A heat wave has been hanging over most of the southwestern part of the Mountain time zone lately, Arizona in particular. It is another hot day in July, but at least it's a dry heat. You decide to get out and take a flight up to Grand Canyon Caverns and go camping with some friends. Today is July 26, 2008. You will be flying your personal Lancair Columbia 300. Your route of flight is below.

Seligman, AZ (P23) N35° 20.10' W112° 53.18' directly to
Needles, CA (EED) N34° 45.98' W114° 37.40
You will pick up Emerson in Needles, he weighs 148 pounds and will sit up front.

Needles directly to
Searchlight, NV (1L3) N35° 26.67' W114° 54.57'
You will pick up McKenzie in Searchlight, she weighs 133 pounds and will sit in back

Searchlight directly to
Grand Canyon Caverns, AZ (L37) N35° 31.62' W113° 14.85'

Personal Records

Private pilot certificate issued on August 15, 1998
High performance endorsement on February 15, 2005
Instrument rating issued on February 25, 2005
Biennial Flight review completed on February 22, 2007
FAA Third class medical certificate issued on July 10, 2003
(You were born on May 2, 1964 and weigh 183 pounds)

Logbook as follows:

04/04/2008	2.2 hours	Day	3 Landings
04/25/2008	1.3 hours	Day	1 Landing
05/29/2008	0.4 hours	Night	1 Landing
06/11/2008	2.5 hours	Night	1 Landing

Aircraft Records

Airworthiness Certificate issued 03/22/2003
Registration Certificate issued on 03/15/2006
Pitot-Static Inspection completed on 06/30/2006
ELT Inspection completed on 07/02/2008
Annual Inspection completed on 07/02/2008
Transponder Inspection completed on 07/02/2008

Aircraft Performance

Climb:	105 KTAS	865 fpm	16.8 gph
Cruise:	Use the cruise chart *closest* to your planned cruise altitude at 2300 rpm at 19" MAP and the *closest* temperature.		
Descent:	175 KTAS	1200 fpm	8.5 gph

For Climb and Descent, assume calm winds
For Cruise, interpolate for your cruise altitude
Use LAS winds aloft for all computations
Use IGM METAR for Seligman and Grand Canyon Caverns
Use EED METAR for Needles and Searchlight

Leg 1 cruise at 12,500 MSL
Leg 2 cruise at 6,500 MSL
Leg 3 cruise at 11,500 MSL

Weather

```
********  FA Synopsis and VFR Clouds/Weather  ********
NV
NRN...SKC. OCNL FU ALF. OTLK...VFR.
SRN...SKC. OTLK...VFR.
.
AZ
NRN HLF..SCT130 SCT-BKN CI. BECMG 1315 SCT120 SCT-BKN CI. ISOL
  -TSRA/-SHRA. CB TOP FL400. OTLK...VFR.
SWRN...SCT120 BKN CI. AFT 13Z ISOL -TSRA/-SHRA. CB TOP FL420.
  OTLK...VFR.
SERN...SCT120-140 BKN CI. WDLY SCT -TSRA/-SHRA. CB TOP FL420.
  OTLK...VFR TSRA.
.
SRN CA..VBG-NID-60NNW BIH LN SWD
CSTL SXNS...
  CSTLN...OVC010-015 TOPS 020. VIS 3-5SM BR/HZ. BECMG 1215
    SCT015-020. OTLK...MVFR CIG FAR SRN PTN..VFR RMNDR.
  INLAND...SKC. OCNL FEW-SCT015. VIS 3-5SM BR/HZ. BECMG 1214
    SKC. OTLK...VFR.
INTR MTNS/DESERTS/VLYS...SKC OCNL SCT-BKN CI FAR ERN PTN. BECMG
  1315 SKC OCNL FEW-SCT130. SCT CI. OTLK...VFR.
.

********  Surface Observations  ********
METAR KEED 261356Z AUTO 21014G19KT 10SM CLR 36/15 A2979 RMK AO2
    SLP047 T03780150 10378 20322 51006
METAR KIGM 261359Z AUTO 26012KT 10SM CLR 30/09 A2996 RMK AO2
     SLP061 T03390094 10339 20239 51003 TSNO
```

******** Terminal Forecasts ********
TAF KEED 261124Z 261818 20012KT P6SM FEW250
FM1500 19015G25KT P6SM SCT120 SCT250
FM2000 21011KT P6SM SCT120 BKN250
FM0400 20007KT P6SM VCSH BKN100 BKN200

******** FD Winds Aloft Forecast ********
DATA BASED ON 261200Z
VALID 261200Z FOR USE 1300-1900Z. TEMPS NEG ABV 24000
FT 3000 6000 9000 12000 18000 24000 30000 34000 39000
PRC 9900+18 0408+10 0606-07 9900-16 212431 224141 224752
BLH 1710 1714+22 1714+17 1514+09 1110-05 1313-17 183132 204641 214952
LAS 1606+24 1211+19 1518+10 1111-06 1612-18 191234 211642 213352

******** NOTAMs ********

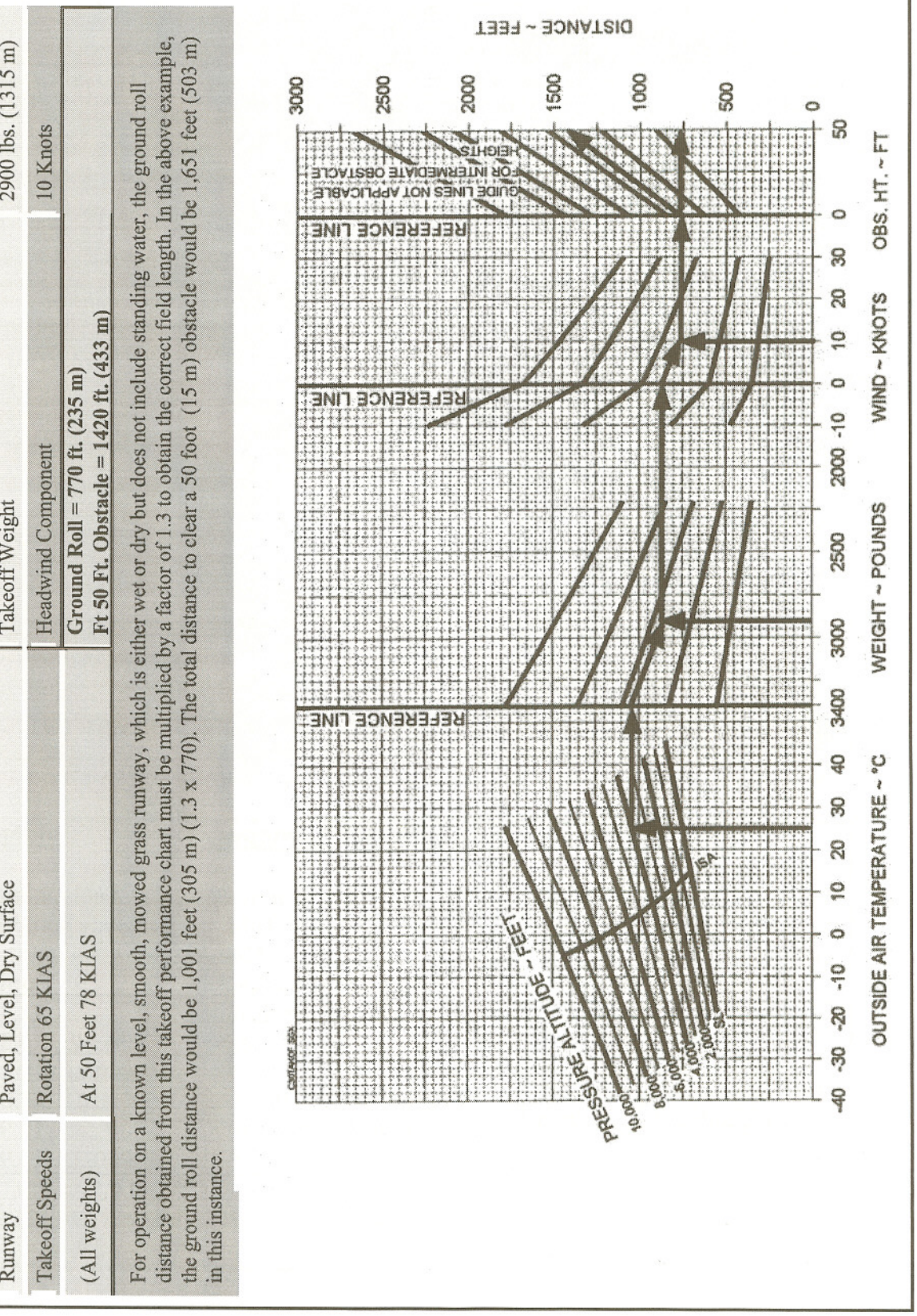
******** Communication NOTAMs ********
!EED 07/004 EED COM RCO 122.2 OTS

******** NOTAMs without keywords ********
!HHR 06/026 ZLA NON-TRANSPONDER OPS DESERT AND REVIELLE NORTH/SOUTH MOA SFC-UNL AVOIDANCE ADVISED
!PRC 07/026 HII AWOS 119.025 OTS
!RNO 04/081 1L3 100LL FUEL UNAVBL
!UAR 01/007 LAS SUNST TWO (RNAV) ARRIVAL.
ADD NOTE: EXCEPT FOR GPS EQUIPPED ACFT BTY MUST BE OPERATIONAL FOR THE ROUTE SEGMENT BEATTY TO IPUMY.

SHORT FIELD TAKEOFF DISTANCE (12° - TAKEOFF FLAPS)

SHORT FIELD TAKEOFF DISTANCE (12° - TAKEOFF FLAPS)	
ASSOCIATED CONDITIONS	**EXAMPLE**
Power	Takeoff Power Set Before Brake Release	Outside Air Temperature (OAT)	25° C
Flaps	12°(Flaps in Takeoff Position)	Pressure Altitude (PA)	4000 Ft.
Runway	Paved, Level, Dry Surface	Takeoff Weight	2900 lbs. (1315 m)
Takeoff Speeds	Rotation 65 KIAS	Headwind Component	10 Knots
(All weights)	At 50 Feet 78 KIAS	**Ground Roll = 770 ft. (235 m)** **Ft 50 Ft. Obstacle = 1420 ft. (433 m)**

For operation on a known level, smooth, mowed grass runway, which is either wet or dry but does not include standing water, the ground roll distance obtained from this takeoff performance chart must be multiplied by a factor of 1.3 to obtain the correct field length. In the above example, the ground roll distance would be 1,001 feet (305 m) (1.3 x 770). The total distance to clear a 50 foot (15 m) obstacle would be 1,651 feet (503 m) in this instance.



(Figure 5-7)

CRUISE PERFORMANCE 6000 FT PRESSURE ALTITUDE

		-30°C (33°C Below Standard)				3°C (Standard Temperature)				25°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	22	***84***	18.1	68.5	182	79	17.0	64.3	185	76	16.4	62.1	185
	22	78	16.8	63.6	177	73	15.7	59.4	179	70	15.1	57.2	179
	20	74	15.9	60.2	173	69	14.9	56.4	174	66	14.2	53.7	174
	19	68	14.6	55.3	167	64	12.1	45.8	168	62	11.7	44.3	167
	18	63	11.9	45.0	161	60	11.3	42.8	161	57	10.8	40.9	159
	17	59	11.2	42.4	155	55	10.4	39.4	154	53	10.0	37.9	152
2500	23	78	16.8	63.6	177	74	15.9	60.2	179	71	15.3	57.9	179
	22	74	15.9	60.2	173	70	15.1	57.2	175	67	14.4	54.5	175
	21	70	15.1	57.2	169	66	14.2	53.7	169	63	11.9	45.0	169
	20	65	14.0	53.0	164	61	11.5	43.5	163	59	11.2	42.4	162
	19	61	11.5	43.5	157	57	10.8	40.9	156	55	10.4	39.4	155
	18	56	10.6	40.1	151	53	10.0	37.9	149	52	9.8	37.1	146
2300	23	67	14.4	54.5	165	62	11.7	44.3	169	60	11.3	42.8	164
	22	63	11.9	45.0	161	60	11.3	42.8	164	57	10.8	40.9	159
	21	59	11.2	42.4	156	56	10.6	40.1	158	53	10.0	37.9	152
	20	55	10.4	39.4	150	52	9.8	37.1	151	50	9.5	36.0	145
	19	52	9.8	37.1	144	49	9.3	35.2	146	47	8.9	33.7	137
	18	48	9.1	34.4	137	45	8.5	32.2	137	43	8.1	30.7	126

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

Numbers shown in bold italics are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Do not attempt mixture adjustment by use of EGT indications for operations above 75% of maximum power; use the fuel flow settings shown in this chart. At cruise settings between 65% and 75% power, set the mixture to 50F° (10°C) rich of peak EGT. See page 4-22 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50°F (10°C) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

Conditions

Cruise Altitude ..... 6000 feet
Temperature ..... 25°C
Manifold Pressure..... 22 inch Hg.
RPM..... 2400

Determine

1. ..... % of BHP
2. ..... Fuel Consumption (GPH)
3. ..... True Airspeed

Solution

% of BHP..... 62%
Fuel Consumption ..... 11.7 GPH* (44.3 LPH)
True Airspeed..... 167 Knots

*The exact mathematical answer is 12.6 GPH by interpolation. However, leaning at 65% to 75% of BHP is different than at settings below 65% BHP. In this instance, locate a 62% BHP setting on the performance chart to determine fuel consumption. See page 5-10 for discussion details.

(Figure 5-14)

CRUISE PERFORMANCE 12000 FT PRESSURE ALTITUDE

		-42°C (33°C Below Standard)				-9°C (Standard Temperature)				13°C (22°C Above Standard)			
RPM	MP	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS	% BHP	GPH	LPH	KTAS
2700	19	75	16.2	61.3	183	70	15.1	57.2	183	67	14.4	54.5	183
	18	70	15.1	57.2	178	66	14.2	53.7	177	63	11.9	45.0	176
	17	66	14.2	53.7	171	61	11.5	43.5	170	59	11.2	42.4	168
	16	60	11.3	42.8	163	56	10.6	40.1	160	54	10.2	38.6	157
	15	55	10.4	39.4	155	52	9.8	37.1	150	49	9.3	35.2	145
2500	19	67	14.4	54.5	174	63	11.9	45.0	173	60	11.3	42.8	171
	18	62	11.7	44.3	167	58	11.0	41.6	164	56	10.6	40.1	161
	17	58	11.0	41.6	160	54	10.2	38.6	156	52	9.8	37.1	152
	16	54	10.2	38.6	153	51	9.6	36.3	148	49	9.3	35.2	142
	15	48	9.1	34.4	140	45	8.5	32.2	131	43	8.1	30.7	119
2300	19	57	10.8	40.9	158	53	10.0	37.9	154	51	9.6	36.3	149
	18	53	10.0	37.9	151	50	9.5	36.0	145	48	9.1	34.4	138
	17	49	9.3	35.2	143	46	8.7	32.9	134	44	8.3	31.4	124
	16	46	8.7	32.9	133	43	8.1	30.7	120	41	7.8	29.5	102

3400 lbs. (1542 kg) Gross Weight — Recommended Mixture Setting

At cruise settings between 65% and 75% power, set the mixture to 50F° rich of peak EGT. See page 4-22 for a discussion of the adjustment procedures. At cruise settings below 65% power, operations at 50°F (10°C) lean of peak EGT will provide the lowest fuel consumption. Data in these charts are based on this leaning schedule. Finally, do not exceed 20 inches of manifold pressure below 2200 RPM.

EXAMPLE PROBLEM AND SOLUTION

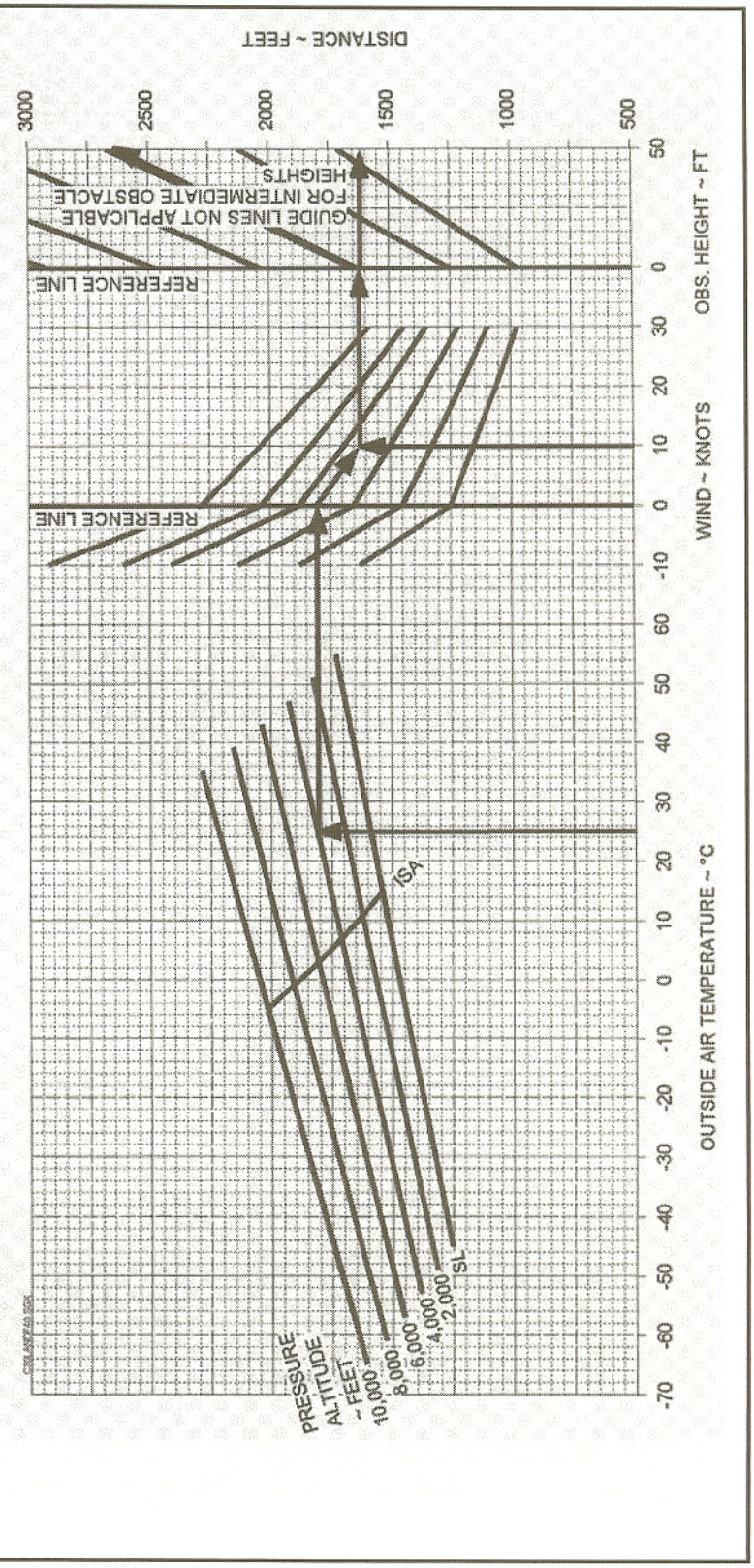
Conditions	Solution
Cruise Altitude ..... 12000 feet	% of BHP 63%
Temperature ..... -9°C	Fuel Consumption ..... 11.9 GPH (45.0 LPH)
Manifold Pressure ..... 19 inch Hg.	True Airspeed ..... 173 Knots
RPM 2500	
Determine	
1. ..... % of BHP	
2. ..... Fuel Consumption (GPH)	
3. ..... True Airspeed	

(Figure 5-17)

SHORT FIELD LANDING DISTANCE (40° - LANDING FLAPS)

SHORT FIELD LANDING DISTANCE (40° - LANDING FLAPS)	
ASSOCIATED CONDITIONS	**EXAMPLE**
Power	As Required to Maintain 3° Approach	Outside Air Temperature (OAT)	25° C
Flaps	40° (Flaps in Landing Position)	Pressure Altitude (PA)	4000 Ft.
Runway	Paved, Level, Dry Surface	Headwind Component	10 Knots
Approach Speed	78 KIAS ($V_{at\ 50\ ft.}$ Speed 78 KIAS All Weights)	**Ground Roll**	**1620 Ft. (494 m)**
Braking	Maximum	**Total Distance Over Ft 50 Ft. Obstacle**	**2650 Ft. (808 m)**

For operation on a known level, smooth, mowed grass runway, which is either wet or dry but does not include standing water, the round roll distance obtained from this landing performance chart must be multiplied by a factor of 1.6 to obtain the correct field length. In the above example, the ground roll distance would be 2,592 feet (790 m) (1.6 x 1620). In this instance, the total distance from a 50 foot (15 m) obstacle would be 3,622 feet (1104 m).



(Figure 5-25)

CALCULATOR METHOD

Sample Problem Calculator Method				Actual Calculation For This Airplane			
ITEM	WT. (Lbs.)	ARM (Inches)	MOMENTS (lbs.-in.)	ITEM	WT. (Lbs.)	ARM (Inches)	MOMENTS (lbs.-in.)
Basic Empty Wt.	2,295		235,820	Basic Empty Wt.	2,391		245,699.16
Front Seat Wts.	380	110.0	41,800	Front Seats		110.0	
Rear Seats Wts.	175	141.4	24,745	Rear Seats		141.4	
Baggage (Main)*	50	166.6	8,390	Baggage (Main)*		166.6	
Baggage (Zone A)*	0	155.7	0	Baggage (Zone A)*		155.7	
Baggage (Zone B)*	0	177.4	0	Baggage (Zone B)*		177.4	
Baggage (Shelf)	0	199.8	0	Baggage (Aft)		199.8	
Fuel (At 6 lbs./gal.)	360	118.0	42,480	Fuel (At 6 lbs./gal.)		118.0	
Totals	3,260		353,175	Totals			
$\frac{353{,}175\ lbs.–in.}{3{,}260\ lbs.} = 108.34\ inches$				$\frac{lbs.–in.}{lbs.} = \quad inches$			

*When computing baggage moment use the arm for either the Main Baggage Area, Zone A, or Zones A and B as applicable. Refer to the Baggage discussion on page 6-10 for more information. In this example, the weight is evenly distributed over the main baggage area.

NOTE

The basic empty weight used in this example will vary for each airplane. Refer to the Weight and Balance Record, which follows Appendix A of this section.

(Figure 6-13)

In the sample problem, multiplying the weight of a particular item, i.e., pilot, passengers, baggage and fuel, times its arm, computes the moment for that item. The moments and weight are then summed with the basic empty weight and the empty moment of the airplane. In the example, these totals are 3,260 pounds and 353,175 moments. The loaded center of gravity of 108.34 inches is then determined by dividing the total moments by the gross weight.

The multiplying graphs, which begin on page 6-16, can be used to determine the moments for each weight location. The answer is not as accurate as doing the calculation with a hand-held calculator; however, the margin of error is not significant and within acceptable parameters of safety. The example arrows in the graphs on pages 6-16 and 6-17 use the data from the sample problem in (Figure 6-13).

When using the multiplying graphs, it is more convenient to divide the moments on the Y or vertical axis by 1000. For example, 70,000 lbs.-in. is read as 70.0 (x 1000) lbs.-in. Once all the calculations are made, the answer can then be multiplied by 1000. The numbers shown in (Figure 6-14) are moment values obtained by reading directly from the graphs and are expressed as 1000 lbs.-in. It should be noted that there is a nominal difference in center of gravity location between the two procedures.

NEEDLES (EED) 5 S UTC−8(−7DT) N34°45.98′ W114°37.40′ PHOENIX
983 B S2 **FUEL** 100LL, JET A TPA—1983(1000) H–4I, L–7E
RWY 11–29: H5005X100 (ASPH) S–16, D–32 MIRL 1.3% up W MAP
RWY 11: REIL. PAPI(P2L)—GA 3.0° TCH 40′.
RWY 29: REIL. PAPI(P2L)—GA 3.0° TCH 40′.
RWY 02–20: H4235X100 (ASPH) S–16, D–32 MIRL 2.0% up S
AIRPORT REMARKS: Attended 1600–0100Z‡. Arpt attended by Paradice Aviation 760–326–5263. ACTIVATE MIRL Rwy 11–29 and Rwy 02–20, REIL Rwy 11 and Rwy 29—CTAF. PAPI Rwy 11 and Rwy 29 opr continuously.
WEATHER DATA SOURCES: ASOS 128.325 (760) 326–4281.
COMMUNICATIONS: CTAF/UNICOM 123.0
RIVERSIDE FSS (RAL) TF 1–800–WX–BRIEF. NOTAM FILE EED.
RCO 122.1R 115.2T (PRESCOTT FSS)
Ⓡ L.A. CENTER APP/DEP CON 134.65
AIRSPACE: CLASS E svc 1600–0000Z‡ other times CLASS G.
RADIO AIDS TO NAVIGATION: NOTAM FILE EED.
(H) VORTAC 115.2 EED Chan 99 N34°45.96′ W114°28.45′ 255° 7.4 NM to fld. 620/15E. HIWAS.
VOR unusable:
100°–130°beyond 27 NM below 6600′ 220°–280°beyond 35 NM below 6800′
170°–220°beyond 20 NM below 5800′

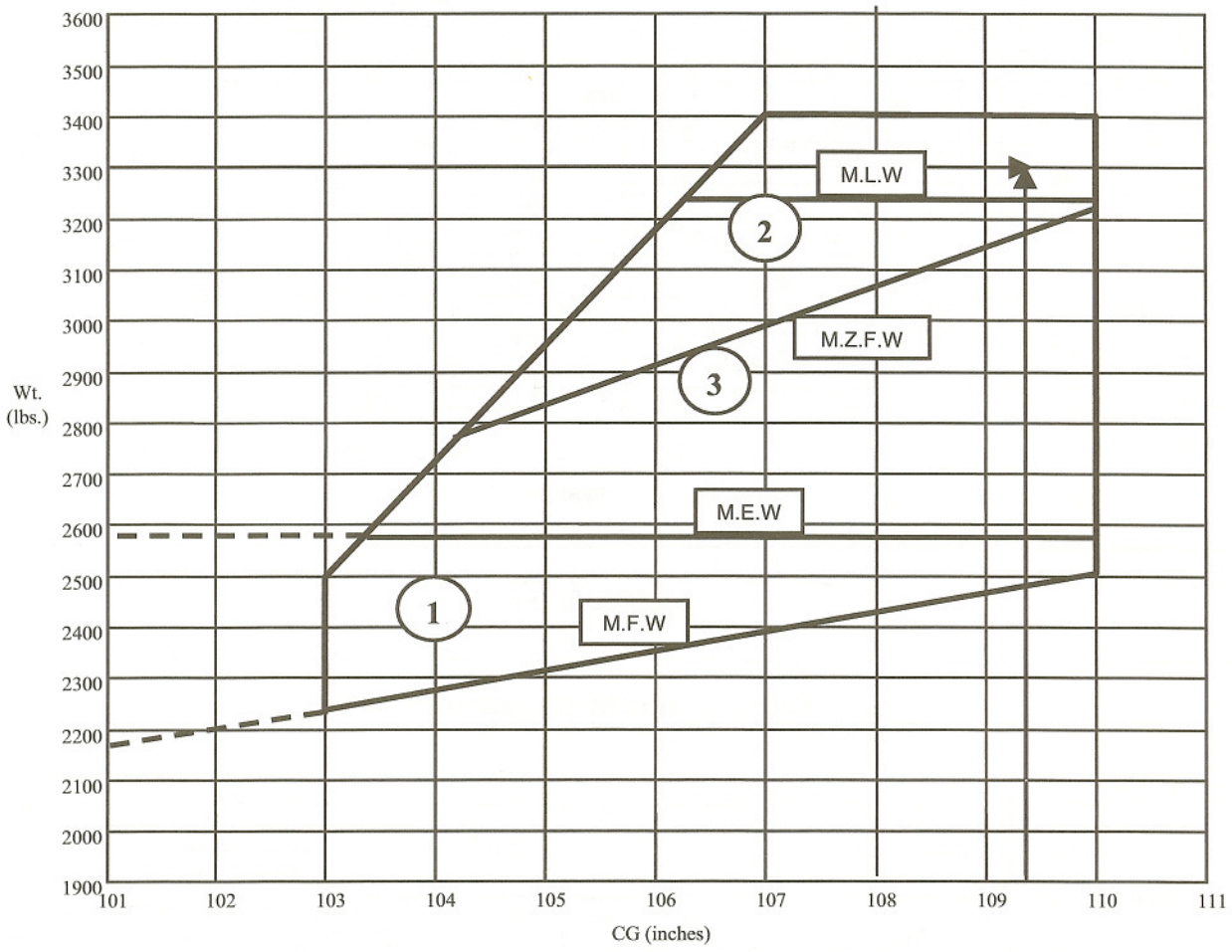
PEACH SPRINGS

GRAND CANYON CAVERNS (L37) 9 E UTC−7 N35°31.62′ W113°14.85′ PHOENIX
5386
RWY 05–23: 5100X45 (GRVL)
RWY 05: Fence. **RWY 23:** Fence.
AIRPORT REMARKS: Attended dalgt hours. Elk on and invof arpt. Prairie dog holes within 5′ of rwy edge full length. Rwy 05–23 2–3′ brush within 10′ of rwy edge full length.
COMMUNICATIONS: CTAF/UNICOM 122.8
PRESCOTT FSS (PRC) TF 1–800–WX–BRIEF. NOTAM FILE PRC.

SEARCHLIGHT (1L3) 2 S UTC−8(−7DT) N35°26.67′ W114°54.57′ PHOENIX
3410 H–4I, L–7E
RWY 16–34: H5040X70 (ASPH)
RWY 16: Fence.
AIRPORT REMARKS: Unattended. Ground rises at constant rate north of arpt for approximately 2 miles. Unlighted 165′ p–line located approximately 3.2 miles south of rwy blo thld. Rwy 16–34 thlds marked with 6 green reflectors.
COMMUNICATIONS: CTAF 122.9
RENO FSS (RNO) TF 1–800–WX–BRIEF. NOTAM FILE RNO.
RADIO AIDS TO NAVIGATION: NOTAM FILE RAL.
GOFFS (L) VORTAC 114.4 GFS Chan 91 N35°07.87′ W115°10.59′ 020° 22.9 NM to fld. 4000/15E.

SELIGMAN (P23) 1 NW UTC−7 N35°20.10′ W112°53.18′ PHOENIX
5235 B L–8F
RWY 04–22: H4800X75 (ASPH) MIRL
RWY 04: REIL. PAPI(P2L)—GA 3.0°. Fence. **RWY 22:** REIL. PAPI(P2L)—GA 3.0°. Rgt tfc.
AIRPORT REMARKS: Unattended. Drainage channel both sides full length of Rwy 04–22, varies in width and depth. Drainage channel 65′ wide, 4–10′ deep located 200–265′ from AER 22. ACTIVATE MIRL Rwy 04–22 REIL Rwy 04 and Rwy 22 7–clicks—CTAF. PAPI Rwy 04 and Rwy 22 opr dalgt hrs, at night ACTIVATED on CTAF.
COMMUNICATIONS: CTAF 122.9
PRESCOTT FSS (PRC) TF 1–800–WX–BRIEF. NOTAM FILE PRC.
RADIO AIDS TO NAVIGATION: NOTAM FILE PRC.
PEACH SPRINGS (H) VORTACW 112.0 PGS Chan 57 N35°37.48′ W113°32.67′ 103° 36.6 NM to fld. 4760/15E. HIWAS.

LANCAIR COLUMBIA 300 (LC 40-550FG) WEIGHT AND BALANCE ENVELOPE



(Figure 6-20)

1. Airplane basic empty weight must be below Maximum Empty Weight (M.E.W.) and above Minimum Flight Weight (M.F.W.).
2. Weight must be below Maximum Landing Weight (M.L.W.) for landing. (If overweight landing occurs, see maintenance manual for required inspection prior to further flight.)
3. Weight and Center of Gravity (CG) without fuel must be below the Maximum Zero Fuel Weight (M.Z.F.W.) line.
4. See Section 2 of the AFM/POH for a listing of weight limitation.