UNITED STATES
FEDERAL AVIATION AGENCY

AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volume V

ENROUTE

FOR

BUREAU OF RESEARCH & DEVELOPMENT
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BY

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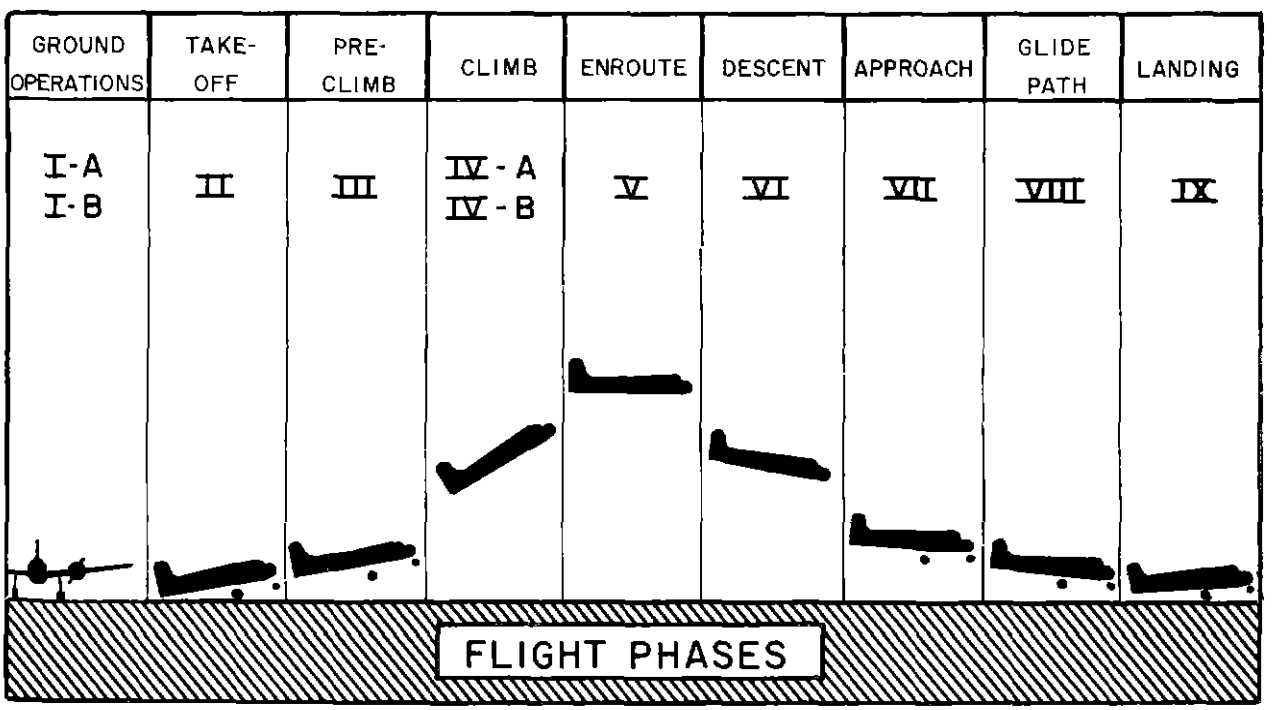
AIR VEHICLE PERFORMANCE CHARACTERISTICS

This is a fourteen volume study,
containing the following

Volume I-A	Ground Operations
Volume I-B	Ground Operations
Volume II	Take-Off
Volume III	Pre-Climb
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



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AIR VEHICLE PERFORMANCE CHARACTERISTICS

MASTER INDEX

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

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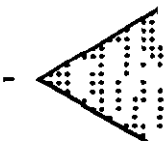

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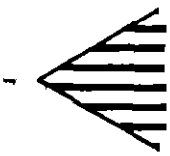

Section 2 - Commercial Aircraft

Section 3 - General Aviation

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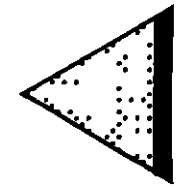
AIR VEHICLE PERFORMANCE CHARACTERISTICS

Volumes I-A through IX



SECTION 1

MILITARY AIRCRAFT

containing data on

Beechcraft T-34A
Bell H-13H (47G-2)
Bell H-40
Boeing B-47B/B-47E
Boeing KC-97G
Boeing KC-135A
Cessna L-19 A/E (OE-1)
Cessna TL-19D
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Hiller H-23D
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Lockheed C-130A
Lockheed T2V-1
Lockheed T-33A-1
Martin B-57B
North American F-86L
North American TB-25M
North American T-28A
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North American T2J-1
Northrop F-89H
Republic F-84F Series
Sikorsky H-19D
Sikorsky H-34A (S-58) (HSS-1)
Sikorsky H-37A
Vertol H-21C (44-B)

(date of latest revision September 1, 1959)

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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)

:age Length in iautical Miles	Altitude (Feet)	Speed Knots IAS	 TAS	Fuel Data at 2, 900 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 100 Lbs.
) 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 IAS	Speed Knots TAS	Fuel Data at 2, 350 Pounds Gross Weight Nautical Miles per 10 Lbs	Fuel Data at 2, 350 Pounds Gross Weight 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 IAS	Speed Knots TAS	Fuel Data at 5,710 Pounds Gross Weight Nautical Miles per 100 Lbs.	Fuel Data at 5,710 Pounds Gross Weight 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 Weight	Do 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 aircraft 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 IAS	TAS	MACH	Fuel Data at 180,000 Pounds Gross Weight 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 desiraole 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 IAS	Speed Knots TAS	Fuel Data at 164,950 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs
0 to 2,000	Max accpt	18,000	173	230	76 3	6 7%
	Opn desir	15,000	183	"	"	"
	Min accpt	12,000	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

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 IAS	TAS	MACH	Fuel Data at 243,000 Pounds Gross Weight 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	Speed Knots TAS	Fuel Data at 2,400 Nautical Miles per 10 Lbs	Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 2,400 Pounds Nautical Miles per 10 Lbs.	Gross Weight 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)

tage Length in Nautical Miles	Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	Fuel Data at 6,400 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs
) 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	Do Not Exceed
At any gross weight	266 (up to 16,500 feet. Above 16,500 feet, reduce airspeed 5 knots per 1,000 feet.)

Turbulent Air Penetration

Gross Weight	Speed
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 IAS	Speed Knots TAS	Fuel Data at 39,000 Pounds Gross Weight 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 IAS	Speed Knots TAS	Fuel Data at 46,000 Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 41,500 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs
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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 42,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max accpt	5,000	165	178	18 6	
	Opn desir	3,000	"	173	"	Not available
	Min accpt.	2,000	"	170	"	from operator
150 to 500	Max. accpt	8,000	165	186	18 6	
	Opn desir	6,000	"	180	"	
	Min accpt	4,000	"	175	"	
500 to 1,000	Max accpt	12,000	165	198	18 6	
	Opn desir	8,000	"	186	"	
	Min accpt.	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 Weight	Do Not Exceed
At any gross weight	238

Turbulent air penetration

Gross Weight	Speed
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)

Stage Length in Nautical Miles		Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	Fuel Data at 167,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 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 IAS	Speed Knots TAS	*Fuel Data at 270,000 Pounds Gross Weight 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)

tage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS	TAS	MACH	Fuel Data at 70,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	Dev. per MACH 0.01
Up to 500	Max accpt	35,000	268	458	0.80	75 0	10 0%	
	Opn desir	20,000	366	487	"	49.5	3 0%	
	Min. accpt	MEA	--	--	--	--	--	
500 to 1,000	Max accpt	35,000	268	458	0.80	75.0	10.0%	
	Opn desir.	25,000	335	478	"	58.5	4.3%	Not available
	Min accpt	20,000	366	487	"	49 5	3 0%	from operator.
1,000 and up	Max accpt	35,000	268	458	0.80	75.0	10 0%	
	Opn desir	30,000	300	468	"	68.0	5 9%	
	Min accpt.	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 IAS	Speed Knots TAS	Fuel Data at 64,000 Pounds Gross Weight Nautical Miles per 1,000Lbs	Dev per 5,000 Lbs.
0 to 400	Max. accpt	10,000	153	178	133	6.0%
	Opn desir.	6,000	164	"	128	5 5%
	Min accpt.	MEA		"		
400 to 1,000	Max accpt	10,000	153	178	133	6 0%
	Opn desir.	8,000	159	"	130	"
	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 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.)

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

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	Fuel Data at 53,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 5,000 Lbs
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 IAS	Speed Knots TAS	Fuel Data at Any Gross Weight: Nautical Miles per 100 Lbs	Fuel Data at Any Gross Weight: 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 IAS	Speed Knots TAS	Fuel Data at any Gross Weight: Nautical Miles per 100 Lbs.	Fuel Data at any Gross Weight: 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

Altitude	Speed
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 IAS	Speed Knots TAS	Fuel Data at 28,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Percent Dev per 1,000 Lbs
0 to 150	Max. accpt.	6,000	140	153	25.2	3.0%
	Opn. desir.	2,000	"	144	24.7	2.8%
	Min accpt	MEA	"			
150 to 2,000	Max. accpt.	11,000	"	166	25.9	3.3%
	Opn. desir.	6,000	"	153	25.2	3.0%
	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 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 LAS	Speed Knots TAS	Fuel Data at 165,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs.
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%

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

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

Hayes-Boeing KB-50J and KB-50K

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 IAS	Speed Knots TAS	Fuel Data at 2,640 Pounds Gross Weight: Nautical Miles per 10 Lbs	Fuel Data at 2,640 Pounds Gross Weight: 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	Do Not Exceed
At any gross weight	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 IAS	Speed Knots TAS	Fuel Data at 130,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 10,000 Lbs.
500 to 1,000	Max	accpt	12,000	180	216	90	3 3%
	Opn	desir	10,000	186	"	"	"
	Min	accpt	8,000	192	"	"	"
1,000 to 1,500	Max	accpt	18,000	177	235	88	4 5%
	Opn	desir	16,000	183	"	"	"
	Min	accpt	8,000	194	218	90	3 3%
Step climb							
For first 500 miles of 1,500 mile stage length	Max	accpt	12,000	181	218	90	3 3%
	Opn	desir	10,000	187	"	"	"
	Min	accpt	8,000	194	"	"	"
After first 500 miles of 1,500 mile stage length	Max	accpt	19,000	178	240	88	4 5%
	Opn	desir	17,000	184	"	"	"
	Min	accpt	15,000	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 Weight	Do 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)

Stage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS	Speed Knots TAS	Fuel Data at 120,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 10,000 Lbs
For all stage lengths	Max accpt	26,500	196	298	76	4 3%
	Opn desir	25,000	194	290	"	"
	Min accpt	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 IAS	TAS	MACH	Fuel Data at 15,000 Pounds Gross Weight 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	Do Not Exceed
At any gross weight	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 IAS	TAS	MACH	Fuel Data at 13,750 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	Dev per MACH 0 01
150 to 500	Max accpt	30,000	250	395	0 67	245	3%	1%
	Opn desir.	27,000	"	375	0 63	226	"	"
	Min accpt	25,000	"	362	0 60	214	"	"
500 to 1,500	Max accpt	35,000	220	383	0 67	274	4%	1%
	Opn desir	30,000	"	351	0 60	244	"	"
	Min. accpt	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 IAS	TAS	MACH	Fuel Data at 52,000 Pounds Gross Weight 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 Weight	Do Not Exceed
At any gross weight	610 knots IAS (no external tanks)
Turbulent air penetration and at all altitudes	250 knots IAS at any gross weight

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 IAS	TAS	MACH	Fuel Data at 16,000 Pounds Gross Weight 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 fo_ 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	Speed Knots TAS	Fuel Data at 27,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 2,000 Lbs
0 to 150	Max accpt	10,000	155	180	357	3%
	Opn desir	5,000	"	167	333	"
	Min accpt	MEA				
150 to 1,500	Max. accpt.	10,000	155	180	357	3%
	Opn. desir.	10,000	"	"	"	"
	Min accpt.	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)

Altitude	0 - 2,500	2,500 - 5,000	5,000 - 7,500	7,500 - 10,000
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)

age Length in autical Miles	Altitude (Feet)		Speed Knots IAS	Speed Knots TAS	Fuel Data at 7,200 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 100 Lbs	Dev per 5 Knots
) 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 - 2,500	2,500 - 15,000	15,000 - 25,000	25,000 - 35,000
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 IAS	Speed Knots TAS	Fuel Data at 8,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 500 Lbs.
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 IAS	Speed Knots TAS	Fuel Data at 8,500 Pounds Gross Weight Nautical Miles 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 IAS	TAS	MACH	Fuel Data at 40,000 Pounds Gross Weight: 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 IAS	TAS	MACH	Fuel Data at 19,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs	Dev. per MACH 0.01
0 to 500	Max accpt	35,000	265	450	0.78	231	3.7%	
	Opn desir.	30,000	280	440	0 75	210	2.6%	
	Min accpt.	20,000	295	395	0.64	173	2.4%	
500 to 1,000	Max accpt.	40,000	245	460	0 80	237	5 3%	Not available
	Opn desir	35,000	265	450	0 78	231	3.7%	from
	Min accpt	30,000	280	440	0 75	210	2 6%	operator
1,000 and up	Max. accpt	40,000	245	460	0.80	237	5 3%	
	Opn desir.	40,000	"	"	"	"	"	
	Min accpt.	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 IAS	Speed Knots TAS	Fuel Data at 7,800 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 50	Max accpt	2,000	73	75	32 2	16 7%
	Opn desir	2,000	"	"	"	"
	Min accpt	MEA	"	"		
50 to 350	Max accpt	6,000	68	74	29 4	21.0%
	Opn desir	4,000	70	"	31 2	17 0%
	Min accpt	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 IAS	Speed Knots TAS	Fuel Data at Nautical Miles per 100 Lbs.	Pounds Gross Weight Dev. per 1,000 Lbs.
0 to 50	Max accpt. 6,000	82	90	20.8	61 0%
	Opn. desir 2,000	93	96	23.2	22.5%
	Min. accpt. 2,000	"	"	"	"
50 to 300	Max. accpt. 8,000	76	86	18.2	49 0%
	Opn desir 4,000	87	92	22.7	36 0%
	Min accpt 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)

tage Length in Nautical Miles		Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	Fuel Data at Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 1,000 Lbs
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 IAS	Speed Knots TAS	Fuel Data at 13,500 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 2,000 Lbs
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

Boeing 707-121

Convair 340/440

de Havilland Comet 4

Douglas DC-3 (C-47, R4D)

Douglas DC-4 (C-54)

Douglas DC-6

Douglas DC-6B

Douglas DC-7

Douglas DC-7B

Douglas DC-7C

Fairchild F-27B

Lockheed Electra 188

Lockheed 1049G

Lockheed 1649A

Martin 404

Vickers Viscount 745D

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 Weight	Do 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	Speed Knots 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)

tage Length in Nautical Miles	Altitude (Feet)		Speed Knots IAS	TAS	MACH	Fuel Data at Nautical Miles per 1,000 Lbs	Pounds Gross Weight Dev per 10,000 Lbs	Dev per MACH 0 01
0 to 500	Max accpt	9,000	311	352	0.55			
	Opn desir	8,000	317	354	"	25 (estimated)		
	Min accpt	7,000	322	357	"			
500 to 1,000	Max accpt.	25,000	330	475	0.79			
	Opn desir	22,500	350	480	"	30 (estimated)	Not available from operators.	
	Min accpt	20,000	368	485	"			
,000 to 1,700	Max accpt.	30,000	300	465	0 79			
	Opn desir	27,500	315	470	"	33 (estimated)		
	Min accpt	25,000	330	475	"			
,700 to 3,000	Max accpt	38,000	250	453	0.79			
	Opn desir	34,000	275	458	"	35 (estimated)		
	Min accpt	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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 47,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 1,000 Lbs.
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

Gross Weight	Do Not Exceed
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 IAS	TAS	MACH	Fuel Data at 135,000 Pounds Gross Weight 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 from
1,000 to 2,000	Max. accpt 35,000	250	427	0.74	61 6	6%	manufacturer.
	Opn. desir 35,000	"	"	"	"	"	
	Min accpt 30,000	278	435	"	48 0	"	

[1] 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 IAS	Speed Knots TAS	Fuel Data at 25,346 Pounds Gross Weight Nautical Miles per 100 Lbs	Fuel Data at 25,346 Pounds Gross Weight Dev per 1,000 Lbs.
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 IAS	Speed Knots TAS	Fuel Data at 70,000 Pounds Gross Weight 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 IAS	Speed Knots TAS	Nautical Miles per 100 Lbs	Dev. per 100 Lbs
Jp to 500	Max accpt	15, 000	187	242	11 2	
	Opn desir.	10, 000	195	233	11 4	
	Mın accpt.	5, 000	204	225	11.0	
500 and up	Max. accpt.	20, 000	175	247	11.4	Not available from operator.
	Opn desir.	15, 000	187	242	11.2	
	Mın accpt	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)

Stage Length in Nautical Miles	Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	*Fuel Data at 95,000 Pounds Gross Weight: Nautical Miles per 100 Lbs.	*Fuel Data at 95,000 Pounds Gross Weight: Dev. per 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 IAS	Speed Knots TAS	Fuel Data at 105,000 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), 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	Speed Knots 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 IAS	TAS	MACH	Fuel Data at 112,500 Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 32,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max. accpt	10,000	190	220	14 4	1%
	Opn desir	10,000	"	"	"	"
	Min accpt	8,000	194	"	13 8	"
150 to 500	Max accpt	20,000	162	220	19 3	2%
	Opn desir	15,000	178	"	16 6	1%
	Min. accpt	10,000	190	"	14 4	"
500 to 1,000	Max accpt	20,000	162	220	19 3	2%
	Opn desir	20,000	"	"	"	"
	Min accpt.	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 Weight	Do 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 IAS	TAS	MACH	Fuel Data at 100,000 Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 135,000 Pounds Gross Weight: Nautical Miles per 100 Lbs.	Fuel Data at 135,000 Pounds Gross Weight: 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 IAS	Speed Knots TAS	Fuel Data at 155,000 Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 40,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 1,000 Lbs
70 to 100	Max	accpt	5,000	173	190	189	
	Opn	desir	3,000	175	187	186	
	Min	accpt	2,000	176	185	184	
100 to 150	Max	accpt	8,000	169	194	190	Not available
	Opn	desir	6,000	171	191	190	from operators
	Min	accpt	6,000	171	191	190	
150 to 400	Max	accpt	16,000	158	207	196	
	Opn	desir	12,000	164	201	194	
	Min	accpt	8,000	169	194	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 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	Do Not Exceed
At any gross weight	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 IAS	Speed Knots TAS	Fuel Data at 63,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev per 5,000 Lbs
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 IAS	TAS	MACH	Fuel Data at 67,000 Pounds Gross Weight Nautical Miles per 1,000 Lbs	Dev. per 5,000 Lbs.	Dev. per MACH 0.01
60 to 100	Max accpt.	11,000	254	300	0 47	77.1	1 3%	0 02%
	Opn desir	9,000	262	299	"	72.9	2 6%	"
	Min. accpt.	9,000	"	"	"	"	"	"
100 to 200	Max accpt.	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 accpt	11,000	254	300	0 47	77 1	1 3%	0.02%
200 to 1,000	Max accpt	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 accpt	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

Aero Commander 680 (L-26C)

Aero Commander 720

Beechcraft "Bonanza" K-35

Beechcraft "Twin Bonanza" (L-23D)

Beechcraft Model 95

Beechcraft Super 18

Cessna 150

Cessna 172

Cessna 175

Cessna 180 (Amphibian)

Cessna 182

Cessna 310A (L-27A)

Cessna 310C

de Havilland "Beaver" (L-20A)

de Havilland "Otter" (U-1A)

Mooney Mark 20A

Piper "Tri-Pacer" PA-22

Piper "Apache"" PA-23

Piper "Comanche" PA-24-180

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UNITED STATES FEDERAL AVIATION AGENCY
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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 IAS	Speed Knots TAS	Fuel Data at 6,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Percent Dev per 200 Lbs.
0 to 150	Max accpt.	5,000	178	192	114	
	Opn desir	5,000	"	"	"	
	Min. accpt	MEA	-	-	-	Not available from manufacturer
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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 6,600 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 100 Lbs
0 to 150	Max. accpt	7,000	150	166		
	Opn Desir	4,000	"	159		
	Min accpt	3,000	"	157		
150 to 500	Max accpt	8,000	150	169	Not available from operator	Not available from operator
	Opn desir	6,000	"	164		
	Min accpt	4,000	"	159		
500 to 1,000	Max accpt	10,000	150	174		
	Opn desir	8,000	"	169		
	Min accpt	7,000	"	166		

(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 IAS	Speed Knots TAS	Fuel Data at 6,750 Pounds Gross Weight 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 Weight	Do 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)

tage Length in Nautical Miles		Altitude (Feet)	Speed Knots IAS	Speed Knots TAS	Fuel Data at Nautical Miles per 10 Lbs	Pounds Gross Weight Dev per 100 Lbs.
0 to 500	Max accpt	8,000	164	185	30	
	Opn desir	4,000	"	174	"	
	Min accpt	2,000	"	169	"	Not available from manufacturer
00 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 IAS	Speed Knots TAS	Fuel Data at 7,000 Nautical Miles per 100 Lbs	Pounds Gross Weight Dev per 100 Lbs
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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 4,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 100 Lbs
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 IAS	Speed Knots TAS	Fuel Data at 9,300 Pounds Gross Weight Nautical Miles per 100 Lbs	Fuel Data at 9,300 Pounds Gross Weight 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 2,200 Nautical Miles per 10 Lbs	Pounds Gross Weight Dev per 100 Lbs
0 to 500	Max accpt 12,500	108	131		Not available
	Opn desir 7,500	"	121	21	from
	Min accpt 2,500	"	112		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), 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 Weights	Do 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	Speed Knots TAS	Fuel Data at 2, 350 Nautical Miles per 10 Lbs	Pounds Gross Weight Dev per 100 Lbs
0 to 150	Max accpt	5, 000	108	116	19 4	
	Opn desir	2, 500	110	113	19 0	
	Mın accpt	2, 500	"	"	"	Not available from manufacturer
150 to 500	Max accpt	10, 000	104	120	20 3	
	Opn desir	5, 000	108	116	19 4	
	Mın 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 IAS	Speed Knots TAS	Fuel Data at 2,850 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 2,650 Pounds Gross Weight Nautical Miles per 10 Lbs.	Dev per 100 Lbs.
0 to 150	Max. accpt	7,500	115	130	17 0	
	Opn. desir	5,000	116	126	"	
	Min. accpt.	MEA				Not available from manufacturer
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 Weight	Do Not Exceed
At any gross weight	216
Turbulent air penetration and at all altitudes	105 to 142 at any gross weight

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 IAS	Speed Knots TAS	Fuel Data at 4,400 Pounds Gross Weight 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 IAS	Speed Knots TAS	Fuel Data at 4,830 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 300 Lbs
0 to 150	Max accpt	7,500	167	189	119	
	Opn desir	5,000	172	185	117	
	Min accpt	2,500	175	181	114	Not available from manufacturer
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	

(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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 4,800 Pounds Gross Weight Nautical Miles per 100 Lbs.	Dev. per 100 Lbs
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 IAS	Speed Knots TAS	Fuel Data at 8,000 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 1,000 Lbs
0 to 150	Max	accpt	5,000	97	104	75	4.0%
	Opn	desir	5,000	"	"	"	"
	Min	accpt	MEA	"	-	-	-
150 to 1,000	Max	accpt	10,000	95	111	78	5 0%
	Opn	desir	10,000	"	"	"	"
	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 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 at all altitudes	130 at any gross weight and

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 IAS	Speed Knots TAS	Fuel Data at 2,425 Nautical Miles per 10 Lbs.	Pounds Gross Weight Dev. per 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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 2,000 Pounds Gross Weight Nautical Miles per 1 Lbs	Dev. per 100 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.)

Piper

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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 3,800 Pounds Gross Weight Nautical Miles per 100 Lbs	Dev per 300 Lbs
0 to 150	Max accpt	7,500	149	167		
	Opn desir	6,000	"	162		
	Min accpt	3,000	"	156		
150 to 500	Max accpt	9,000	149	171		
	Opn desir	7,500	"	167	Not available from manufacturer	
	Min accpt	3,000	"	156		
500 to 1,000	Max accpt	10,000	149	173		
	Opn desir.	9,000	"	171		
	Min accpt	3,000	"	156		

(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 Weight	Do 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 IAS	Speed Knots TAS	Fuel Data at 2,550 Pounds Gross Weight Nautical Miles per 10 Lbs	Dev per 100 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)

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

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 V1 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.

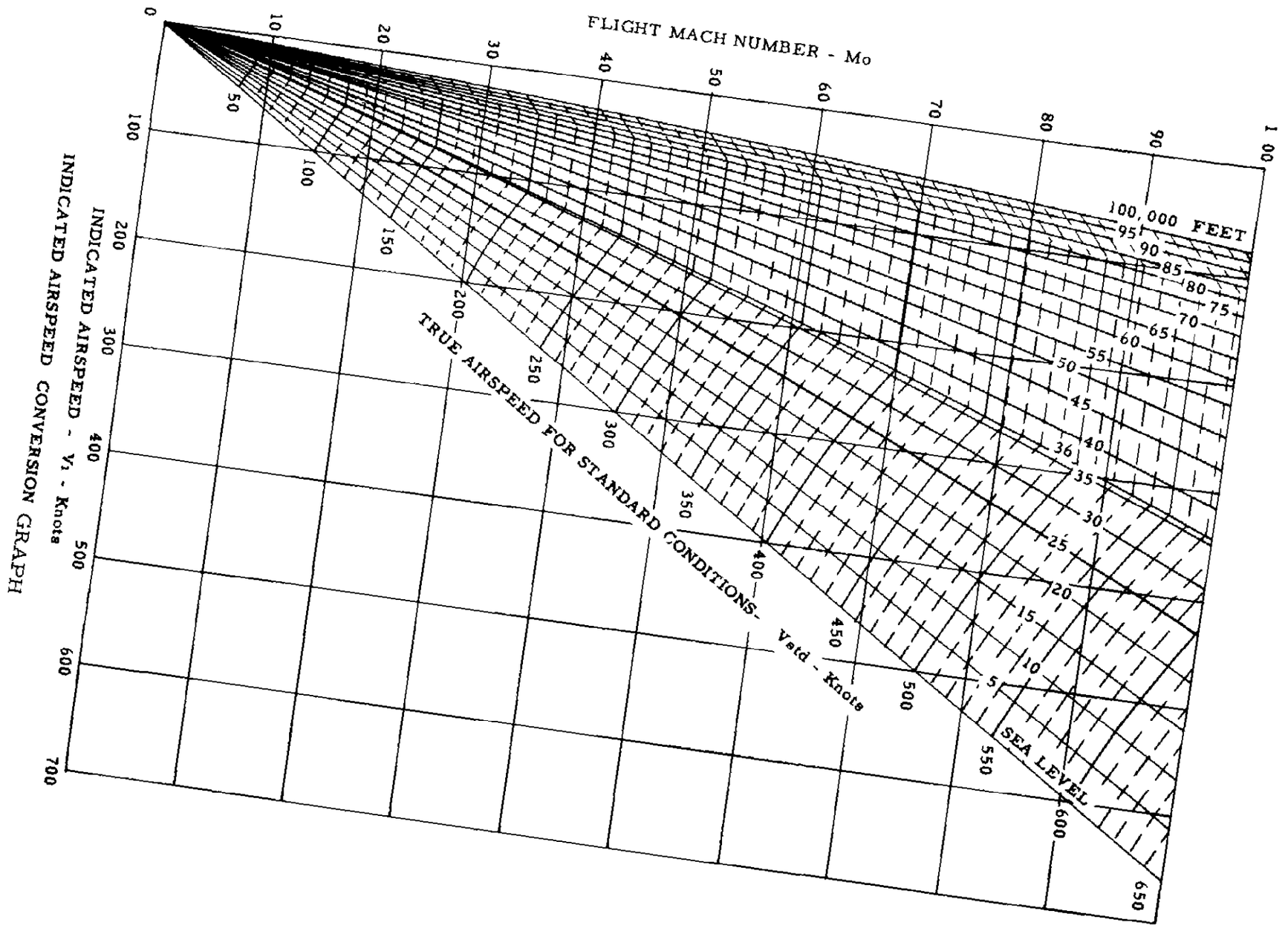
SPEED BRAKES Any aerodynamic device designed for slowing down an airplane in flight.

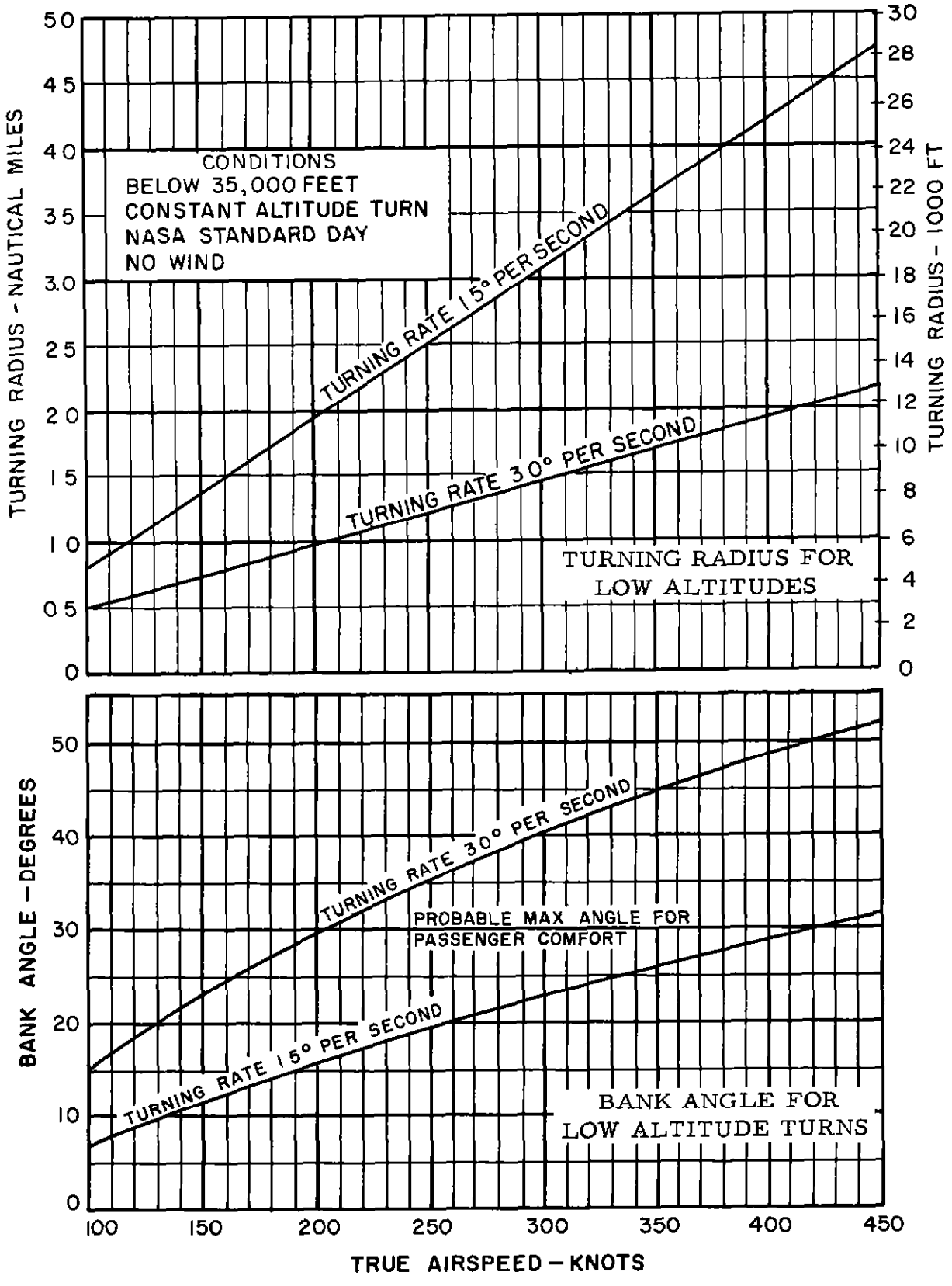
HOVER (relating to helicopters or VTOL) To remain in a stationary position at a given altitude above the surface.

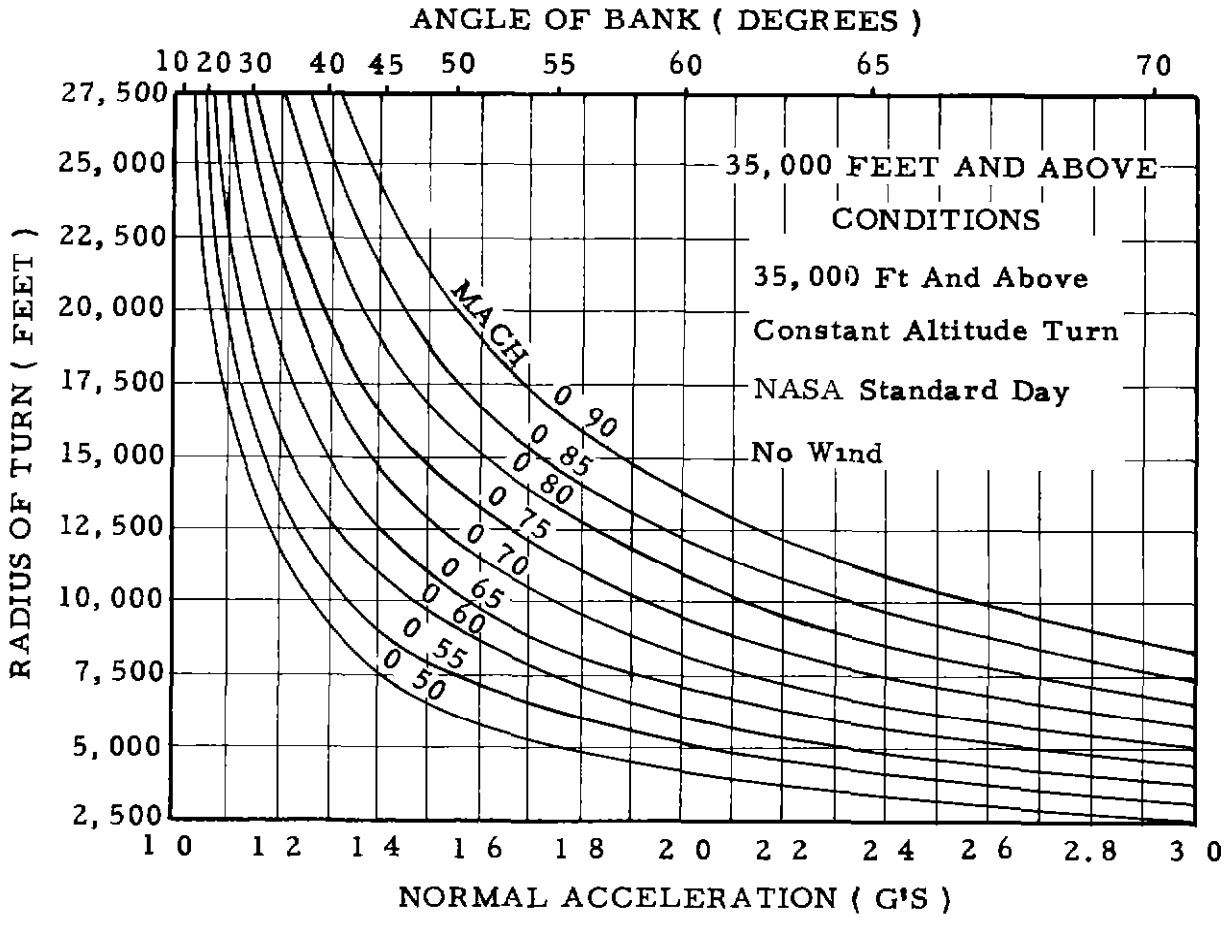
TRANSLATIONAL LIFT The lift force exerted on the rotor blades of a helicopter when increased speed is imparted to the blades or when their angle of attack is changed in going from one type of flight to another, such as from hovering to horizontal flight

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


FLIGHT MACH NUMBER - Mo
0
10
20
30
40
50
60
70
80
90
1 00
INDICATED AIRSPEED - Vi - Knots
50
100
150
200
250
300
350
400
450
500
550
600
650
700
TRUE AIRSPEED FOR STANDARD CONDITIONS - Vstd - Knots
100,000 FEET
95
90
85
80
75
70
65
60
55
50
45
40
36
35
30
25
20
15
10
5
SEA LEVEL
INDICATED AIRSPEED CONVERSION GRAPH


TURNING RADIUS - NAUTICAL MILES
TURNING RADIUS - 1000 FT
CONDITIONS
BELOW 35,000 FEET
CONSTANT ALTITUDE TURN
NASA STANDARD DAY
NO WIND
TURNING RATE 15° PER SECOND
TURNING RATE 30° PER SECOND
TURNING RADIUS FOR
LOW ALTITUDES
BANK ANGLE - DEGREES
TURNING RATE 30° PER SECOND
PROBABLE MAX ANGLE FOR
PASSENGER COMFORT
TURNING RATE 15° PER SECOND
BANK ANGLE FOR
LOW ALTITUDE TURNS
TRUE AIRSPEED - KNOTS



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
* Fn - Normal specific range
Wa - Actual gross weight
Wn - Normal gross weight
Sa - Actual 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

* a - % Deviation in specific range per X pounds change in gross weight
* b - % Deviation in specific range per Y units change in speed

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