PREFACE

This computer testing supplement is designed by the Flight Standards Service of the Federal Aviation Administration (FAA) for use by computer testing designees (CTD's) in the administration of airman knowledge tests in the following knowledge areas.

Fundamentals of Instructing
Ground Instructor—Basic
Ground Instructor—Advanced
Flight Instructor—Airplane
Flight Instructor—Helicopter
Flight Instructor—Gyroplane
Flight Instructor—Glider
Flight Instructor—Airplane (Added Rating)
Flight Instructor—Helicopter (Added Rating)
Flight Instructor—Gyroplane (Added Rating)
Flight Instructor—Glider (Added Rating)


Comments regarding this supplement should be sent to:

U.S. Department of Transportation
Federal Aviation Administration
Flight Standards Service
Airman Testing Standards Branch, AFS-630
P.O. Box 25082
Oklahoma City, OK 73125
CONTENTS

Preface .................................................................................................................. iii
Contents .................................................................................................................. v

FIGURE 1.—Lesson Plan ....................................................................................... 1
FIGURE 1A.—Lesson Plan .................................................................................... 2
FIGURE 2.—Pseudo-Adiabatic Chart .................................................................. 3
FIGURE 3.—Aviation Routine Weather Reports (METAR) ................................... 4
FIGURE 4.—Pilot Weather Report ....................................................................... 4
FIGURE 5.—Terminal Aerodrome Forecasts (TAF) ............................................. 4
FIGURE 6.—Aviation Area Forecast (FA) .............................................................. 5
FIGURE 7.—Winds and Temperatures Aloft Forecast (FD) ................................. 6
FIGURE 8.—Surface Analysis Chart Symbol .................................................... 6
FIGURE 9.—Surface Analysis Chart Symbols .................................................... 6
FIGURE 10.—Weather Depiction Chart Symbol ................................................. 6
FIGURE 11.—Weather Depiction Chart Symbol ............................................... 6
FIGURE 12.—Weather Depiction Chart ............................................................. 7
FIGURE 13.—Radar Summary Chart ................................................................ 8
FIGURE 14.—Significant Weather Prognostic Chart ......................................... 9
FIGURE 15.—Severe Weather Outlook Chart .................................................. 10
FIGURE 16.—Stability Chart ........................................................................... 11
FIGURE 17.—Velocity/Load Factor Chart ......................................................... 11
FIGURE 18.—Load Factor/Stall Speed Chart .................................................... 12
FIGURE 19.—Angle-of-Attack Chart ................................................................ 12
FIGURE 20.—Drag Chart .................................................................................. 13
FIGURE 21.—Aspect Ratio ............................................................................... 13
FIGURE 22.—Force Vectors ............................................................................. 13
FIGURE 23.—Wing Flap Diagrams ................................................................... 14
FIGURE 24.—Density Altitude Chart ................................................................ 14
FIGURE 25.—Airspeed Calibration/Stall Speeds Chart ...................................... 15
FIGURE 26.—Takeoff Data Chart .................................................................... 15
FIGURE 27.—Maximum Climb Chart ............................................................... 16
FIGURE 28.—Short-Field Takeoff Distance Chart ........................................... 17
FIGURE 29.—Glide Distance Chart .................................................................. 18
FIGURE 30.—Wind Component Chart .............................................................. 19
FIGURE 31.—Landing Distance Chart ............................................................... 20
FIGURE 32.—Weight and Balance Diagram ...................................................... 21
FIGURE 33.—Weight and Balance Diagram ...................................................... 21
FIGURE 34.—Weight and Balance Diagram ...................................................... 21
FIGURE 35.—Weight and Balance Diagram ...................................................... 21
FIGURE 36.—Weight and Balance Chart .......................................................... 22
FIGURE 37.—Rotor Blade Positions .................................................................. 23
FIGURE 37A.—Rotor Blade .............................................................................. 23
FIGURE 38.—Glider Cross-Country ................................................................. 23
FIGURE 39.—Balloon Performance Graph ....................................................... 23
FIGURE 40.—Wind Triangle ............................................................................ 24
FIGURE 41.—ADF Indicators (Fixed-Dial) ....................................................... 24
FIGURE 42.—VOR Indicators ......................................................................... 25
FIGURE 43.—RMI Indicators ......................................................................... 26
FIGURE 44.—Sectional Chart Excerpt ............................................................... 27
FIGURE 45.—Sectional Chart Excerpt ............................................................... 28
<table>
<thead>
<tr>
<th>LESSON</th>
<th>REFERENCE MANEUVERS</th>
<th>STUDENT</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TO DEVELOP THE STUDENT'S SKILL IN PLANNING AND FOLLOWING A PATTERN OVER THE GROUND COMPENSATING FOR WIND DRIFT AT VARYING ANGLES.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>USE OF GROUND REFERENCES TO CONTROL PATH. OBSERVATION AND CONTROL OF WIND EFFECT. CONTROL OF AIRPLANE ATTITUDE, ALTITUDE, AND HEADING.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| C      | PREFLIGHT DISCUSSION. : 10  
INSTRUCTOR DEMONSTRATIONS. : 25  
STUDENT PRACTICE. : 45  
POSTFLIGHT CRITIQUE. : 10 |
| D      | CHALKBOARD FOR PREFLIGHT DISCUSSION. IFR VISOR FOR MANEUVERS REVIEWED. |
| E      | PREFLIGHT – DISCUSS LESSON OBJECTIVE. DIAGRAM "S" TURNS, EIGHTS ALONG A ROAD, AND RECTANGULAR COURSE ON A CHALKBOARD.  
INFIGHT – DEMONSTRATE ELEMENTS. DEMONSTRATE FOLLOWING A ROAD, "S" TURNS, EIGHTS ALONG A ROAD, AND RECTANGULAR COURSE. COACH STUDENT PRACTICE.  
POSTFLIGHT – CRITIQUE STUDENT PERFORMANCE AND MAKE STUDY ASSIGNMENT. |
| F      | PREFLIGHT – DISCUSS LESSON OBJECTIVE AND RESOLVE QUESTIONS.  
INFIGHT – REVIEW PREVIOUS MANEUVERS INCLUDING POWER-OFF STALLS AND FLIGHT AT MINIMUM CONTROLLABLE AIRSPEED. PERFORM EACH NEW MANEUVER AS DIRECTED.  
POSTFLIGHT – ASK PERTINENT QUESTIONS. |
| G      | STUDENT SHOULD DEMONSTRATE COMPETENCY IN MAINTAINING ORIENTATION, AIRSPEED WITHIN 10 KNOTS, ALTITUDE WITHIN 100 FEET, AND HEADINGS WITHIN 10 DEGREES, AND IN MAKING PROPER CORRECTION FOR WIND DRIFT. |

**Figure 1.**—Lesson Plan.
# LESSON PLAN

**Introduction (3 minutes)**

A. Relates aircraft accident in which a multi-engine airplane ran off the end of the runway. This could have been avoided by correctly computing the landing distance. Relate similar personal experience of the same type of mishap.

**Body (29 minutes)**

B. Tell students how landing distance can affect them (any aircraft, plus future application).

C. Explain what will be learned. Explain how the lesson will proceed. Define landing distance and explain the normal landing distance chart. Then, demonstrate how to solve for landing distance. The students will practice the procedure: at least once with supervision and at least once with as little help as possible. Next, the students will be evaluated according to the standards. Finally, the lesson will conclude with questions and answers, followed by a brief summary.

D. Define landing distance. Explain the normal landing distance chart to include the scale and interpolation. Ensure students can see demonstration and encourage questions. Demonstrate the procedure using °C with a headwind and °F with a tailwind. Show the normal landing distance chart with given data in the following order:
   1. temperature
   2. pressure altitude
   3. gross weight
   4. headwind-tailwind component
   5. read ground roll distance from graph

E. Review standards. Hand out chart and practice problems. Remind students to use a pencil, to make small tick marks, and to work as accurately as possible. Explain that they should follow the procedure on the chart to work the practice problems. Encourage students to ask questions. Check progress of each student continually so they develop skill proficiency within acceptable standards. Re-teach any area(s) of difficulty to the class as they go along.

F. Review procedure again from the chart. Re-emphasize standards of acceptable performance including time available. Prepare area for evaluation by removing the task step chart and practice problem sheets, and by handing out the evaluation problems. Ask students to work the three problems according to conditions and standards specified. Terminate evaluation after 6 minutes. Evaluate each student's performance and tactfully reveal results. Record results for use in re-teaching any area(s) of difficulty in the summary.

**Conclusion (3 minutes)**

G. Review lessons with emphasis on any weak area(s).

H. Remind students that landing distance will be an important consideration in any aircraft they fly.

I. Advise students that this lesson will be used as a starting point for the next lesson. Assign study materials for the next lesson.

---

**Figure 1A.** Lesson Plan.

---

2
Figure 2.—Pseudo-Adiabatic Chart.
METAR KAMA 301651Z 05016KT 5/8SM R04/3000FT BR OVC007 11/9 A3013 RMK DZB26DZE40
METAR KAUS 301651Z 12008KT 4SM -RAHZ BKN010 BKN023 OVC160 21/17 A3005 RMK RAB25
METAR KBRO 301655Z 15015G20KT 7SM SCT020 SCT130 TCU OVC250 29/19 A2997 RMK RAB19RAE25
METAR KDAL 301649Z 00000KT 3SM BRHZ OVC009 22/17 A3010
METAR KFTW 301654Z 09004KT 1/2SM HZFU VV006 21/17 A3010
METAR KTYR 301650Z AUTO 08004KT 3SM BR SCT015 24/19 A2999

Figure 3.—Aviation Routine Weather Reports (METAR).

UA/OV KOKC-KTUL/TM 1800/FL120/TP BE90//SK BKN018-TOP055/OVC072-TOP089/CLR ABV/TA M7/WV 08021/TB LGT 055-072/IC LGT-MOD RIME 072-089

Figure 4.—Pilot Weather Report.

TAF

KMEM 121720Z 121818 20012KT 5SM HZ BKN030 PROB40 2022 1SM TSRA OVC008CB
FM2200 33015G20KT P6SM BKN015 OVC025 PROB40 2202 3SM SHRA
FM0200 35012KT OVC008 PROB40 2025 2SM -RASN BECMG 0608 02008KT BKN012
BECMG 1012 00000KT 3SM BR SKC TEMPO 1214 1/2SM FG
FM1600 VRB06KT P6SM SKC=

KOKC 051130Z 051212 14008KT 5SM BR BKN030 TEMPO 1316 1 1/2SM BR
FM1600 18010KT P6SM SKC BECMG 2224 20013G20KT 4SM SHRA OVC020
PROB40 0006 2SM TSRA OVC008CB BECMG 0608 21015KT P6SM SCT040=

Figure 5.—Terminal Aerodrome Forecasts (TAF).
BOSC FA 241845
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 251300
CLDS/WX VALID UNTIL 250700...OTLK VALID 250700-251300
ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA AND CTSI WTRS

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG.

SYNOPSIS...19Z CDFNT ALG A 160NE ACK-ENE LN...CONTG AS A QSTNRY
FNT ALG AN END-50SW MSS LN. BY 13Z...CDFNT ALG A 140ESE ACK-HTO
LN...CONTG AS A QSTNRY FNT ALG A HTO-SYR-YZZ LN. TROF ACRS CNTRL
PA INTO NRRN VA. ...REYNOLDS...

OH LE
NRRN HLF OH LE...SCT-BKN025 OVC045. CLDS LYRD 150. SCT SHRA. WDLY
SCT TSRA. CB TOPS FL350. 23-01Z OVC020-030. VIS 3SM BR. OCNL -
RA. OTLK...IFR CIG BR FG.
SWRN QTR OH...BKN050-060 TOPS 100. OTLK...MVFR BR.
SERN QTR OH...SCT-BKN040 BKN070 TOPS 120. WDLY SCT -TSRA. 00Z
SCT-BKN030 OVC050. WDLY SCT -TSRA. CB TOPS FL350. OTLK...VFR
SHRA.

CHIC FA 241945
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 251400
CLDS/WX VALID UNTIL 250800...OTLK VALID 250800-251400
ND SD NE KS MN IA MO WI LM LS MI LH IL IN KY

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG.

SYNOPSIS.:LOW PRES AREA 20Z CNTRD OVR SERN WI FCST MOV NEWD INTO
LH BY 12Z AND WKN. LOW PRES FCST DEEPEN OVR ERN CO DURG PD AND
MOV NR WRN KS BORDER BY 14Z. DVLPG CDFNT WL MOV EWD INTO S CNTRL
NE-CNTRL KS BY 14Z. ...SMITH..

UPR MI LS
WRN PTNS...AGL SCT030 SCT-BKN050. TOPS 080. 02-05Z BECMG CIG
OVC010 VIS 3-5SM BR. OTLK...IFR CIG BR.
ERN PTNS...CIG BKN020 OVC040. OCNL VIS 3-5SM -RA BR. TOPS FL200.
23Z CIG OVC010 VIS 3-5SM -RA BR. OTLK...IFR CIG BR.

LWR MI LM LH
CNTRL/NRRN PTNS...CIG OVC010 VIS 3-5SM -RA BR. TOPS FL200.
OTLK...IFR CIG BR.

SRN THIRD...CIG OVC015-025. SCT -SHRA. TOPS 150. 00-02Z BECMG CIG
OVC010 VIS 3-5SM BR. TOPS 060. OTLK...IFR CIG BR.

IN
NRRN HALF...CIG BKN035 BKN080. TOPS FL200. SCT -SHRA. 00Z CIG
BKNSCT040 BKN-SCT080. TOPS 120. 06Z AGL SCT-BKN030. TOPS 080.
OCNL VIS 3-5SM BR. OTLK...MVFR CIG BR.
SRN HALF...AGL SCT050 SCT-BKN100. TOPS 120. 07Z AGL SCT 030
SCT100. OTLK...VFR.

Figure 6.—Aviation Area Forecast (FA).
### Figure 7.—Winds and Temperatures Aloft Forecast (FD).

<table>
<thead>
<tr>
<th>FT</th>
<th>3000</th>
<th>6000</th>
<th>9000</th>
<th>12000</th>
<th>18000</th>
<th>24000</th>
<th>30000</th>
<th>34000</th>
<th>39000</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS</td>
<td>2420</td>
<td>2635-08</td>
<td>2535-18</td>
<td>2444-30</td>
<td>245945</td>
<td>246755</td>
<td>246862</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMA</td>
<td>2714</td>
<td>2725+00</td>
<td>2825-04</td>
<td>2531-15</td>
<td>2542-27</td>
<td>265842</td>
<td>256352</td>
<td>256762</td>
<td></td>
</tr>
<tr>
<td>DEN</td>
<td>2321-04</td>
<td>2532-08</td>
<td>2434-19</td>
<td>2441-31</td>
<td>235347</td>
<td>236056</td>
<td>236262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLC</td>
<td>1707-01</td>
<td>2113-03</td>
<td>2219-07</td>
<td>2330-17</td>
<td>2435-30</td>
<td>244145</td>
<td>244854</td>
<td>245561</td>
<td></td>
</tr>
<tr>
<td>MKC</td>
<td>0507</td>
<td>2006+03</td>
<td>2215-01</td>
<td>2322-06</td>
<td>2338-17</td>
<td>2348-29</td>
<td>236143</td>
<td>237252</td>
<td>238160</td>
</tr>
<tr>
<td>STL</td>
<td>2113</td>
<td>2325+07</td>
<td>2332+02</td>
<td>2339-04</td>
<td>2356-16</td>
<td>2373-27</td>
<td>239440</td>
<td>730649</td>
<td>731960</td>
</tr>
</tbody>
</table>

### Figure 8.—Surface Analysis Chart Symbol.

### Figure 9.—Surface Analysis Chart Symbols.

### Figure 10.—Weather Depiction Chart Symbol.

### Figure 11.—Weather Depiction Chart Symbol.
Figure 15.—Severe Weather Outlook Chart.
Figure 16.—Stability Chart.

Figure 17.—Velocity/Load Factor Chart.
Figure 18.—Load Factor/Stall Speed Chart.

Figure 19.—Angle-of-Attack Chart.
Figure 20.—Drag Chart.

<table>
<thead>
<tr>
<th>AIRCRAFT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>WING SPAN</td>
<td>40'</td>
<td>35'</td>
<td>48'</td>
<td>30'</td>
</tr>
<tr>
<td>AVERAGE WING CHORD</td>
<td>6'</td>
<td>5'</td>
<td>6'</td>
<td>6'</td>
</tr>
</tbody>
</table>

Figure 21.—Aspect Ratio.

Figure 22.—Force Vectors.

NOTE: CF denotes centrifugal force. HCL denotes horizontal component of lift. Length of arrows denotes magnitude of force.
Figure 23.—Wing Flap Diagrams.

Figure 24.—Density Altitude Chart.
### AIRSPEED CALIBRATION — NORMAL SYSTEM

<table>
<thead>
<tr>
<th>KIAS</th>
<th>KCAS</th>
<th>KIAS</th>
<th>KCAS</th>
<th>KIAS</th>
<th>KCAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>84</td>
<td>70</td>
<td>79</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td>100</td>
<td>102</td>
<td>80</td>
<td>86</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>120</td>
<td>122</td>
<td>90</td>
<td>94</td>
<td>90</td>
<td>93</td>
</tr>
<tr>
<td>140</td>
<td>141</td>
<td>100</td>
<td>103</td>
<td>100</td>
<td>102</td>
</tr>
<tr>
<td>160</td>
<td>161</td>
<td>110</td>
<td>112</td>
<td>110</td>
<td>111</td>
</tr>
<tr>
<td>180</td>
<td>181</td>
<td>120</td>
<td>121</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
<td>130</td>
<td>131</td>
<td>130</td>
<td>129</td>
</tr>
<tr>
<td>220</td>
<td>221</td>
<td>140</td>
<td>141</td>
<td>140</td>
<td>138</td>
</tr>
<tr>
<td>240</td>
<td>242</td>
<td>150</td>
<td>151</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**KIAS — INDICATED AIRSPEED IN KNOTS**<br>
**KCAS — CALIBRATED AIRSPEED IN KNOTS**

### STALL SPEEDS — KCAS

**4600 LB GROSS WEIGHT**

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>ANGLE OF BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0°</td>
</tr>
<tr>
<td>Gear and Flaps Up</td>
<td>84</td>
</tr>
<tr>
<td>Gear Down and Flaps 15°</td>
<td>80</td>
</tr>
<tr>
<td>Gear Down and Flaps 45°</td>
<td>76</td>
</tr>
</tbody>
</table>

**Figure 25.** — Airspeed Calibration/Stall Speeds Chart.

### TAKEOFF DATA

**TAKEOFF DISTANCE WITH 10° FLAPS FROM HARD-SURFACED RUNWAY**

<table>
<thead>
<tr>
<th>GROSS WEIGHT LB</th>
<th>KIAS AT 50 FT</th>
<th>HEAD WIND KTS</th>
<th>AT SEA LEVEL &amp; 15° C GROUND ROLL</th>
<th>TOTAL TO CLEAR 50' OBS</th>
<th>AT 2500 FT &amp; 10° C GROUND ROLL</th>
<th>TOTAL TO CLEAR 50' OBS</th>
<th>AT 5000 FT &amp; 5° C GROUND ROLL</th>
<th>TOTAL TO CLEAR 50' OBS</th>
<th>AT 7500 FT &amp; 0° C GROUND ROLL</th>
<th>TOTAL TO CLEAR 50' OBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200</td>
<td>55</td>
<td>0</td>
<td>345</td>
<td>680</td>
<td>405</td>
<td>770</td>
<td>480</td>
<td>885</td>
<td>580</td>
<td>1040</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>205</td>
<td>460</td>
<td></td>
<td>245</td>
<td>525</td>
<td>295</td>
<td>615</td>
<td>365</td>
<td>725</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>100</td>
<td>275</td>
<td></td>
<td>120</td>
<td>320</td>
<td>155</td>
<td>380</td>
<td>195</td>
<td>460</td>
</tr>
<tr>
<td>2600</td>
<td>60</td>
<td>0</td>
<td>500</td>
<td>915</td>
<td>585</td>
<td>1045</td>
<td>705</td>
<td>1230</td>
<td>855</td>
<td>1470</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>310</td>
<td>635</td>
<td></td>
<td>370</td>
<td>735</td>
<td>455</td>
<td>870</td>
<td>560</td>
<td>1055</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>165</td>
<td>395</td>
<td></td>
<td>200</td>
<td>465</td>
<td>255</td>
<td>565</td>
<td>325</td>
<td>695</td>
</tr>
<tr>
<td>3000</td>
<td>64</td>
<td>0</td>
<td>695</td>
<td>1210</td>
<td>820</td>
<td>1405</td>
<td>990</td>
<td>1675</td>
<td>1205</td>
<td>2045</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>450</td>
<td>855</td>
<td></td>
<td>535</td>
<td>1005</td>
<td>660</td>
<td>1215</td>
<td>815</td>
<td>1505</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>250</td>
<td>555</td>
<td></td>
<td>310</td>
<td>685</td>
<td>390</td>
<td>820</td>
<td>500</td>
<td>1030</td>
</tr>
</tbody>
</table>

**NOTE:** INCREASE DISTANCES 10% FOR EACH 14° C ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

**Figure 26.** — Takeoff Data Chart.
Figure 27.—Maximum Climb Chart.
### SHORT-FIELD TAKEOFF DISTANCE

**CONDITIONS:**
1. Power — FULL THROTTLE and 2700 RPM before releasing brakes.
2. Mixtures — LEAN for field elevation.
3. Cowl flaps — OPEN.
4. Wing flaps — UP.
5. Level, dry, hard-surface runway.

**NOTE:**
1. Increase total distance 8 percent for operation on dry, sod runway.
2. Decrease total distance 7 percent for each 10 knots of headwind.
3. Increase total distance 5 percent for each 2 knots of tailwind.

<table>
<thead>
<tr>
<th>WEIGHT-POUNDS</th>
<th>TAKEOFF TO 50-FOOT OBSTACLE FEET</th>
<th>PRESSURE ALTITUDE FEET</th>
<th>20 C</th>
<th>30 C</th>
<th>40 C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GROUND ROLL FEET</td>
<td>TOTAL DISTANCE TO CLEAR 50' OBS</td>
<td>GROUND ROLL FEET</td>
<td>TOTAL DISTANCE TO CLEAR 50' OBS</td>
<td>GROUND ROLL FEET</td>
</tr>
<tr>
<td>5500</td>
<td>Sea Level</td>
<td>1390</td>
<td>1760</td>
<td>1490</td>
<td>1860</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>1530</td>
<td>1950</td>
<td>1640</td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>1680</td>
<td>2150</td>
<td>1810</td>
<td>2300</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>1860</td>
<td>2380</td>
<td>2000</td>
<td>2550</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>2060</td>
<td>2650</td>
<td>2220</td>
<td>2850</td>
</tr>
<tr>
<td></td>
<td>5000</td>
<td>2280</td>
<td>2950</td>
<td>2460</td>
<td>3100</td>
</tr>
<tr>
<td></td>
<td>6000</td>
<td>2530</td>
<td>3310</td>
<td>2730</td>
<td>3590</td>
</tr>
<tr>
<td></td>
<td>7000</td>
<td>2830</td>
<td>3750</td>
<td>3100</td>
<td>4190</td>
</tr>
<tr>
<td></td>
<td>8000</td>
<td>3280</td>
<td>4420</td>
<td>3540</td>
<td>4940</td>
</tr>
<tr>
<td></td>
<td>9000</td>
<td>3890</td>
<td>5170</td>
<td>4020</td>
<td>5730</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>4150</td>
<td>6140</td>
<td>4500</td>
<td>6980</td>
</tr>
<tr>
<td>5100</td>
<td>Sea Level</td>
<td>1160</td>
<td>1470</td>
<td>1240</td>
<td>1570</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>1240</td>
<td>1620</td>
<td>1370</td>
<td>1720</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>1400</td>
<td>1780</td>
<td>1500</td>
<td>1910</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>1550</td>
<td>1960</td>
<td>1690</td>
<td>2100</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>1710</td>
<td>2180</td>
<td>1840</td>
<td>2240</td>
</tr>
<tr>
<td></td>
<td>5000</td>
<td>1890</td>
<td>2410</td>
<td>2030</td>
<td>2490</td>
</tr>
<tr>
<td></td>
<td>6000</td>
<td>2080</td>
<td>2690</td>
<td>2250</td>
<td>2860</td>
</tr>
<tr>
<td></td>
<td>7000</td>
<td>2330</td>
<td>3010</td>
<td>2510</td>
<td>3250</td>
</tr>
<tr>
<td></td>
<td>8000</td>
<td>2500</td>
<td>3400</td>
<td>2800</td>
<td>3660</td>
</tr>
<tr>
<td></td>
<td>9000</td>
<td>2920</td>
<td>3980</td>
<td>3270</td>
<td>4360</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>3390</td>
<td>4580</td>
<td>3900</td>
<td>5050</td>
</tr>
<tr>
<td>4700</td>
<td>Sea Level</td>
<td>960</td>
<td>1220</td>
<td>1020</td>
<td>1300</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>1050</td>
<td>1340</td>
<td>1120</td>
<td>1430</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>1150</td>
<td>1460</td>
<td>1230</td>
<td>1560</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>1270</td>
<td>1510</td>
<td>1350</td>
<td>1720</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>1400</td>
<td>1770</td>
<td>1500</td>
<td>1900</td>
</tr>
<tr>
<td></td>
<td>5000</td>
<td>1540</td>
<td>1960</td>
<td>1650</td>
<td>2100</td>
</tr>
<tr>
<td></td>
<td>6000</td>
<td>1700</td>
<td>2170</td>
<td>1830</td>
<td>2330</td>
</tr>
<tr>
<td></td>
<td>7000</td>
<td>1900</td>
<td>2410</td>
<td>2030</td>
<td>2550</td>
</tr>
<tr>
<td></td>
<td>8000</td>
<td>2100</td>
<td>2700</td>
<td>2290</td>
<td>2910</td>
</tr>
<tr>
<td></td>
<td>9000</td>
<td>2350</td>
<td>3040</td>
<td>2540</td>
<td>3290</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>2620</td>
<td>3430</td>
<td>2830</td>
<td>3730</td>
</tr>
</tbody>
</table>

**Figure 28.—Short-Field Takeoff Distance Chart.**
GLIDE DISTANCE

CONDITIONS:
GEAR UP
FLAPS UP
COWL FLAPS CLOSED
PROPELLER FULL HIGH PITCH (LOW RPM)
GLIDE SPEED 122 KIAS

NOTES:
1. INCREASE GLIDE DISTANCE APPROXIMATELY 10% FOR EACH 10 KNOTS OF TAILWIND.
2. DECREASE GLIDE DISTANCE APPROXIMATELY 10% FOR EACH 10 KNOTS OF HEADWIND.

Figure 29.—Glide Distance Chart.
Figure 30.—Wind Component Chart.
LANDING DISTANCE

CONDITIONS:

POWER
AS REQUIRED TO MAINTAIN 800 FT/MIN DESCENT ON APPROACH

FLAPS
DOWN

RUNWAY
PAVED, LEVEL, DRY SURFACE

APPROACH SPEED
IAS AS TABULATED

NOTE: GROUND ROLL IS APPROX. 53% OF TOTAL LANDING DISTANCE OVER A 50 FT OBSTACLE.

EXAMPLE:

OAT
27 °C

PRESSURE ALTITUDE
4000 FT

LANDING WEIGHT
3200 LB

HEADWIND
10 KTS

TOTAL LANDING DISTANCE OVER A 50 FT OBSTACLE
1475 FT

GROUND ROLL (53% OF 1475)
782 FT

IAS APPROACH SPEED
87 MPH IAS

<table>
<thead>
<tr>
<th>WEIGHT POUNDS</th>
<th>IAS APPROACH SPEED (ASSUMES ZERO INSTR. ERROR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MPH</td>
</tr>
<tr>
<td>3400</td>
<td>90</td>
</tr>
<tr>
<td>3200</td>
<td>87</td>
</tr>
<tr>
<td>3000</td>
<td>84</td>
</tr>
<tr>
<td>2800</td>
<td>81</td>
</tr>
<tr>
<td>2600</td>
<td>78</td>
</tr>
<tr>
<td>2400</td>
<td>75</td>
</tr>
</tbody>
</table>

Figure 31.—Landing Distance Chart.
USEFUL LOAD WEIGHTS AND MOMENTS

EMPTY WEIGHT DATA

<table>
<thead>
<tr>
<th>Empty Weight (Lb.)</th>
<th>Empty Weight Moment (/100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificated Weight</td>
<td>2110 1652</td>
</tr>
</tbody>
</table>

*Oil is included in empty weight

OCCUPANTS

<table>
<thead>
<tr>
<th></th>
<th>Front Seats</th>
<th>Rear Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARM 85</td>
<td>ARM 111</td>
</tr>
<tr>
<td>Weight</td>
<td>Fwd Position</td>
<td>Weight</td>
</tr>
<tr>
<td>120</td>
<td>102</td>
<td>120</td>
</tr>
<tr>
<td>130</td>
<td>111</td>
<td>130</td>
</tr>
<tr>
<td>140</td>
<td>119</td>
<td>140</td>
</tr>
<tr>
<td>150</td>
<td>128</td>
<td>150</td>
</tr>
<tr>
<td>160</td>
<td>136</td>
<td>160</td>
</tr>
<tr>
<td>170</td>
<td>145</td>
<td>170</td>
</tr>
<tr>
<td>180</td>
<td>153</td>
<td>180</td>
</tr>
<tr>
<td>190</td>
<td>162</td>
<td>190</td>
</tr>
<tr>
<td>200</td>
<td>170</td>
<td>200</td>
</tr>
</tbody>
</table>

FUEL

<table>
<thead>
<tr>
<th>Gallons</th>
<th>Weight</th>
<th>Moment</th>
<th>Gallons</th>
<th>Weight</th>
<th>Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>30</td>
<td>23</td>
<td>45</td>
<td>270</td>
<td>203</td>
</tr>
<tr>
<td>10</td>
<td>60</td>
<td>45</td>
<td>49</td>
<td>294</td>
<td>221</td>
</tr>
<tr>
<td>15</td>
<td>90</td>
<td>68</td>
<td>55</td>
<td>330</td>
<td>248</td>
</tr>
<tr>
<td>20</td>
<td>120</td>
<td>90</td>
<td>60</td>
<td>360</td>
<td>270</td>
</tr>
<tr>
<td>25</td>
<td>150</td>
<td>113</td>
<td>65</td>
<td>390</td>
<td>293</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>135</td>
<td>70</td>
<td>420</td>
<td>315</td>
</tr>
<tr>
<td>35</td>
<td>210</td>
<td>158</td>
<td>75</td>
<td>450</td>
<td>338</td>
</tr>
<tr>
<td>40</td>
<td>240</td>
<td>180</td>
<td>80</td>
<td>480</td>
<td>360</td>
</tr>
</tbody>
</table>

GROSS WEIGHT MOMENT LIMITS

NOTE: All moments are equal to weight X arm / 100

Figure 36.—Weight and Balance Chart.
Figure 40.—Wind Triangle.

Figure 41.—ADF Indicators (Fixed-Dial).
VOR INDICATIONS
NOTE: OBS set to 180 °

T  TO
U  TO
V  FROM
W  FROM
X  Neutral Flag
Y  Neutral Flag
Z  Neutral Flag

Figure 42.—VOR Indications.
Figure 43.—RMI Indicators.
Figure 46.—Sectional Chart Excerpt.
Class C Airspace

Figure 47.—Class C Airspace Diagram.

Figure 48.—Rectangular Course.
Figure 49.—Ground Track Diagram.

Figure 50.—S-Turn Diagram.

Figure 51.—S-Turn Diagram.

Figure 52.—Turn-and-Slip Indicators.

Figure 53.—Heliport Markings.

Figure 54.—Traffic Pattern Indicator.
TEXAS

DALLAS LOVE FLD (DAL) 5 NW UTC-6(-5DT) N32°50.53' W96°51.11'

487 B 54 FUEL 100LL, JET A 01, 2, 3, 4 LRA ARFF Index B
RWY 13R-31L H8800X150 (CONC) S-100, D-200, DT-350 HIRL CL
RWY 13R: VASI(V4L)—GA 3.0' TCH 53'. Thrid despacd 490'. Tree. Rgt tfc.
RWY 31L: MALSRT. TDZ. Building.

RWY 13L: H7753X150 (CONC-GRVD) S-100, D-200, DT-350 HIRL CL
RWY 13L: MALSRT. TDZ. Tree. RWY 31R: MALSRT. VASI(V4L)—GA 3.0' TCH 38'. Pote. Rgt tfc.

RWY 18R: H6149X150 (ASPH) S-50, D-74, DT-120 HIRL
RWY 18R: VASI(V4L)—GA 3.0' TCH 52'. Rgt tfc. RWY 36R: VASI(V4L)—GA 3.0' TCH 52'. REIL. Tree. Rgt tfc.

RUNWAY DECLARED DISTANCE INFORMATION

RWY 13: TORA—7753 TORA—7753 ASDA—7753 LDA—7753
RWY 31R: TORA—7753 TORA—7753 ASDA—7753 LDA—7753
RWY 31L: TORA—8600 TORA—8600 ASDA—8600 LDA—8610
RWY 31R: TORA—8600 TORA—8600 ASDA—8600 LDA—8600
RWY 31L: TORA—6149 TORA—6149 ASDA—6149 LDA—6149
RWY 31R: TORA—6149 TORA—6149 ASDA—6149 LDA—6149

AIRPORT REMARKS: Attended continuously. Birds on and infl vnt arpt. 250' AGL crane 1 mile south AER 3 1L SR-SS. 180' marked crane 4000' south AER 31L daight hours. Log Rwys 18 & takeoff Rwys 36 not authorized to aircraft over 80,000 lbs gross weight unless crosswind NW-SE reys exceed safe safe operating capability. Noise sensitive areas all quadrants, noise abatement procedures in effect for fixed and rotary wing tfc, for information call arpt ops 214-570-8810. Private pilot certificate or better required to takeoff or land, no student solo flights permitted. Rwys 26 VASI OTS Indef. Rwys 31R VASI OTS Indef. Rwys 77 clsd indef. Rwys A has a 500' light barricade 3600' eph and Rwry 13L. Twy M edge lights out of svc between Twy B and Rwry 18. Reflectors in place. Twy K clsd thru traffic. Flight Notification Service (ADCMUS) available. NOTE: See Land and Hold Short Operations Section.

COMMUNICATIONS: ATIS 120.15 UNICOM 122.95

FORT WORTH FSS (FTW) TF 1-800-WX-BRIEF. NOTAM FILE DAL.
DALLAS RCO 122.3 (FORT WORTH FSS)

@REGIONAL APP CON 125.2 (South) 124.3 (North)

LOVE TOWER 118.7 GND CON 121.75 CLNC DEL 127.9

@REGIONAL DEP CON 118.55

FORT WORTH FSS (FTW) TF 1-800-WX-BRIEF. NOTAM FILE DAL.

DALLAS-FT. WORTH (DFW) VORTACW 117.0 DFW Chan 117 N32°51.96' W97°01.88'

090° 9.0 NM to ftd. 5600E

CONS NDB (LOM) 275° LV N32°46.48' W96°45.61' 311° 5.8 NM to ftd.

ILS/DME 111.5-1-DAL Chan 52 Rwry 13L

ILS/DME 111.1-1-1-DPX Chan 46 Rwry 13R. LOC unusable beyond 25' right side of course.

ILS/DME 111.1-1-LVF Chan 46 Rwry 31L. LOM CONS NDB. BC unusable.

ILS/DME 111.5-1-O/VW Chan 52 Rwry 31R.

ASR

RED BIRD (RBD) 8 SW UTC-6(-5DT) N32°49.39' W96°52.09'

860 B 54 FUEL 100LL, JET A 01, 2, 3, 4 LRA ARFF Index B

RWY 13-31: H6451X150 (CONC) S-35, D-60, DT-110 HIRL 0.3% up NW

RWY 13: REIL. VASI(V4L)—GA 3.0' TCH 50'. Trees.

RWY 31: LDIN. VASI(V4L)—GA 3.0' TCH 47'. Road.

RWY 17-35: H3801X150 (CONC) S-35, D-60, DT-110 HIRL

RWY 17: REIL. PAPI (P4R)—GA 3.0' TCH 43'. RWY 35: REIL.


Vasi Rwry 13 and PAPI Rwry 17 1200. NOTE: See Land and Hold Short Operations Section.

WEATHER DATA SOURCES: ASOS 125.925 (214) 330-5317. LAWRS.

COMMUNICATIONS: CTAF 120.3 ATIS 126.35 UNICOM 122.95

FORT WORTH FSS (FTW) TF 1-800-WX-BRIEF. NOTAM FILE RDW.

@REGIONAL APP/DEP CON 125.2

TOWER 120.3 (1400-03002) GND CON 121.7 CLNC DEL 125.45

RADIUS: CLASS D svc effective 1400-03002 other times CLASS G.

RADIO AIDS TO NAVIGATION: NOTAM FILE DFW.

DALLAS-FORT WORTH (DFW) VORTACW 117.0 DFW Chan 117 N32°51.96' W97°01.88'

136° 13.7 NM to ftd. 56008.

NDB (NW) 287 RBD N32°40.62' W96°52.27' at ftd. NOTAM FILE RBD.

ILS 108.5 I-RBD Rwry 31, Unmonitored when tower closed.

DAN E. RICHARDS MUNI (See PADUCAH)

DAVID HOOKS N30°07.53' W95°33.96' NOTAM FILE DWH.

HOUSTON NDB (MWB) 521 DWH 164° 3.9 NM to David Wayne Hooks Mem. Unmonitored.

L-17B

DAVID WAYNE HOOKS MEM (See HOUSTON)

FIGURE 55.—Airport/Facility Directory.