

**UNITED STATES  
FEDERAL AVIATION AGENCY**

**AIR VEHICLE PERFORMANCE CHARACTERISTICS**

**Volume V  
E N R O U T E**

*FOR*

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

*BY,*

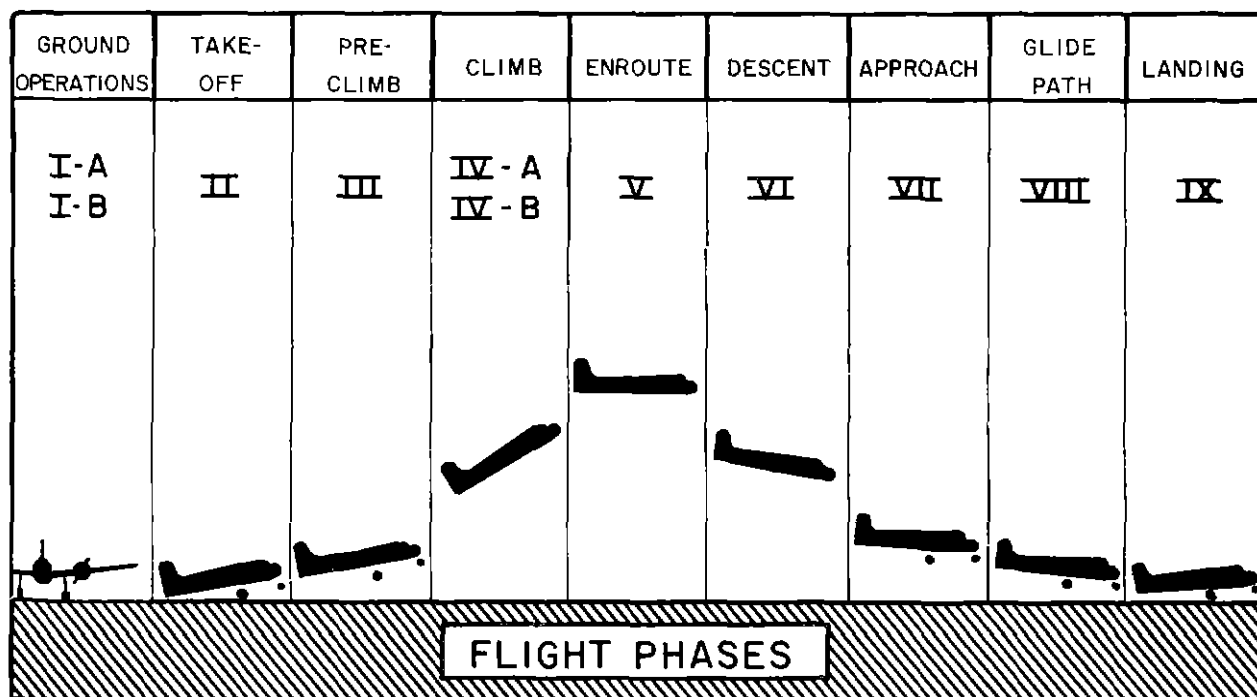
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Alexandria, Virginia

# 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
Volume IV-A . . . . .	Climb
Volume IV-B . . . . .	Climb
Volume V . . . . .	Enroute
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



# AIR VEHICLE PERFORMANCE CHARACTERISTICS

## MASTER INDEX

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

<u>Aircraft</u>	<u>Vol</u>	<u>Aircraft</u>	<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 MK 5	X	Convair R4Y-1	I-IX
Beechcraft "Bonanza" K-35	I-IX	Convair T-29C	I-IX
Beechcraft "Twin Bonanza" (L-23D)	I-IX	Convair YB/RB-58	X
Beechcraft Model 95	I-IX	Curtiss C-46R	I-IX
Beechcraft MS 760	XI	de Havilland "Beaver" (L-20A)	I-IX
Beechcraft Super 18	I-IX	de Havilland Comet 4	I-IX
Beechcraft T-34A	I-IX	de Havilland "Otter" (U-1A)	I-IX
Bell H-13H (47G-2)	I-IX	Douglas AD-6	X
Bell H-40	I-IX	Douglas A3D-2	X
Bell XV-3	XI	Douglas A4D-1	X
Boeing 707-121	I-IX	Douglas C-124C	I-IX
Boeing 707-320	XI	Douglas C-133A	I-IX
Boeing B-377	I-IX	Douglas DC-3 (C-47, R4D)	I-IX
Boeing B-47B/B-47E	I-IX	Douglas DC-4 (C-54)	I-IX
Boeing B-52F	X	Douglas DC-6	I-IX
Boeing KC-97G	I-IX	Douglas DC-6B	I-IX
Boeing KC-135A	I-IX	Douglas DC-7	I-IX
Canadair CP-107	X	Douglas DC-7B	I-IX
Canadair Sabre MK 6	X	Douglas DC-7C	I-IX
Canadair T-33A MK 3	X	Douglas DC-8	XI
Cessna 150	I-IX	Douglas DC-9	XI
Cessna 172	I-IX	Douglas F4D-1	X
Cessna 175	I-IX	Douglas RB/WB-66B	I-IX
Cessna 180 (Amphibian)	I-IX	Fairchild C-119G	I-IX
Cessna 182	I-IX	Fairchild C-123B	I-IX
Cessna 310A (L-27A)	I-IX	Fairchild F-27B	I-IX
Cessna 310C	I-IX	Goodyear ZPG-2	I-IX
Cessna L-19 A/E (OE-1)	I-IX	Goodyear ZPG-3W	I-IX
Cessna T-37A	I-IX	Grumman F9F-8T	X
Cessna TL-19D	I-IX	Grumman F11F-1	X
Chance-Vought F8U-1	X	Grumman SA-16A GR (UF-1)	I-IX
Convair 340/440	I-IX	Grumman S2F-1	X
Convair 600	XI	Hayes-Boeing KB-50J/KB-50K	I-IX
Convair 880-22	XI		

# AIR      VEHICLE      PERFORMANCE      CHARACTERISTICS

## MASTER INDEX - (Cont'd.)

<u>Aircraft</u>	<u>Vol</u>	<u>Aircraft</u>	<u>Vol.</u>
Hiller H-23D	I-IX	North American F-100D	X
Hiller XH-18	XI	North American F-108	XI
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	XI
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	XI	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
North American F-86L	I-IX	Vickers Viscount 745D	I-IX
		Vickers Viscount 812	I-IX

# AIR VEHICLE PERFORMANCE CHARACTERISTICS

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### Section 1 - Military Aircraft - - - - -

Beechcraft T-34A	Douglas C-124C	Lockheed T2V-1
Bell H-13H (47G-2)	Douglas C-133A	Lockheed T-33A-1
Bell H-40	Douglas RB/WB-66B	Martin B-57B
Boeing B-47B/B-47E	Fairchild C-119G	North American F-86L
Boeing KC-97G	Fairchild C-123B	North American TB-25M
Boeing KC-135A	Goodyear ZPG-2	North American T-28A
Cessna L-19 A/E (OE-1)	Goodyear ZPG-3W	North American T-28B
Cessna TL-19D	Grumman SA-16A- GR (UF-1)	North American T2J-1
Cessna T-37A	Hayes-Boeing KB-50J and KB-50K	Northrop F-89H
Convair C-131A	Hiller H-23D	Republic F-84F Series
Convair R4Y-1	Lockheed C-121 C/G	Sikorsky H-19D
Convair T-29C	Lockheed C-130A	Sikorsky H-34A (S-58) (HSS-1)
Curtiss C-46R		Sikorsky H-37A
		Vertol H-21C (44-B)

### Section 2 - Commercial Aircraft - - - - -

Boeing B-377	Douglas DC-6	Lockheed 1049G
Boeing 707-121	Douglas DC-6B	Lockheed 1649A
Convair 340/440	Douglas DC-7	Martin 404
de Havilland Comet 4	Douglas DC-7B	Vickers Viscount 745D
Douglas DC-3 (C-47, R4D)	Douglas DC-7C	Vickers Viscount 812
Douglas DC-4 (C-54)	Fairchild F-27B	
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### Section 3 - General Aviation - - - - -

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

### Appendix - - - - -

(date of latest revision September 1, 1959)

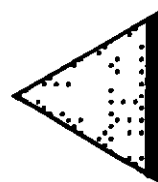
UNITED STATES FEDERAL AVIATION AGENCY  
Bureau of Research & Development Washington 25, D. C.

# AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volumes I-A through IX

## SECTION 1

### MILITARY AIRCRAFT



containing data on

Beechcraft T-34A	Grumman SA-16A-GR (UF-1)
Bell H-13H (47G-2)	Hayes-Boeing KB-50J/KB-50K
Bell H-40	Hiller H-23D
Boeing B-47B/B-47E	Lockheed C-121 C/G
Boeing KC-97G	Lockheed C-130A
Boeing KC-135A	Lockheed T2V-1
Cessna L-19 A/E (OE-1)	Lockheed T-33A-1
Cessna TL-19D	Martin B-57B
Cessna T-37A	North American F-86L
Convair C-131A	North American TB-25M
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Convair T-29C	North American T-28B
Curtiss C-46R	North American T2J-1
Douglas C-124C	Northrop F-89H
Douglas C-133A	Republic F-84F Series
Douglas RB/WB-66B	Sikorsky H-19D
Fairchild C-119G	Sikorsky H-34A (S-58) (HSS-1)
Fairchild C-123B	Sikorsky H-37A
Goodyear ZPG-2	Vertol H-21C (44-B)
Goodyear ZPG-3W	

(date of latest revision September 1, 1959)

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for enroute data at cruise altitude), a maximum range airspeed of 102 knots IAS is maintained. This is also the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous	146
Maximum endurance	73
Maximum range	102
Maximum allowable	243

Turbulent air penetration. 120 to 130 knots IAS at any gross weight and at all altitudes

### Altitudes

Maximum operationally desirable	10,000 feet
Minimum acceptable	2,000 feet
Maximum endurance	6,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at 110 knots IAS in clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,900 Nautical Miles		Pounds Gross Weight	
			IAS	TAS	per 100	Lbs	Dev per 100	Lbs.
0 to 700	Max accpt.	10,000	102	119	285		4.8%	
	Opn. desir.	6,000	"	110	"		"	
	Min accpt	2,000	"	105	-		-	

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



## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), a constant airspeed of 75 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed

Maximum continuous 87 knots IAS  
Maximum endurance 40 knots IAS  
Maximum range 60 knots IAS  
Maximum allowable 87 knots IAS  
Minimum allowable rotor rpm 322  
Maximum allowable rotor rpm 360  
Operationally desirable rotor rpm 360

Turbulent air penetration 45 knots IAS at any gross weight  
and at all altitudes

### Altitudes

Maximum operationally desirable 6,000 feet  
Minimum acceptable 2,000 feet  
Maximum endurance 2,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish standard rate turns at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 2,350 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 10 Lbs	Dev. per 250 Lbs.
0 to 50	Max. accpt. 4,000	75	80	13.3	6%
	Opn. desir. 2,000	"	77	13.5	5%
	Min. accpt. 2,000	"	"	"	"
50 to 200	Max. accpt. 6,000	75	82	12.5	3%
	Opn. desir. 4,000	"	80	13.3	6%
	Min. accpt. 2,000	"	77	13.5	5%

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), enroute airspeed will vary between 75 and 102 knots IAS. These are operationally desirable enroute airspeeds

### Speeds

Maximum continuous 105 knots IAS  
Maximum endurance 50 knots IAS  
Maximum range 100 knots IAS  
Maximum allowable 105 knots IAS  
Minimum allowable rotor rpm 285  
Maximum allowable rotor rpm 314  
Operationally desirable rotor rpm 314

Turbulent air penetration 75 knots IAS at any gross weight  
and at all altitudes.

### Altitudes

Maximum operationally desirable 10,000 feet  
Minimum acceptable MEA  
Maximum endurance 6,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish standard rate turns at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs )

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 5,710 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 100 Lbs.	Dev. per 500 Lbs
0 to 50	Max. accpt. 6,000	95	104	28	3.0%
	Opn. desir 2,000	102	"	25	2.4%
	Min. accpt. MEA	"			
50 to 150	Max accpt 10,000	75	88	27	1.8%
	Opn. desir. 6,000	95	104	28	3.0%
	Min accpt 2,000	102	"	25	2.4%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I) for optimum cruise altitudes for various stage lengths), a maximum range airspeed of Mach 0.74 is maintained. This is the operationally desirable enroute airspeed

Speeds

Maximum continuous Mach 0.81 (limited to 100 nautical miles)

Maximum endurance \* 275 knots IAS (at a gross weight of 180,000 pounds and 23,000 feet altitude)

Maximum range Mach 0.74 or 252 knots IAS

Maximum allowable (with external wing tanks empty or partially filled)

Gross WeightDo Not Exceed

Below 140,000 pounds	456 knots IAS or Mach 0.86
140,000 to 180,000 pounds	390 knots IAS or Mach 0.85
Above 180,000 pounds	370 knots IAS or Mach 0.80

Turbulent Air Penetration

125,000 pounds gross weight 250 knots IAS up to 32,500 feet Mach 0.74 from 32,500 to 34,500 feet Do not exceed 34,500 feet.

180,000 pounds gross weight 280 knots IAS up to 24,800 feet. Mach 0.74 from 24,800 to 27,000 feet Do not exceed 27,000 feet.

Note For gross weights below 125,000 pounds, speeds can be decreased 25 knots, for gross weights above 180,000 pounds, speeds can be increased 45 knots

\* For each 10,000 pounds decrease in gross weight, the air-craft must climb 1,700 feet and IAS must be decreased 8 knots to maintain maximum endurance speed.

## Altitudes

Maximum Operationally desirable	35,500 feet
Minimum acceptable	24,000 feet
Maximum endurance	23,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with gear down. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots			Fuel Data at 180,000 Pounds Gross Weight		
			IAS	TAS	MACH	Nautical Miles per 1,000 Lbs.	Dev. Per 10,000 Lbs.	Dev. Per MACH 0.01
0 to 150	Max. accpt.	28,000	288	440	0.74	32.0	5.0%	2.0%
	Opn. desir.	26,000	300	443	"	31.5	4.0%	"
	Min. accpt.	24,000	316	447	"	30.5	3.6%	"
150 to 500	Max. accpt.	30,000	277	436	0.74	31.7	6.5%	2.0%
	Opn. desir.	28,000	288	440	"	32.0	5.0%	"
	Min. accpt.	26,000	300	443	"	31.5	4.0%	"
500 to 1,000	Max. accpt.	31,000	272	434	0.74	31.0	7.3%	2.0%
	Opn. desir.	29,000	285	438	"	32.0	5.8%	"
	Min. accpt.	27,000	295	442	"	31.7	4.5%	"
1,000 and up	Max. accpt.	35,500	243	425	0.74	27.0 *	10.8%	2.0%
	Opn. desir.	33,000	259	430	"	29.0 †	9.0%	"
	Min. accpt.	31,000	272	434	"	31.0	7.3%	"

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

\* This aircraft cannot fly at or above 33,000 feet at gross weights in excess of 177,000 pounds.

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an average airspeed of 230 knots TAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 280  
Maximum endurance 170  
Maximum range 180  
Maximum allowable 301 at any gross weight

Turbulent air penetration 190 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 18,000 feet  
Minimum acceptable 12,000 feet  
Maximum endurance 15,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)



TABLE I ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in * Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 164,950 Pounds Nautical Miles per 1,000 Lbs	Gross Weight Dev per 10,000 Lbs
		IAS	TAS		
0 to 2,000	Max accept	173	230	76 3	6 7%
	Opn desir	183	"	"	"
	Min accept	192	"	"	"

\*The mission of the aircraft directs the above desired altitudes for all stage lengths regardless of distance

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed of Mach 0.78 is maintained. This is the operationally desirable enroute airspeed.

Speed

Maximum continuous Mach 0.82  
 \*Maximum endurance 254 knots IAS (at a gross weight of 243,000 pounds and at an altitude of 28,700 feet)  
 Maximum range Mach 0.78  
 Maximum allowable

At any gross weight	Do not exceed 350 knots IAS or Mach 0.90, whichever is less
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Turbulent air penetration Mach 0.70 or 250 knots IAS, whichever is less (any gross weight and at all altitudes)

Altitudes

Maximum operationally desirable 34,000 feet  
 Minimum acceptable 25,000 feet  
 \*Maximum endurance 28,700 feet (at a gross weight of 243,000 pounds)

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with speed brakes extended. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

\*For each 10,000 pound decrease in gross weight, the aircraft must climb approximately 570 feet and IAS must be decreased approximately 6 knots to maintain maximum endurance speed.

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots			Fuel Data at 243,000 Pounds Gross Weight			
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev. per 10,000 Lbs	Dev per MACH 0.01	
0 to 2,000	Max accpt	34,000	270	452	0.78	37	4%	Negligible
	Opn desir	33,000	275	454	"	"	3%	"
	Min accpt	25,000	328	468	"	31	1%	"

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between 81 and 87 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous	150
Maximum endurance	74
Maximum range	81
Maximum allowable	155 (L-19A & OE-1) 165 (L-19E)

Turbulent air penetration 87 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable	10,000 feet
Minimum acceptable	MEA
Maximum endurance.	10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots IAS      TAS		Fuel Data at 2,400 Pounds Gross Weight	
						Nautical Miles per 10 Lbs	Dev per 300 Lbs
0 to 150	Max	accpt	5,000	83	89	21 0	2.9%
	Opn	desir	5,000	"	"	"	"
	Min	accpt	MEA				
150 and Up	Max	accpt	10,000	81	94	21 8	3.9%
	Opn	desir	10,000	"	"	"	"
	Min	accpt	5,000	83	89	21 0	2.9%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies from 90 to 98 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 161  
 Maximum endurance 74  
 Maximum range 90  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

165

Turbulent air penetration 87 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 2,500 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 2,400 Pounds	Gross Weight
		IAS	TAS	Nautical Miles per 10 Lbs.	Dev. per 200 Lbs.
0 to 150	Max. accpt. 7,500	93	103	24.5	4.0%
	Opn. desir. 5,000	95	102	24.0	3.4%
	Min. accpt. 2,500	98	100	23.7	3.1%
150 to 500	Max. accpt. 10,000	90	105	25.0	4.6%
	Opn. desir. 5,000	95	102	24.0	3.4%
	Min. accpt. 2,500	98	100	23.7	3.1%

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths) a maximum range airspeed varying between 147 and 187 knots IAS is maintained. These are the operationally desirable enroute airspeeds.

### Speed

Maximum continuous 236 knots TAS  
Maximum endurance 130 knots IAS  
Maximum range 236 knots TAS  
Maximum allowable Mach 0.65 or 382 knots IAS (whichever is less)

Turbulent air penetration 200 knots IAS at any gross weight and at all altitudes

### Altitude

Maximum operationally desirable 30,000 feet  
Minimum acceptable 10,000 feet  
Maximum endurance 30,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed plus 10 knots and in clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn at 140 knots IAS. (See appendix for turning radius, angle of bank and speed conversion graphs.)



TABLE I, ENROUTE (Performance Data for Various Stage Lengths)						
Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 6,400 Nautical Miles per 1,000 Lbs	Pounds Gross Weight Dev. per 1,000 Lbs	
		IAS	TAS			
0 to 600	Max accpt.	30,000	147	236	430	1.7%
	Opn. desir.	25,000	164	245	420	1.2%
	Min accpt.	10,000	187	216	400	1.0%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude, (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed varies from 169 to 187 knots IAS as indicated in Table I. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous. 220

Maximum endurance: 124

Maximum range. 180 (at 39,000 pounds gross weight at 10,000 feet)

Maximum allowable:

Gross Weight

At any gross weight

Do Not Exceed

266 (up to 16,500 feet.  
Above 16,500 feet, reduce  
airspeed 5 knots per 1,000  
feet.)

Turbulent Air PenetrationGross WeightSpeed

34,000	156
36,000	158
38,000	160
40,000	162
42,000	165
44,000	167
46,000	169

Altitudes

Maximum operationally desirable 20,000 feet

Minimum acceptable MEA

Maximum endurance: 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish either a one-half standard or standard rate turn, at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 39,000 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 1,000 Lbs.	Dev. per 1,000 Lbs.
0 to 100	Max. accpt. 10,000	179	210	229	1.0%
	Opn. desir. 5,000	187	200	217	0.5%
	Min. accpt. MEA	Not available from operator			
100 to 300	Max. accpt. 15,000	175	220	232	1.3%
	Opn. desir. 8,000	182	205	223	0.8%
	Min. accpt. MEA	Not available from operator			
300 to 800	Max. accpt. 15,000	175	220	232	1.3%
	Opn. desir. 10,000	179	210	229	1.0%
	Min. accpt. 5,000	187	200	217	0.5%
1000 to 3000	Max. accpt. 20,000	169	230	235	1.3%
	Opn. desir. 15,000	175	220	232	"
	Min. accpt. 5,000	187	200	217	0.5%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a constant airspeed of 175 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 260  
 Maximum endurance 130  
 Maximum range 155  
 Maximum allowable At any gross weight do not exceed  
 airspeeds presented below

Altitude (Feet)	Level Flight	Diving
Sea level to		
10,000	260	295
15,000	248	264
20,000	218	232

Turbulent air penetration 160 knots at any gross weight  
 and at all altitudes

Altitude

Maximum operationally desirable 14,000 feet  
 Minimum acceptable MEA  
 Maximum endurance MEA

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots		Fuel Data at 46,000 Pounds Gross Weight	
				IAS	TAS	Nautical Miles per 100 Lbs	Dev per 2,000 Lbs
0 to 100	Max	accpt	5,000	175	188	20 2	3 5%
	Opn	desir	3,000	"	183	20 3	2 8%
	Min	accpt	MEA	"	-	-	-
100 to 300	Max	accpt	10,000	175	203	20 2	3 0%
	Opn	desir	8,000	"	197	"	3 2%
	Min	accpt	5,000	"	188	"	3 5%
300 to 500	Max	accpt	13,000	175	214	19 9	3 3%
	Opn	desir	9,000	"	200	20 2	3 1%
	Min	accpt	5,000	"	188	"	3 5%
500 to 1,200	Max	accpt	14,000	175	219	19 2	3 4%
	Opn	desir	12,000	"	210	19 7	3 2%
	Min	accpt	8,000	"	197	20 2	3 2%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), the airspeed will vary between 154 and 187 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 202 to 209 (44,500 to 32,000 pounds gross weight at 15,000 feet altitude)  
 Maximum endurance 127 to 108 (44,500 to 32,000 pounds gross weight)  
 Maximum range 153 to 138 (44,500 to 32,000 pounds gross weight at 5,000 feet altitude)  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

266 (sea level to 16,500 feet altitude)  
 258 (at 18,000 feet altitude)  
 248 (at 20,000 feet altitude)

Turbulent air penetration 164 at a gross weight of 41,500 pounds. Deviation with gross weight 1.0% per 1,000 pounds.

Altitude

Maximum operationally desirable 18,000 feet  
 Minimum acceptable MEA  
 Maximum endurance MEA

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles		Altitude (Feet)	Speed Knots		Fuel Data at 41,500 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs
			IAS	TAS		
0 to 100	Max. accpt	5,000	186	200	172	1.0%
	Opn desir.	4,000	187	"	175	"
	Min. accpt	MEA	-	"	-	-
100 to 300	Max. accpt	10,000	172	200	187	1.5%
	Opn desir.	8,000	177	"	181	1.0%
	Min accpt.	5,000	186	"	172	"
300 to 500	Max. accpt.	13,000	164	200	187	2.0%
	Opn desir.	9,000	175	"	185	1.5%
	Min. accpt	5,000	186	"	172	1.0%
500 to 1,200	Max. accpt	18,000	154	200	187	2.5%
	Opn desir.	12,000	167	"	"	1.5%
	Min. accpt	8,000	177	"	181	1.0%

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



## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths) a maximum range airspeed of 165 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 189  
 Maximum endurance 115  
 Maximum range 165  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight - - - - - 233

Turbulent air penetration 127 at any gross weight, and at all altitudes

Altitude

Maximum operationally desirable 12,000 feet  
 Minimum acceptable 2,000 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 42,000 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max	acct	5,000	165	178	18 6
	Opn	desir	3,000	"	173	"
	Min	acct.	2,000	"	170	"
						Not available from operator
150 to 500	Max.	acct	8,000	165	186	18 6
	Opn	desir	6,000	"	180	"
	Min	acct	4,000	"	175	"
500 to 1,000	Max	acct	12,000	165	198	18 6
	Opn	desir	8,000	"	186	"
	Min	acct.	4,000	"	175	"

Note Above 12,000 feet altitude, the number of nautical miles obtained per 100 pounds of fuel decreases approximately 1 7% for each 1,000 foot increase in altitude

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed varies between 166 and 170 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 220 (low blower at 10,000 feet and 2,650 bhp)  
 Maximum endurance 140  
 Maximum range 168  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

238

Turbulent air penetration

Gross WeightSpeed

168,000 pounds	171
160,000 pounds	168
150,000 pounds	165
140,000 pounds	162

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 5,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at 145 knots IAS with flaps extended 10 degrees. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

						Fuel Data at 167,000 Pounds Gross Weight	
Stage Length in		Altitude		Speed Knots		Nautical Miles	Dev. per
Nautical Miles		(Feet)		IAS	TAS	per 1,000 Lbs	10,000 Lbs
0 to 1,000	Max	accpt.	9,000	166	190	65	Negligible
	Opn	desir	7,000	"	185	66	"
	Min	accpt	MEA	"			"
1,000 and up	Max	accpt	10,000	166	192	64	Negligible
	Opn	desir	9,000	"	190	65	"
	Min	accpt	5,000	"	179	67	"

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

Note. Between 5,000 and 10,000 feet altitude, the number of nautical miles obtained per 1,000 pounds of fuel decreases approximately 1.5% for each 10° C increase in temperature.

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude, (see Table I for optimum altitude for various stage lengths) a maximum range airspeed of 260 knots TAS is maintained. This is the operationally desirable enroute airspeed.

Speeds

Maximum continuous 274 knots IAS\*  
Maximum endurance

Gross Weight (knots IAS)

275,000 pounds	173
255,000 "	160
200,000 "	145
150,000 "	150

Maximum range 260 knots TAS  
Maximum allowable 340 knots IAS\*

Turbulent air penetration 230 to 260 knots TAS\*

Altitudes

Maximum operationally desirable 25,000 feet  
Minimum acceptable 13,000 feet  
Maximum endurance. 25,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for angle of bank, turning radius, and speed conversion graphs )

\*Estimated data

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		*Fuel Data at 270,000 Pounds Gross Weight		
		IAS	TAS	Nautical Miles per 1,000 Lbs	Dev. per 10,000 Lbs	
100 to 500	Max. accpt.	15,000	206	260	28.7	4.5%
	Opn. desir.	15,000	"	"	"	"
	Min. accpt.	13,000	213	"	28.0	3.0%
500 to 1,000	Max. accpt.	25,000	174	260	41.2	5.6%
	Opn. desir.	21,000	186	"	36.0	3.1%
	Min. accpt.	15,000	206	"	28.7	4.5%
1,000 to 3,000	Max. accpt.	25,000	174	260	41.2	5.6%
	Opn. desir.	25,000	"	"	"	"
	Min. accpt.	21,000	186	"	36.0	3.1%

\* At 270,000 pounds gross weight, climb cruise procedure is initiated at 15,000 feet altitude.  
At a constant TAS of 260, rate of climb is approximately 20 feet per minute.

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), an airspeed of 0.80 Mach is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous 350 to 361 (80,000 to 50,000 pounds gross weight at 25,000 feet altitude)  
 Maximum endurance 185 to 235 (50,000 to 70,000 pounds gross weight at 30,000 feet altitude)  
 Maximum range 232 to 266 (50,000 to 70,000 pounds gross weight at 36,089 feet altitude)  
 Maximum allowable

### Gross Weight

### Do Not Exceed

At any gross weight 570 up to 5,000 feet  
 Mach 0.95 at 5,000 feet and above

Turbulent air penetration 250 at any gross weight and at all altitudes

### Altitude

Maximum operationally desirable 43,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 30,000

### Holding Configuration and Turning Radius

Enroute holding is accomplished at 225 knots IAS with the aircraft in clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a half-standard rate turn (see appendix for turning radius, angle of bank, and speed conversion graph).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots			Fuel Data at 70,000 Pounds Gross Weight		Dev. per MACH 0.01
			IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	
Up to 500	Max	acct	35,000	268	458	0.80	75.0	10.0%
	Opn	desir	20,000	366	487	"	49.5	3.0%
	Min.	acct	MEA	--	--	--	--	--
500 to 1,000	Max	acct	35,000	268	458	0.80	75.0	10.0%
	Opn	desir.	25,000	335	478	"	58.5	4.3%
	Min	acct	20,000	366	487	"	49.5	3.0%
1,000 and up	Max	acct	35,000	268	458	0.80	75.0	10.0%
	Opn	desir	30,000	300	468	"	68.0	5.9%
	Min	acct.	25,000	335	478	"	58.5	4.3%

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



## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed of 178 knots TAS is maintained. This is the operationally desirable enroute airspeed.

### Speeds

Maximum continuous 225 knots TAS  
Maximum endurance 154 to 170 knots TAS  
Maximum range 175 to 180 knots TAS  
Maximum allowable 217 knots IAS (maximum dive speed)

Turbulent air penetration 157 knots IAS at 64,000 pounds gross weight at all altitudes

Percent deviation with gross weight per 1,000 pounds  
0.5%

### Altitudes

Maximum operationally desirable 10,000 feet  
Minimum acceptable MEA  
Maximum endurance 5,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance air speed in a clean configuration. An alternate configuration is with gear down. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 64,000 Pounds Gross Weight Nautical Miles per 1,000Lbs	Dev per 5,000 Lbs.
			IAS	TAS		
0 to 400	Max. accept	10,000	153	178	133	6.0%
	Opn desir.	6,000	164	"	128	5.5%
	Min. accept.	MEA		"		
400 to 1,000	Max. accept	10,000	153	178	133	6.0%
	Opn desir.	8,000	159	"	130	"
	Min. accept.	MEA		"		

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a constant airspeed of 160 knots TAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous: 180 at sea level, 169 at 10,000 feet

Maximum endurance: 108 at 53,000 pounds gross weight  
(for each 5,000 pounds decrease in gross weight, IAS must decrease 4-7 knots to maintain maximum endurance speed)

Maximum range: 126 at 53,000 pounds gross weight

Maximum allowable: 245 at any gross weight and at all altitudes

Turbulent air penetration: 151 at 53,000 pounds gross weight  
(percent deviation per 5,000 pounds gross weight: 3%)

### Altitude

Maximum operationally desirable: 10,000 feet

Minimum acceptable: MEA

Maximum endurance: 10,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

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TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 53,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 5,000 Lbs
			IAS	TAS		
0 to 400	Max.	accpt. 10,000	138	160	154	5.0%
	Opn	desir 6,000	144	"	146	4.0%
	Min	accpt. MEA				
400 to 1,000	Max	accpt 10,000	138	160	154	5.0%
	Opn	desir 8,000	142	"	150	4.5%
	Min	accpt. MEA				

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude which is dependent upon the published minimum enroute altitude (MEA), a constant airspeed of 50 knots IAS is maintained during the enroute phase. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 68  
Maximum endurance 35 (single engine)  
Maximum range Not available from operator  
Maximum allowable 75 at any gross weight

Turbulent air penetration moderate turbulence, do not exceed 55, severe turbulence, do not exceed 48, at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 3,000 feet  
Minimum acceptable MEA  
Maximum endurance Not available from operator

Holding Configuration

Enroute holding is accomplished at operationally desirable airspeed with the airship in clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Any Stage Length up to 1,500 Nautical Miles)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at Any Gross Weight	
		IAS	TAS	Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 1,500	Max accpt. 3,000	50	54	14	Negligible
	Opn. desir MEA	"			
	Min accpt. MEA	"			

The airship cannot fly above 5,500 feet at gross weights in excess of 66,800 pounds,  
nor above 5,000 feet at gross weights in excess of 68,800 pounds

Note    Airships can hold within. Plus or minus 20 feet altitude in stable air  
   Plus or minus 100 feet altitude in moderate turbulence  
   Plus or minus 500 feet altitude in severe turbulence

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude which is dependent upon the published minimum enroute altitude (MEA), a constant airspeed of 55 knots IAS is maintained. This is the operationally desirable enroute airspeed

### Speed (knots IAS)

Maximum continuous 70  
Maximum endurance not available from operator \*  
Maximum range not available from operator \*  
Maximum allowable 82

Turbulent air penetration moderate turbulence, do not exceed 55, severe turbulence, do not exceed 40 at any gross weight and at all altitudes.

### Altitudes

Maximum operationally desirable 4,000 feet  
Minimum acceptable MEA  
Maximum endurance not available from operator \*

### Holding Configuration

Enroute holding is accomplished at operationally desirable airspeed and in clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a standard rate turn (See appendix for turning radius, angle of bank, and speed conversion graphs.)

\* This airship is presently undergoing tests. It is not expected to join Navy Fleet until January 1960.

TABLE I, ENROUTE

(Performance Data for any Stage Length up to 1,300 Nautical Miles)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at any Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs.	Dev. per 1,000 Lbs.
0 to 1,300	Max. accpt.	4,000	55	58	8.3	Negligible
	Opn. desir.	MEA	"			
	Min. accpt.	MEA	"			

The airship cannot fly above 5,000 feet at any gross weights in excess of 80,000 pounds

NOTE Airships can hold within Plus or minus 20 feet altitude in stable air  
 Plus or minus 100 feet altitude in moderate turbulence  
 Plus or minus 500 feet altitude in severe turbulence



## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitude for various stage lengths), an airspeed of 140 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous

<u>Altitude</u>	<u>Speed</u>
5,000	191
10,000	172
15,000	161

Maximum endurance 115

Maximum range 128

Maximum allowable 260

Turbulent air penetration 110 to 130

Altitude

Maximum operationally desirable 15,000 feet

Minimum acceptable MEA

Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at 140 knots IAS in a clean configuration. Turns at operational altitude are executed at an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 28, 000 Nautical Miles per 100 Lbs	Pounds Gross Weight Percent Dev per 1, 000 Lbs	
		IAS	TAS			
0 to 150	Max. accpt.	140	153	25.2	3.0%	
	Opn. desir.	"	144	24.7	2.8%	
	Min accpt	"				
150 to 2, 000	Max. accpt.	"	166	25.9	3.3%	
	Opn. desir.	"	153	25.2	3.0%	
	Min. accpt.	"				

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), a constant airspeed of 185 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

4 reciprocating engines

Maximum continuous	225
Maximum endurance	160
Maximum range	not applicable
Maximum allowable	296 (or Mach 0.62, whichever is less)

6 engines

Maximum continuous	296 (or Mach 0.62, whichever is less)
Maximum endurance	170
Maximum range	not applicable
Maximum allowable	same as max. continuous

Turbulent air penetration

### Gross Weight

160,000 pounds	200
140,000 pounds	190
120,000 pounds	180

### Altitudes

4 reciprocating engines

Maximum operationally desirable	25,000 feet
Minimum acceptable	5,000 feet
Maximum endurance	not available

6 engines

Maximum operationally desirable	35,000 feet
Minimum acceptable	20,000 feet
Maximum endurance	not available

Holding Configuration and Turning Radius

Enroute holding is accomplished at 155 knots IAS, flaps extended 15 degrees and engine rpm at 2,100. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn (see appendix for turning radius, angle of bank and speed conversion graphs).

TABLE I, ENROUTE

A. 4 Reciprocating Engines (Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 165,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs.
		IAS	TAS		
0 to 500	Max. accpt. 10,000	185	215	60	12.5%
	Opn. desir 8,000	"	209	62	12%
	Min. accpt. 5,000	"	198	65	7.5%
500 to 1000	Max. accpt. 15,000	185	232	60	12.5%
	Opn. desir. 10,000	"	215	"	"
	Min. accpt. 5,000	"	198	65	7.5%
1000 and up	Max. accpt. 15,000	185	232	60	12.5%
	Opn. desir. 12,000	"	222	"	"
	Min. accpt 8,000	"	209	62	12%

3. 6 Engines (Performance Data for Various Stage Lengths)

Any	Max. accpt. 30,000	185	297	Not available from operator
	Opn. desir. 25,000	"	272	
	Min accpt. 20,000	"	250	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), a constant airspeed of 65 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed

Maximum continuous 81 knots IAS  
Maximum endurance 40 knots IAS  
Maximum range 60 knots IAS  
Maximum allowable 83 knots IAS  
Minimum allowable rotor rpm 314  
Maximum allowable rotor rpm 395  
Operationally desirable rotor rpm 370

Turbulent air penetration 45 knots IAS at any gross weight  
and at all altitudes

Altitude

Maximum operationally desirable 6,000 feet  
Minimum acceptable MEA  
Maximum endurance MEA

Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish standard rate turns at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 2,640 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 10 Lbs	Dev per 500 Lbs
0 to 50	Max. accpt. 4,000	65	69	6.7	4%
	Opn. desir. 2,000	"	67	6.5	"
	Min. accpt. MEA	"	-		
50 to 150	Max. accpt. 6,000	65	71	6.9	4%
	Opn. desir. 4,000	"	69	6.7	"
	Min. accpt. MEA	"	-		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeeds will vary with different stage lengths between 216 knots TAS and 240 knots TAS. These are the operationally desirable airspeeds.

Speed (knots IAS)

Maximum continuous 260 below 12,000 feet, above 12,000 feet same as maximum allowable airspeed

Maximum endurance 173

Maximum range 198

Maximum allowable

Gross Weight

At any gross weight

Do Not Exceed

260 at 12,500 feet and below, above 12,500 feet decrease airspeed 10 knots for each 2,500 feet increase in altitude

Turbulent air penetration 60 knots IAS above stall speed at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 19,000 feet

Minimum acceptable 8,000 feet

Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at maximum endurance airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 130,000 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 100 Lbs	Dev per 10,000 Lbs.
500 to 1,000	Max	180	216	90	3 3%
	Opn desir	186	"	"	"
	Min	192	"	"	"
1,000 to 1,500	Max	177	235	88	4 5%
	Opn desir	183	"	"	"
	Min	194	218	90	3 3%
Step climb					
For first 500 miles of 1,500 mile stage length	Max	181	218	90	3 3%
	Opn desir	187	"	"	"
	Min	194	"	"	"
After first 500 miles of 1,500 mile stage length	Max	178	240	88	4 5%
	Opn desir	184	"	"	"
	Min	190	"	"	"

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for all stage lengths) airspeed will vary between 192 and 196 knots IAS as indicated in the table. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 220 to 208 (70,000 to 120,000 pounds gross weight at 25,000 feet altitude)  
 Maximum endurance 114 to 151 (70,000 to 120,000 pounds gross weight at 25,000 feet altitude)  
 Maximum range 168 to 194 (70,000 to 120,000 pounds gross weight at 25,000 feet altitude)  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

287 at sea level  
 280 at 10,000 feet  
 273 at 20,000 feet  
 257 at 25,000 feet  
 230 at any altitude with cargo exceeding 27,500 pounds

Turbulent air penetration 60 knots above power-off stall speeds for operating gross weights, never exceed 230 in moderate to severe turbulence

Altitude

Maximum operationally desirable 26,000 feet  
 Minimum acceptable 23,000 feet  
 Maximum endurance 23,000 feet to 31,000 feet at 120,000 to 70,000 pounds gross weight

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed, plus 20 knots IAS in a clean configuration. Turns at 20,000 feet or above, are executed with an angle of bank to accomplish one-half standard rate turn. Below 20,000 feet altitude, turns are executed at an angle of bank to accomplish a standard rate turn (see appendix for turning radius, angle

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

					Fuel Data at 120,000 Pounds Gross Weight		
Stage Length in	Altitude		Speed Knots		Nautical Miles	Dev per	
Nautical Miles	(Feet)		IAS	TAS	per 1,000 Lbs	10,000 Lbs	
For all stage lengths	Max	acct	26,500	196	298	76	4 3%
	Opn	desir	25,000	194	290	"	"
	Min	acct	23,000	192	287	"	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude, (see Table I for optimum cruise altitude for various stage lengths), a maximum range airspeed of Mach 0.64 is maintained. This is the operationally desirable enroute airspeed.

### Speeds

Maximum continuous Mach 0.75  
Maximum endurance Mach 0.54  
Maximum range Mach 0.64  
Maximum allowable Mach 0.80 or 505 knots IAS (whichever is less)

Turbulent air penetration 240 knots IAS at all altitudes and at all gross weights

### Altitudes

Maximum operationally desirable 40,000 feet  
Minimum acceptable 30,000 feet  
Maximum endurance 35,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish one-half standard rate turns, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots			Fuel Data at 15,000 Pounds Gross Weight			
			IAS	TAS	MACH	Nautical Miles per 100 Lbs	Dev. per 1,000 Lbs	Dev. per MACH 0.01	
0 to 1,500	Max	accpt.	40,000	190	367	0.64	23.0	4.0%	0.5%
	Opn.	desir	35,000	210	370	"	"	"	"
	Min	accpt.	30,000	240	376	"	"	"	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), cruise airspeeds will vary with different stage lengths from 220 knots IAS to 250 knots IAS

### Speed

Maximum continuous    Mach 0.80 or 505 knots IAS (whichever is less)  
 Maximum endurance    200 knots IAS  
 Maximum range        220 knots IAS  
 Maximum allowable

### Gross Weight

At any gross weight

### Do Not Exceed

Mach 0.80 or 505 knots IAS, whichever is less

Turbulent air penetration    250 knots IAS up to 30,000 feet,  
 220 knots IAS above 30,000 feet

### Altitude

Maximum operationally desirable.    35,000 feet  
 Minimum acceptable    25,000 feet  
 Maximum endurance    32,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed with speed brakes extended. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn at maximum endurance airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots			Fuel Data at 13,750 Pounds Gross Weight		
				IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	Dev per MACH 0.01
150 to 500	Max	acct	30,000	250	395	0.67	245	3%	1%
	Opn	desir.	27,000	"	375	0.63	226	"	"
	Min	acct	25,000	"	362	0.60	214	"	"
500 to 1,500	Max	acct	35,000	220	383	0.67	274	4%	1%
	Opn	desir	30,000	"	351	0.60	244	"	"
	Min.	acct	27,000	"	308	0.51	232	"	"

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude, (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed of Mach 0.72 is maintained. This is the operationally desirable enroute airspeed.

Speed

Maximum continuous clean - Mach 0.82, with external tip tanks - Mach 0.78

Maximum endurance 140 to 240 knots IAS

Maximum range Mach 0.72

Maximum allowable clean - 513 knots IAS, with external tip tanks - 444 knots IAS

Turbulent air penetration 180-200 knots IAS at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 48,000 feet

Minimum acceptable MEA

Maximum endurance 33,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a one-half standard rate or a standard rate turn at either maximum endurance or operationally desirable airspeed (See appendix for turning radius, angle of bank, and speed conversion graphs.)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots			Fuel Data at 52,000 Pounds Gross Weight		
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev per 5,000 Lbs	Dev. per MACH 0.01
Any stage length up to 1,600 N M.	Max accpt. 48,000	177	415	0.72	104	8.0%	1.0%
	Opn desir 37,500	230	"	"	106	"	"
	Min accpt MEA						

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude, the maximum range airspeed will vary between 255 knots IAS and 275 knots IAS. These are the operationally desirable enroute airspeeds.

Speed

Maximum continuous Mach 0.87 (no afterburner)  
 Maximum endurance 180 knots IAS at 25,000 feet altitude  
 Maximum range 255 knots IAS at 36,000 feet altitude  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight 610 knots IAS (no external tanks)

Turbulent air penetration 250 knots IAS at any gross weight  
 and at all altitudes

Altitude

Maximum operationally desirable 38,000 feet  
 Minimum acceptable 25,000 feet  
 Maximum endurance 30,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at 10 knots IAS above maximum endurance airspeed and in clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn at 10 knots IAS above maximum endurance airspeed (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots			Fuel Data at 16,000 Pounds Gross Weight		
				IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs	Dev per MACH 0.01
0 to 1,200	Max	accpt	38,000	250	452	0.79	213	3.8%	0.5%
	Opn	desir	34,000	275	454	"	"	"	"
	Min	accpt	25,000	"	397	0.66	"	"	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 155 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous	174
Maximum endurance	115
Maximum range	147
Maximum allowable	278

Turbulent air penetration 160 at 27,000 pounds gross weight  
(percent deviation per 1,000 pounds gross weight 1.6%)  
at all altitudes.

### Altitudes

Maximum operationally desirable	10,000 feet
Minimum acceptable	MEA
Maximum endurance	9,500 feet or below

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots		Fuel Data at 27,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 2,000 Lbs
				IAS	TAS		
0 to 150	Max	acct	10,000	155	180	357	3%
	Opn	desir	5,000	"	167	333	"
	Min	acct	MEA				
150 to 1,500	Max.	acct.	10,000	155	180	357	3%
	Opn.	desir.	10,000	"	"	"	"
	Min	acct.	5,000	"	167	333	"

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitude), an airspeed of 160 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 185  
 Maximum endurance 90  
 Maximum range 130  
 Maximum allowable (varies with altitude and configuration)

<u>Altitude</u>	<u>0 - 2,500</u>	<u>2,500 - 5,000</u>	<u>5,000 - 7,500</u>	<u>7,500 - 10,000</u>
No extra load	340	335	330	310
With extra load	295	290	285	270

Turbulent air penetration 160 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 10,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 5,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished in clean configuration, at 130 knots IAS with 2,100 rpm and 24 inches manifold pressure. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 7,200 Pounds Gross Weight		Nautical Miles		Dev per		Dev per	
			IAS	TAS	per 100	Lbs	per 100	Lbs	100 Lbs	5 Knots	100 Lbs	5 Knots
0 to 1,000	Max. accpt.	10,000	160	187	92		2	2%		4.4%		
	Opn. desir.	5,000	"	171	"		"		"	"		
	Min. accpt	MEA	-	-	-		-		-	-		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 150 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous Not available from manufacturer  
 Maximum endurance 90  
 Maximum range Not available from manufacturer  
 Maximum allowable (varies with altitude and configuration)

Altitude	0 - <u>2,500</u>	2,500 - <u>15,000</u>	15,000 - <u>25,000</u>	25,000 - <u>35,000</u>
No extra load	340	315	275	225
With extra load	295	270	240	190

Turbulent air penetration 160 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 35,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished in clean configuration, at 130 knots IAS with 2,100 rpm and 24 inches manifold pressure. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn (see appendix for turning radius, angle of bank, and speed conversion graphs).



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots		Fuel Data at 8,000 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 500 Lbs.	
				IAS	TAS			
0 to 800	Max	accpt	35,000	150	265	94.5	3.5%	
	Opn	desir	20,000	"	205	"	"	
	Min	accpt	MEA	"				

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude, an operationally desirable airspeed of 220 knots IAS is maintained.

### Speeds

Maximum continuous   Mach 0.70  
Maximum endurance   139 knots IAS  
Maximum range   180 knots IAS  
Maximum allowable   0 - 7,800 feet, 486 knots IAS, above  
                          7,800 feet, Mach 0.85

Turbulent air penetration   200 knots IAS

### Altitudes

Maximum operationally desirable   40,000 feet  
Minimum acceptable   20,000 feet  
Maximum endurance   40,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish one-half standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 8,500 Nautical Miles		Pounds Gross Weight	
		IAS	TAS	per	Lbs	Dev	per Lbs

No enroute data available from operator; aircraft is presently engaged in performance tests

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between Mach 0.68 and Mach 0.70. These are the operationally desirable enroute airspeeds.

### Speed

Maximum continuous Not available from operators  
Maximum endurance 250 knots TAS  
Maximum range Mach 0.70  
Maximum allowable. Below 20,000 feet, Mach 0.90 or 470 knots IAS, whichever is less. There are no airspeed limitations above 20,000 feet.

### Turbulent Air Penetration

At all altitudes With any tip tank fuel - 275 knots IAS,  
with no tip tanks or with tip tanks empty - 325  
knots IAS

### Altitudes

Maximum operationally desirable 36,000 feet  
Minimum acceptable 28,000 feet  
Maximum endurance 30,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn, at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots			Fuel Data at 40,000 Pounds Gross Weight		
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	Dev. per MACH 0.01
0 to 500	Max. accpt. 32,000	240	396	0.68	99.0	1.5%	0.7%
	Opn. desir. 30,000	255	400	"	93.0	1.3%	0.5%
	Min. accpt. 28,000	265	404	"	87.0	1.1%	0.3%
500 and Up	Max. accpt. 36,000	228	400	0.70	110.0	2.0%	1.1%
	Opn. desir. 35,000	235	404	"	107.0	1.9%	1.0%
	Min. accpt. 33,000	242	407	"	101.0	1.7%	0.8%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), the average airspeed will vary from Mach 0.64 to Mach 0.80, as shown in the table. This is the operationally desirable range of airspeeds.

Speed

Maximum continuous Mach 0.88  
Maximum endurance 220 knots IAS  
Maximum range 250 knots IAS  
Maximum allowable Mach 0.95

Turbulent air penetration 275 knots IAS at any gross weight  
and at all altitudes

Altitude

Maximum operationally desirable 40,000 feet  
Minimum acceptable 20,000 feet  
Maximum endurance 35,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a one half standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots			Fuel Data at 19,000 Pounds Gross Weight		
				IAS	TAS	MACH	Nautical Miles per 1,000Lbs	Dev. per 1,000 Lbs	Dev. per MACH 0.01
0 to 500	Max	acct.	35,000	265	450	0.78	231	3.7%	
	Opn	desir.	30,000	280	440	0.75	210	2.6%	
	Min	acct.	20,000	295	395	0.64	173	2.4%	
500 to 1,000	Max	acct.	40,000	245	460	0.80	237	5.3%	Not available from operator
	Opn	desir.	35,000	265	450	0.78	231	3.7%	
	Min	acct.	30,000	280	440	0.75	210	2.6%	
1,000 and up	Max.	acct.	40,000	245	460	0.80	237	5.3%	
	Opn	desir.	40,000	"	"	"	"	"	
	Min	acct.	35,000	265	450	0.78	231	3.7%	

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), enroute airspeed will vary between 68 and 73 knots IAS. These are operationally desirable enroute airspeeds.

### Speed

Maximum continuous 100 knots IAS  
Maximum endurance 52 knots IAS  
Maximum range 76 knots IAS  
Maximum allowable 115 knots IAS  
Minimum allowable rotor rpm 170  
Maximum allowable rotor rpm 245  
Operationally desirable rotor rpm 185 to 220

Turbulent air penetration 70 knots IAS at any gross weight  
and at all altitudes

### Altitude

Maximum operationally desirable 6,000 feet  
Minimum acceptable MEA  
Maximum endurance MEA

### Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish standard rate turns at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots		Fuel Data at 7,800 Nautical Miles per 100 Lbs		Pounds Gross Weight Dev per 1,000 Lbs	
				IAS	TAS				
0 to 50	Max	acct	2,000	73	75	32 2		16 7%	
	Opn	desir	2,000	"	"	"		"	
	Min	acct	MEA	"	"				
50 to 350	Max	acct	6,000	68	74	29 4		21.0%	
	Opn	desir	4,000	70	"	31 2		17 0%	
	Min	acct	2,000	73	75	32 2		16 7%	

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), the airspeed will vary between 76 and 93 knots IAS. These are the operationally desirable enroute airspeeds.

### Speed

Maximum continuous 95 knots IAS  
Maximum endurance 60 knots IAS  
Maximum range 85 knots IAS  
Maximum allowable 110 knots IAS  
Minimum allowable rotor rpm 170  
Maximum allowable rotor rpm 258  
Operationally desirable rotor rpm 195 to 220

Turbulent air penetration 75 knots IAS at any gross weight  
and at all altitudes

### Altitudes

Maximum operationally desirable 8,000 feet  
Minimum acceptable: 2,000 feet  
Maximum endurance 2,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish standard rate turns at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	*Altitude (Feet)	Speed Knots		Fuel Data at Nautical Miles per 100 Lbs.	Pounds Gross Weight Dev. per 1,000 Lbs.
		IAS	TAS		
0 to 50	Max. acpt. 6,000	82	90	20.8	61.0%
	Opn. desir. 2,000	93	96	23.2	22.5%
	Min. acpt. 2,000	"	"	"	"
50 to 300	Max. acpt. 8,000	76	86	18.2	49.0%
	Opn. desir. 4,000	87	92	22.7	36.0%
	Min. acpt. 2,000	93	96	23.2	22.5%

\*This helicopter cannot fly above 8,000 feet at gross weights in excess of 13,300 pounds.

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), enroute airspeed will vary between 70 and 90 knots IAS. These are operationally desirable enroute airspeeds.

### Speeds

Maximum continuous 100 knots IAS  
Maximum endurance 75 knots IAS  
Maximum range 79 knots IAS  
Maximum allowable 110 knots IAS  
Minimum allowable rotor rpm 140  
Maximum allowable rotor rpm 215  
Operationally desirable rotor rpm 157 to 185

Turbulent air penetration 75 knots IAS at any gross weight  
and at all altitudes

### Altitudes

Maximum operationally desirable 8,000 feet  
Minimum acceptable 2,000 feet  
Maximum endurance 2,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished in a clean configuration at cruise airspeed. Turns at operational altitudes are executed normally with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeeds. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots		Fuel Data at Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 1,000 Lbs	
				IAS	TAS			
0 to 50	Max	accpt	6,000	72	78	7.5	5.7%	
	Opn.	desir.	2,000	90	93	8.2	none	
	Min.	accpt.	2,000	"	"	"	"	
50 to 300	Max	accpt	8,000	70	79	6.7	11.0%	
	Opn	desir.	4,000	79	84	7.7	2.0%	
	Min	accpt	2,000	90	93	8.2	none	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), enroute airspeed will vary between 64 and 81 knots IAS. These are the operationally desirable enroute airspeeds

Speeds

Maximum continuous 95 knots IAS  
Maximum endurance 58 knots IAS  
Maximum range 76 knots IAS  
Maximum allowable 100 knots IAS  
Minimum allowable rotor rpm 233  
Maximum allowable rotor rpm. 258  
Operationally desirable rotor rpm 240

Turbulent air penetration 75 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 8,000 feet  
Minimum acceptable 2,000 feet  
Maximum endurance 2,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at cruise airspeed Turns at operational altitudes are executed normally with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (See appendix for turning radius, angle of bank and speed conversion graphs )

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 13,500 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 2,000 Lbs	
			IAS	TAS			
0 to 50	Max	accpt	6,000	76	83	16 1	41%
	Opn	desir	2,000	81	"	17 8	33%
	Min	accpt	2,000	"	"	"	"
50 to 300	Max	accpt	8,000	64	72	14 5	48%
	Opn	desir	4,000	77	82	17 0	36%
	Min	accpt	2,000	81	83	17 8	33%

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

# AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volumes I-A through IX

## SECTION 2

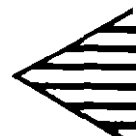
### COMMERCIAL AIRCRAFT

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.





## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), enroute airspeed varies between 176 and 185 knots IAS

Speed (knots IAS)

Maximum continuous 264

Maximum endurance 171

Maximum range 186

Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

302

Turbulent air penetration 165 to 190 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 25,000 feet

Minimum acceptable 6,000 feet

Maximum endurance 14,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS      TAS		*Fuel Data at 120,000 Pounds Gross Weight		
					Nautical Miles per 1,000 Lbs	Dev. per 10,000 Lbs	
0 to 150	Max	accpt	12,000	185	224	83 3	9%
	Opn.	desir	"	"	"	"	"
	Min	accpt.	6,000	184	204	82 0	7%
150 to 500	Max	accpt	14,000	185	232	83 5	9%
	Opn.	desir	11,000	"	220	82 8	8%
	Min	accpt	9,000	"	213	82 5	"
500 to 3,000	Max	accpt	25,000	176	262	83 5	8%
	Opn.	desir	25,000	"	"	"	"
	Min	accpt	14,000	185	232	"	9%

\*Increase fuel required by 1% for each 6° C above standard

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed of Mach 0.79 is maintained except for stage lengths of 500 nautical miles or less which are flown at Mach 0.55. These are the operationally desirable airspeeds.

### Speed

Maximum continuous Mach 0.82  
Maximum endurance 242 knots TAS  
Maximum range Mach 0.79  
Maximum allowable Mach 0.90

Turbulent air penetration 240 knots IAS at any gross weight and at all altitudes

### Altitude

Maximum operationally desirable 38,000 feet  
Minimum acceptable 7,000 feet  
Maximum endurance 25,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with gear down. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn, at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots			Fuel Data at Nautical Miles per 1,000 Lbs	Pounds Gross Weight	
				IAS	TAS	MACH		Dev per 10,000 Lbs	Dev per MACH 0.01
0 to 500	Max	acct	9,000	311	352	0.55			
	Opn	desir	8,000	317	354	"	25 (estimated)		
	Min	acct	7,000	322	357	"			
500 to 1,000	Max	acct.	25,000	330	475	0.79			
	Opn	desir	22,500	350	480	"	30 (estimated)	Not available from operators.	
	Min	acct	20,000	368	485	"			
1,000 to 1,700	Max	acct.	30,000	300	465	0.79			
	Opn	desir	27,500	315	470	"	33 (estimated)		
	Min	acct	25,000	330	475	"			
1,700 to 3,000	Max	acct	38,000	250	453	0.79			
	Opn	desir	34,000	275	458	"	35 (estimated)		
	Min	acct	30,000	300	465	"			

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed will vary from 162 to 192 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 260 (up to 13,000 feet. Above 13,000 feet, reduce airspeed 6 knots per 1,000 feet)  
 Maximum endurance 130  
 Maximum range 160 (at 5,000 feet and 48,000 pounds gross weight)  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

293 (up to 13,000 feet, above 13,000 feet reduce airspeed 6 knots per 1,000 feet)

Turbulent air penetration 160 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 20,000 feet  
 Minimum acceptable: 2,000 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 47,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs.
			IAS	TAS		
0 to 200	Max. accpt.	10,000	180	211	199	0.5%
	Opn. desir.	5,000	187	201	190	"
	Min. accpt.	2,000	192	197	185	"
200 to 500	Max. accpt.	16,000	171	218	202	0.5%
	Opn. desir.	10,000	180	211	199	"
	Min. accpt.	8,000	183	206	195	"
500 to 1,000	Max. accpt.	20,000	162	219	210	0.5%
	Opn. desir.	15,000	173	218	202	"
	Min. accpt.	10,000	180	211	199	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a constant airspeed of Mach 0.74 is maintained. This is the operationally desirable enroute airspeed.

For long range routes, a climb cruise procedure is desirable. After reaching the initial altitude (30,000 feet), a climb cruise procedure is established maintaining a constant airspeed of Mach 0.70 and approximately 20 fpm rate of climb.

### Speed

Maximum continuous Mach 0.77  
 Maximum endurance 210 knots IAS  
 Maximum range Mach 0.69  
 Maximum allowable

<u>Gross Weight</u>	<u>Do Not Exceed</u>
At any gross weight	Mach 0.77
Turbulent air penetration	Mach 0.67 or 220 knots IAS (whichever is less), At any gross weight and at all altitudes.

### Altitude

Maximum operationally desirable 42,000 feet  
 Minimum acceptable 20,000 feet  
 Maximum endurance 30,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish one half standard rate turns at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots			Fuel Data at 135,000 Pounds Gross Weight		
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs	Dev per MACH 0.01
500 to 1,000	Max. accpt.	30,000	278	435	0.74	48.0	6%
	Opn. desir	30,000	"	"	"	"	Not
	Min accpt	25,000	310	445	"	43.7	Available
1,000 to 2,000	Max. accpt	35,000	250	427	0.74	61.6	6%
	Opn. desir	35,000	"	"	"	"	from
	Min accpt	30,000	278	435	"	48.0	manufacturer.

At gross weights in excess of 135,000 pounds, a climb cruise procedure is initiated at 30,000 feet maintaining Mach 0.70 and 20 fpm rate of climb.

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



NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a constant airspeed of 160 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 183  
Maximum endurance 105  
Maximum range 130  
Maximum allowable

Gross Weight

Do Not Exceed

At any gross weight - - - - - 223

Turbulent air penetration 121 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 12,000 feet  
Minimum acceptable MEA  
Maximum endurance MEA

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 25,346 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 1,000 Lbs.
			IAS	TAS		
0 to 150	Max. accpt	6,000	160	174	33 0	No deviation
	Opn. desir	5,000	"	172	32 4	"
	Min. accpt	MEA				"
150 to 500	Max. accpt.	9,000	160	183	34 7	No deviation
	Opn. desir	7,000	"	178	33 5	"
	Min. accpt	MEA				"
500 to 1,000	Max. accpt	12,000	160	192	36.3	No deviation
	Opn. desir	10,000	"	186	35 0	"
	Min. accpt	MEA				"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths) a maximum range airspeed of 150 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous Not available from operators.  
Maximum endurance 140 at a gross weight of 70,000 pounds  
Maximum range 150  
Maximum allowable 217 (glide or dive)

Turbulent Air Penetration 140 to 150 at any gross weight  
and at all altitudes

### Altitudes

Maximum operationally desirable 12,000 feet  
Minimum acceptable 10,000 feet  
Maximum endurance MEA

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 70,000 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs	Dev per 1,000 Lbs.
0 to 150	Max. accpt.	6,000	150	163	14.6	2.6%
	Opn. desir.	6,000	"	"	"	"
	Min. accpt.	MEA				
150 to 600	Max. accpt.	10,000	150	174	13.9	2.0%
	Opn. desir.	8,000	"	169	14.2	2.4%
	Min. accpt.	6,000	"	163	14.6	2.6%
600 to 1,300	Max. accpt.	12,000	150	180	13.4	1.5%
	Opn. desir.	10,000	"	174	13.9	2.0%
	Min. accpt.	8,000	"	169	14.2	2.4%

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude, (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed varies between 175 and 204 knots IAS. This is the operationally desirable enroute airspeed range.

### Speed (knots IAS)

Maximum continuous 245 (below 17,000 feet altitude)  
Maximum continuous airspeed is reduced 5 knots per  
1,000 feet altitude above 17,000 feet  
Maximum endurance 140  
Maximum range Not available from operator  
Maximum allowable 297 (below 12,000 feet altitude)  
Maximum allowable airspeed is reduced 5 knots per  
1,000 feet altitude above 12,000 feet

Turbulent air penetration 147 to 156

### Altitude

Maximum operationally desirable 24,000 feet  
Minimum acceptable 5,000 feet  
Maximum endurance 5,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graph.)

TABLE I, ENROUTE  
 (Performance Data for Various Stage Lengths)  
 Fuel Data at 85,000 to 90,000 Pounds  
 Gross Weight

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Nautical Miles		Dev. per	
			IAS	TAS	per 100	Lbs	100	Lbs
Jp to 500	Max	acct	15,000	187	242	11.2	Not available from operator.	
	Opn	desir.	10,000	195	233	11.4		
	Min	acct.	5,000	204	225	11.0		
500 and up	Max.	acct.	20,000	175	247	11.4		
	Opn	desir.	15,000	187	242	11.2		
	Min	acct	12,000	192	237	11.6		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed varies between 180 and 195 knots IAS as indicated in Table I. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 245 (below 17,000 feet altitude). Maximum continuous airspeed is reduced 5 knots per 1,000 feet altitude in excess of 17,000 feet.

Maximum endurance 141

Maximum range 240 (below 17,000 feet altitude). Maximum range airspeed is reduced 5 knots per 1,000 feet altitude in excess of 17,000 feet.

Maximum allowable 297 (below 12,000 feet altitude). Maximum allowable airspeed is reduced 5 knots per 1,000 feet altitude in excess of 12,000 feet.

Turbulent air penetration 158 to 165 (at gross weight of 80,000 pounds and above), 148 to 158 (at gross weights up to 80,000 pounds)

Altitude

Maximum operationally desirable 19,000 feet

Minimum acceptable 8,000 feet

Maximum endurance 8,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

*Fuel Data at 95,000 Pounds Gross Weight					
Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Nautical Miles per 100 Lbs.	Dev. per
		IAS	TAS		1,000 Lbs. Decrease in G. W.
500 to 1,000	Max. accpt. 12,000	186	223	11.0	Negligible
	Opn. desir. 10,000	190	222	11.1	"
	Min. accpt. 8,000	195	"	"	"
1,000 to 1,500	Max. accpt. 17,000	187	240	9.9	1.5%
	Opn. desir. 14,000	186	230	10.8	Negligible
	Min. accpt. 8,000	195	222	11.1	"
1,500 nautical miles and up (step climb after 1,000 nautical miles)	Initial Altitude				
	Max. accpt. 12,000	186	223	11.0	Negligible
	Opn. desir. 10,000	190	222	11.1	"
	Min. accpt. 8,000	195	"	"	"
	Altitude after Step Climb				
	Max. accpt. 19,000	181	240	11.2	Negligible
	Opn. desir. 17,000	184	238	"	"
	Min. accpt. 15,000	188	235	11.3	"

\* Step climb data based on fuel burn-off of 9000 pounds, giving a gross weight of 86,000 pounds.

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



## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed will vary between 210 and 245 knots IAS. These are the operationally desirable enroute airspeeds.

Speed

## Maximum continuous

Sea level to 13,000 feet altitude 265 knots IAS

Above 13,000 feet altitude Mach 0.52

Maximum endurance Not available from operator

## Maximum range

At a gross weight of 100,000 pounds 182 knots IAS

Deviation per 10,000 pound change in gross weight 4.4%

## Maximum allowable

Sea level to 11,000 feet altitude 309 knots IAS

Above 11,000 feet altitude Mach 0.585

## Turbulent air penetration

Below 100,000 pounds gross weight 170 knots IAS

Above 100,000 pounds gross weight 180 knots IAS

Altitude

Maximum operationally desirable 24,000 feet

Minimum acceptable 8,000 feet

Maximum endurance Not available from operator

Holding Configuration and Turning Radius

Enroute holding is accomplished at a speed of 145 knots IAS with flaps extended 20 degrees. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 105,000 Pounds Gross Weight	Dev per 10,000 Lbs	
			IAS	TAS	Nautical Miles per 1,000 Lbs		
150 to 700	Max	acct	13,000	230	282	93.5	2 4%
	Opn.	desir	12,000	240	287	95.5	1 9%
	Min	acct	8,000	245	277	92.0	1 4%
700 and Up	Max	acct	23,000	210	296	98.5	3 8%
	Opn	desir	22,000	215	301	100.0	3 1%
	Min	acct.	16,000	225	287	95.5	2 3%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeed will vary between 210 and 245 knots IAS. These are the operationally desirable enroute airspeeds.

Speed

## Maximum continuous

Sea level to 13,000 feet altitude 265 knots IAS

Above 13,000 feet altitude Mach 0.52

Maximum endurance Not available from operator

## Maximum range

At a gross weight of 100,000 pounds 182 knots IAS

Deviations per 10,000 pound change in gross weight 4.4%

## Maximum allowable.

Sea level to 11,000 feet altitude 309 knots IAS

Above 11,000 feet altitude Mach 0.585

## Turbulent air penetration

Below 100,000 pounds gross weight 170 knots IAS

Above 100,000 pounds gross weight 180 knots IAS

Altitude

Maximum operationally desirable 24,000 feet

Minimum acceptable 8,000 feet

Maximum endurance Not available from operator

Holding Configuration and Turning Radius

Enroute holding is accomplished at a speed of 145 knots IAS with flaps extended 20 degrees. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS      TAS		Fuel Data at 110,000 Pounds Gross Weight		
					Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs	
150 to 700	Max	accpt	13,000	230	282	93 5	2 4%
	Opn	desir	12,000	240	287	95 5	1 9%
	Min	accpt	8,000	245	277	92 0	1 4%
700 and Up	Max	accpt	23,000	210	296	98 5	3 8%
	Opn	desir	22,000	215	301	100 0	3 1%
	Min	accpt	16,000	225	287	95 5	2 3%

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed will vary between 178 and 230 knots IAS. These are the operationally desirable enroute airspeeds.

Speed

Maximum continuous Mach 0.52  
Maximum endurance 148 knots IAS  
Maximum range 178 to 230 knots IAS (see Table I)  
Maximum allowable Mach 0.58 at any gross weight and at all altitudes

Turbulent air penetration

100,000 pounds gross weight and below 165 knots IAS  
100,000 to 125,000 pounds gross weight 175 knots IAS  
Above 125,000 pounds gross weight 190 knots IAS

Altitude

Maximum operationally desirable 25,000 feet  
Minimum acceptable 10,000 feet  
Maximum endurance 15,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with the speed brake extended. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Enroute Speed			Fuel Data at 112,500 Pounds Gross Weight			
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs. GW Increase	Decrease	
0 to 500 (Eastbound)	Max. accpt. 25,000	178	266	0.44	100.3	N/A*	0.5%	
	Opn. desir. 20,000	210	287	0.47	98.4	3.1%	2.0%	
	Min. accpt. 15,000	220	275	0.44	97.1	2.6%	1.9%	
500 to 1,000 (Eastbound)	Max. accpt. 25,000	178	266	0.44	100.3	N/A*	0.5%	
	Opn. accpt. 23,000	200	280	0.46	100.2	N/A*	0.2%	
	Min. accpt. 15,000	220	275	0.44	97.1	2.6%	1.9%	
0 to 500 (Westbound)	Max. accpt. 16,000	216	277	0.45	97.8	2.6%	2.2%	
	Opn. desir. 16,000	216	277	0.45	97.8	2.6%	2.2%	
	Min. accpt. 10,000	230	268	0.42	94.2	2.2%	1.6%	
500 to 1,000 (Westbound)	Max. accpt. 25,000	178	266	0.44	100.3	N/A*	0.5%	
	Opn. desir. 23,000	200	280	0.46	100.2	N/A*	0.2%	
	Min. accpt. 15,000	220	275	0.44	97.1	2.6%	1.9%	

\*Not applicable

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 220 knots TAS is maintained. This is the operationally desirable airspeed.

Speed (knots IAS)

Maximum continuous 227  
 Maximum endurance 106  
 Maximum range 164  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

259 below 18,000 feet  
 Above 18,000 feet reduce  
 airspeed 5 knots per 1,000  
 feet increase in altitude

Turbulent air penetration 154 at any gross weight and at  
 all altitudes

Altitude

Maximum operationally desirable 20,000 feet  
 Minimum acceptable 8,000 feet  
 Maximum endurance 20,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed with a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed.

An alternate method of holding is accomplished by utilizing 16.5 degrees flaps and maximum endurance airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 32,000 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max. accept	10,000	190	220	14 4	1%
	Opn desir	10,000	"	"	"	"
	Min. accept	8,000	194	"	13 8	"
150 to 500	Max. accept	20,000	162	220	19 3	2%
	Opn desir	15,000	178	"	16 6	1%
	Min. accept	10,000	190	"	14 4	"
500 to 1,000	Max. accept	20,000	162	220	19 3	2%
	Opn desir	20,000	"	"	"	"
	Min. accept.	10,000	190	"	14 4	1%

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



## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between 342 and 347 knots TAS. These are the operationally desirable enroute airspeeds.

Speed

Maximum continuous Mach 0.615 (above 12,000 feet)  
 Maximum endurance 240 knots TAS  
 Maximum range 346 knots TAS  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

364 knots IAS  
 below 8,000 feet  
 Mach 0.64 at 8,000  
 feet and above

Turbulent air penetration 170 knots IAS at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 25,000 feet  
 Minimum acceptable 16,000 feet  
 Maximum endurance 18,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with gear down. Turns at operational altitudes are executed with an angle of bank to accomplish a one-half standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots			Fuel Data at 100,000 Pounds Gross Weight		
		IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev per 5,000 Lbs	Dev per MACH 0.01
0 to 500	Max. accpt. 16,000	277	347	0.56	69		
	Opn. desir 16,000	"	"	"	"		
	Min. accpt 10,000	300	345	0.54	60		
						Not available from operators	
500 to 1,000	Max. accpt. 20,000	260	344	0.56	78		
	Opn. desir 16,000	277	347	"	69		
	Min. accpt 12,000	290	346	0.55	63		
1,000 to 1,500	Max. accpt. 21,000	250	342	0.56	79		
	Opn. desir 18,000	265	346	"	73		
	Min. accpt 16,000	277	347	"	69		

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

## NARRATIVE SUMMARY

Sequence of Operations

The aircraft is operated in a step-climb profile to operationally desirable cruise altitudes which vary with aircraft gross weight rather than stage length. The "1049 Series" is normally employed for distances in excess of 1,000 miles. After reaching cruise altitude, an average airspeed of 190 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 261 up to 12,500 feet (above 12,500 feet, reduce airspeed 10 knots for each 2,000 feet of altitude)

Maximum endurance 150

Maximum range 240

Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

294 at 12,500 feet or below. Reduce airspeed 11 knots for each 2,000 feet above 12,500.

Turbulent air penetration 175 to 200 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 24,000 feet

Minimum acceptable 12,000 feet

Maximum endurance 12,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at 150 knots IAS and flaps extended 30 percent. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate of turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 135,000 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 100 Lbs.	Dev. per 5,000 Lbs.
	Initial Altitude				
1000 to 3,000	Max. accpt. 14,000	190	236	8	12%
	Opn. desir. 14,000	"	"	"	"
	Min. accpt. 12,000	"	228	"	"
	Altitude After Step Climb				
1,000 to 3,000	Max. accpt. 24,000	190	277	11	12%
	Opn. desir. 21,000	"	264	"	"
	Min. accpt. 14,000	"	236	8	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

The aircraft is operated in a step-climb profile to operationally desirable cruise altitudes which vary with aircraft gross weight rather than stage length. After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), an airspeed of 205 knots IAS is maintained. This is the operationally desirable airspeed.

### Speed (knots IAS)

Maximum continuous 261 (18,000 feet or below. Above  
18,800 feet, reduce airspeed 6 knots IAS for each 1,000  
feet of altitude)  
Maximum endurance 140  
Maximum range 240  
Maximum allowable

### Gross Weight

### Do Not Exceed

At any gross weight

294 at 13,000 feet  
or below. Airspeed  
reduced 6 knots for  
each 1,000 feet above  
13,300

Turbulent air penetration. 185 at 150,000 pounds gross weight;  
165 at 120,000 pounds gross weight

### Altitudes

Maximum operationally desirable. 24,000 feet  
Minimum acceptable 12,000 feet  
Maximum endurance 12,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at 140 knots IAS with flaps extended 80 percent. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 155,000 Pounds Gross Weight		
		IAS	TAS	Nautical Miles per 100 Lbs	Dev. per 5,000 Lbs.	
	Initial Altitude					
1,000 to 3,000	Max. accpt.	18,000	205	270	9.1	4.2%
	Opn. desir.	18,000	"	"	"	"
	Min. accpt.	12,000	"	245	8.6	"
	Altitude After Step Climb					
1,000 to 3,000	Max. accpt.	24,000	205	295	11.2	3.4%
	Opn. desir.	24,000	"	"	"	"
	Min. accpt	18,000	"	270	9.1	4.2%

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

## NARRATIVE SUMMARY

## Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths) airspeed will vary between 158 and 176 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 247  
 Maximum endurance 130  
 Maximum range 165  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

261

Turbulent air penetration 150 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 16,000 feet  
 Minimum acceptable 2,000 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished in a clean configuration at maximum endurance airspeed. An alternate configuration is with flaps extended 12.5 degrees. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 40,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs
			IAS	TAS		
70 to 100	Max	accpt	5,000	173	190	
	Opn	desir	3,000	175	187	
	Min	accpt	2,000	176	185	
100 to 150	Max	accpt	8,000	169	194	
	Opn	desir	6,000	171	191	
	Min	accpt	6,000	171	191	
150 to 400	Max	accpt	16,000	158	207	
	Opn	desir	12,000	164	201	
	Min	accpt	8,000	169	194	

Not available  
from operators

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



## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed will vary between 173 to 234 knots IAS. This will also be the operationally desirable enroute airspeed

Speed (knots IAS)

Maximum continuous 238  
 Maximum endurance 150  
 Maximum range 175  
 Maximum allowable

Gross Weight

At any gross weight

Do Not Exceed

272 below 10,000 feet  
 Above 10,000 feet, reduce speed 1 knot per 2,000 feet increase in altitude

Turbulent air penetration 165 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 25,000 feet  
 Minimum acceptable 5,000 feet  
 Maximum endurance 25,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed with flaps extended 20 degrees. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 63,000 Nautical Miles per 1,000 Lbs	Pounds Gross Weight Dev per 5,000 Lbs
			IAS	TAS		
0 to 150	Max. accpt	10,000	232	270	78	5%
	Opn desir.	5,000	234	253	71	"
	Min. accpt	5,000	"	"	"	"
150 to 500	Max. accpt.	25,000	173	254	103	none
	Opn. desir.	14,000	222	276	87	"
	Min. accpt	10,000	232	270	78	5%
500 to 1,000	Max accpt	25,000	173	254	103	none
	Opn desir.	21,000	191	266	100	"
	Min. accpt	14,000	222	276	87	"

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between 181 and 262 knots IAS. These are the operationally desirable enroute airspeeds.

### Speed

Maximum continuous 268 knots IAS at sea level, decreasing 1 knot each 1,000 feet up to 21,000 feet, Mach 0.58 above 21,000 feet altitude

Maximum endurance 140 knots IAS

Maximum range 175 knots IAS

Maximum allowable 296 knots IAS at sea level, decreasing to 286 knots IAS at 18,000 feet, and Mach 0.68 above 18,000 feet altitude

Turbulent air penetration 170 knots IAS at any gross weight and at all altitudes

### Altitude

Maximum operationally desirable 25,000 feet

Minimum acceptable 9,000 feet

Maximum endurance 24,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed with flaps extended 20 degrees. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots			Fuel Data at 67,000 Pounds Gross Weight		
			IAS	TAS	MACH	Nautical Miles per 1,000 Lbs	Dev. per 5,000 Lbs.	Dev. per MACH 0.01
60 to 100	Max	acct.	11,000	254	300 0 47	77.1	1 3%	0 02%
	Opn	desir	9,000	262	299 "	72.9	2 6%	"
	Min.	acct.	9,000	"	" "	"	"	"
100 to 200	Max	acct.	15,000	238	295 0 47	84.3	2.3%	0.03%
	Opn.	desir	13,000	247	301 0 48	81.6	0 9%	Negligible
	Min	acct	11,000	254	300 0 47	77.1	1 3%	0.02%
200 to 1,000	Max	acct	25,000	181	269 0 44	103.5	7 5%	0.09%
	Opn	desir.	24,000	191	276 0 46	101.8	5.1%	0.05%
	Min	acct	15,000	238	295 0 47	84.3	2 3%	0 03%

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

# 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)

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a constant airspeed of 178 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous	180
Maximum endurance	113
Maximum range	140
Maximum allowable	234

Turbulent air penetration 110 at any gross weight and at all altitudes

### Altitudes

Maximum operationally desirable	10,000 feet
Minimum acceptable	MEA
Maximum endurance	7,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots		Fuel Data at 6,000 Nautical Miles per 100 Lbs		Pounds Gross Weight Percent Dev per 200 Lbs.	
				IAS	TAS				
0 to 150	Max	accpt.	5,000	178	192	114			
	Opn	desir	5,000	"	"	"			
	Min.	accpt	MEA	-	-	-			Not available from manu- facturer
150 to 500	Max.	accpt	10,000	178	205	122			
	Opn	desir	10,000	"	"	"			
	Min	accpt.	5,000	"	192	114			
500 to 1,000	Max	accpt	10,000	178	205	122			
	Opn	desir	10,000	"	"	"			
	Min	accpt	5,000	"	192	114			

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), an average of 150 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 182  
 Maximum endurance 91  
 Maximum range 125  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

234

Turbulent Air Penetration 112 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 3,000 feet  
 Maximum endurance 8,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs).



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 6,600 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 100 Lbs
		IAS	TAS		
0 to 150	Max. accpt	7,000	150		
	Opn Desir	4,000	"		
	Min accpt	3,000	"		
150 to 500	Max accpt	8,000	150	Not available from operator	Not available from operator
	Opn desir	6,000	"		
	Min accpt	4,000	"		
500 to 1,000	Max accpt	10,000	150		
	Opn desir	8,000	"		
	Min accpt	7,000	"		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths) flaps are retracted and a maximum range airspeed of 160 knots IAS is established. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous	192
Maximum endurance	130
Maximum range	160
Maximum allowable	234

Turbulent air penetration 104 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable	15,000 feet
Minimum acceptable	5,000 feet
Maximum endurance	8,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 6,750 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs	Dev per 500 Lbs
0 to 150	Max. accpt	10,000	160	186	91	Not available from manufacturer
	Opn desir	5,000	"	172	83	
	Min. accpt	5,000	"	"	"	
150 to 500	Max accpt	15,000	160	201	100	
	Opn desir	10,000	"	186	91	
	Min accpt	5,000	"	172	83	
500 to 1,000	Max accpt	15,000	160	201	100	
	Opn. desir	12,000	"	192	94	
	Min accpt.	10,000	"	186	91	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 164 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 169  
 Maximum endurance 95  
 Maximum range 139  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

195

Turbulent air penetration 112 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 2,000 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. An alternate configuration is with gear down. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots		Fuel Data at Nautical Miles per 10 Lbs	Pounds Gross Weight Dev per 100 Lbs.
				IAS	TAS		
0 to 500	Max	accpt	8,000	164	185	30	Not available from manufacturer
	Opn	desir	4,000	"	174	"	
	Min	accpt	2,000	"	169	"	
500 to 1,000	Max	accpt	10,000	164	190	30	
	Opn	desir	6,000	"	179	"	
	Min	accpt	4,000	"	174	"	

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 160 knots IAS is maintained. This is the operationally desirable enroute airspeed.

### Speed (knots IAS)

Maximum continuous 190  
Maximum endurance 110  
Maximum range 130  
Maximum allowable 234 at any gross weight

Turbulent air penetration 145 at any gross weight and at all altitudes

### Altitude

Maximum operationally desirable 10,000 feet  
Minimum acceptable 2,000 feet  
Maximum endurance 6,000 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 7,000 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 100 Lbs
			IAS	TAS		
0 to 150	Max. accpt	10,000	160	186		
	Opn desir	8,000	"	181	106	7.9%
	Min. accpt	2,000	"	166		
150 to 1,000	Max accpt	10,000	160	186		
	Opn. desir.	8,000	"	181	106	7.9%
	Min. accpt	6,000	"	175		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an average airspeed of 160 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 182  
 Maximum endurance 112  
 Maximum range 136  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

208

Turbulent Air Penetration 112 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 2,000 feet  
 Maximum endurance 7,500 feet

Holding Configuration

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs.)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles			Altitude (Feet)	Speed Knots		Fuel Data at 4,000 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 100 Lbs
				IAS	TAS		
0 to 150	Max	accpt	7,500	160	177	82	
	Opn	desir	5,000	"	172	"	
	Min	accpt	2,000	"	165	"	
150 to 500	Max	accpt	10,000	160	186	82	Not available from manufacturer
	Opn	desir	6,000	"	174	"	
	Min	accpt	5,000	"	172	"	
500 to 1,000	Max	accpt	10,000	160	186	82	
	Opn	desir	8,000	"	181	"	
	Min	accpt	5,000	"	172	"	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), an airspeed of 160 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 178  
Maximum endurance 105  
Maximum range 131  
Maximum allowable 222

Turbulent air penetration 104 to 121 at any gross weight  
and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
Minimum acceptable 2,500 feet  
Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots		Fuel Data at 9,300 Pounds Gross Weight	
		IAS	TAS	Nautical Miles per 100 Lbs	Dev. per 100 Lbs
0 to 150	Max. accpt. 10,000	160	194	64	Not available from manufacturer
	Opn. desir. 5,000	"	173	58	
	Min. accpt. 2,500	"	168	56	
150 to 500	Max. accpt. 10,000	160	194	64	
	Opn. desir. 10,000	"	"	"	
	Min. accpt. 5,000	"	173	58	
500 to 1,000	Max. accpt. 10,000	160	194	64	
	Opn. desir. 10,000	"	"	"	
	Min. accpt. 5,000	"	173	58	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), a maximum range airspeed of 108 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 121  
 Maximum endurance 82  
 Maximum range 108  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

139

Turbulent Air Penetration 87 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 12,500 feet  
 Minimum acceptable 2,500 feet  
 Maximum endurance 7,500 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,200 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 10 Lbs	Dev per 100 Lbs
0 to 500	Max	acct	12,500	108	131	Not available from manufacturer
	Opn	desir	7,500	"	121	
	Min	acct	2,500	"	112	
					21	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed will vary between 104 knots IAS and 110 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 120  
 Maximum endurance 88  
 Maximum range 88  
 Maximum allowable

Gross WeightsDo Not Exceed

At any gross weight 153

Turbulent air penetration 88 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 2,500 feet  
 Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS      TAS		Fuel Data at 2,350 Nautical Miles		Pounds Gross Weight Dev per 100 Lbs
					per 10	Lbs	
0 to 150	Max	accpt	5,000	108	116	19 4	Not available from manufacturer
	Opn	desir	2,500	110	113	19 0	
	Min	accpt	2,500	"	"	"	
150 to 500	Max	accpt	10,000	104	120	20 3	
	Opn	desir	5,000	108	116	19 4	
	Min	accpt	5,000	"	"	"	

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), enroute airspeeds will vary between 107 and 118 knots IAS. These are the operationally desirable enroute airspeeds.

### Speed (knots IAS)

Maximum continuous. 113  
Maximum endurance. 72  
Maximum range 96  
Maximum allowable. 142

Turbulent air penetration 100 at any gross weight and at all altitudes

### Altitudes

Maximum operationally desirable 10,000 feet  
Minimum acceptable. MEA  
Maximum endurance 7,500 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank, and speed conversion graphs).



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,850 Nautical Miles		Pounds Gross Weight Dev per	
			IAS	TAS	per 100	Lbs	100	Lbs
0 to 150	Max accpt	7,500	113	127	161		Not available from manufacturer	
	Opn desir	5,000	118	"	146			
	Min accpt	MEA						
150 to 500	Max. accpt	10,000	107	125	175			
	Opn. desir	7,500	113	127	161			
	Min. accpt	2,500	117	123	143			
500 to 820	Max accpt	10,000	107	125	175			
	Opn desir	7,500	113	127	161			
	Min accpt	5,000	118	"	146			

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between 108 and 116 knots IAS as indicated in Table 1. These are the operationally desirable enroute airspeeds

Speed (knots IAS)

Maximum continuous 138  
 Maximum endurance 91  
 Maximum range 104  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight-----138

Turbulent air penetration: 90 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 10,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 8,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,650 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 10 Lbs.	Dev per 100 Lbs.
0 to 150	Max. accpt	7,500	115	130	17 0	Not available from manufacturer
	Opn. desir	5,000	116	126	"	
	Min. accpt.	MEA				
150 to 500	Max accpt.	10,000	108	125	18 5	
	Opn desir.	10,000	"	"	"	
	Min accpt	5,000	116	126	17 0	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), a constant airspeed of 175 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 201  
 Maximum endurance 95  
 Maximum range 137  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

216

Turbulent air penetration 105 to 142 at any gross weight  
 and at all altitudes

Altitudes

Maximum operationally desirable 15,000 feet  
 Minimum acceptable 2,500 feet  
 Maximum endurance 5,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graph).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 4,400 Pounds Gross Weight	
			IAS	TAS	Nautical Miles per 100 Lbs	Dev. per 200 Lbs
0 to 150	Max. accpt	10,000	175	204	122	14.0%
	Opn. desir.	5,000	"	189	119	"
	Min. accpt	2,500	"	182	116	"
150 to 500	Max accpt.	15,000	175	221	Not available from manufacturer or operator.	
	Opn. desir.	8,000	"	196	121	14.0%
	Min. accpt.	2,500	"	182	116	"
500 to 1,000	Max accpt.	15,000	175	221	Not available from manufacturer or operator	
	Opn. desir.	8,000	"	196	121	14.0%
	Min accpt.	5,000	"	189	119	"

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), airspeeds vary between 161 knots IAS and 175 knots IAS. These are operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 183  
Maximum endurance 130  
Maximum range 148  
Maximum allowable 183 at any gross weight

Turbulent air penetration 135 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
Minimum acceptable 2,500 feet  
Maximum endurance 10,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed (see appendix for turning radius, angle of bank and speed conversion graphs).

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 4,830 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 300 Lbs
			IAS	TAS		
0 to 150	Max	accpt	7,500	167	189	119
	Opn	desir	5,000	172	185	117
	Min	accpt	2,500	175	181	114
150 to 1,000	Max	accpt	10,000	161	187	127
	Opn	desir	7,500	167	189	119
	Min	accpt	5,000	172	185	117

Not available  
from  
manufacturer

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 110 knots IAS is maintained. This is the operationally desirable airspeed.

Speed (knots IAS)

Maximum continuous 130  
 Maximum endurance 71  
 Maximum range 95  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

173

Turbulent air penetration. 105

Altitude

Maximum operationally desirable: 10,000 feet  
 Minimum acceptable MEA  
 Maximum endurance. 5,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeeds. (See appendix for turning radius, angle of bank and speed conversion graphs)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 4,800 Nautical Miles per 100 Lbs.	Pounds Gross Weight Dev. per 100 Lbs
			IAS	TAS		
0 to 150	Max. accpt	5,000	110	118	Not available from operators.	Not available from operators
	Opn desir.	3,000	"	115		
	Min accpt.	MEA	"			
150 to 700	Max accpt	10,000	110	128		
	Opn desir.	5,000	"	118		
	Min accpt.	2,000	"	113		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), airspeed varies between 95 and 97 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 125  
Maximum endurance 87  
Maximum range 95  
Maximum allowable 168 at any gross weight and at all altitudes

Turbulent air penetration 85 at any gross weight

Altitude

Maximum operationally desirable 10,000 feet  
Minimum acceptable MEA  
Maximum endurance MEA

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed at an angle of bank to accomplish a standard rate turn, at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)			Speed Knots		Fuel Data at 8,000 Pounds Gross Weight	
				IAS	TAS	Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max	acct	5,000	97	104	75	4.0%
	Opn	desir	5,000	"	"	"	"
	Min	acct	MEA	"	-	-	-
150 to 1,000	Max	acct	10,000	95	111	78	5.0%
	Opn	desir	10,000	"	"	"	"
	Min	acct	MEA	"	-	-	-

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

## NARRATIVE SUMMARY

### Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), an airspeed of 147 knots IAS is maintained. This is the operationally desirable enroute airspeed

### Speed (knots IAS)

Maximum continuous 156  
Maximum endurance 138  
Maximum range 138  
Maximum allowable

### Gross Weight

### Do Not Exceed

At any gross weight

159

Turbulent air penetration 130 at any gross weight and  
at all altitudes

### Altitudes

Maximum operationally desirable 10,000 feet  
Minimum acceptable MEA  
Maximum endurance 7,500 feet

### Holding Configuration and Turning Radius

Enroute holding is accomplished at 100 knots IAS in a clean configuration. Turns at operational altitude are executed with an angle of bank to accomplish a standard rate turn. (See appendix for turning radius, angle of bank and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,425 Nautical Miles		Pounds Gross Weight Dev. per	
			IAS	TAS	per 10	Lbs.	100	Lbs.
0 to 900	Max. accpt.	10,000	147	172	26.6		Not available from manufacturer	
	Opn. desir	7,500	"	165	25.2			
	Min. accpt.	MEA	"					

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths) an airspeed of 117 knots IAS is maintained. This is the operationally desirable enroute airspeed

Speed (knots IAS)

Maximum continuous 122  
 Maximum endurance 82  
 Maximum range 108  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

148

Turbulent Air Penetration 90 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 6,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 6,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank and speed conversion graphs )

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,000 Nautical Miles		Pounds Gross Weight Dev. per 100 Lbs
			IAS	TAS	per	1 Lbs	
0 to 500	Max. accpt.	6,000	117	128		2.4	Not available from manufacturer.
	Opn. desir.	4,000	"	124		2.3	
	Min accpt.	MEA	"	-		-	

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for optimum cruise altitudes for various stage lengths), an airspeed of 149 knots IAS is maintained. This is the operationally desirable enroute airspeed.

Speed (knots IAS)

Maximum continuous 158  
 Maximum endurance 91  
 Maximum range 144  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

195

Turbulent air penetration 90 at any gross weight and at all altitudes

Altitude

Maximum operationally desirable 10,000 feet  
 Minimum acceptable 3,000 feet  
 Maximum endurance 9,000 feet

Holding Configuration

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitude are executed at an angle of bank to accomplish a standard rate turn at either maximum endurance airspeed or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)



TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 3,800 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 300 Lbs
			IAS	TAS		
0 to 150	Max	accpt	7,500	149	Not available from manufacturer	
	Opn	desir	6,000	"		
	Min	accpt	3,000	"		
150 to 500	Max	accpt	9,000	149		
	Opn	desir	7,500	"		
	Min	accpt	3,000	"		
500 to 1,000	Max	accpt	10,000	149		
	Opn	desir.	9,000	"		
	Min	accpt	3,000	"		

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

## NARRATIVE SUMMARY

Sequence of Operations

After reaching cruise altitude (see Table I for cruise altitudes for various stage lengths), airspeed varies between 114 and 128 knots IAS. These are the operationally desirable enroute airspeeds.

Speed (knots IAS)

Maximum continuous 138  
 Maximum endurance 78  
 Maximum range 91  
 Maximum allowable

Gross WeightDo Not Exceed

At any gross weight

145

Turbulent air penetration 110 at any gross weight and at all altitudes

Altitudes

Maximum operationally desirable 10,000 feet  
 Minimum acceptable MEA  
 Maximum endurance 8,000 feet

Holding Configuration and Turning Radius

Enroute holding is accomplished at maximum endurance airspeed in a clean configuration. Turns at operational altitudes are executed with an angle of bank to accomplish a standard rate turn at either maximum endurance or operationally desirable airspeed. (See appendix for turning radius, angle of bank, and speed conversion graphs.)

TABLE I, ENROUTE  
(Performance Data for Various Stage Lengths)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots		Fuel Data at 2,550 Nautical Miles		Pounds Gross Weight Dev per 100 Lbs
			IAS	TAS	per 10	Lbs	
0 to 150	Max. accpt.	8,000	125	141	23.5		
	Opn desir	6,000	126	138	23.0		
	Min. accpt.	MEA	128	-	-		Not available from manufacturer
150 to 700	Max. accpt.	10,000	114	132	25.0		
	Opn. desir	8,000	125	141	23.5		
	Min accpt	MEA	128	-	-		

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

AIR      VEHICLE      PERFORMANCE      CHARACTERISTICS

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-off.

### DISTANCES

ABORT DISTANCE The remaining runway distance required to stop aircraft after attaining  $V_1$  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 aircraft 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, taxiing, and engine warm-up

**MAXIMUM TAKE-OFF WEIGHT** Maximum allowable weight at take-off 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.

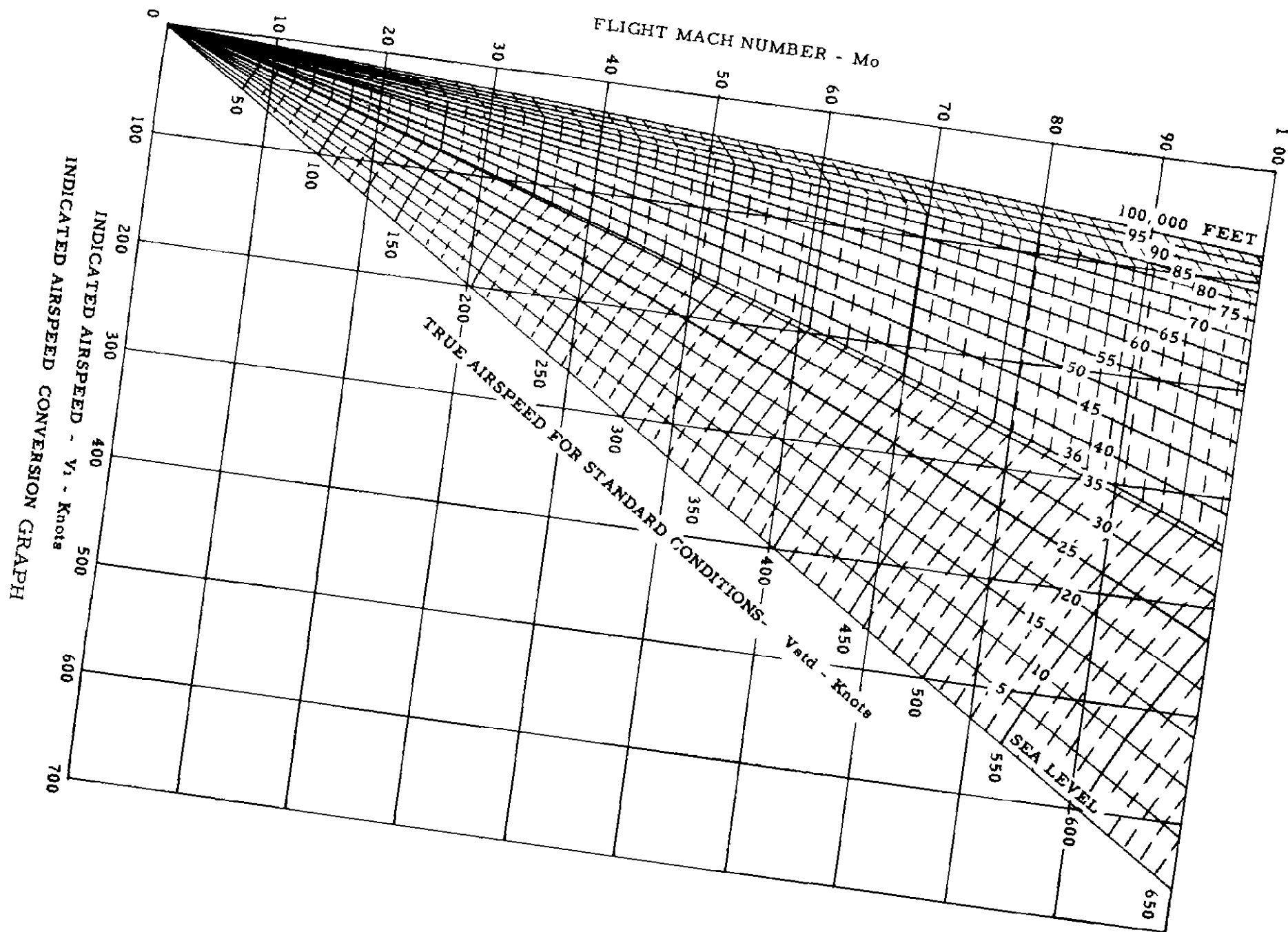
**HOVER** (relating to helicopters or VTOL) To remain in a stationary position at a given altitude above the surface.

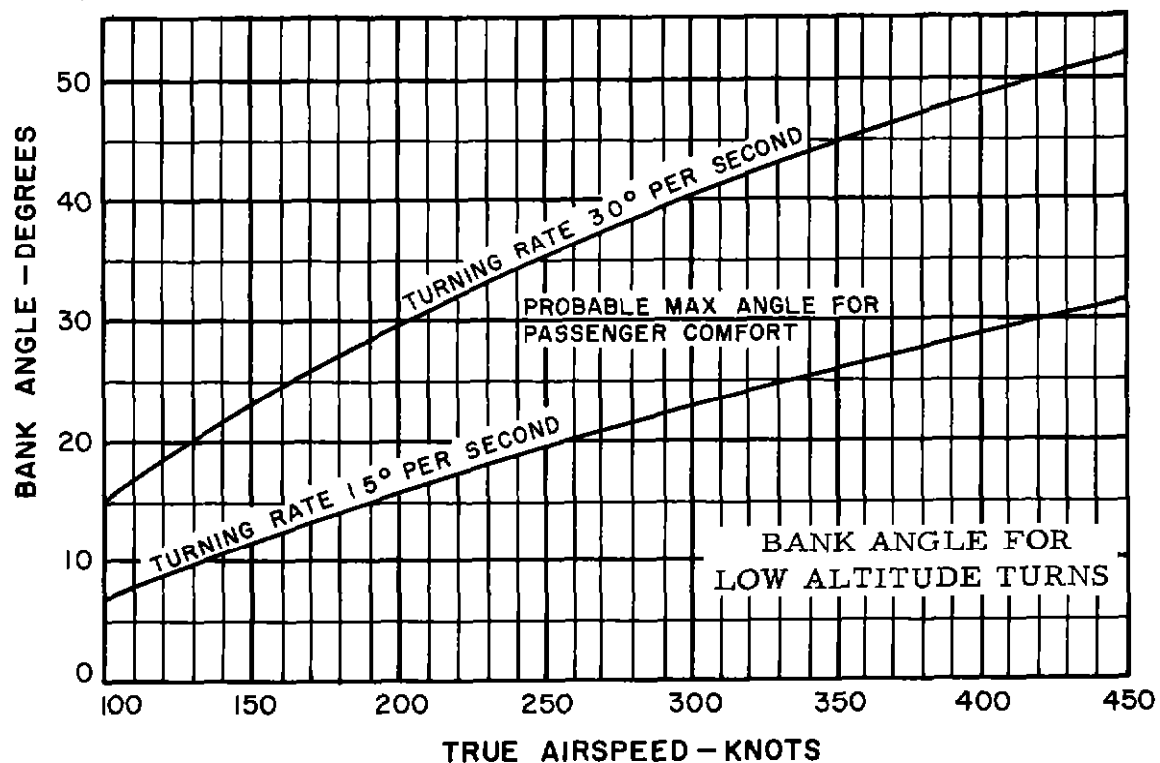
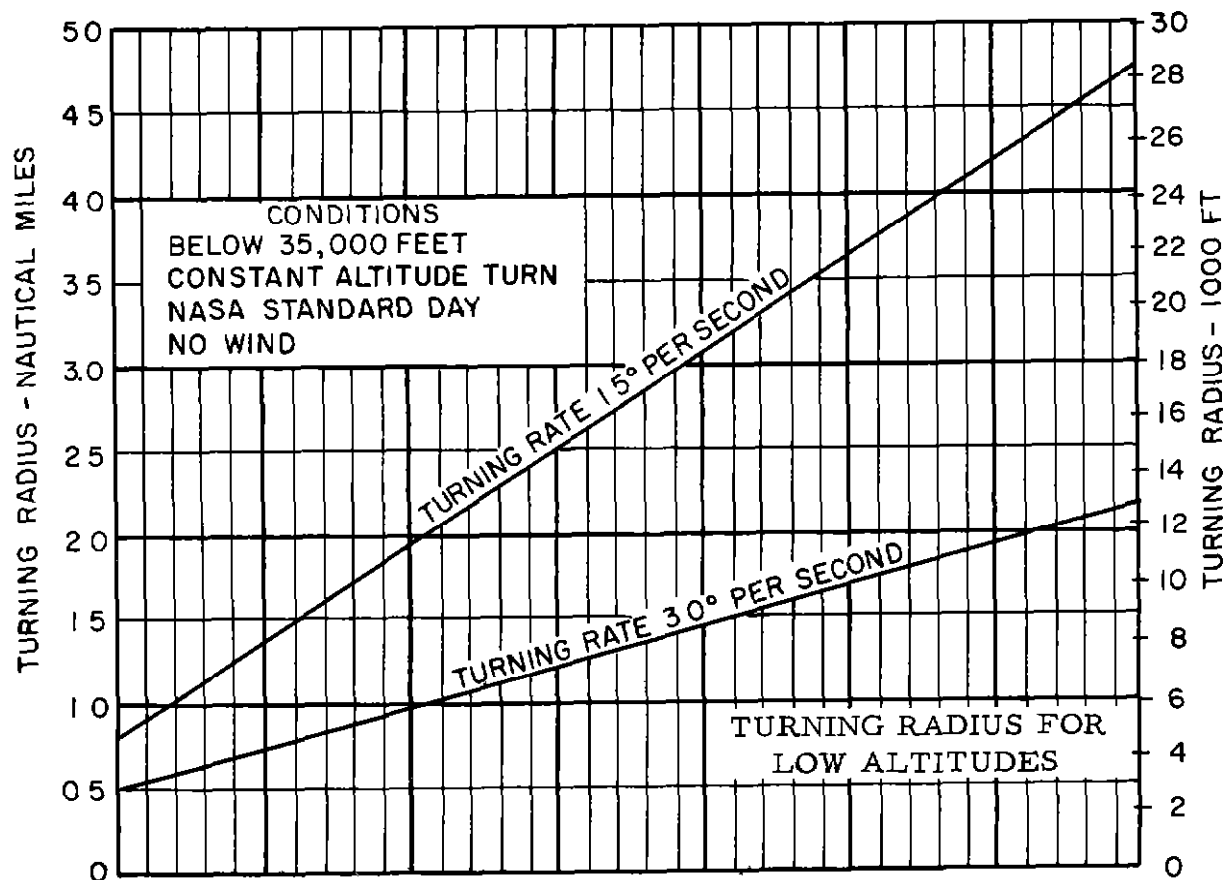
**TRANSLATIONAL LIFT** The lift force exerted on the rotor blades of a helicopter when increased speed is imparted to the blades or when their angle of attack is changed in going from one type of flight to another, such as from hovering to horizontal flight

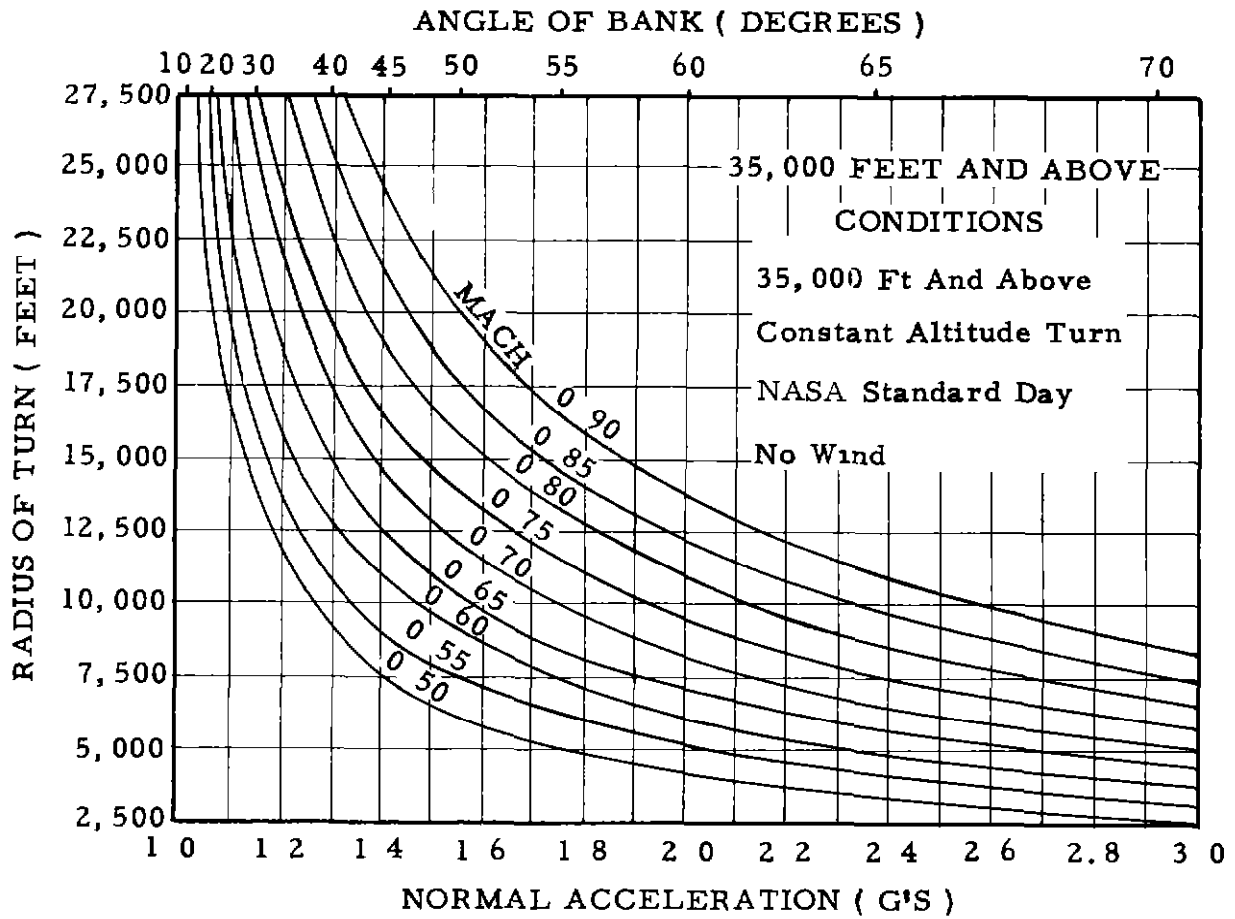
## SYMBOLS AND ABBREVIATIONS

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 Detection
shp	Shaft Horsepower
rpm	Revolutions Per Minute
TAS	True Airspeed
T/O	Take-Off
V1	Critical Engine Failure Speed
V2 (Vlof)	Take-Off Safety Speed - Actual Lift-Off Speed









TURNING RADIUS GRAPH  
HIGH ALTITUDES

## ENROUTE

The following equation is used in conjunction with the enroute tables. The equation will yield actual specific range for given gross weight and speed conditions. Normal values and deviations are contained in the tables. In substituting from the tables, divide all percentage values by 100.

$$Fa = Fn \left( 1 - a \frac{Wa - Wn}{X} \right) \left( 1 - b \frac{Sa - Sn}{Y} \right)$$

- |  |                                     |
|--|-------------------------------------|
| * Fa - Actual specific range           | * a - % Deviation in specific range |
| * Fn - Normal specific range           | per X pounds change in gross        |
| Wa - Actual gross weight               | weight                              |
| Wn - Normal gross weight               | * b - % Deviation in specific range |
| Sa - Actual speed                      | per Y units change in speed         |
| Sn - Normal speed                      |                                     |
| X - Unit pounds in which the           |                                     |
| deviation with gross weight            |                                     |
| is expressed                           |                                     |
| Y - Unit Mach number or knots in which |                                     |
| the deviation with speed is expressed  |                                     |

\* Refers to nautical miles per ( ) pounds of fuel as given in Table I