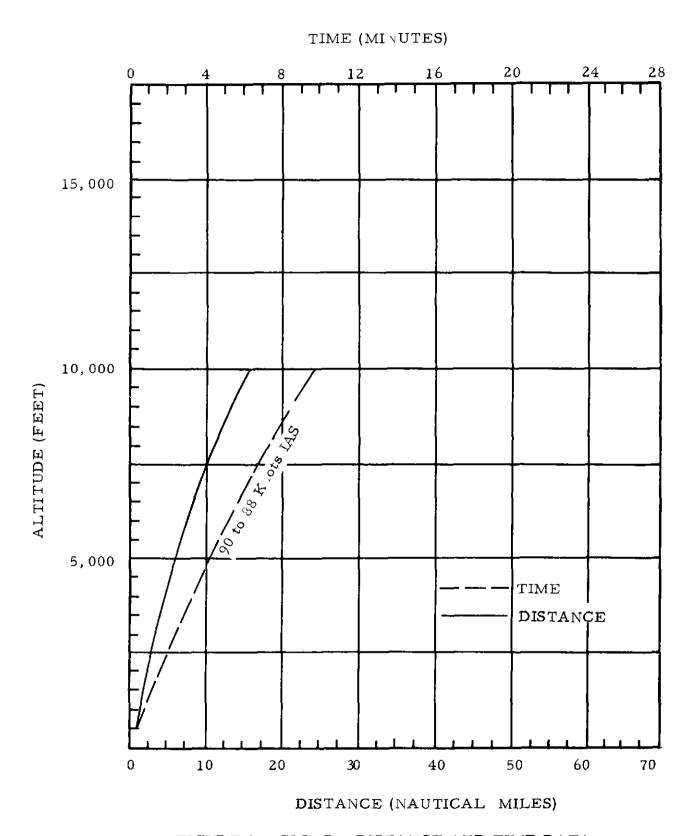


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet, the initial climb airspeed of 106 knots IAS is gradually decreased to 102 knots IAS at 10,000 feet altitude. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data.

Seechcraft Super 18

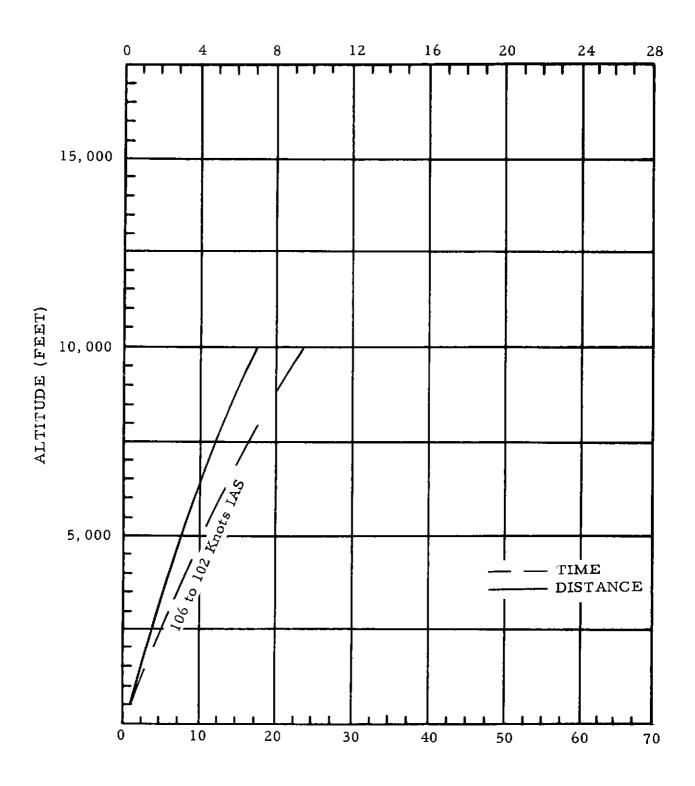
TABLE I, CLIMB
(Climb Schedule for Normal Power at 9,700 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0 5	0 8	1,340	3	106	106
1,000	0 9	1,5	1,320	6	11	107
2,000	1 6	2.8	1,300	12	105	108
3,000	2 4	4 2	1,270	18	tt	110
4,000	3 2	5 7	1,240	24	104	111
5,000	4 1	7.4	1, 150	30	11	112
10,000	9 5	17.7	690	65	102	118

*Fuel consumed from start engines through lift-off 57 pounds

Note Deviation with change from 9,700 pounds gross weight not available from manufacturer

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet, a constant climb airspeed of 65 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet, the optimum climb airspeed will vary between 63 and 59 knots IAS. During climb, speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A, and Figure 1 present climb data

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TABLE I, CLIMB
(Climb Schedule for Normal Power at 2, 200 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	$(M_{1}nutes)$	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0.8	0.8	660	1	65	66
1,000	1.5	1 6	11	2	11	11
2,000	3.0	3 3	tt	4	11	67
3,000	4.6	5 0	u	6	ti	68
•						
4,000	6 1	6.8	tt	8	11	69
-,	· -			_		• ,
5,000	7 6	8 5	ŧτ	10	63	68
2,000	. •				~~	33
10,000	18 8	20 4	240	23	60	70
20,000	10 0	20 J	210	2 5	00	. •
15,000	39 6	45 4	30	60	59	74
15,000	37 0	40 X	50	00	J 9	l -≖

^{*}Fuel consumed from start engines through lift-off 5 pounds

TABLE I A, CLIMB
(Deviation With Change From 2,200 Pounds Gross Weight)

	Per 100	Pounds Increase in Gro	oss Weight	Per 100	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance Fuel	Climb	Climb	Distance	Fuel	Climb
500				8%	9%	0%	8%
1,000				If	I †	11	11
2,000				IT	tt	11	11
3,000		Not Applicable		П	tl	11	11
4,000		~ -		11	11	Ħ	11
5,000				11	11	11%	11
10,000				10%	10%	11	17%
15,000				12%	14%	13%	18%

Deviation With 10° Change From Standard Temperature

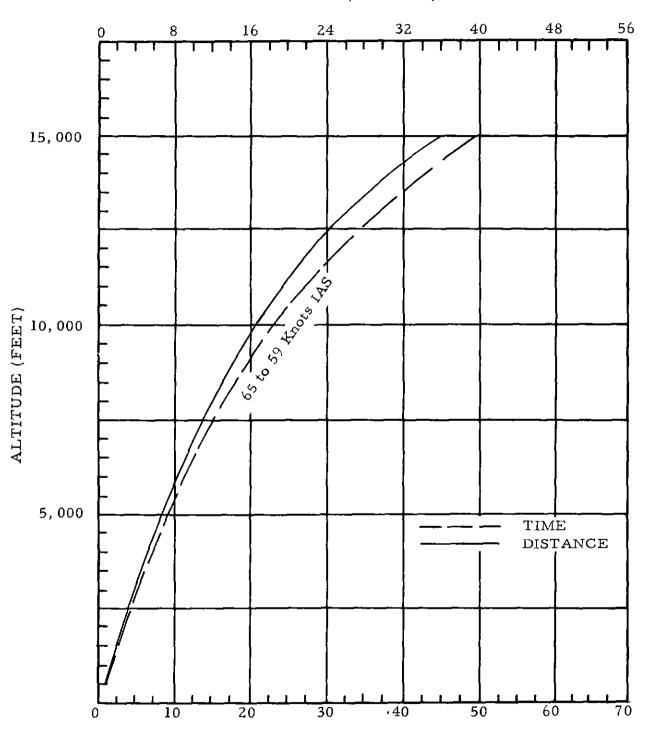
Each 10° C Each 10° C
Above Std Temp. Below Std. Temp.

Rate of Climb
Time of Climb
Climb Distance
Climb Fuel

Not available from manufacturer

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage figures by 100)

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)
FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet, a constant climb airspeed of 73 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet, the optimum climb airspeed will vary between 71 and 70 knots IAS.

Table I and Figure 1 present climb data.

TABLE I, CLIMB
(Climb Schedule for Normal Power at 2, 350 Pounds Gross Weight)

					Climb Speed		
Altıtude	Time of Climb	Climb Distance	Rate of Climb	Climb Fuel	IAS	TAS	
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)	
500	1 5	1,5	850	1	73	74	
1,000	2 1	2 3	u	2	11	11	
2,000	3 3	3.7	11	4	11	75	
3,000	4 5	5 1	11	5	н	76	
4,000	5 7	6 7	11	7	11	77	
5,000	7 0	8 4	615	9	71	79	
10,000	17 0	22 1	380	19	70	85	

*Fuel consumed from start engine through lift-off 6 pounds

NOTE Deviation with change from gross weight not available from manufacturer

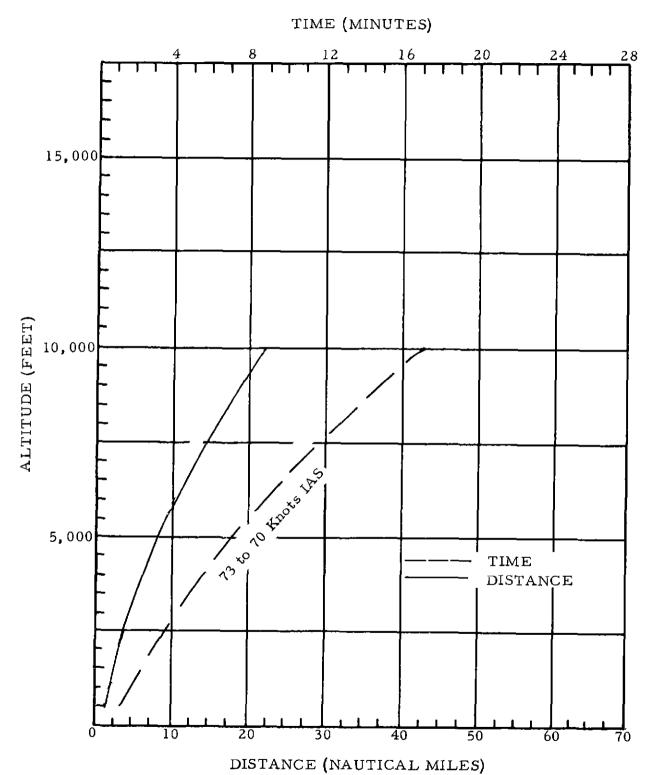


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

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Sequence of Operations

From an altitude of 500 feet, a constant climb speed of 75 knots IAS and a maximum rate of climb are maintained until cruise altitude is attained Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A and Figure 1 present climb data.

Cessna 180 Amphibian

TABLE I, CLIMB
(Climb Schedule for Normal Power at 2,850 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	LAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
				_		
500	0 7	0.8	1,055	3	75	75
1 000		1 4	1 000	4	11	76
1,000	1 2	1 4	1,000	4		70
2,000	2 2	2 6	960	6	fī	77
2,000	- -	- +	,	-		
3,000	3, 3	3.8	915	9	11	78
4,000	4.5	5 4	840	12	11	79
	_			1.5	11	0.0
5,000	5.8	7.1	770	15	,,	80
10,000	13.7	18.2	485	31	11	87
10,000	13, 1	10, 2	105	91		J .

*Fuel consumed from start engines through lift-off 6 pounds

Cessna 180 Amphibian

TABLE I A, CLIMB
(Deviation With Change From 2, 850 Pounds Gross Weight)

	Per 250	Pounds Incr	ease in Gro	ss Weight	Per 250	Pounds Dec	crease in Gr	oss Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500					12%	15%	Negligible	17%
1,000					11	11	†1	11
2,000					11	11	11	H
3,000	No	t Applicable			H	11	11	11
4,000	-11				П	11	11	†1
5, 000					17%	26%	9%	20%
10,000					28%	28%	13%	30%

Deviation With 10° Change From Standard Temperature

Each 10° C	Each 10° C
Above Std Temp	Below Std. Temp

Rate of Climb	
Time of Climb	Not available from manufacturer
Climb Distance	
Climb Fuel	

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all values by 100)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a climb speed of 75 to 68 knots IAS is maintained until cruise altitude is attained. Speeds of plus or minus 5 knots from the optimum will not materially affect performance

Tables I, IA and Figure 1 present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 2,650 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	े Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0 6	0.7	1,030	3.0	75	75
1,000	1.1	1 3	н	5.5	74	11
2,000	2.2	2.7	930	8.0	11	76
3,000	3 3	4. 1	890	10.5	73	11
4,000	4.4	5.5	ŧŧ	13 0	11	77
5,000	5.6	7.1	795	15.0	72	78
10,000	12.6	16.3	560	29.0	68	79

*Fuel consumed from start engines through lift-off. 6 pounds

TABLE I A, CLIMB
(Deviation With Change From Maximum 2, 650 pounds Gross Weight)

	Per 250	Pounds Incre	ease in Gr	oss Weight	Per 250	Pounds De	crease in Gr	oss Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
500					14%	10%	Negligible	17%
1,000					11	11	11	1.1
2,000					11	11	11	11
3,000		Not Applicable			It	11	11	fI
4,000					11	H	11	11
5,000					ff	11	11%	20%
10,000					20%	15%	15%	26%

Deviation With 10° Change From Standard Temperature

Each 10°C	Each 10° C	
Above Std. Temp.	Below Std Tem	р

Rate of Climb	
Time of Climb	Not available from manufacturer
Climb Distance	
Climb Fuel	

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100.)

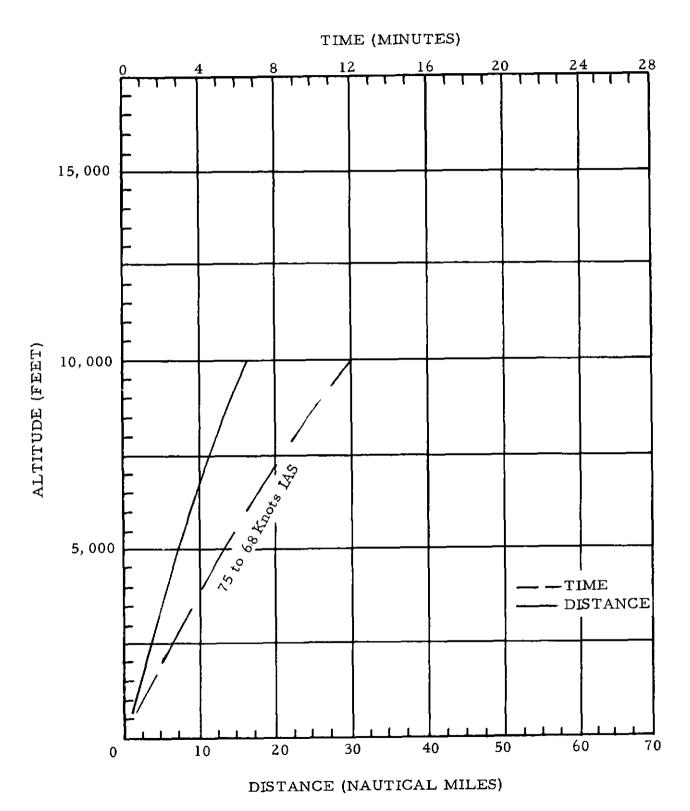


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet climb airspeed varies between 108 and 97 knots IAS. Speeds plus or minus 5 knots from the optimum will not materially affect performance

Tables I, IA and Figure 1 present climb data

Sessna 310A (L-27A

TABLE I, CLIMB (Climb Schedule for Normal Power at 4,400 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	* Climb Fuel (Pounds)	Climb S IAS (Knots)	Speed TAS (Knots)
500	0.4	0 7	1,802	5	108	109
1,000	0 7	1 2	11	11	ti	110
2,000	1 2	2,4	11	17	11	111
3,000	1.8	3.5	11	23	11	112
4,000	2 4	5.0	11	29	tt	11
5,000	2 9	6.5	11	35	104	113
10,000	7.0	14 1	1, 176	51	101	117
15,000	13.3	26.6	800	63	97	122

*Fuel consumed from start engines through lift-off 18 pounds (estimated)

Cessna 310A (L-27A)

TABLE I A, CLIMB (Deviation With Change From 4,400 Pounds Gross Weight)

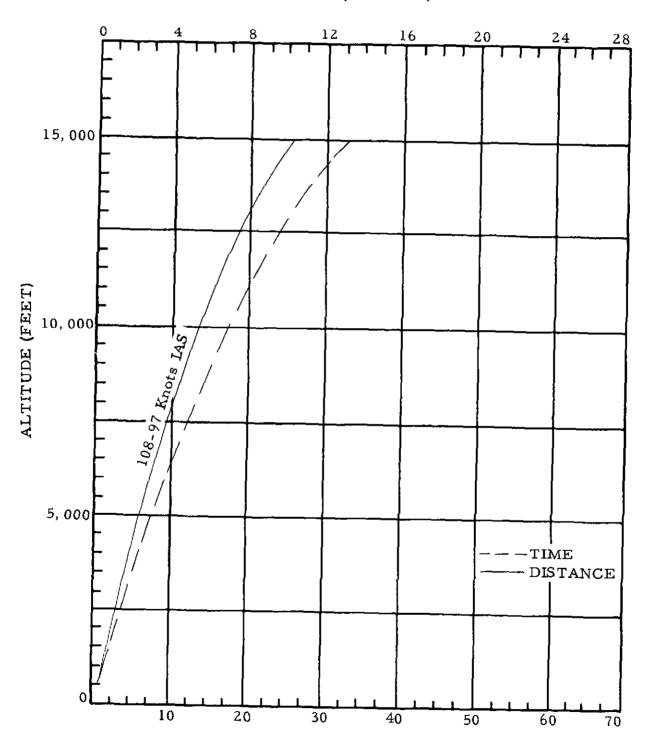
	Per	Pounds Inc	rease in Gro	oss Weight	Per	Pounds Dec	rease ın G	ross Weight
Altitude	Time of	Climb	Climb	Rate of	Time of	Climb	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	${\sf Climb}$	Distance	Fuel	Climb
500								
1,000								
2,000	Not avail	able from ma	anufacturer	or	Not ava	lable from ma	anufacturei	• 0 •
3,000		operators			_,	operator		. 01
4,000		-					~	
5,000	17.0%	15.5%	Not avail	lable from	7.0%	6.5%	Not ava	lable from
10,000	11.5%	11 5%	manufac	turer or	u ,	7.0%		cturer or
15,000	11	11	opera	tors	11	u ,**		ators

Deviation With 10° Change From Standard Temperature

	Each 10°C Each 10°C Above Std Temp Below Std. Temp.
Rate of Climb	Not available from manufacturer or operators
Time of Climb	5.4% 3.3%
Climb Distance	11 tr
Climb Fuel	Not available from manufacturer or operators

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100)

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 1,000 feet a constant climb airspeed of 103 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet the optimum climb airspeed will vary between 102 and 100 knots IAS.

Tables I, IA, and Figure I present climb data

TABLE I, CLIMB
(Climb Schedule for Normal Power at 4,830 Pounds Gross Weight)

Altitude (Feet)	Time of Climb (Minutes)	Climb Distance (Nautical Miles)	Rate of Climb (Feet per Minute)	*Climb Fuel (Pounds)	Climb IAS (Knots)	Speed TAS (Knots)
1,000	1 5	1.6	1,800	3	103	105
2,000	2.1	2,6	tr	5	ŧī	106
3,000	2 7	3 7	н	8	11	108
4,000	3 3	4.8	11	12	11	109
5,000	3 9	5. 9	1,405	13	102	110
10,000	8 1	13 8	1,005	27	100	116

^{*}Fuel consumed from start engines through lift-off. 21 pounds

Sessna 3100

TABLE I A, CLIMB
(Deviation With Change From 4, 830 Pounds Gross Weight)

	Per 400	Pounds Inc	rease in Gr	oss Weight	Per 400	Pounds Dec	rease in G	ross Weight
Altıtude	Time of	Climb	Climb	Rate of	Time of	${\sf Climb}$	Climb	Rate of
(Feet)	Climb	Distance	Fuel	Climb	Climb	Distance	Fuel	Climb
1,000					23%	27%	1 %	15%
2,000					11	11	2%	tt
3,000					22%	26%	3%	11
4,000		Not appl:	ıcable		11	11	4%	T)
5, 000					21%	25%	5%	16%
10,000					18%	20%	8%	19%
15,000					11	11	11%	27%

Deviation With 10° Change From Standard Temperature

Each 10°C Each 10°C

Above Std Temp Below Std, Temp.

Rate of Climb
Time of Climb
Climb Distance
Climb Fuel

Not available
from
manufacturer

(The values above are to be substituted directly in the climb equations in the appendix In substituting, divide all percentage values by 100)

TIME (MINUTES)

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 81 knots IAS is maintained until an altitude of 5,000 feet is attained. Above 5,000 feet, the optimum climb airspeed will vary between 77 and 74 knots IAS. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Tables I, I A and Figure 1 present climb data

Pounds Gross Weight) (Climb Schedule for Normal Power at 4, 800 TABLE I, CLIMB

Speed TAS (Knots)	81	82	83	85	98	83	98
Climb Speed IAS TAS (Knots) (Kno	81	Ξ	2	٤	Ħ	77	74
*Climb Fuel (Pounds)	2	4	2	11	14	18	48
Rate of Climb (Feet per Minute)	920	Ξ	æ	z	Ξ	875	625
Climb Distance (Nautical Miles)	1.1	1.7	3 2	4.8	6 3	8 2	17.2
Time of Climb (Minutes)	1 0	1 4	2.5	3.6	4.7	8	12.5
Altitude (Feet)	200	1,000	2,000	3, 000	4,000	5, 000	10, 000

*Fuel consumed from start engine through lift-off 40 pounds

Pounds Gross Weight) TABLE I A, CLIMB (Deviation With Change From 4, 800

ss Weight Rate of	Crimo			32.0%	21 6%
Pounds Decrease in Gross Weight Climb Climb Rate of		one testore	3	9.1%	6.7%
Pounds Decr Climb	Distance	Not available from oneratore		14, 3%	12 5%
Per 400 Time of		Not		16 7%	=
s Weight Rate of	Citito			12 9%	15 7%
Pounds Increase in Gross Weight Climb Climb Rate of Distance Finel Climb	10n	oberators		9 1%	12 5%
Pounds Incr Climb	חוש לשווכם	Not available from		8.5%	12.5%
Per 300 Time of		Not av		16 7%	25 0%
Altitude (Feat)	200	1,000	3, 000 4, 000	5,000	10,000

Deviation With 10° Change From Standard Temperature

Below Std. Temp Each 10° C Above Std Temp Each 10° C

Climb Distance Time of Climb Rate of Climb Climb Fuel

Not available from operators.

(The values above are to be substituted directly in the climb equations in the appendix. In substituting, divide all percentage values by 100.)

)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 200 feet a constant climb airspeed of 80 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data

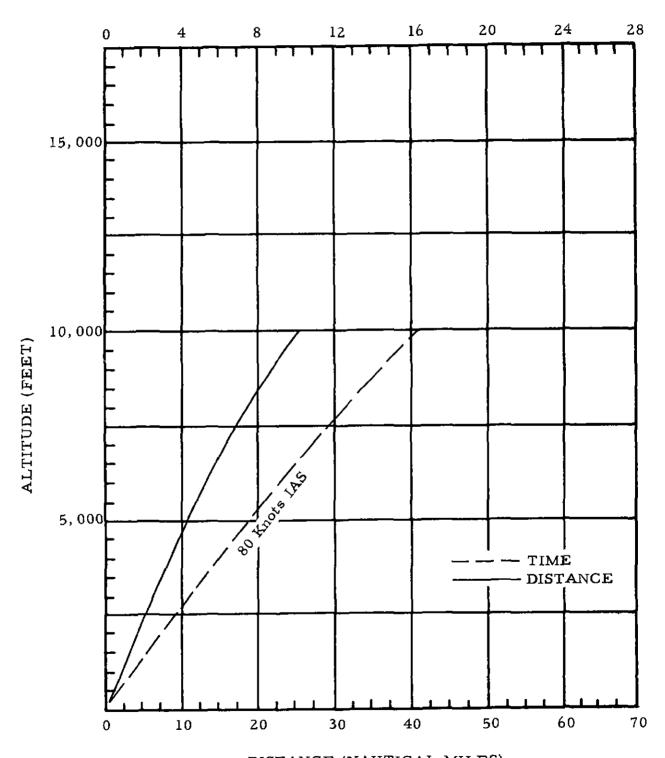
TABLE I, CLIMB
(Climb Schedule for Normal Power at 8,000 Pounds Gross Weight)

					Climb	Speed
Altıtude	Time of Climb	Climb Distance	Rate of Climb	₹Climb Fuel	IAS	TAS
(Feet)	(M_{inutes})	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
200	0.3	0 4	750	8	80	80
1,000	1.4	2.0	725	18	11	81
2,000	2 8	4 2	700	28	11	82
3,000	4 3	6 4	650	38	11	83
4,000	5 9	8.6	625	48	1.6	84
5,000	7 5	11 0	600	58	11	86
10,000	16 5	26 0	500	108	11	93

NOTE. These airspeeds apply for all gross weights Also for every 10 degrees centigrade temperature change, time to climb changes by 5 0%, distance changes by 7 0%, and fuel used changes by 3 0%.

*Fuel consumed from start engines through lift-off 22 pounds

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)
FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

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Sequence of Operations

From an altitude of 500 feet a constant climb speed of 104 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

Table I and Figure 1 present climb data.

Mooney Mark 201

TABLE 1, CLIMB
(Climb Schedule for Normal Power at 2.444 Pounds Gross Weight)

					Climb	ımb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS	
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)	
500	0.8	1.0	600	1.0	104	105	
1,000	1.6	2.4	11	1.9	11	106	
2,000	3. 3	5.4	tt	3.8	11	107	
3,000	4.9	8.3	tt	5.7	11	109	
4,000	6. 6	11.4	11	7.6	11	111	
5,000	8.3	14.6	11	9.5	tt.	112	
10,000	16.7	31.0	tt	19.0	11	121	

^{*} Fuel consumed from start engines through lift-off: 5 pounds

NOTE Deviation with change from gross weight not available from manufacturer.

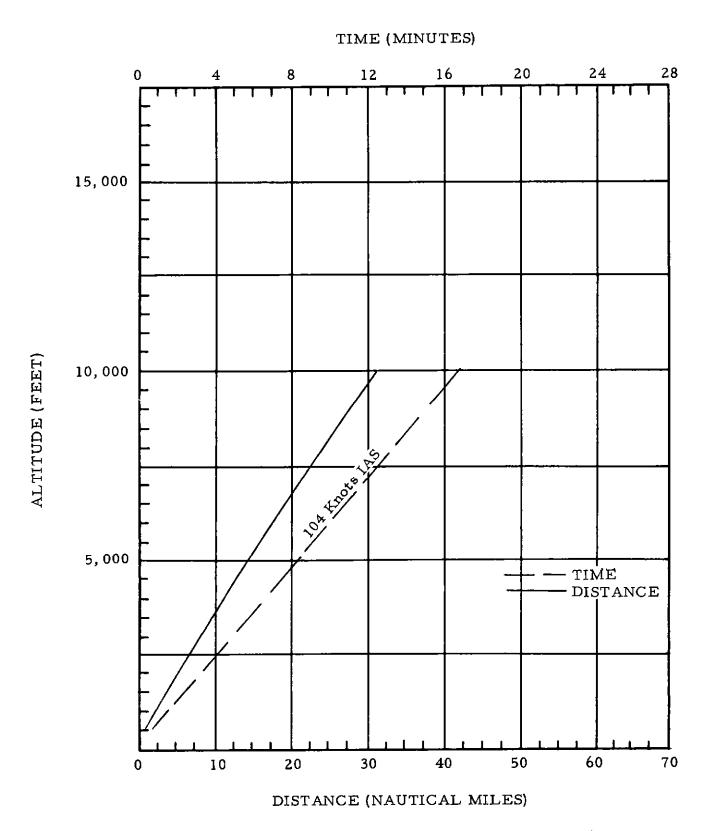


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet a constant climb airspeed of 74 knots IAS is maintained until cruise altitude is attained. Speeds plus or minus 5 knots from the optimum will not materially affect performance.

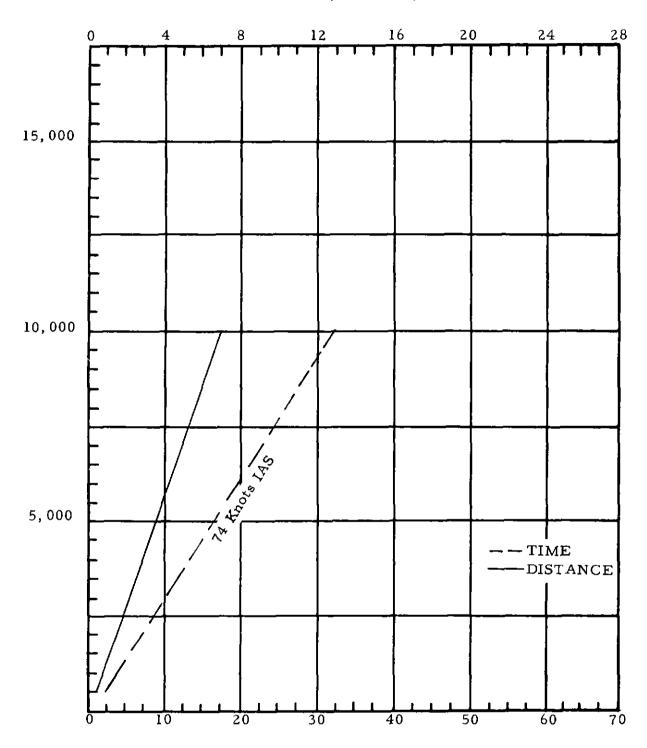
Table I and Figure 1 present climb data.

TABLE I, CLIMB
(Climb Schedule for Normal Power at 1,800 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	1.0	1, 2	800	Not available	74	74
1 000	, _	2 1		from manu-	••	- -
1,000	1.7	2.1	II	facturer.	11	75
2,000	2.9	3.6	11		11	76
-						
3,000	4 2	5.2	11		11	77
4 505	- 1		.,		11	
4,000	5.4	6.8	11		"	78
5,000	6.7	8.5	11		11	80
10,000	12.9	17.1	11		tt	86

NOTE. Deviations with change in gross weight not available from manufacturer.

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)
FIGURE 1 - CLIMB-DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet, a constant climb airspeed of 86 knots IAS is maintained until cruise altitude is attained. During climb, speed plus or minus 5 knots will not materially affect performance.

Table I and Figure I present climb data

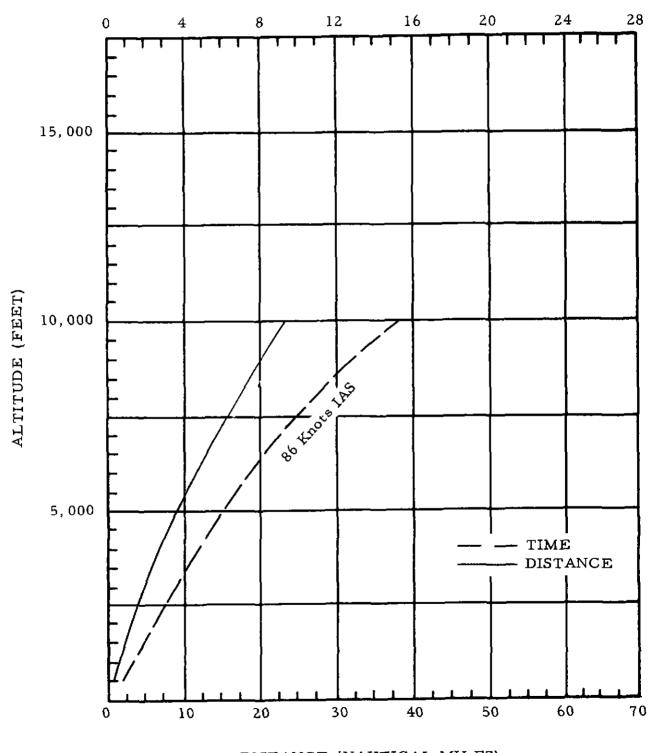
TABLE I, CLIMB
(Climb Schedule for Normal Power at 3,800 Pounds Gross Weight)

					Climb Speed	
Altıtude	Time of Climb	Climb Distance	Rate of Climb	*Climb Fuel	IAS	TAS
(Feet)	(Minutes)	(Nautical Miles)	(Feet per Minute)	(Pounds)	(Knots)	(Knots)
500	0 8	1 0	1,050	2	86	86
1,000	1 3	1 7	1,000	3	ti	87
2,000	2 3	3.2	945	6	u	88
3,000	3 4	4 8	850	8	11	90
4,000	4.6	6.6	765	11	ŧŧ	91
5,000	6.0	8 8	688	14	11	93
10,000	15 2	23.6	400	37	11	100

Note Deviations with change in gross weight not available from manufacturer.

^{*}Fuel consumed from start engines through lift-off 22 pounds

TIME (MINUTES)



DISTANCE (NAUTICAL MILES)

FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

Sequence of Operations

From an altitude of 500 feet, the climb airspeed varies between 75 and 85 knots IAS. Climb airspeed is reduced approximately 5 knots IAS per 5,000 feet of climb.

Table I and Figure 1 present climb data

Pounds Gross Weight) (Climb Schedule for Normal Power at 2,550 TABLE I, CLIMB

Climb Speed IAS TAS Knots) (Knots)	85	=	98	Ξ	=	Ε	87
Climb IAS (Knots)	82	Ξ	=	=	=	80	75
*Glimb Fuel (Pounds)	2.0	3 0	4 7	2 9	8 0	10.8	23 4
Rate of Climb (Feet per Minute)	006	860	820	780	740	700	490
Climb Distance (Nautical Miles)	8 0	1 6	3.3	5 1	7.0	9.1	21.3
Time of Climb (Minutes)	9 0	1.2	2 4	3.6	4 9	6.3	14.7
Altıtude (Feet)	500	1,000	2,000	3,000	4,000	5, 000	10,000

*Fuel consumed from start engines through lift-off 12 pounds

Deviation with change from gross weight not available from manufacturer NOTE

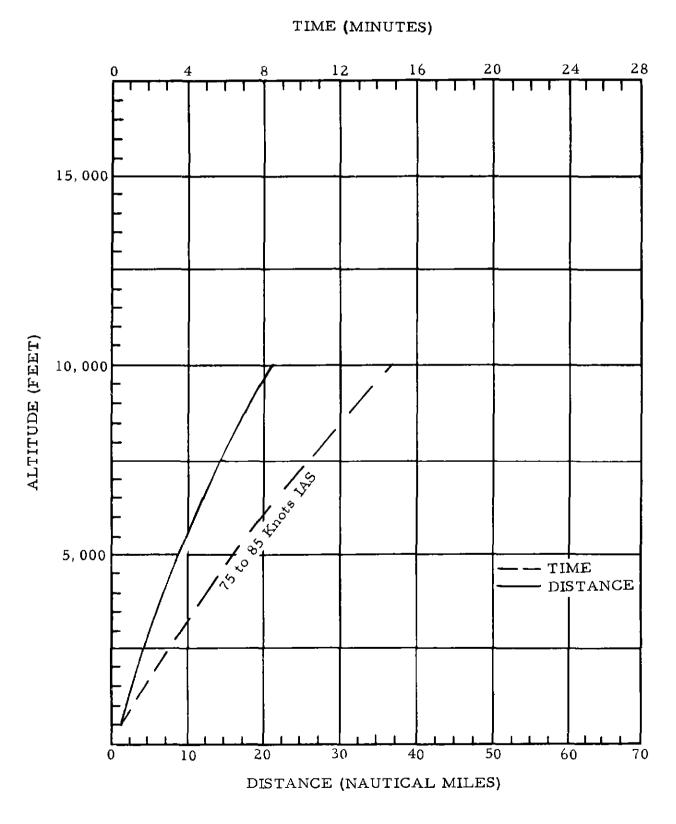


FIGURE 1 - CLIMB - DISTANCE AND TIME DATA

APPENDIX

(Containing Definitions and Reference Data)

DEFINITIONS

PHASES OF OPERATION

- 1. GROUND OPERATIONS All ground activity from intent to start engines to and including pre-take-off preparations
- 2 TAKE-OFF The complete action of getting an air vehicle into the air from the point of brake release through lift-off point
- 3 PRE-CLIMB The flight path from the point of lift-off to the point where climb schedule is established
- 4. CLIMB The flight path from the point where climb schedule is established to enroute or operational altitude
- 5. ENROUTE Flight path from top of climb to beginning of descent
- 6. DESCENT The flight path from beginning of descent to level-off for approach
- 7 APPROACH PATTERN The flight path from the end of descent to glide path interception
- 8 GLIDE PATH The flight path from the glide path interception to landing flareout
- 9. LANDING Landing flareout to turn-oft

DISTANCES

- ABORT DISTANCE The remaining runway distance required to stop aircraft after attaining VI speed
- REFUSAL DISTANCE The distance at which the aircraft will reach refusal speed assuming normal acceleration.

SPEEDS

- FLARE SPEED (also see flareout) The transitional airspeed that is established at the completion of the glide path phase to bring the aircraft down in a smooth curve, preparatory for touchdown
- MAXIMUM (FLAP RETRACTION) SPEED The highest allowable airspeed at which the aircraft can be flown, with flaps extended

- MINIMUM (FLAP RETRACTION) SPEED The lowest airspeed at which the flaps may be retracted without an undesirable loss of altitude
- MACH NUMBER The ratio of the speed of air, or of a moving body through the air, to the speed of sound in the air
- REFUSAL SPEED The highest speed to which an aircraft can be accelerated, assuming normal acceleration, and still be stopped on the remaining runway

WEIGHTS

- BASIC OPERATING WEIGHT The maximum gross weight of the air-craft less cargo, crew, passengers, fuel and oil.
- NORMAL GROSS WEIGHT Typical operating weight selected as most probable at any given phase of flight.
- MAXIMUM GROSS WEIGHT Maximum operating weight, essentially the same as maximum take-off weight
- MAXIMUM RAMP WEIGHT Maximum weight of the loaded aircraft which can be expected at the ramp, generally this will be the maximum take-off weight plus weight of fuel needed for starting, taxing, and engine warm-up
- MAXIMUM TAKE-OFF WEIGHT Maximum allowable weight at takeoff limited by performance and/or regulations
- MAXIMUM LANDING WEIGHT Maximum allowable weight at landing limited by structural capability and/or regulations.
- ZERO FUEL WEIGHT Maximum ramp weight minus usable fuel.

MISCELLANEOUS

- MAXIMUM AND MINIMUM ACCEPTABLE (as used with respect to enroute airspeeds and altitudes) These minimum and maximum values are the acceptable tolerance on the operationally desirable values given They are not necessarily limits imposed by performance capabilities or by regulations
- OPERATIONALLY DESIRABLE Value or condition given by operators or manufacturers as the most preferable, (speeds, altitudes, etc.)

- DRY POWER Power with engine water/methanol system inoperative.
- WET POWER Power with engine water/methanol system operative.
- FLAREOUT (also see flare speed) The act of bringing an airplane down in a smooth curve, preparatory to touching down.
- SPEED BRAKES Any aerodynamic device designed for slowing down an airplane in flight
- HOVER (relating to helicopters or VTOL) To remain in a stationary position at a given altitude above the surface.
- TRANSLATIONAL LIFT The lift force exerted on the rotor blades of a helicopter when increased speed is imparted to the blades or when their angle of attack is changed in going from one type of flight to another, such as from hovering to horizontal flight.

SYMBOLS AND ABBREVIATIONS

ADI Anti-Detonation Injection

AEW Airborne Early Warning

ASW Anti-submarine Warfare

ATO Assisted Take-Off

bhp Brake Horsepower

BLC Boundary Layer Control

BMEP Brake Mean Effective Pressure

ECM Electronic Countermeasures

EGT Exhaust Gas Temperature

eshp Equivalent Shaft Horsepower

fpm Feet Per Minute

IAS Indicated Airspeed

JPT Jet Pipe Temperature

MEA Minimum Enroute Altitude

METO Maximum Except Take-Off

N. A. S. A National Aeronautics and Space Administration

psi Pounds Per Square Inch

RCD/MAD Radar Countermeasures - Magnetic Airborne De-

tection

shp Shaft Horsepower

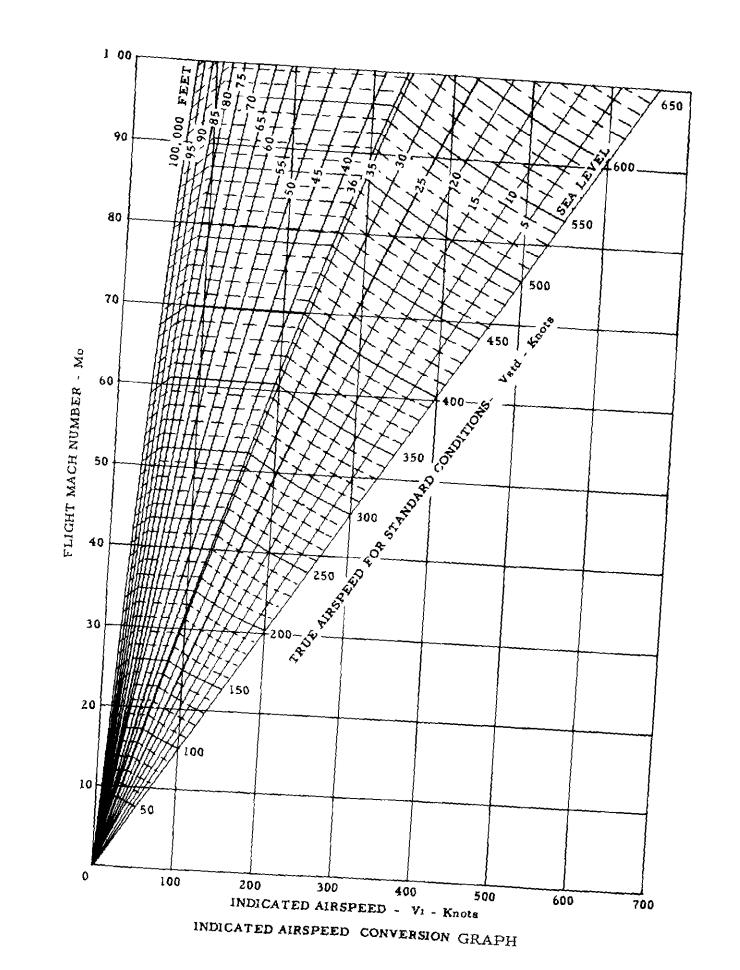
rpm Revolutions Per Minute

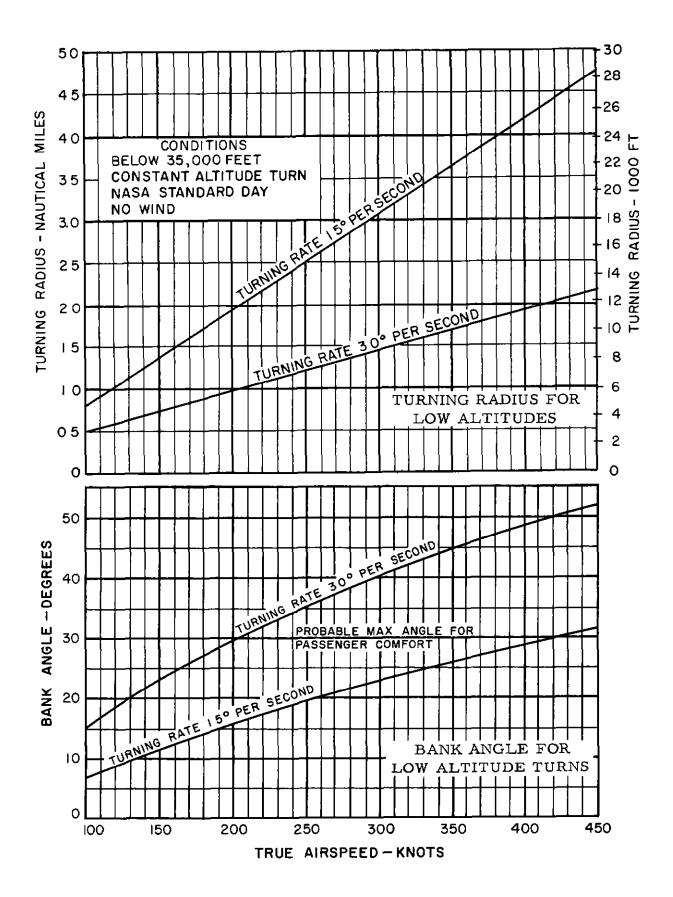
TAS True Airspeed

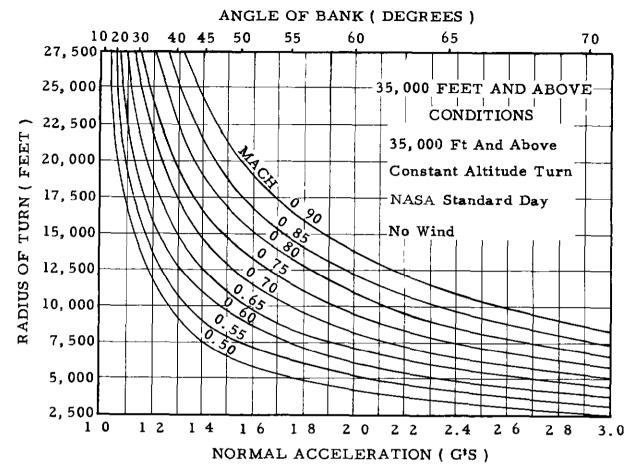
T/O Take-Off

Vl Critical Engine Failure Speed

V2 (Vlof) Take-Off Safety Speed - Actual Lift-Off Speed







TURNING RADIUS GRAPH HIGH ALTITUDES

CLIMB

The following equations are used in conjunction with the climb tables. The equations will yield actual distance, time, rate of climb, and fuel consumed for given gross weight and atmospheric conditions. Normal values and deviations are contained in the tables. In substituting from the tables, divide all percentage values by 100.

Da = Dn
$$(1 + a \frac{Wa - Wn}{X})$$
 $(1 + b \frac{ta - ts}{10})$
Ta = Tn $(1 + c \frac{Wa - Wn}{X})$ $(1 + d \frac{ta - ts}{10})$
Ra = Rn $(1 - g \frac{Wa - Wn}{X})$ $(1 - j \frac{ta - ts}{10})$
Fa = Fn $(1 + e \frac{Wa - Wn}{X})$ $(1 + f \frac{ta - ts}{10})$

- Da Actual climb distance
- Dn Normal climb distance
- Ta Actual climb time
- Tn Normal climb time
- Ra Actual rate of climb
- Rn Normal rate of climb
- Fa Actual fuel consumed
- Fn Normal fuel consumed
- Wa Actual gross weight
- *Wn Normal gross weight
 - ta Ambient temperature (°C)
 - ts Standard day temperature (15° C)
- X Unit pounds in which the deviation with gross weight is expressed

- description of the control of the cont
- b % Deviation in climb distance per 10° change in temperature
- c % Deviation in climb time per X pounds change in gross weight
- d % Deviation in climb time per 10° C change in temperature
- e % Deviation in climb fuel
 per X pounds in gross
 weight
- f % Deviation in climb fuel per 10°C change in temper-
- g % Deviation in rate of climb per X pounds in gross weight
- J % Deviation in rate of climb per 10° C change in temperature

^{*} Symbol "Wn" refers to the gross weight given (either maximum, or normal) at the top of Table IA